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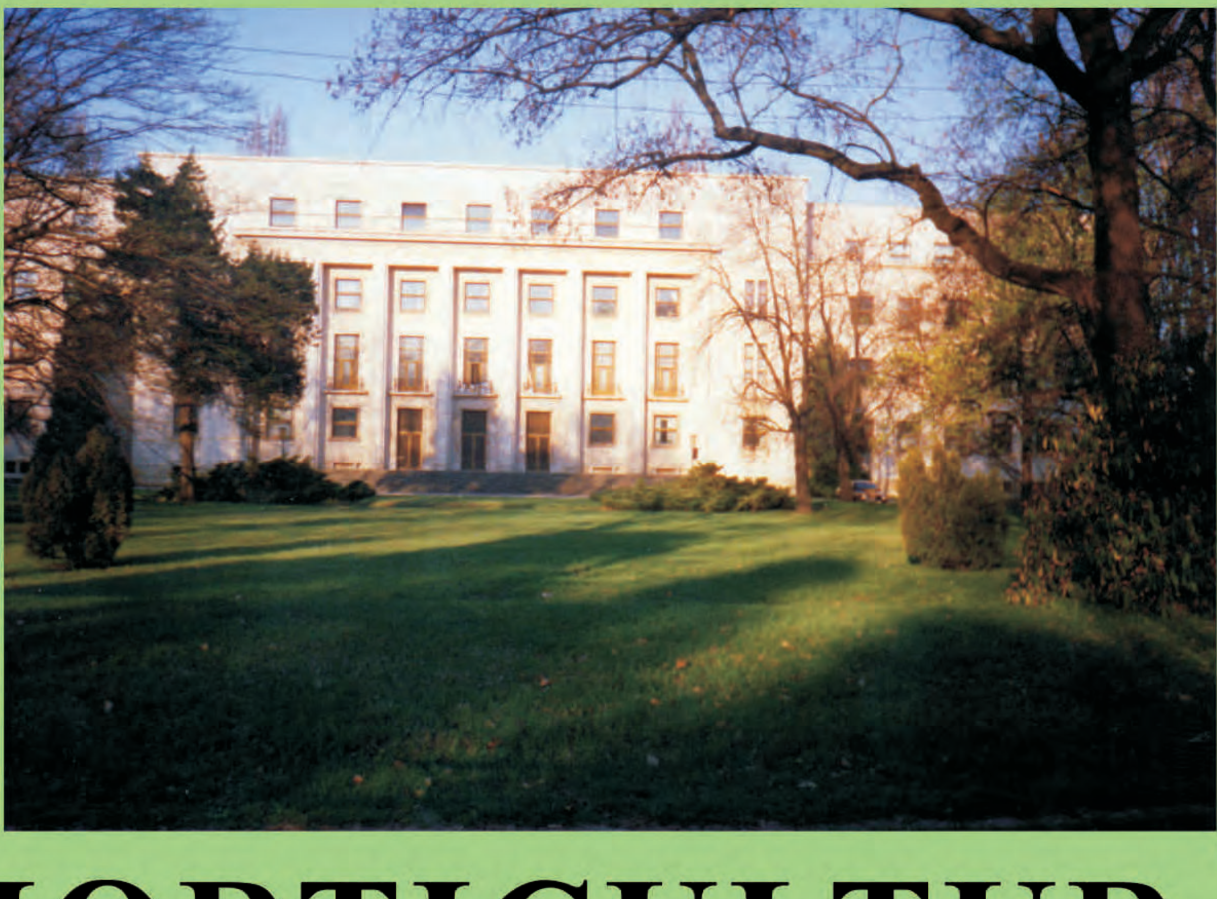

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MINISTRY OF EDUCATION, RESEARCH, YOUTH AND SPORTS

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VEGETABLE GROWING

Research on quality of carrot cultivars grown in Dobrogea

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Keywords: carrots quality, nitrates, carbohydrate, acidity, vitamin C

ABSTRACT

Carrot is a vegetable species and roots are used in human food both fresh and preserved or cooked condition. Carrots have high content of carbohydrates (8.64 g/100g fresh weight), minerals (calcium 33g/100g fresh weight, phosphorus 32g/100g fresh weight, iron 0.6 g/100g fresh weight, sodium and potassium 42g/100g fresh weight and 303g/100g fresh weight) and vitamins, especially vitamin A (11,000 IU). The aim of this research is to establish the quality of different cultivars of carrots cultivated in our country. Analyses of quality suppose some agrochemical and biochemical characteristics and also the production obtained at cultivated cultivars.

INTRODUCTION

Carrot is a vegetable species and roots are used in human food both fresh and preserved or cooked condition. Carrot is grown for its root tuberrized, which has a high food value. It has a high content of carbohydrates (8.64 g/100g fresh weight), minerals (calcium 33g/100g fresh weight, phosphorus 32g/100g fresh weight, iron 0.6 g/100g fresh weight, sodium and potassium 42g/100g fresh weight and 303g/100g fresh weight) and vitamins, especially vitamin A (11,000 IU) (Gherghe et al., 2001).

The flavors of raw-consumed-roots are great and have multiple therapeutic effects. Carrot juice, taken daily in quantities - 1 liter normalize functions throughout the body and especially the liver. Stimulates appetite and helps digestion, is a natural solvent of ulcer formation and cancer and has an anti infectious effect (Walton et al., 1966).

To all this, adding that consumption possibilities are simple and varied, it can be purchased at reasonable prices, that is an important raw material for industrialization, particularly for producing fortified juices that roots with resistance to storage can be consumed fresh throughout the year, explains that the carrot of root vegetables is the biggest consumer in the world. (Voican et al., 2002).

Culture is practiced in all temperate areas of the globe and in our country in the year 2009 in our country have grown about 7500ha with a total production of about 100,000tone and the average production was 13.3 t/ha.

The aim of this research is to establish the quality of different cultivars of carrots cultivated in our country.

MATERIALS AND METHODS

In order to achieve researches on production performance and quality of new carrot cultivars the studies were made at SC big Land Company SRL, Constanta County in 2010.

Cultivars to be studied are presented in Table 1.

Technology characteristics used are:

Sowing

• planting scheme: 70 x 35 x 35; density between plants per row: 3.5 to 4.5; Density: 650.000 plants/ha; seed required per hectare: 5-6 kg/ha.

Carrots were sown on 16/03/2010, plants have sprung up to 02.04.2010 under normal conditions.

Irrigation culture

• Irrigation is done after sowing to ensure optimum moisture conditions necessary sprung of plants and 5-6 times during the fattening roots with norms of 400-600 cubic meters/ha.

Maintenance works

• run a blind breeding for crust formation or in case of weeds; manual thinning is performed when the roots have thickness of a pencil, in order to capitalize on the market, leave a distance of 4-5 cm between plants per row; culture fertilization was performed with a dose of 90kg/ha at the beginning of culture, fertilizer complex deep plowing with 15:15:15.

Sampling was conducted approximately 120 days after emergence respectively on 14.07.2010.

At harvest were made analysis on the quality of carrots: measuring length and diameter of the package, weighing carrots, analyzes the content of nitrates, phosphates and potassium, biochemical analysis of the content of sugars, acidity, vitamin C and carotene, the resulting data are 20pcs average values, collected randomly.

RESULTS AND DISCUSSIONSS

Biometric measurements of length and diameter of carrots are included in Table 2.

Examining the results of length from the five cultivars is observed that the lowest value was recorded in Belgrade F1 with a growing average of 16.52 cm and the longest carrots were obtained from cultivation Canada F1 with a length of 19.56 cm. In some cultivars the smaller diameters were registered in this case of Marion F1 with 2.20 cm followed by Belgrade F1 with a diameter of 2.37 cm, at the opposite pole there are cultivars Canada F1 with an average diameter of 4.24 cm and Florida F1 4, 15cm.These dimensions recorded in the same culture conditions show that all tested cultivars adapted to the climate of our country provided that the required technology.

Analyzing in terms of commercial quality required by standards for carrots, the cultivars are at the first quality, very good and can be sold fresh for human consumption (Order no. 1 of 3 January 2002).

The quality for consumption of carrots can be appreciated from the specific content analysis of nitrates, phosphorus and potassium (Table 3).It is known that the carrot culture is a good vegetable which recover very well the nitrogen fertilization, sometimes accumulating large amounts of nitrates without showing distinct signs in this case. In our experimental variants it can be seen that nitrate accumulated in small quantities, quantities between 78ppm and 101ppm. Fertilization was carried out without affecting the normal nitrogen content of carrots and this element was metabolized during the growing season. Comparing the values obtained from the values obtained at the experimented cultivars with maximum admitted limits for nitrates of 400ppm in N-NO3 required by the Order Nr. 1 of January 3, 2002, show that the carrots are qualitative and have no restrictions on consumption.

In the case of phosphorus, an element that helps to achieve higher yields but which has a known effect on the quality of vegetables, values accumulated in appreciable amounts ranging from 246.21 ppm at Canada F1cultivar to 318.32 ppm at Belgrade F1cultivar. These quantities evaluated assure the quality of carrots because the normal supply of these vegetables should be between 200 and 400ppm.

Potassium accumulated in high values in carrots respectively between 2350ppm and 2980ppmK, values that provide good carrots aspect for marketing and transport.

For vegetables some features taste are important to their marketing. So these features are revealed by biochemical analysis of the content of carbohydrates, vitamin C and acidity to be balanced (Table 4).

If the consumption is of fresh carrots and the industrialization in the form of smoothies for children is very important carbohydrate content. Analysis of the characteristics of the cultivars tested indicates that carbohydrates vary widely between 5.8% respectively in the De Nantes cultivar and growing 8.2% in Canada F1. From the literature it is known that Canada F1 and Florida F1 cultivars are recommended for industrialization which can be explained by greater accumulation of carbohydrates in them by 8.2% and 7.1% respectively.

Acidity, a characteristic that can affect human consumption is situated in experimental cultivars between 0.46% and 0.65%, lower content.

Vitamin C also accumulated in varying amounts for the same culture conditions varying between 185mg/100g fresh matter at De Nantes cultivar and 293mg/100g fresh matter at Belgrade F1. Vitamin C is a quality characteristic of carrots because determined necessary vitamin supplement for human body.

Examination of biochemical characteristics can be said that two cultivars are best in terms of quality, namely Canada F1 and Florida F1.

Biochemical analysis also included the carotene pigment that determines color intensity and also carrots outside aspect. When there were tested cultivars carotene content vary between 7.20mg/100g fresh matter at F1 Canada to 10.60 mg/100g fresh matter at Belgrade F1. Carotene values are with small differences which shows that carrots are close to the color selected so that from this point of view quality is not affected.

The production of carrot culture in the Dobrogea conditions area (Table 5) shows that the quantities produced range from 16.25 t/ha to the cultivar Marion F1 and 18.18 t/ha to the cultivar Canada F1. Statistical interpretation of the results shows little difference between cultivars yields insignificant quantity obtained being close.

CONCLUSIONS

Research carried out on carrot cultivars showed the following:

1. These dimensions of the carrots recorded in the same culture conditions show that all tested cultivars adapted to the climate of our country provided that the required technology;
2. Analyzing in terms of commercial quality standards required for all cultivars carrots are at the first quality, very good and can be sold fresh for human consumption (Order no. 1 of 3 January 2002);
3. In our experimental variants can be seen that nitrate accumulated in small quantities, quantities between 78ppm and 101ppm fall. Comparing the values obtained from the values obtained at the experimented cultivars with maximum admitted limits for nitrates of 400ppm in N-NO3 required by the Order Nr. 1 of January 3, 2002, show that the carrots are qualitative and have no restrictions on consumption;
4. Analysis of the characteristics of the cultivars tested indicates that carbohydrates varies widely between 5.8% respectively in the cultivar of Nantes and growing 8.2% in Canada F1;
5. Acidity, a characteristic that can affect human consumption is situated in experimental cultivars between 0.46% and 0.65%, lower content;
6. Examination of biochemical characteristics can be said that two cultivars are best in terms of quality, namely Canada F1and Florida F1;
7. Statistical interpretation of the results shows little difference between cultivars yields insignificant quantity obtained being close.

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TABLES

Table 1

Experimental variants

No var.	Cultivar	Destination for consumption
Ct	De Nantes	Fresh consumption or storage
V1	Belgrad F1	Industrialization, storage, use fresh
V2	Marion F1	Fresh consumption or storage
V3	Canada F1	Storage, industrialization
V4	Florida F1	Storage, industrialization

Table 2

Determinations regarding the measurements of carrot cultivars, medium value

Variant	Cultivar	Carrot measurements	
		Length, cm	Diameter, cm
Mt	De Nantes	17,32	2,51
V1	Belgrad F1	16,52	2,37
V2	Marion F1	17,31	2,20
V3	Canada F1	19,56	4,24
V4	Florida F1	19,26	4,15
Medium value		17,994	3,094

Table 3

Agrochemichal characteristics of carrots

Variant	Cultivar	Content, ppm		
		N-NO3	P-PO4	K
Mt	De Nantes	78	268,31	2450
V1	Belgrad F1	76	318,32	2980
V2	Marion F1	101	298,50	2540
V3	Canada F1	95	246,21	2380
V4	Florida F1	98	265,10	2350

Table 4

Biochemical characteristics of carrots

Variant	Cultivar	Carbohydrates, %	Acidity, %	Vitamin C, mg/100g fresh matter (malic acid)	Carotene, mg/100g fresh matter
Mt	De Nantes	5,8	0,46	185	8,50
V1	Belgrad F1	5,9	0,52	293	7,20
V2	Marion F1	6,2	0,65	250	9,12
V3	Canada F1	8,2	0,57	199	10,60
V4	Florida F1	7,1	0,61	260	9,80

Table 5

The production of carrots obtained from the cultivars

Variant	Cultivar	Production, t/ha	Procent	Dif. +/-	Signification
Mt	De Nantes	17,6184	100,00	-	-
V1	Belgrad F1	17,7704	100,86	+0,152	ns
V2	Marion F1	16,2592	92,28	-1,0892	o
V3	Canada F1	18,1888	103,24	+0,5704	ns
V4	Florida F1	17,9824	102,06	+0,364	ns

DL5%= 0.836109 DL1%= 1.157991 DL0.1%= 1.597636

Study of the productive and qualitative potential behavior of some eggplant hybrids cultivated in field in different technology conditions

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Keywords: production, technology, nutrition, hybrid, fertilization

ABSTRACT

Long drought conditions in unprotected field, as a result of the "global warming", determined a drastic decrease of vegetables production, especially for *eggplants*, because of the excessive temperatures that embarrassed pollen's germination and as a consequence determined no fecundation of flowers. In order to obtain profitable productions it is necessary that, along the choose of the suitable hybrids for the culture system, to apply an adequate culture technology and to assure a water regime (in soil and air) and a root nutrition necessary for plants, to assure also an extra-root appliance of bioactive products in order to stimulate flower fecundation and plants' metabolism. In this paper there are presented the results of production obtained after assuring the optimum conditions of humidity, root and extra-root fertilisation in a polyfactorial experiment initiated in this purpose.

INTRODUCTION

The climatic changes that happened in the world, known as "*global warming*" determined the installation of drought on large areas on the globe, contributing, many times, to a decrease of production obtained from unprotected field culture. Field vegetables culture in long drought conditions is dramatic, especially for eggplants, because really high temperatures determine the lack of pollen's germination and is favorable for diseases and pests attack.

With all the difficulties encountered, eggplants are required by consumers because they have special properties. It is considered that solanine, poisonous substance from raw eggplant, after burning, give rise to very healthy substances for the human body. (Iosif A. Kelleman şi Raphael W. Welstone de la Seattle University - 2002).

Nasunine, anthocyanins of eggplant composition, is a powerful antioxidant that prevents destruction of brain lipids in cell membranes, which protects it from harmful action of free radicals.

Assortment of eggplant cultivars has changed according to market requirements, cultivating hybrids with high biological and economic value, which is distinguished by resistance to storage, transport and especially the resistance to diseases and pests.

To obtain cost-effective production of economical point of view, with judicious choice of hybrids should be grown and application of culture technology, which in addition to providing a fluid system (soil and atmosphere) and adequate nutrition at plant root, it completes the application by extra root use of bioactive products in order to stimulate binding of flowers and plant metabolism (bioregulators Rodoleg and Vifarex or ecological products Bionex and Cropmax etc.).

Absorption of mineral elements by leaves is selective and irreversible and depends on many factors such as: light intensity and temperature, air humidity, pH (slightly acidic to neutral → 6.0 to 6.8) and state supply of the plant with applied foliar nutrients.

Ions from nutrient solutions penetrate through the cuticle and osteola of eggplant leaves and is even faster as solution's evaporation is slower. Potassium, calcium and magnesium cations penetrate the leaf cuticle faster than the anions of phosphorus and sulphur, while nitrogen far outdoes cations.

Extra-root fertilization with nitrogen, which is the most important nutrient for this, especially in cold soils, where root assimilation is much reduced, leads to an increased rate of photosynthesis, creating a positive correlation between mineral uptake by roots and extra-root feeding of nitrogen.

Correct routing of fluid regime (soil - air) and nutrition (root and extra-root) of eggplants are the premises of optimum manifestation of hybrids' production and quality potential grown in our experiment.

MATERIALS AND METHODS

The research was conducted on family owned land in the area of vegetable crops Sacoşu Turcesc village, Timis County.

Eggplant culture was established during 1-5.06.2009-2010 in unprotected field. Seedling age was 60 days, the density of 31,250 plants/ha, being established a polifactorial experience type:

Factor A – The hybrid;

a_1 – Madonna F1; a_2 – Dobrix F1.

Factor B – Irrigation and fertilization method

b_1 - sprinkler irrigation (administration of chemical fertilizers by spreading on the ground); b_2 - drip irrigation (water management along with chemical fertilizer drip irrigation – fertigation); b_3 – mixed irrigation (drip and sprinkler and water management of chemical fertilizers while drip irrigation - fertigation).

Factor C – Bioactive products applied by foliar treatments in order to stimulate flower binding and plants' metabolism

c_1- Rodoleg – bioregulator; c_2-Vifarex – bioregulator; c_3-Bionex – ecological product - foliar fertilizer with plant extract; c_4-Cropmax – complex nutrient very concentrated for foliar fertilization (100% natural).

Research goal was to make improvements in field crop technology, in terms of intervention for better binding of flowers by applying extra-root (foliar) bioactive products that influence, by their mode of action, fruit formation, irrigation methods that are best suited to the new conditions of drought, as an effect of global warming, and water management for root irrigation with required chemical fertilizers.

Research objectives refer to:

- behavior of eggplant hybrids, Madonna F1 and Dobrix F1, under the impact of interaction between experimental studied factors, in terms of production and quality potential manifestation (number of flowers/plants, number of bind flowers, number of normally developed fruits, average weight/fruit, percentage of First quality fruits etc.);
- setting the productive and qualitative potential manifestation at maximum, under the impact of one or another experimental;
- indicating the most favorable interaction factor in terms of productive potential manifestation.

RESULTS AND DISCUSSIONSS

Table 1 presents experimental results on the production elements under the impact of experimental factors.

There is a sharp distinction their lowest values recorded under the influence of b_2 (drip irrigation) in both hybrids studied.

In terms of number of flowers per plant in both hybrids are recorded a greater number under the influence of b_2 (drip irrigation) than in that of b_1 (sprinkler irrigation). Related to the number of flowers per plant, it reduces to both graduations b_1 (sprinkler irrigation) and b_3 (mixed irrigation), with percentages ranging, depending on the graduations of factor C (bioactive products applied by foliar spraying for binding flowers and acceleration of plant metabolism), from 13.2 → 18.5%.

Reduced number of flowers under the impact of b_2 (drip irrigation) can be explained by lack of pollen fertility due to low atmospheric humidity, due to very high temperatures during the day and even nights when the temperature not often falls below 20-22 ^oC.

In terms of number of fruits per plant normally developed in both hybrids has been marked variability depending on the influence of graduations of factor b (irrigation) in correlation with factor c (bioactive products applied by foliar spraying). The highest number of normally developed fruits is found in combinations $a_{1-2}b_3c_1$ of 87.7, respectively 85.8% striking out the combined impact for both hybrids of mixed irrigation (b_3) and Rodoleg bioregulator (c_1).

The average weight of fruits are also variable, with differences from one hybrid to the other, the best being those under the impact of b_3 (mixed irrigation) of Madonna F1 (199.9-202.8 g/piece) and those under the impact of b_2 (drip irrigation) of Dobrix F1 (191.5-195.5 g/buc).

The average productions per plant, as a result of the number of fruit/plant and the average weight/fruit, varies between 1.177 kg/pl ($a_1b_2c_4$) and 1.853 kg/pl ($a_1b_3c_1$) for Madonna F1 and between 1.094 kg/pl ($a_2b_2c_4$) and 1.747 kg/pl ($a_2b_3c_1$) for Dobrix F1. For both hybrids we remark mixed irrigation (b_3) and Rodoleg bioregulator (c_1), the correspondent productions being 36.8 t/ha and 57.9 t/ha for Madonna F1 and of 34.2 t/ha and 54.6 t/ha for Dobrix F1.

Tables 2 and 3 and figures 1 and 2 show the different productions obtained under the impact of the two factors - B (irrigation method) and C (bioactive products applied by foliar sprayings) – and also the average value of the experiment for the three graduations of B factor and for the four graduations of C factor.

Under the impact of factor B graduations, that is the three irrigation methods, we find the following:

- the highest obtained productions for both hybrids are in b_3 (mixed irrigation) of 55.3 t/ha (124.3%) for Madonna F1 and of 52.8 t/ha (126.3%) for Dobrix F1, the percentage being calculated considering the average obtained production under the impact of b_1 (sprinkler irrigation), of 44.5 t/ha for Madonna F1 and of 41.8 t/ha for Dobrix F1.

- the average production of the experiment under the impact of the three irrigation methods is of 37.4 t/ha (83.5%) in b_2 (drip irrigation), de 43,2 t/ha (96.4%) in b_1 (sprinkler irrigation) and of 54.1 t/ha (120.8%) in b_3 (mixed irrigation), the percentage calculation being made reporting to the average value of the experiment (Mx) of 44.8 t/ha (100.0%).

- the lowest production was obtained under the impact of drip irrigation (b_2), being 37.4 t/ha (83.5%), while the highest value was obtained under the impact of mixed irrigation (b_3), being 54.1 t/ha (120.8%).

Under the impact of factor A (the hybrid) The average obtained productions are close to each other, being 46.0 t/ha in a_1 – Madonna F1 and 43.7 t/ha in a_2 – Dobrix F1 (95.0% than a_1).

The maximum percentage of First quality productions was obtained in a_2b_3 – 78.8%, for Dobrix F1, where we applied mixed irrigation, then a_2b_1 – 77.0%, for Dobrix F1 with sprinkler irrigation (b_1). Madonna F1 has lower percentages in the same order. The average value of First quality for Dobrix F1 (a_2) is 75.7%, and for Madonna F1 (a_1) is 73.5% (tables 2 and 3, figures1and 2).

Under the impact of factor C (bioactive products) the best results of quality were obtained in c_1 – Rodoleg (76.1%), then c_4 – Cropmax (74.8%). The average value of First quality production (Mx) is 33.5 t/ha – 74.7%.

In terms of production phased in, over the period July to September there is a sharp ealyness of production under the influence of b_3 (mixed irrigation) to higher values in a_1 - Madonna F1, peak production lies in the second and the third decade of August (fig. 1 and 2).

The analysis of table 4, where there are the effects of unilateral and interactions influence of experimental factors on production, resulting from the variance analysis statistical calculation, reveals the following:
- the productions obtained from Madonna F1 (a_1) are statistically covered, the significance of production differences between it and the productions obtained from Dobrix F1 (a_2) and the average value of the experiment (Mx – a_3) being very significant negative. The production of Madonna F1 (a_1) is superior to the productions obtained from a_2 – Dobrix F1 and the average value of the experiment (Mx-a_3);
- the productions obtained under the impact of the three irrigation methods are statistically covered, the production difference significance being very significant negative or positive, depending on each case;
- we remark mixed irrigation (b_3) the differences between it and b_1 (sprinkler irrigation) and b_2 (drip irrigation) being in both cases very significant positive;
- considering the unilateral impact of the bioactive product upon the production, we see very significant positive and negative differences, the hierarchy being the same in the anterior tables (point 3);
- the interaction between different irrigation methods and different hybrids point out the superiority of some methods (b_3 and b_1) associated with one of the hybrids (point 4);
- the interaction impact of other parameters show the superiority of irrigation method b_3 (mixed irrigation) and b_1 (sprinkler irrigation) associated with any of the bioactive products;
- the production differences from point 6 have significances that vary from very significant negative to distinct and significant negative to no significance.

CONCLUSIONS

1. Irrigation methods b_1 (sprinkler irrigation) and b_3 (mixed irrigation: drip + sprinkler) showed their efficacy by the high obtained productions and their high quality;
2. Mixed irrigation (b_3) and sprinkler irrigation (b_1), in field conditions culture showed their efficacy compared to drip irrigation (b_2), by the high productions obtained from Madonna F1 and Dobrix F1;
3. The obtained productions under the impact of Rodoleg bioactive product (c_1) in all irrigation variants and for both hybrids Madonna F1 (a_1) and Dobrix F1 (a_2) overpassed the others considering the quantitative and qualitative aspects;
4. The lowest productions, obtained in case of drip irrigation (b_2), are due to the smallest number of bind flowers/plant (58.8-61.3% compared with 78.2-81.9 % in b_3), because of very high temperatures registered in field during the day with infertility effects upon pollen. Air humidity was extremely low when there was applied drip irrigation;
5. We recommend to use, for eggplants culture in field, mixed irrigation (drip + sprinkler), and if the costs are to high or it is impossible to use this method, we recommend at least sprinkler irrigation, instead of drip irrigation;
6. We recommend the use of bioactive natural or synthesis products with foliar sprayings in order to stimulate flower binding and plants' metabolism, especially the use of Rodoleg (c_1), but we do not exclude the other products;
7. We also recommend a continuation of this research in order to consolidate the conclusions obtained and to elucidate some aspects about unilateral or interaction impacts between the experimental factors upon eggplants' production, considering the vegetation factors, especially the relative air humidity, the temperature and soil's fertility, and plants' reaction to bioactive products sprayings, maybe other than those presented in this article.

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TABLES AND FIGURES

Table 1

Experimental results concerning the irrigation methods and bioactive products applied by foliar sprayings to eggplants cultivated in field, 2009-2010

Factor			Number of flowers/plant			No. of normally developed fruits		Average weight of a fruit (g/piece)	Obtained production						
									Average production		Compared to c_1 (%)	Average production under the impact of			
A	B	C	piece (pcs.)	Din care legate:								Factor B		Factor A	
				pcs.	%	pcs.	%		kg/pl.	t/ha		t/ha	%	t/ha	%
a_1	b_1	c_1	11,55	9,10	78,8	7,78	85,5	191,7	1,491	46,6	100,0	44,5	100,0	46,0	100,0
		c_2	11,73	8,81	75,1	7,43	84,3	190,1	1,414	44,2	94,8				
		c_3	12,97	9,38	72,3	7,54	80,4	188,9	1,424	44,5	95,5				
		c_4	12,10	8,69	72,8	7,09	81,6	192,2	1,363	42,6	91,4				
	b_2	c_1	12,76	7,82	61,3	6,31	80,7	201,3	1,270	39,7	100,0	38,2	85,8		
		c_2	12,36	7,44	60,2	6,14	82,5	198,5	1,219	38,1	96,0				
		c_3	11,97	7,12	59,5	6,19	86,9	197,7	1,225	38,3	96,5				
		c_4	12,06	7,13	59,1	5,87	82,3	200,3	1,177	36,8	92,7				
	b_3	c_1	12,72	10,42	81,9	9,14	87,7	202,8	1,853	57,9	100,0	55,3	124,3		
		c_2	12,86	10,38	80,7	8,83	85,1	200,6	1,772	55,4	95,7				
		c_3	13,64	10,87	79,7	8,95	82,3	199,9	1,789	55,9	96,5				
		c_4	12,46	9,88	79,3	8,26	83,6	201,7	1,667	52,1	89,9				
a_2	b_1	c_1	11,94	9,28	77,7	7,69	82,9	182,4	1,402	43,8	100,0	41,8	100,0	43,7	95,0
		c_2	11,78	8,98	75,2	7,33	81,6	180,1	1,328	41,5	94,7				
		c_3	12,06	9,49	73,8	7,48	78,8	179,3	1,341	41,9	95,7				
		c_4	12,19	8,89	72,9	7,04	79,2	181,5	1,277	39,9	91,1				
	b_2	c_1	12,22	7,36	60,2	6,37	86,5	195,5	1,245	38,9	100,0	36,5	87,3		
		c_2	12,13	7,28	60,0	6,18	84,9	192,1	1,187	37,1	95,4				
		c_3	12,55	7,44	59,3	5,98	80,4	191,5	1,146	35,8	92,0				
		c_4	12,99	7,05	58,8	5,62	79,7	194,7	1,094	34,2	87,9				
	b_3	c_1	13,85	11,05	79,8	9,48	85,8	184,3	1,747	54,6	100,0	52,8	126,3		
		c_2	13,94	11,10	79,6	9,29	83,7	181,5	1,686	52,7	96,5				
		c_3	15,04	11,81	78,5	9,46	80,1	178,6	1,690	52,8	96,7				
		c_4	14,10	11,00	78,2	8,93	81,2	182,4	1,629	50,9	93,2				

Table 2

Synthesis of the experimental results concerning eggplants production of hybrids Madona F_1 and Dobrix F_1 cultivated in field under the impact of different irrigation methods and some foliar bioactive products, in 2009-2010

Factor			Average production obtained under the impact of:																
			Factor C					Factor B					Factor A						
A	B	C	Av. Prod. (t/ha)	% than $a_{1-3}c_1$	Of which: I^{st} qual. (t/ha)	%	% than $a_{1-3}c_1$	Av. prod. (t/ha)	% than $a_{1-3}b_1$	Of which: I^{st} qual. (t/ha)	%	% than $a_{1-3}b_1$	Av. Prod. (t/ha)	% than: a_1	a_3 (M_x)	Of which: I^{st} qual. (t/ha)	%	% than: a_1	a_3 (M_x)
a_1	b_1	c_1	46,6	100,0	35,3	75,8	100,0	44,5	100,0	33,0	74,2	100,0	46,0	100,0	102,7	33,8	73,5	100,0	100,9
		c_2	44,2	94,8	32,7	73,9	92,6												
		c_3	44,5	95,5	32,3	72,5	91,5												
		c_4	42,6	91,4	31,6	74,1	89,5												
	b_2	c_1	39,7	100,0	27,8	69,9	100,0	38,2	85,8	26,4	69,1	80,0							
		c_2	38,1	96,0	26,2	68,7	94,2												
		c_3	38,3	96,5	26,1	68,2	93,9												
		c_4	36,8	92,7	25,3	68,7	91,0												
	b_3	c_1	57,9	100,0	45,3	78,2	100,0	55,3	124,3	42,1	76,1	127,6							
		c_2	55,4	95,7	41,9	75,6	92,5												
		c_3	55,9	96,5	41,7	74,6	92,1												
		c_4	52,1	89,9	39,6	76,0	87,4												
a_2	b_1	c_1	43,8	100,0	34,5	78,8	100,0	41,8	100,0	32,2	77,0	100,0	43,7	95,0	97,5	33,1	75,7	97,9	98,8
		c_2	41,5	94,7	31,3	75,5	90,7												
		c_3	41,9	95,7	31,9	76,1	92,5												
		c_4	39,9	91,1	30,9	77,4	89,6												
	b_2	c_1	38,9	100,0	27,3	70,1	100,0	36,5	87,3	25,4	69,6	78,9							
		c_2	37,1	95,4	25,7	69,3	94,1												
		c_3	35,8	92,0	24,7	68,9	90,5												
		c_4	34,2	87,9	23,7	69,4	86,8												
	b_3	c_1	54,6	100,0	43,8	80,2	100,0	52,8	126,3	41,6	78,8	129,2							
		c_2	52,7	96,5	41,1	77,9	95,6												
		c_3	52,8	96,7	40,8	77,2	93,2												
		c_4	50,9	93,2	40,6	79,7	92,7												

Table 3

Synthesis of the experimental results for a_3 – Average value of the experiment (Mx) concerning eggplants production of hybrids Madonna F_1 and Dobrix F_1 cultivated in field under the impact of irrigation methods and some foliar bioactive products, 2009-2010

Factor			Average production obtained under the impact of:																
			Factor C					Factor B					Factor A						
A	B	C	Av. Prod. (t/ha)	% than $a_{1-3}c_1$	Of which:			Av. prod. (t/ha)	% than $a_{1-3}b_1$	Of which:			Av. Prod. (t/ha)	% than:		Of which:			
					Ist qual. (t/ha)	%	% than $a_{1-3}c_1$		% than $a_{1-3}b_1$	Ist qual. (t/ha)	%	% than $a_{1-3}b_1$		Ist qual. (t/ha)	%	% than $a_{1-3}c_1$	%	% față de: a_1	a_3 (M_x)
	b_1	c_1	45,2	100,0	34,9	77,2	100,0												
		c_2	42,9	94,9	32,0	74,6	91,7												
		c_3	43,2	95,6	32,1	74,3	92,0	43,2	96,4	32,6	75,5	100,0							
		c_4	41,3	91,4	31,3	75,8	89,7												
	Average b_1		43,2	*	32,6	75,5	*												
	b_2	c_1	39,3	100,0	27,6	70,2	100,0												
		c_2	37,6	95,7	26,0	69,1	94,2												
		c_3	37,1	94,4	25,4	68,5	92,0	37,4	83,5	25,9	69,3	79,4	44,8	99,1	100,0	33,5	74,8	99,1	100,0
		c_4	35,5	90,3	24,5	69,0	88,8												
Average exp.(Mx)	Average b_2		37,4	*	25,9	69,3	*												
	b_3	c_1	56,3	100,0	44,6	79,2	100,0												
		c_2	54,1	96,1	41,5	76,7	93,0												
		c_3	54,4	96,6	41,3	54,9	92,6	54,1	120,8	41,9	77,4	128,5							
		c_4	51,5	91,5	40,1	77,9	89,9												
	Average b_3		54,1	*	41,9	77,4	*												
	*	c_1	46,9	100,0	35,7	76,1	100,0												
		c_2	44,8	95,5	33,2	74,1	93,0												
		c_3	44,9	95,7	329	73,3	92,2	44,8	100,0	33,5	74,8	102,8	44,8	99,1	100,0	33,5	74,8	99,1	100,0
		c_4	42,8	91,3	32,0	74,8	89,6												
Average exp.(Mx)			44,8	*	33,5	74,7	*												

Table 4

Unilateral and interaction impact of the experimental factors upon eggplant hybrids Madonna F1 and Dobrix F1 production, cultivated in field with different technologies

Variant	Average production (t/ha)		Relative production (%)	Difference (± t/ha)	Significance
1. Unilateral impact of the hybrid upon eggplants production					
a2-a1	43,68	46,13	94,67	-2,46	000
a3-a1	44,87	46,13	97,26	-1,26	000
a3-a2	44,87	43,68	102,73	1,19	***
DL 5%= 0,35 DL 1%= 0,53 DL 0,1%= 0,85					
2. Unilateral impact of the irrigation method upon eggplants production					
b2-b1	37,50	43,14	86,93	-5,64	000
b3-b1	54,04	43,14	125,29	10,91	***
b3-b2	54,04	37,50	144,13	16,55	***
DL 5%= 0,70 DL 1%= 0,96 DL 0,1%= 1,32					
3. Unilateral impact of foliar bioactive products for stimulating flower binding and plants metabolism upon eggplants production					
c2-c1	44,84	46,93	95,56	-2,08	000
c3-c1	44,88	46,93	95,64	-2,05	000
c4-c1	42,92	46,93	91,47	-4,00	000
c3-c2	44,88	44,84	100,07	0,03	-
c4-c2	42,92	44,84	95,71	-1,92	000
c4-c2	42,92	44,84	95,71	-1,92	000
DL 5%= 0,94 DL 1%= 1,28 DL 0,1%= 1,71					
4. Interactions impact between different hybrids and the same or different irrigation methods upon eggplants production					
a2b1-a1b1	41,78	44,48	93,93	-2,70	000
a3b1-a1b1	43,16	44,48	97,04	-1,32	0
a3b1-a2b1	43,16	41,78	103,31	1,38	*
a2b2-a1b2	36,50	38,60	94,56	-2,10	000
a3b2-a1b2	37,39	38,60	96,87	-1,21	0
a3b2-a2b2	37,39	36,50	102,44	0,89	-
a2b3-a1b3	52,75	55,33	95,35	-2,58	000
a3b3-a1b3	54,06	55,33	97,71	-1,27	0
a3b3-a2b3	54,06	52,75	102,48	1,31	*
a2b2-a1b1	36,50	44,48	82,07	-7,97	000
a3b3-a1b1	54,06	44,48	121,55	9,58	***
a3b3-a2b2	54,06	36,50	148,11	17,56	***
DL 5%= 1,04 DL 1%=1,45 DL 0,1%= 2,03					
5. Interactions impact between the same hybrid and different bioactive products upon eggplants production					
a1c2- a1c1	45,90	48,07	95,49	-2,17	000
a1c3- a1c1	46,23	48,07	96,19	-1,83	0
a1c4- a1c1	44,33	48,07	92,23	-3,73	000
a1c3- a1c2	46,23	45,90	100,73	0,33	-
a1c4- a1c2	44,33	45,90	96,59	-1,57	-
a1c4- a1c3	44,33	46,23	95,89	-1,90	0
a2c2- a2c1	43,77	45,77	95,63	-2,00	0
a2c3- a2c1	43,50	45,77	95,05	-2,27	00
a2c4- a2c1	41,67	45,77	91,04	-4,10	000
a2c3- a2c2	43,50	43,77	99,39	-0,27	-
a2c4- a2c2	41,67	43,77	95,20	-2,10	0
a2c4- a2c3	41,67	43,50	95,79	-1,83	0
a3c2- a3c1	44,87	46,94	95,57	-2,08	0
a3c3- a3c1	44,90	46,94	95,64	-2,04	0
a3c4- a3c1	42,77	46,94	91,10	-4,18	000
a3c3- a3c2	44,90	44,87	100,07	0,03	-
a3c4- a3c2	42,77	44,87	95,32	-2,10	0
a3c4- a3c3	42,77	44,90	95,25	-2,13	0
DL 5%= 1,63 DL 1%= 2,21 DL 0,1%= 2,96					
6. Interactions impact between the same hybrid and the same irrigation method and different bioactive products upon eggplants production					
a1b1c4- a1b1c1	42,60	46,60	91,42	-4,00	000
a2b2c4- a2b2c1	34,20	38,90	87,92	-4,70	00
a2b2c3- a2b2c2	35,80	37,10	96,50	-1,30	-
a2b2c4- a2b2c3	34,20	35,80	95,53	-1,60	-
a3b3c4- a3b3c2	51,50	54,07	95,25	-2,57	-
a3b3c4- a3b3c3	51,50	54,40	94,67	-2,90	0
DL 5%= 2,83 DL 1%= 3,83 DL 0,1%= 5,12					

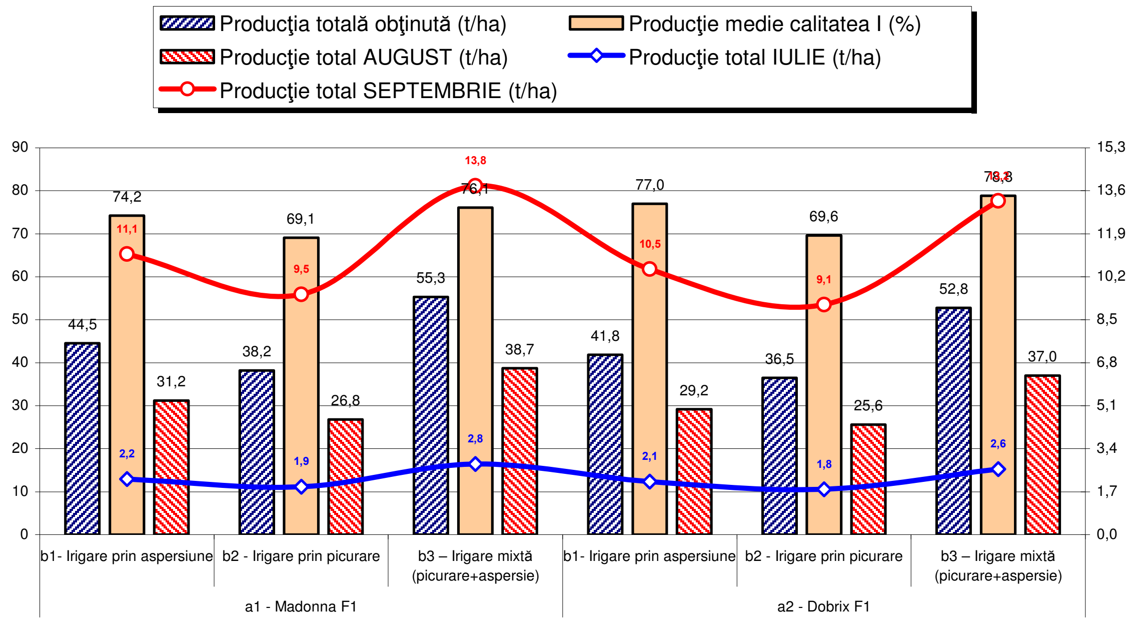

Fig.1. Production's quality and staging for factor B (irrigation method), eggplants cultivated in field, 2009-2010

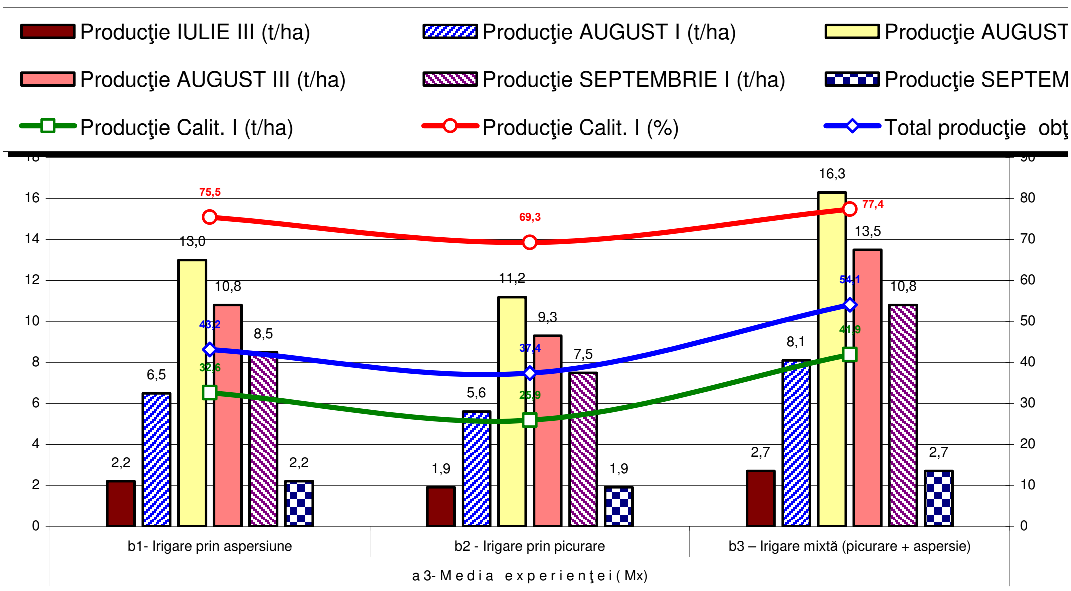

Fig.2. Production's quality and staging for a_3 – average value of the experiment (Mx) for factor B (irrigation method), eggplants cultivated in field, 2009-2010

The impact of establishment method and flower binding stimulation method upon the productive and qualitative potential of melons' culture in protected and unprotected field

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ABSTRACT

Production potential and quality of melon hybrids, with recognized organoleptic qualities, by the application of direct seeding technology classic unprotected field or, at best, a classic in the field by planting seedlings unprotected (improved traditional technology), was not observed within, due to the limited influence of some important technological links, such as protection against late frosts in spring, providing a constant hydric regime, fertilization, stimulation of flowers' binding etc. Improving and upgrading technologies applied in culture focused on technological links mentioned above, were the basis for achieving a high level of production, considering both quantity and quality. In this paper, results are presented under the influence of irrigation and crop establishment methods as well as stimulating the binding of flowers, using a variety of products with foliar application.

INTRODUCTION

Melon hybrid use and technology culture that we apply are crucial to obtain high and quality yields from this species in the family *Cucurbitaceae.*

Evolution, over time, of the culture technology, greatly improved and upgraded technology links all lead to the conclusion that, at present, we can talk about *a traditional improved field culture technology* and a *modernised culture technology in low tunnels of polyethylene film.*

Production potential and quality of melon hybrids, with recognized organoleptic qualities, by the application of direct seeding technology classic unprotected field or, at best, a classic in the field by planting seedlings unprotected (improved traditional technology), was not observed within, due to the limited influence of some important technological links, such as protection against late frosts in spring, providing a constant hydric regime, fertilization, stimulation of flowers' binding etc. Improving and upgrading technologies applied in culture focused on technological links mentioned above, were the basis for achieving a high level of production, considering both quantity and quality.

In this article there are given unilateral influences and interactions of the experimental factors, including the bioactive products used by foliar application as a more recent technology link in obtaining high and quality melons yields.

MATERIALS AND METHODS

The experiment aimed at studying comparative competition cultures, in terms of interacting factors that will provide essential technical elements of the melons growing improved framework technology in low tunnels of polyethylene film under current conditions:

Factor A – The hybrid

a_1- Fiata F_1 – extraearly with yellow-orange pulp;
a_2 - Corin F_1 – early with yellow-orange pulp;
a_3- Galia F_1 – early with white-green pulp;
a_4 - Solarbel F_1– semilate with white-green pulp.

Factor B – Establishment of culture and irrigation methods

b_1 – seedling planting and drip irrigation (traditional improved culture technology);

b_2 – seedling planting and soil's mulching with polyethylene film and culture protection in low tunnels and drip irrigation (modernised culture technology).

Factor C – The method of flower binding and plants' metabolism stimulation

c_1 – no stimulation;
c_2 – stimulation with Bostim;
c_3 – foliar spraying with Agroleaf (soluble foliar fertilizer);
c_4 – foliar spraying with Cropmax (complex nutrient very concentrated for foliar fertilization – 100% natural).

The purpose of the undertaken research was to study the possibilities of full manifestation of the productive potential of hybrid melon, recognized as very valuable, in terms of production and quality, by applying two technologies culture: improved traditional technology and modernized technology, under the influence of flower binding and plants metabolism stimulation with synthetic or natural bioactive products (Bostic, Agroleaf and Cropmax). There were studied the following hybrids: Fiata F_1, Corin F_1, Galia F_1 and Solarbel F_1 from Nunhems society.

Considering the anterior things presented, we had the following *objectives*:

- Cultivation of new hybrids known for their very high productive potential by applying the two culture technologies (Traditional improved and modernized).

- Verifying the possibility of reaching in practice the theoretical productive potential said by the production societies, after testing them on their own fields.

- The impact of synthetic or natural bioactive products upon flower binding and plants metabolism stimulation and upon the production increase, registered as an effect of increasing the number of fruits per plant.

There were made two observations upon hybrids behaviour when there were applied the two culture types (traditional improved and modernized) and there were done sprayings with bioactive products (Bostim, Agroleaf and Cropmax), as it follows: when the first 2-3 were open or partially open (first treatment) and the second treatment at full flowering of plants.

There were determined: the number of fruits/plant; fruits' diameters; fruits' average weight; percentage ratio of production in the four periods of staging in intervals naturally set up according to the price on the free market; the percentage ratio of First quality production of the total production for each experimental factor, as an effect of the unilateral and interactions between factors impact.

By calculations, there were determined the average productions obtained/plant and per hectare.

RESULTS AND DISCUSSIONSS

Table 1 shows the differentiation of one of the production elements for the four melon hybrids, not that high, the average production/plant and also per hectare, excepting the one obtained in c_1 (no stimulation).

There are important differences between the productions obtained under the impact of factor B, being very increased in b_2 – protection with polyethylene film and fertirrigation and drip irrigation ($a_2b_2 \rightarrow 54.6$ t/ha- 158.3% compared with $a_2b_1 \rightarrow 34.5$ t/ha – 100%).

Under the impact of factor C (stimulation of flower binding and plants'metabolism) the highest productions were in c_2 (Bostim), 50.9 t/ha in $a_1b_2c_2$ (144.6%), 62.1 t/ha in $a_2b_2c_2$ (160.5%) or 51.1 t/ha in $a_3b_2c_2$ (143.5%). The productions obtained under the impact of b_1 (seedling planting and drip irrigation) in interaction with c_2 (Bostim) ale lower than those presented before.

Out of table 2 and figures 1 and 2 we can see the high percentage of production obtained in b_2 than b_1, with variations between 37.3 and 59.6 %. It also results the percentage of First quality production of the total production, being higher in b_2 (modernized technology). There is also presented the production obtained under the impact of factor A (the hybrid). The highest production was obtained in a_2 – Corin F_1 of 44.5 t/ha – 119.0 % compared with $M\bar{x}$ – 100.0 %. The other two hybrids a_3 – Galia F_1 and a_4 – Solarbel F_1 had lower productions, of only 38.1 t/ha (101.9 %) and, respectively, 29.6 (79.1 %) compared with $M\bar{x}$ – 100.0 %.

First quality production obtained in a_4 – Solarbel F_1 of 73.3 % (b_1) and 85.7 (b_2) of the total production, is the highest compared with the other hybrids 70.1-72.1 % (b_1) and 77.4-83.5 % (b_2).

The highest percentage of first quality production was obtained from Solarbel F_1 (a_4) – 23.8 t/ha – 80.4%, then Galia F_1 (a_3) – 30.1 t/ha – 79.0 %.

In the two tables there is presented a synthesis of production results differentiated for the three factors A, B and C. there are compared the results of the four hybrids in case of the same hybrid the results under the impact of factor B (the culture establishment and irrigation systems) and factor C (stimulation of flower binding and plants metabolism).

By analysing the tables, we see the good results of Fiata F_1 (a_1) and Corin F_1 (a_2) hybrids under the aspect of production level obtained and Solarbel F_1 and Galia F_1 hybrids under the aspect of production's quality.

The highest productions were obtained from Corin F_1 (a_2) of 44.5 t/ha (119.6 % than a_1 – Fiata F_1 – 100.0 %) and Galia F_1 (a_3), of 38.1 t/ha (102.4 % than a_1 – Fiata F_1 – 100.0 %).

Under the impact of factor B (establishing the culture and irrigation methods) the production obtained in b_2 (seedling planting and mulching with polyethylene film and protection in low tunnels and drip irrigation) is of 45.3 t/ha – 153.5 % compared to the one obtained in b_1 (seedling planting and drip irrigation) of 29.5 t/ha – 100.0 %.

Under the impact of factor C (stimulation of flower binding and plants' metabolism) the production obtained varied from 30.4 t/ha – 41.5 t/ha. The production obtained in c_2 – Bostim is of 41.5 t/ha (136.5 % than c_1 – no stimulation), followed by c_4 – Cropmax, of 40.3 t/ha – 132.6%.

Data from table 3 concretized from the statistical calculation, specific for the variance of analyse method, production differences significations as a result of factors' interdependation.

Of the unilateral analyse of experimental factors from points 1-3 it results that:
- the obtained production from a_2 – Corin F_1 hybrid is statistically covered, the production differences' significance to a_1 – Fiata F_1 being very significant positive;
- the other significances of production differences' are very significant negative according to the made comparations;
- the obtained production in a_3- Galia F_1 is statistically covers, the significance of the difference to a_1 – Fiata F_1 being significant positive;
- the productions obtained under the impact of bioactive products c_2 – Bostim, c_3 – Agroleaf and c_4 – Cropmax are statistically covered, being very significant positive than c_1 – no stimulation;
- the average productions obtained by a modernized culture technology (b_2) is statistically assured being very significant positive than b_1 (improved traditional technology);

Out of the complex analyse from points 4-8 there are differences of production characterised as very significant, distinct significant and significant positive in most cases, according to the interactions between the graduations of the experimental factors.

CONCLUSIONS

1. The cultivated melon hybrids have a different behaviour concerning the qualitative and productive potential under the impact of modernized culture technology.

2. The modernized culture technology is superior to the traditional improved one being seen in the qualitative and quantitative aspect, which is the percentage of First quality production from the total production obtained per hectare.
3. We remarked Corin F_1 and Fiata F_1 hybrids which overpassed the other two hybrids Galia F_1 and Solarbel F_1, these last two being the best in first quality production of the total obtained production.
4. Bioactive synthetic or natural products applye by foliar sprayings (Bostim, Agroleaf and Cropmax) contribute to obtaining larger productions and of a better quality, compared with the ones where they were not used.
5. Bostim bioregulator determines the highest production, closely followed by Cropmax (complex nutrient over concentrated for foliar fertilization – 100% natural).
6. We recommend a thoroughgoing study by continuing the experiment because the studied hybrids are very valuable and the modernized culture technology is on top in production, being based on bioactive products for stimulation of flower binding and plants' metabolism.

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TABELS AND FIGURES

Table 1

Synthesis of production results from yellow-orange and white-green pulp melons' culture

A	B	C	Average production under the impact of:									
			Factor C			Factor B			Factor A			
			kg/pl	t/ha	% than c_1	kg/pl	t/ha	% than b_1	kg/pl	t/ha	% than a_1	% than Mx
a_1	b_1	c_1	3,658	25,6	100,0	4,099	28,7	100,0	5,229	37,2	100,0	99,5
		c_2	4,448	31,1	121,5							
		c_3	4,015	28,1	109,8							
		c_4	4,275	29,9	116,8							
	b_2	c_1	5,032	35,2	100,0	6,359	45,8	159,6				
		c_2	7,269	50,9	144,6							
		c_3	6,826	47,8	135,8							
		c_4	7,028	49,2	139,8							
a_2	b_1	c_1	4,324	30,3	100,0	4,923	34,5	100,0	6,360	44,5	119,6	119,0
		c_2	5,485	38,4	126,7							
		c_3	4,755	33,3	109,9							
		c_4	5,129	35,9	118,5							
	b_2	c_1	5,526	38,7	100,0	7,796	54,6	158,3				
		c_2	8,868	62,1	160,5							
		c_3	8,111	56,8	146,8							
		c_4	8,677	60,7	156,8							
a_3	b_1	c_1	3,855	27,0	100,0	4,259	29,8	100,0	5,446	38,1	102,4	101,9
		c_2	4,726	33,1	122,6							
		c_3	3,996	28,0	103,7							
		c_4	4,460	31,2	115,6							
	b_2	c_1	5,086	35,6	100,0	6,632	46,4	155,7				
		c_2	7,302	51,1	143,5							
		c_3	6,857	48,0	134,8							
		c_4	7,281	51,0	143,3							
a_4	b_1	c_1	3,008	21,0	100,0	3,560	24,9	100,0	4,226	29,6	79,6	79,1
		c_2	3,897	27,3	130,0							
		c_3	3,512	24,6	117,1							
		c_4	3,823	26,8	127,6							
	b_2	c_1	4,182	29,3	100,0	4,892	34,2	137,3				
		c_2	5,330	37,3	127,3							
		c_3	4,758	33,3	113,7							
		c_4	5,292	37,0	126,3							
Mx	b_1	c_1	3,711	26,0	100,0	4,211	29,5	100,0	5,338	37,4	100,5	100,0
		c_2	4,639	32,5	125,0							
		c_3	4,070	28,5	109,6							
		c_4	4,422	31,0	119,2							
	b_2	c_1	4,958	34,7	100,0	6,465	45,3	153,5				
		c_2	7,192	50,4	145,2							
		c_3	6,638	46,5	134,0							
		c_4	7,070	49,5	142,6							
	*	c_1	4,335	30,4	100,0	5,338	37,4	126,8				
		c_2	5,916	41,5	136,5							
		c_3	5,354	37,5	123,4							
		c_4	5,746	40,3	132,6							
	Mx		5,338	37,4	*	5,338	37,4	*	5,338	37,4	100,5	100,0

Table 2

Production's quality of yellow-orange and white-green pulp melons

A	B	C	Average production under the impact of: Factor C t/ha	Factor C %	Factor C of which: Qual. I t/ha	Factor C of which: Qual. I %	Factor B t/ha	Factor B %	Factor B of which: Qual. I t/ha	Factor B of which: Qual. I %	Factor A t/ha	Factor A %	Factor A of which Qual. I t/ha	Factor A of which Qual. I %
a_1	b_1	c_1	25,6	100,0	15,9	62,1	28,7	100,0	20,1	70,1	37,2	99,5	27,8	74,6
		c_2	31,1	121,5	22,8	73,2								
		c_3	28,1	109,8	19,5	69,5								
		c_4	29,9	116,8	22,2	74,4								
	b_2	c_1	35,2	100,0	26,2	74,4	45,8	159,6	35,4	77,4				
		c_2	50,9	144,6	40,0	78,5								
		c_3	47,8	135,8	36,2	75,8								
		c_4	49,2	139,8	39,2	79,6								
a_2	b_1	c_1	30,3	100,0	21,0	69,3	34,5	100,0	24,6	71,2	44,5	119,0	33,9	76,2
		c_2	38,4	126,7	27,7	72,1								
		c_3	33,3	109,9	23,3	69,9								
		c_4	35,9	118,5	26,4	73,5								
	b_2	c_1	38,7	100,0	27,4	70,8	54,6	158,3	43,2	79,2				
		c_2	62,1	160,5	50,7	81,6								
		c_3	56,8	146,8	44,9	79,0								
		c_4	60,7	156,8	49,8	82,1								
a_3	b_1	c_1	27,0	100,0	18,9	70,0	29,8	100,0	21,5	72,1	38,1	101,9	30,1	79,0
		c_2	33,1	122,6	24,2	73,2								
		c_3	28,0	103,7	19,8	70,6								
		c_4	31,2	115,6	23,1	74,1								
	b_2	c_1	35,6	100,0	28,4	79,8	46,4	155,7	38,7	83,5				
		c_2	51,1	143,5	43,7	85,5								
		c_3	48,0	134,8	39,6	82,6								
		c_4	51,0	143,3	43,1	84,5								
a_4	b_1	c_1	21,0	100,0	14,7	70,0	24,9	100,0	18,3	73,3	29,6	79,1	23,8	80,4
		c_2	27,3	130,0	20,7	75,7								
		c_3	24,6	117,1	17,3	70,5								
		c_4	26,8	127,6	20,5	76,6								
	b_2	c_1	29,3	100,0	23,5	80,2	34,2	137,3	29,3	85,7				
		c_2	37,3	127,3	32,7	87,8								
		c_3	33,3	113,7	28,1	84,5								
		c_4	37,0	126,3	32,9	88,9								
Mx	b_1	c_1	26,0	100,0	17,6	67,8	29,5	100,0	21,1	71,5	37,4	100,0	28,9	77,3
		c_2	32,5	125,0	23,9	73,5								
		c_3	28,5	109,6	20,0	70,2								
		c_4	31,0	119,2	23,1	74,5								
	b_2	c_1	34,7	100,0	26,4	76,1	45,3		36,7	81,0				
		c_2	50,4	145,2	41,8	82,9								
		c_3	46,5	134,0	37,2	80,0								
		c_4	49,5	142,6	41,3	83,4								
	*	c_1	30,4	100,0	22,0	72,4	37,4	126,8	28,9	77,3	37,4	100,0	28,9	77,3
		c_2	41,5	136,5	32,9	79,3								
		c_3	37,5	123,4	28,6	76,3								
		c_4	40,3	132,6	32,2	79,9								
	Mx		37,4	*	*	*	37,4	*	28,9	77,3	37,4	100,0	28,9	77,3

Table 3

Unilateral and interactions' impact of experimental factors upon melon's production in different technology conditions in protected and unprotected field

Variant	Average production (t/ha)		Relative production (%)	Difference (± t/ha)	Significance
1. Unilateral impact of the hybrid upon melon's production					
a2-a1	44,53	37,23	119,61	7,30	***
a3-a1	38,13	37,23	102,42	0,90	*
a4-a1	29,58	37,23	79,45	-7,65	000
a3-a2	38,13	44,53	85,63	-6,40	000
a4-a2	29,58	44,53	66,42	-14,95	000
a4-a3	29,58	38,13	77,57	-8,55	000
DL 5%= 0,61		DL 1%= 0,92		DL 0,1%= 1,48	
2. Unilateral impact of the culture establishment method upon melon's production					
b2-b1	45,25	29,48	153,52	15,78	***
DL 5%= 0,54		DL 1%= 0,74		DL 0,1%= 1,41	
3. Unilateral impact of stimulation of flower binding upon melon's production					
c2-c1	41,41	30,34	136,51	11,08	***
c3-c1	37,49	30,34	123,57	7,15	***
c4-c1	40,21	30,34	132,55	9,88	***
c3-c2	37,49	41,41	90,52	-3,93	000
c4-c3	40,21	41,41	97,10	-1,20	0
DL 5%= 0,77		DL 1%= 2,16		DL 0,1%= 1,40	
4. Interactions' impact between different hybrids and the same or different culture establishment methods upon melons' production					
a2b1-a1b1	34,48	28,68	120,23	5,80	***
a3b1-a1b1	29,83	28,68	104,01	1,15	*
a4b1-a1b1	24,93	28,68	86,92	-3,75	000
a3b1-a2b1	29,83	34,48	86,51	-4,65	000
a4b1-a2b1	24,93	34,48	72,30	-9,55	000
a4b1-a3b1	24,93	29,83	83,57	-4,90	000
a2b2-a1b2	54,58	45,78	119,22	8,80	***
a3b2-a1b2	46,43	45,78	101,42	0,65	-
a4b2-a1b2	34,23	45,78	74,77	-11,55	000
a3b2-a2b2	46,43	54,58	85,07	-8,15	000
a4b2-a2b2	34,23	54,58	62,71	-20,35	000
a2b2-a1b1	34,23	46,43	73,72	-12,20	000
DL 5%= 0,97		DL 1%= 1,39		DL 0,1%= 2,03	
5. Interactions' impact between the same hybrid and different stimulation of flower binding methods upon melons' production					
a1c2- a1c1	41,00	30,40	134,87	10,60	***
a1c3- a1c1	37,95	30,40	124,84	7,55	***
a1c4- a1c1	39,55	30,40	130,10	9,15	***
a1c3- a1c2	37,95	41,00	92,56	-3,05	000
a1c4- a1c2	39,55	41,00	96,46	-1,45	-
a1c4- a1c3	39,55	37,95	104,22	1,60	*
a2c2- a2c1	50,25	34,50	145,65	15,75	***
a2c3- a2c1	45,05	34,50	130,58	10,55	***
a2c4- a2c1	48,30	34,50	140,00	13,80	***
a2c3- a2c2	45,05	50,25	89,65	-5,20	000

Variant	Average production (t/ha)		Relative production (%)	Difference (± t/ha)	Significance
a2c4- a2c2	48,30	50,25	96,12	-1,95	0
a2c4- a2c3	48,30	45,05	107,21	3,25	***
a3c2- a3c1	42,10	31,30	134,50	10,80	***
a3c3- a3c1	38,00	31,30	121,41	6,70	***
a3c4- a3c1	41,10	31,30	131,31	9,80	***
a3c3- a3c2	38,00	42,10	90,26	-4,10	000
a3c4- a3c2	41,10	42,10	97,62	-1,00	-
a3c4- a3c3	41,10	38,00	108,16	3,10	***
a4c2- a4c1	32,30	25,15	128,43	7,15	***
a4c3- a4c1	28,95	25,15	115,11	3,80	***
a4c4- a4c1	31,90	25,15	126,84	6,75	***
a4c3- a4c2	28,95	32,30	89,63	-3,35	000
a4c4- a4c2	31,90	32,30	98,76	-0,40	-
a4c4- a4c3	31,90	28,95	110,19	2,95	***
DL 5%= 1,54 DL 1%= 2,09 DL 0,1%= 2,79					
6. Interactions' impact between the same hybrid, the same culture establishment method and different stimulation of flower binding methods upon melons' production					
a1b1c2- a1b1c1	31,10	25,60	121,48	5,50	***
a1b1c3- a1b1c1	28,10	25,60	109,77	2,50	*
a1b1c4- a1b1c1	29,90	25,60	116,80	4,30	***
a1b1c3- a1b1c2	28,10	31,10	90,35	-3,00	00
a1b1c4- a1b1c2	29,90	31,10	96,14	-1,20	-
a1b1c4- a1b1c3	29,90	28,10	106,41	1,80	-
a2b2c2- a2b2c1	62,10	38,70	160,47	23,40	***
a2b2c3- a2b2c1	56,80	38,70	146,77	18,10	***
a2b2c4- a2b2c1	60,70	38,70	156,85	22,00	***
a2b2c3- a2b2c2	56,80	62,10	91,47	-5,30	000
a2b2c4- a2b2c2	60,70	62,10	97,75	-1,40	-
a2b2c4- a2b2c3	60,70	56,80	106,87	3,90	**
DL 5%= 2,18 DL 1%= 2,92 DL 0,1%= 3,98					
7. Interactions' impact between the same hybrid, different culture establishment methods and the same stimulation of flower binding method upon melons' production					
a1b2c1- a1b1c1	35,20	25,60	137,50	9,60	***
a2b2c2- a2b1c2	62,10	38,40	161,72	23,70	***
a3b2c3- a3b1c3	48,00	28,00	171,43	20,00	***
a4b2c4- a4b1c4	37,00	26,80	138,06	10,20	***
DL 5%= 2,15 DL 1%= 2,92 DL 0,1%= 3,98					
8. Interactions' impact between different hybrids and the same culture establishment and stimulation of flower binding methods upon melons' production					
a2b1c1- a1b1c1	30,30	25,60	118,36	4,70	***
a3b1c1- a1b1c1	27,00	25,60	105,47	1,40	-
a4b1c1- a1b1c1	21,00	25,60	82,03	-4,60	000
a2b1c2- a1b1c2	38,40	31,10	123,47	7,30	***
a3b1c2- a1b1c2	33,10	31,10	106,43	2,00	-
a4b1c2- a1b1c2	27,30	31,10	87,78	-3,80	00
a2b1c3- a1b1c3	33,30	28,10	118,51	5,20	***
a3b1c3- a1b1c3	28,00	28,10	99,64	-0,10	-
a4b1c3- a1b1c3	24,60	28,10	87,54	-3,50	00

Variant	Average production (t/ha)		Relative production (%)	Difference (± t/ha)	Significance
a2b1c4- a1b1c4	35,90	29,90	120,07	6,00	***
a3b1c4- a1b1c4	31,20	29,90	104,35	1,30	-
a4b1c4- a1b1c4	26,80	29,90	89,63	-3,10	00
a2b2c2- a1b2c2	62,10	50,90	122,00	11,20	***
a3b2c2- a1b2c2	51,10	50,90	100,39	0,20	-
a4b2c2- a1b2c2	37,30	50,90	73,28	-13,60	000
a2b2c3- a1b2c3	56,80	47,80	118,83	9,00	***
a3b2c3- a1b2c3	48,00	47,80	100,42	0,20	-
a4b2c3- a1b2c3	33,30	47,80	69,67	-14,50	000
a2b2c4- a1b2c4	60,70	49,20	123,37	11,50	***
a3b2c4- a1b2c4	51,00	49,20	103,66	1,80	-
a4b2c4- a1b2c4	37,00	49,20	75,20	-12,20	000
DL 5%= 2,12		DL 1%= 2,91		DL 0,1%= 3,96	

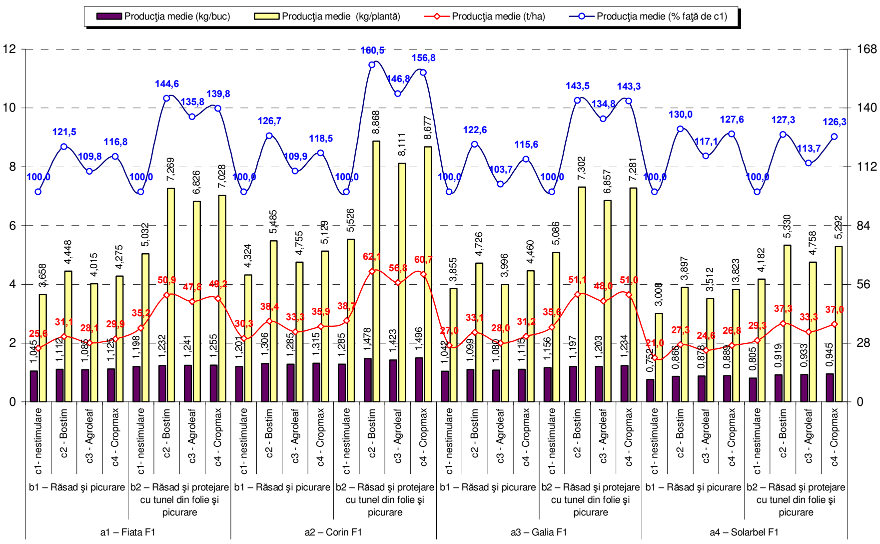

Fig. 1. Synthesis of production results from yellow-orange and white-green pulp melons' culture

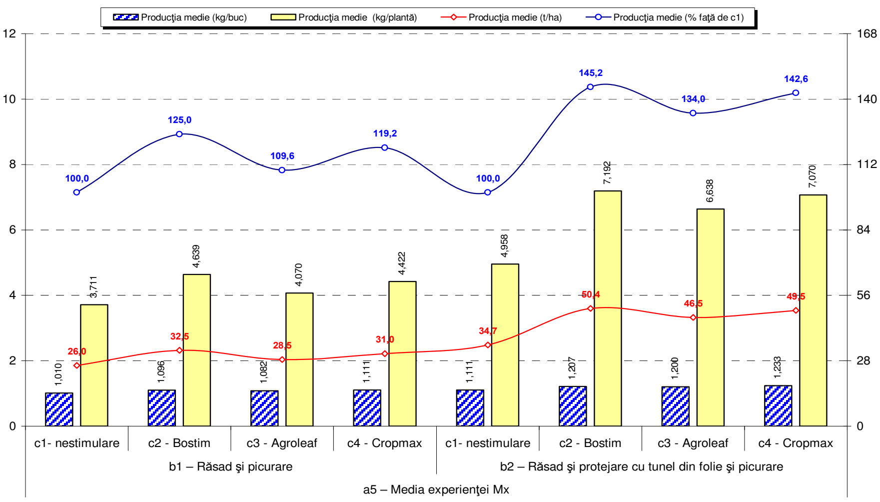

Fig. 2. Synthesis of production results for a_5 – average value of the experiment (Mx) for yellow-orange and white-green pulp melons' culture

Study of *Thrips tabaci* Lind. attack in the seedling stage of vegetables

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Keywords: greenhouse, experiments, efficacy of insecticide

ABSTRACT

During 2008 - 2011, greenhouse experiments were performed in Vegetable Research-Development Station Bacau - Romania, in order to evaluate the vegetable varieties and lines susceptibility to the onion thrips attack in the seedling stage at the following species: tomato, cabbage, lettuce, pepper and egg plant. It was identified the attack symptoms in: tomato (Unibac: F% - 1.6 %, I% - 15.4 % and DA – 0.2%; Roma F – 4.3%, I – 11.6%, DA – 0.5%; Moldoveanca F – 1.2%, I – 9.8%, DA – 0.1%; Rio Grande, F – 0.2%, I% - 2.4%, DA – 0.1%), diagram 1, in cotyledon and 5 leaves stage. lettuce (Silvia, F – 1.2%, I – 4.6%, DA – 0.1%), in 8 leaves stage; round pepper (Creola, F – 2.9%, I – 2.2%, DA – 0.1%), in 4 leaves stage, round pepper (Lider (F – 5.2%,I – 3.1%, DA – 0.2%), in 4 leaves stage; sweet pepper (Dariana Bac, F – 0.9 %, I - 0.7%, DA – 0.1%), in 3 leave stage; long pepper (Ionel (F – 6.7 %, I – 2.5%, DA – 0.2%, in 5 leaves; long pepper (Siret (F – 1.1%, I – 0.8%, DA – 0.1%, in 2 leaves; egg plants (Contesa F – 8.4%, I – 0.1%, DA – 0.1% in 5 leaves. In tomato: L1, 2 and L3, in cabbage and Serata - lettuce variety we didn't identified any virus attack. The efficacy of insecticides against onion thrips was very good: Laser 240SC – **0.05%: 85.9% after 24 hours,96.5% after 48 hours, 98.3% after 72 hours, followed by Talstar 10 EC – 0.05%: 74.3% after 24 hours, 91.4% after 48 hours, 94.2% after 72 hours, and Confidor Energy – 0.08%: 65.7% after 24 hours, 89.3% after 48 hours and 91.6% after 72 hours).**

INTRODUCTION

Onion thrips are one of the most difficult pests to control in seedling stage (Aylsworth, 1994, Anon, 1992, 1993). Thrips are tiny insects that reproduce rapidly, congregate in tight places that make pesticide coverage difficult, and feed with rasping-piercing-sucking mouth parts, resulting in deformation of flowers and leaves (Maria Calin, 2004, 2005, Gill and Ross. 1994,. Grossman, 1996, Parella, 1995).

The characteristic for this specie is parthenogenesis multiplication. One female insert 80 - 100 eggs in soft plant tissue (5).

Tolerance of thrips on vegetable crops is low. In addition, when *Thrips tabaci* feed on plants infected with the viruses as: *Lycopersicon virus* 3, *Solanum virus* 8, *Nicotiana virus* 1, *Tomato Spotted wilt virus.* Once plants are infected, it is too late to do anything except dispose of diseased plants. Thus, the best way to prevent virus infection is to control thrips (Aylsworth, 1994, Anon, 1992, 1993).

A regular monitoring program is the basis of all pest management programs. Conduct a regular, weekly monitoring program to detect problems early. This early detection and treatment will result in better pest control since plant canopies are smaller and better spray coverage can be achieved. Plant inspection is needed to assess general plant health and to detect the pests.

MATERIALS AND METHODS

1. Susceptibility of vegetable seedlings at onion thrips attack

During 2008-2011, greenhouse experiments were performed in Vegetable Research-Development Station Bacau - Romania, in order to evaluate the vegetable varieties susceptibility to thrips attack in the seedling stage at the following species: tomato, cabbage, lettuce, pepper and egg plant (Table 1).

The lines and cultivars were sown in the greenhouse on March. After emergence, in almost 3-6 days, the young plants were transplanted in 65-96 cell plastic trays. No preventive chemicals treatments were applied in order to encourage the development of the pest attack.

For monitoring attack we randomly selected plants at four locations, each sample with 100 seedlings and we examined the plants. We examined the underside of leaves for insect pests and inspect root systems to determine whether they are healthy or not (Maria Calin, 2004, 2005).

The observations were made every 10 days after plantation of young vegetable plant in plastic trays.

The attack estimation with following indicators:
Frequency of attack (F%),
Intensity of attack (I%),
Degree of attack (DA%).

The results obtained will be used in plant breeding and also in order to decrease the number of pest's chemicals treatment in seedling technologies of vegetable.

The control measures must be applied because the thrips transmit many viruses. In addition if the treatments for control pests is not applied, the populations increase very quickly and they are very difficult to control.

2. The control of onion thrips

It was evaluated the effect of the following insecticides: Laser 240SC – 0.05%, Talstar 10 EC 0.05% - and Confidor Energy – 0.08% on onion thrips (*Thrips tabaci* Lind.).

The observations were made at 24, 48 and 72 hours after application, and we focused on the counting of larvae and adults. All adult and larvae of thrips were counted on 50 randomly chosen leaves per plot;

We used for to determine the efficiency of insecticide by Sun-Shepard method.

Assessments were also made on fito - toxicity, crop development and visible residues.
Treatment technique: spraying till run-of 600 l/ha in cucumber.
Crop and cultivar used: cucumber, Mapamond variety.

RESULTS AND DISCUSSIONS

1. Susceptibility of vegetable seedlings at onion thrips attack

The susceptibility of lines and varieties of seedlings to attack of the thrips was following (table 2).

The data obtained showed different behavioral of vegetable species to thrips attack.

It was identified the attack symptoms in:
Tomato (Unibac: F% - 1.6 %, I% - 15.4 % and DA – 0.2%; Roma F – 4.3%, I – 11.6%, DA – 0.5%; Moldoveanca F – 1.2%, I – 9.8%, DA – 0.1%; Rio Grande F – 0.2%, I% - 2.4%, DA – 0.1%), diagram 1, in cotyledon and 5 leaves stage.
Lettuce (Silvia, F – 1.2%, I – 4.6%, DA – 0.1%), in 8 leaves stage.
Round pepper (Creola, F – 2.9%, I - 2.2%, DA - 0.1%), in 4 leaves stage.
Round pepper (Lider (F – 5.2%I – 3.1%, DA – 0.2%), in 4 leaves stage.
Sweet pepper (Dariana Bac, F – 0.9 %, I - 0.7%, DA - 0.1%), in 3 leave stage.
Long pepper (Ionel (F – 6.7 %, I - 2.5%, DA - 0.2%, in 5 leaves.
Long pepper (Siret (F – 1.1%, I - 0.8%, DA - 0.1%, in 2 leaves.
Egg plants (Contesa F – 8.4%, I – 0.1%, DA – 0.1% in 5 leaves.

The above variants had a high frequency of onion thrips attack (F%), fig. 1 and fig 2.

In tomato: L1, L2 and L3, in cabbage and Serata variety of lettuce we do not identified the viruses attack.

Because *Thrips tabaci* when feed on plants infected them with the viruses as: *Lycopersicon virus* 3, *Solanum virus* 8, *Nicotiana virus* 1, *Tomato Spotted wilt virus,* must necessary control of pests.

2. Control onion thrips

The efficacy of insecticide against vegetable pests is shoved in fig 3.

You can see that the variants Laser 240SC – 0.05%, had very good efficiency (85.9% after 24 hours,96.5% after 48 hours, 98.3% after 72 hours), followed by Talstar 10 EC 0.05% (74.3% after 24 hours, 91.4% after 48 hours, 94.2% after 72 hours) and Confidor Energy – 0.08% (65.7% after 24 hours, 89.3% after 48 hours and 91.6% after 72 hours).

CONCLUSIONS

During 2008-2011, greenhouse experiments were performed in Vegetable Research-Development Station Bacau - Romania, in order to evaluate the vegetable varieties and lines to the onion thrips attack in the seedling stage of the following species: tomato, cabbage, lettuce, pepper and egg plant.

It was identified the attack symptoms in: tomato (Unibac: F% - 1.6 %, I% - 15.4 % and DA - 0.2%; Roma F – 4.3%, I - 11.6%, DA - 0.5%; Moldoveanca F – 1.2%, I – 9.8%, DA - 0.1%; Rio Grande, F – 0.2%, I% - 2.4%, DA - 0.1%), diagram 1, in cotyledon and 5 leaves stage. lettuce (Silvia, F - 1.2%, I - 4.6%, DA - 0.1%), in 8 leaves stage; round pepper (Creola, F – 2.9%, I - 2.2%, DA - 0.1%), in 4 leaves stage, round pepper (Lider (F – 5.2%,I – 3.1%, DA – 0.2%), in 4 leaves stage; sweet pepper (Dariana Bac, F – 0.9 %, I - 0.7%, DA - 0.1%), in 3 leave stage; long pepper (Ionel (F – 6.7 %, I - 2.5%, DA - 0.2%, in 5 leaves; long pepper (Siret (F – 1.1%, I - 0.8%, DA - 0.1%, in 2 leaves; egg plants (Contesa F – 8.4%, I – 0.1%, DA – 0.1% in 5 leaves. In tomato: L1, L2 and L3, in cabbage and Serata variety of lettuce we do not identified any viruses attack.

The efficacy of insecticides against onion thrips was very good: Laser 240SC – 0.05%.- 85.9% after 24 hours, 96.5% after 48 hours, 98.3% after 72 hours, followed by Talstar 10 EC – 0.05%: 74.3% after 24 hours, 91.4% after 48 hours, 94.2% after 72 hours, and Confidor Energy – 0.08%: 65.7% after 24 hours, 89.3% after 48 hours and 91.6% after 72 hours.

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TABLES AND FIGURES

Table 1

The study of varieties and lines of vegetables

No. Var.	Varieties/lines	Time			Comments
		Sowing	Come up of plants	Transplant of plants in plastic trays	
		Tomato			
V1	Unibac V1	14.03	19.03	27-28.03	Normally come up of plants
V2	Roma	24.03	24.03	31.03	Normally come up of plants
V3	Moldoveanca	26.03	26.03	02.04	Normally come up of plants
V4	Rio Grande	14.03	19.03	24- 26.03	Normally come up of plants
		Cabbage			
V1	Flavius	28.02	05.03	07-8.03	Come up of plants in 6 days
V2	Rovana	07.03	10.03	11-12.03	Come up of plants in 3 days
V3	De Isalniţa				Come up of plants in 3 days
		Lettuce			
V1	Serata	05.03	08.03	15.03	Normally come up of plants
V2	Silvia	15.03	22.03	26.03	Normally come up of plants
		Pepper			
V1	Round pepper–Creola V1	28.02	09.03	13.03	Normally come up of plants
V2	Round pepper –Lider	28.02	16.03	24.03	Normally come up of plants
V3	Sweet pepper Dariana Bac	28.02	09.03	13.03	Normally come up of plants
V4	Long pepper Ionel	28.02	09.03	14.03	Normally come up of plants
V5	Long pepper Siret	05.03	17.03	21.03	Normally come up of plants
V6	Hot pepper - Iute delicos	10.03	17.03	27.03	Quickly come up of plants
		Egg plants			
V1	Contesa	10.03	22.03	30.03	Normally come up of plants

Table 2

The degree attack of thrips in vegetable seedling

No. var.	Varieties/Lines	Attack			Comments
		Frequency (F %)	Intensity (I %)	Degree of attack (DA %)	
0	1	2	3	4	5
		Tomato			
V1	Unibac	1.6	15.4	0.2	Cotyledon leaves
V2	Roma	4.3	11.6	0.5	Cotyledon leaves
V3	Moldoveanca	1.2	9.8	0.1	Cotyledon leaves
V4	Rio Grande	0.2	2.4	0.1	5 leaves
V5	L1	0	0	0	Cotyledon leaves
V6	L2	0	0	0	Cotyledon leaves
V7	L3	0	0	0	Cotyledon leaves
V8	L4	0	0	0	Cotyledon leaves
		Cabbage			
V1	Flavius	0	0	0	9 leaves
V2	Rovana	0	0	0	6 – 7 leaves
V3	De Isalniţa	0	0	0	4 – 6 leaves
		Lettuce			
V1	Serata	0	0	0	8 leaves
V2	Silvia	1.2	4.6	0.1	8 leaves
		Pepper			
V1	Round pepper–Creola	2,9	2.2	0.1	4 leaves
V3	Round pepper–Lider	5.2	3.1	0.2	4 leaves
V4	Sweet pepper – Dariana Bac	0,9	0.7	0.1	3 leaves
V6	Long pepper – Ionel	6.7	2.5	0.2	5 leaves
V8	Long pepper – Siret	1.1	0.8	0.1	2 leaves
V9	Hot pepper – Iute delicios	0	0	0	2 leaves
		Egg plants			
V1	Contesa	8.4	0.1	0.1	5 leaves

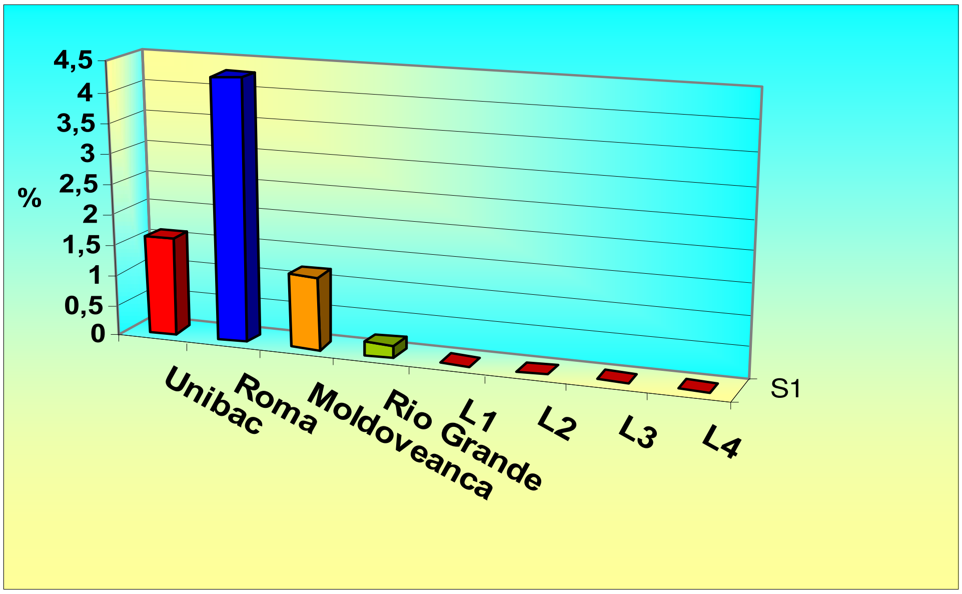

Fig. 1 Frequency of thrips attack in tomato

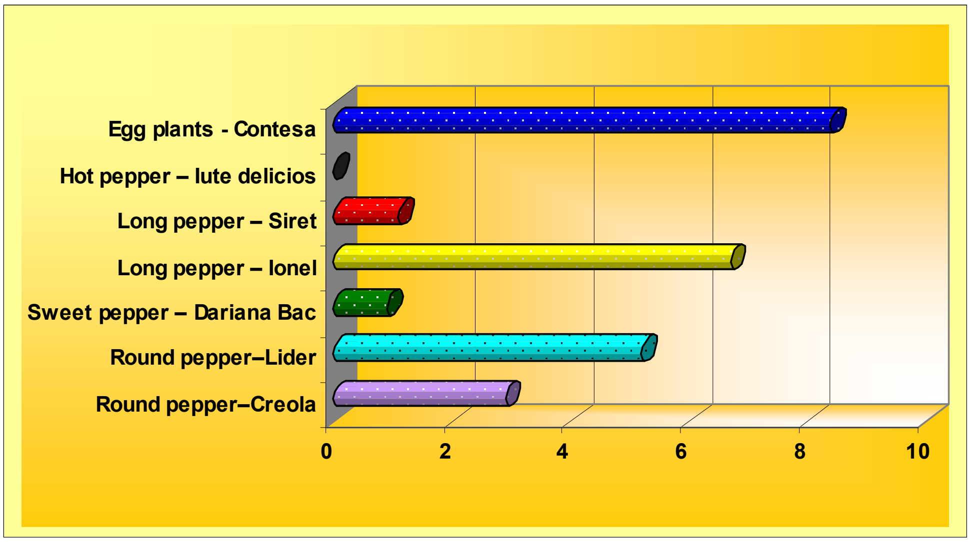

Fig. 2 Attack (%) of thrips in pepper and egg plants

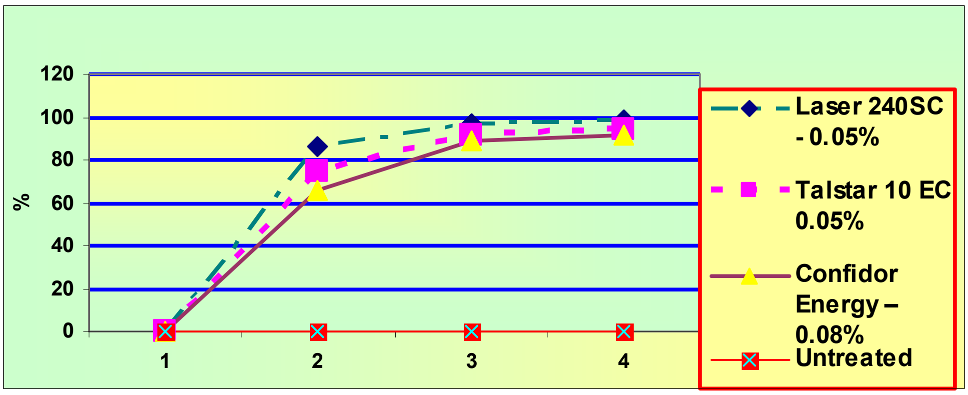

Fig. 3 The efficiency of insecticides in control of onion thrips

Researches regarding the red onion seed's production, according to: bulb size, planting time and the density of plants/ha

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Keywords: bulb weight, number of plants/unit area, seed production capacity, quality indices of seeds

ABSTRACT

From the researches of some factors which influence the quantity and quality of onion seed was found that among the most important factors include: bulb size, time of planting, plant density per unit area. The bulb's size denotes the quantity of restored substances from the bulb that examine the plant growth and the seed's plant development from the first phase after the resumption of vegetation of the transformation from the bulb-plant phase into seed plants phase. The influence of planting time is determined by the vernalization conditions of bulb-mother plants. The plant's density per unit area influence the production and quality of onion seeds through the nutrition area that was provide to the seed plants.

INTRODUCTION

The seed production process is a complex of factors that through their correlation determines the quantity and quality of seed (Stefanescu, 2000). The genotype of the biological material that is used in the multiplication of a cultivar and in the seed's production represents the determining factor of the expected results. Environmental conditions, such as the applied methodology influence the phenotypic expression of genotype (Stefanescu, 2000; Lascu and Poaşcă, 1989; Vilceanu, 1967, Khalid, 1984). The present work investigated the influence of some factors on the production of red onion, Rosie de Aries variety.

MATERIALS AND METHODS

The studies have been conducted on the biological material from PB category (pre-basic) to Rosie de Iernut variety, according to the SCDL Iernut conditions, from 2007-2010 periods.

The research was conducted as part of trifactorial experiences placed in subdivide lots in four repetitions, where:

-Factor A - Age up to experience (with two graduations: A_1 during the period 10-15 October and A_2 between 25-30 March);

- B factor - the size of the bulb (g);

- Factor C- density of plants/unit area, planting schedule distance between rows/distance between plants/row: C1-70 cm/30 cm, C2-70 cm/20 cm, C3-70 cm/10 cm (fig 1).

RESULTS AND DISCUSSIONS

The average yields achieved on experimental variants of the trifactorial experience are presented in table 1. The dispersion analyses (table 2) were established limit differences and degrees of freedom to determine the significance of differences in production of experimental variations.

Factor A - time of planting, influenced the seed production achieved per hectare but not significant (table 3). The average production experiences achieved was established in autumn 1116 kg/ha, and to the experiences created by planting bulbs at the end of March was 865 kg/ha.

The bulb-mother-plant's size influenced the production of seed produced per hectare (table 4). To the variants with large bulbs (B_1) was recorded on average 1 125 kg/ha beside the average of the variant with small bulbs (B_2) which was 857 kg/ha.

The studies on the influence of plant density per unit area showed significant differences between the seed production of the variants with different densities (Table 5). Between the variants C1 and C2 were made significant distinct differences, and between C1 and C3 variants were registered very significant differences.

In those two periods of up to experience, the highest yield was obtained at the variants with the largest mother-plant- bulbs (table 6), where was almost the same difference between B1 and B2 production, at the variant from A1 age (292 kg7ha) and also at the variants from A2 age (236 kg/ha).

The combination of two age factors and planting density (Table 7) resulted the differentiation of made productions but insignificant.

The average production on total experiences is summarized in table 8 and figure 2.

CONCLUSIONS

From the study of those three factors A- planting age of mother plant- bulbs, B – the bulb's size and C – plants density/ha was shown:

A factor influences in a favourable way the seed production to the planted variants in autumn but with insignificant differences beside the spring variants;

B factor influence in a favourable way the seed production to the variant with large B1's bulbs but with insignificant differences beside the variant with B2 small bulbs;

C factor recorded significant distinct differences between the C1 and C2 variants and very significant between the C2 and C3 variants;

Following the obtained results it is recommended: the establishment from autumn of onion seed crop regarding Rosie de Aries variety, with large bulbs and high density according planting schedule 70cm between rows/10 cm between plants per row.

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TABLES AND FIGURES

Table 1

The obtained productions (kg/ha) from trifactorial experience (2 x 2 x 3), on repetition

A	B	C	R_1	R_2	R_3	R_4	V
A_1	B_1	C_1	821	747	859	859	3286
		C_2	1008	1176	1120	1176	4480
		C_3	1680	2016	1792	1904	7392
			3509	3939	3771	3939	15158
	B_2	C_1	784	672	597	634	2687
		C_2	896	784	952	952	3584
		C_3	1120	1344	1568	1344	5376
		Middle lots	2800	2800	3117	2930	11647
		Big lots	6309	6739	6888	6869	26805
A_2	B_1	C_1	647	709	634	672	2662
		C_2	784	952	840	784	3360
		C_3	1456	1456	1344	1568	5824
			2887	3117	2818	3024	11846
	B_2	C_1	560	448	523	672	2203
		C_2	672	560	672	784	2688
		C_3	1008	1008	784	1232	4032
		Middle lots	2240	2016	1979	2688	8923
		Big lots	5127	5133	4797	5712	20769
R			11436	11872	11685	12581	47574

Table 2

Dispersional analisis for trifactorial experience (2 x 2 x 3)

Variability cause	SP	GL	S^2 (D)	"F" test
TOTAL	704	47		
Large lots	867765.6	7		
Repetitions	60491.4	3		
A (age)	24714430	1	24714430	3.101301
Error (a)	-23907156	3	7969052	
Middle lots	948905	8		
B (bulb size-g)	847537	1	847537	0,211579
A.B	-23933313	1	23933313	5.974695
Error (b)	24034681	6	4005780	
Small lots	1816671	24		
C (densities)	4626729	2	2313364	17.91028
A.C	-23853703	2	11926851	92.33882
B.C	282392	2	141196	1.093153
A.B.C	23940811	2	11970405	92.67602
Error (c)	-3099948	24	129164	

Table 3

The onion seed's production as result of the planting age

Planting age	Production		Difference	Signification
	Kg/ha	%		
A_1	1116.875	112.7	+125	-
A_2	865.375	87	-125	-
The average experience	991	100	Mt	Mt

DL 5% = 2591 sd =815
DL 1% = 4759
DL 0.1% = 10546

Table 4

The influence of mother plant-bulb's size on the onion seed production

Bulb size	Production		Difference	Signification
	Kg/ha	%		
B_1	1125	113	134	-
B_2	857	86	-134	-
Average	991	100	Mt	Mt

DL 5% = 1416 sd = 578
DL 1% = 2144
DL 0.1% = 3445

Table 5

The influence of seed's density on seed production/he

Density	Production		Difference	Signification
	Kg/ha	%		
C_1	1355	100	Mt	-
C_2	1764	130	409	**
C_3	2828	208	1473	***

DL 5% = 262 sd = 127
DL 1% = 356
DL 0.1% = 476

Table 6

The combined action of planting age and the size of bulb- mother plant

Age / Bulb size	Autumn (October) A_1			„Spring (March) A_2			Difference between ages $(A_1 - A_2)$	
	Kg/ha	Dif.	Signif.	Kg/ha	Dif.	Signif.	Kg/ha	Signif.
B_1	1263	293	-	987	236	-	276	-
B_2	970	Mt.	Mt.	743	Mt.	Mt.	226	-

DL 5% = 2591 sd = 667630
DL 1% = 4759
DL 0.1% = 10546

Table 7

The combined action of planting age and the density of planting

Age / Density	Autumn (October) A_1			Spring (March) A_2			Difference between ages $(A_1 - A_2)$	
	Kg/ha	Dif.	Signif.	Kg/ha	Dif.	Signif.	Kg/ha	Signif.
C_1	746	Mt	Mt	608	Mt	Mt	138	-
C_2	1008	262	-	756	148	-	252	-
C_3	1596	850	-	1232	624	-	364	-

DL 5% = 2591 sd = 667630
DL 1% = 4759
DL 0.1% = 10546

Table 8

The average productions on experimental variant to the Roşie de Arieş onion variaty

Age	Bulb (g)	C_1 (70/30 cm)	C_2 (70/20) cm	C_3 (70/10 cm)
A_1	B_1	821	1120	1848
	B_2	665	840	1456
A_2	B_1	672	896	1344
	B_2	551	672	1008

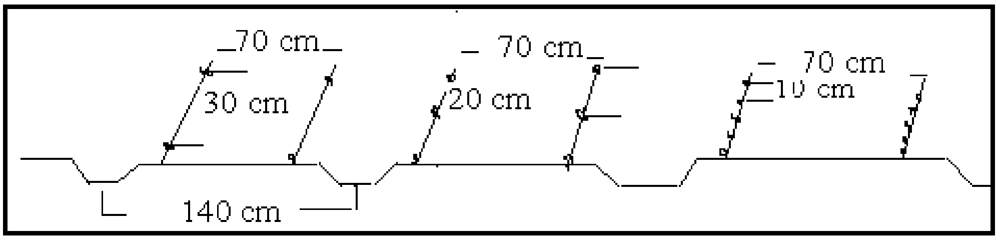

Fig 1. – Planting diagram

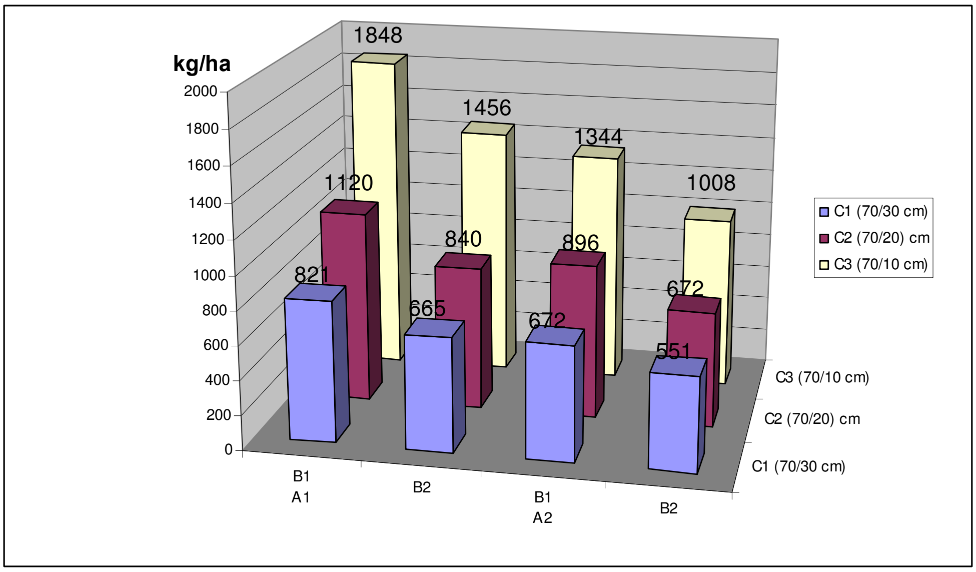

Fig.2 – Average productions (kg/ha) resulted from trifactorial experiences regarding Roşie de Arieş onion variety

Fig.3 – Onion bulbs – Roşie de Arieş variety

Fig.4 – Onion bulbs – Roşie de Arieş variety

Fig.5 – Roşie de Arieş onion variety – seed tree crop, “before flowering” development phase

Effect of plant density and fertilizer on crop growth root yield and quality of carrot

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Keywords: variety, nutrition, spacing, management

ABSTRACT

Many of the physiological process are directly or indirectly controlled by environment under which crops are grown. In addition, hybrids type, soil and cultural practice have a profound influence on the productivity and quality crop plants. In order to suit the requirement for a crop, the environment can be manipulated to certain extent by cultural practices (Horgoș, 2003). Hence, an attempt was made to increase the yield as well as quality by way of manipulating cultural practices like date of sow, nutrition and spacing (Ciofu et al., 2003).A field experiment was carried to study the effect of nutrition, plant density and root production in carrot crop.

INTRODUCTION

While carrots grow under a range of climatic conditions, they performer best under moderate temperatures and consumption can provide all year around. Root quality however, including color, maybe reduced by temperatures extremes and high temperatures can cause burning of young seedlings. Land suitability assessments are based on a range of climate and soil factors including, mean temperatures, soil type and pH. A grower's choice of carrot variety should be driven by the combination of market requirements and local climatic land, soil characteristics (Indrea, 2004). To develop good root size and shape, carrots need to grow rapidly and without restriction. Soils that have not been deeply loosened recently may need deep ripping any compact layers that inhibit root growth (Badea, 2003).

Precision seedling is important because thinning of carrots is unlikely to be available option for managing crop density (Indrea, 2007). With precision seedling, growers can manipulate crop density accurately to suit variable seasonal conditions and varietals characteristics. Crop density and uniformity deserve attention because of important role they play in obtain good production in quality parameters and weed management (Atanasiu, 2000).

The aim of this highlighting optimal fertilization variants and spacing.

MATERIALS AND METHODS

The field experiment was situated in Bucov – Prahova County, and the study were initiated that experiment was laid out in medium clay loam soil.

The details are as follows:

- biological materials used to sow are described in table 1.
- date of sowing : 1st; March, 15th; March, 1st; April, 15th; April

Factor I – Nutrition (N)

N1 – NPK (100 : 250 : 150 Kg/ha)

N2 – green manure – plant debris incorporated into the soil.

Factor II - Spacing (S)

S1 – shaped field, 2 lanes of each 2 rows per layer with 15 cm distance between rows and 50 cm distance between lanes.

S2 – unformed field with 5 rows per lane, 25 cm distance between rows and 50 cm distance between lanes.

As cultural practice, the land was ploughed and harrowed twice after the harvest of previous crop followed by planking to bring the soil to a fine tilt (Gedda, 2007).

The crop from field N1 was fertilized with N, P, K at 100 : 250 : 150 kg/ha in the form of ammonium nitrate, single super phosphate and potassium salt, respectively as basal dose. The doses was divided in 3 parts and applied 3 times (Chilom, 2002).The field N2 was fertilized with green manure incorporated into the soil in previous year.

Sowing was done at fifteen days interval on 1st; March, 15th; March,1st; April, 15th; April, seed in drills about 2 cm deep and 15 cm apart that the spacing the foliage of adjacent plants will make a dense canopy when the plants are mature (Hill ,1987).

In order to keep the soil pours and also free from weeds, regular intercultivation operations were carried out. Two irrigations were given up to germination and there after the crop was irrigated at 8-10 days intervals depending upon the soil condition (Burzo et al., 2005).

Plant protection measures were not necessary.

Observations and measurements on nutrition and plant density were made in experience.

RESULTS AND DISCUSSIONSS

Seed germination was influenced by sowing date. Higher per cent of seed germination was recorded in plots fertilized with chemical fertilizer: H2 (97.5%), H4 (96%), H1 (70%), H3 (40.5%).

Higher per cent of seed germination in plots fertilized with green manure was recorded in H4 (90%), H2 (88%), H1 (65%), H3 (40%).

Nutrition level was significantly influenced the speed of germination.

Seed germination influenced by spacing, on shaped field (S1) stands 4 days early seed germination comparing S2.

As growth parameters : plant measured at 15 days from seedling was influenced by nutrient level, significantly higher plant height in N1 plots was recorded in H2 (15.2cm), H3 (14.7 cm), H1 (12.4 cm), and H4 (10.8cm).

In N2 plots were recorded the higher plants in H2 (12.3 cm), H3 (12.1 cm), H1 (8.4 cm) and H4 (5.7 cm).

Plant measured at 30 days from seedling influenced by nutrient level, significantly higher in N1 was recorded in H3 (37.3 cm), H2 (35.2 cm), H1 (28.4 cm), H4 (20.2cm).
Significantly higher in N2 was recorded in H2 (27.6 cm), H3 (25.1 cm), H1 (19.8 cm), H4 (15.2 cm).

Number of leaves was significantly influenced by spacing. Higher number of leaves was recorded in S2 than the S1: H3 (14)over H3 (12), H2 (13) over H2(10), H1(8) over H1(7), H4 (6) over H4 (5).

Nutrition levels didn't influenced the number of leaves significantly.

Root length and thickness were recorded in plots fertilized with chemicals and also in plots where the distance between rows were 25 cm.

Weight was influenced by nutrition level and spacing. In plots with 25 cm distance and also fertilized by chemicals, the higher weight was recorded in H2 (see tables 2 and 3).

As the sowing was delayed, environmental conditions went on becoming adverse and affected the plant growth, yield and root quality.

Application of inorganic fertilizer significantly influenced the growth parameters in carrot. The use of green manure alone suffers from draw back of low contents of nutrients and its slow release.

Plant spacing had significant effect on plant : height, number of leaves per plant, weight of root .Plant high under plant geometry (25 x 50 cm) were significantly superior over plant geometry (15 x 50 cm). Increase in plant height at closer intra row spacing was due to mutual shading by the plants and the competition for light.

CONCLUSIONS

To get maximum economic yield an integrated approach is necessary to combine these two nutrients organic and inorganic.

The increase in growth and yield components noticed in the present study may be due to the fact organics and known to enhance microbial activity which might have helped to improved availability of nutrients.

Options set for the experience influenced the production. Production influenced range.

Was obtain a mean 4 kg/m² in root production but with good machineries, optimal doses of fertilizers and plant density the production can increase at 6-7 kg/m².

* * *

Experience was repeated this year, not yet collected but after harvest complements the biochemical analysis to reveal the biochemical composition and level of pollutants in the root.

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TABLES

Table 1

Biological materials used for study

Variety	Type	Vegetation period		Root		Variant
		Maturity	No. of days	Shape	Length(cm)	
Atlantis F1	Nantes	semilate	120	cylinder	18-20	H1
Ascania F1	Nantes	semilate	130	cylinder	19-22	H2
Kardame F1	Berlicum/Flakkee	late	140	cylinder	18-21	H3
Neptun F1	Flakkee	late	155	conical	25-30	H4

Table 2

Root length and thickness variation

L = length of root; Ø = thickness of root

Cultivar	N1		N2		S1		S2	
	L	Ø	L	Ø	L	Ø	L	Ø
H1	18.2	5.5	17.2	5.3	16.2	5.2	18.4	6.1
H2	22.6	5.3	20.1	4.7	18.7	4.6	21.2	5.3
H3	15.1	4.3	13.4	3.6	15.3	4.2	14.9	4.3
H4	14.7	3.6	10.2	3.1	15.1	4.1	16.2	4.1

Table 3

Weight root and leaves variation

WR+L = weight root + leaves; WR = weight root

Cultivar	N1		N2		S1		S2	
	WR +L (g)	WR (g)	WR +L (g)	WR (g)	WR+L (g)	WR (g)	WR+L (g)	WR (g)
H1	273	146	255	121	228	127	247	142
H2	651	320	334	198	436	248	474	278
H3	520	285	323	142	402	137	433	166
H4	165	72	127	56	103	48	117	67

Research and results on the influence of nutritive solutions in the nonconventional carrot culture on perlite sublayer

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Keywords: soilless culture, cultivars, management

ABSTRACT

The extended research made along the years by scientists and researchers on mineral nutrition of the plants cultivated in a nonconventional system resulted in a series of nutritive solutions. Nutritive solutions are to soilless culture the most important technological factor whereby the mineral and hydric nutrition of plants is assured with maximum accuracy. Elaborating and preparing nutritive solutions requires solid knowledge of chemistry and plant physiology, so that putting them into practice should represent a specific manner of obtaining large and good quality productions (Atanasiu ,2009).For the culture achieved within this experiment, fertirrigation has been made by using some nutritive solutions whose main parameters, electroconductivity and pH have been monitored and adjusted function of the phenophases and the environment conditions.This work presents experimental data regarding the evolution of the plants components and some preliminary results on production. It is very important to be familiar both with the composition of the nutritive elements in the solution as well as with the best concentrations or limits within which they may vary so as not to become toxic for the plant. Therefore these recipes present both the composition of nutritive elements necessary to the carrot culture and the concentrations they must have when supplied in the nutritive solutions.

INTRODUCTION

The literature in the field offered relatively few information on nutritive solutions and the way of using them function of the cultivated species until 20 years ago .During the last years, “soilless” horticultural cultures have obtained very good positions in the top of vegetal production of world agriculture but we discover the growth of interest in some domestic producers for these nonconventional technologies. Some variants of these nonconventional technologies are largely applied to produce tomatoes, cucumbers, cut flowers and ornamental plants in flowerpots on perlite sublayer (Kenyon,1992).In relation to the recipes of nutritive solutions used for these cultures, the literature in the field shows two points of view:
- using one single type of nutritive solution, differentiated at the most as electroconductivity for all species that may be cultivated in the nonconventional system. This point of view is promoted by some Japanese specialists.
- using some differentiated solutions such as electroconductivity and nutrition-wise balanced function of the species, phenophase and environment conditions. This point of view is promoted in Europe, with priority by the Dutch researchers.In both situations, the literature in the field specifies that the results of fertirrigation with nutritive solution may be adapted to the requirements of the cultivated species both as nutritive balance and as a limit of the concentration.The purpose of this work is to determine a fertilization method proper for carrot growing on perlite sublayer.

MATERIALS AND METHODS

The setting up of the carrot culture on perlite sublayer has been done in plastic flowerpots with a volume of 12 l/flowerpot, on whose walls (5 cm from the base), 4-5 mm diameter holes have been made to drain the nutritive solution (Muckle ,1994). The sublayer that has been used is the perlite, laid in the flowerpots.

In preparing the nutritive solution, two types of complex fertilizer have been used, made by Scotts – The Netherlands.The main characteristics of the complex fertilizer are presented in table 1.

In order to achieve the determined research, the variants specified in table 2 have been studied.

The 12 variants of the bifactorial experience have been achieved by combining 2 types of nutritive solution with 6 cultivars F1 in 5 degrees of earliness.

The nutritive solution 1 has been achieved by using blue Universol soluble complex fertilizer containing (N, P, K and the complete set of necessary nutritive elements in small amounts – Mg and microelements).

The nutritive solution 2 has been made of green Universol fertilizer. Both solutions have been added the necessary amounts of Ca and Mg.

Electroconductivity, the nutritive solution, used in experiments, has been determined and permanently adjusted in the values of table 3.

The cultivars assortment used comes from companies that deal with seed improvement and trade in Europe (The Netherlands and The United Kingdom).The perlite sublayer, with fine granulation has been laid in the flowerpots, moistened and sowed. The seeds had been previously moistened (to hasten emergence), had been superficially sowed and covered with a thin layer of vermiculite. The culture has been sowed with a precision sewing machine (Pro Seeder) assuring a density of 80 plants/m² (Ciofu et al., 2003).

The nutritive solution has been applied by sprinkling the surface of the sublayer to the roots of the plant have reached the base of the perlite layer. Subsequently, the perlite sublayer has been irrigated by applying the solution in the trays where the flowerpots were placed.

Periodically the nutritive solutions have been replaced. The care-taking works have been limited to fertirrigation, since no other works of disease and pest controls were required.

In this experiment, observations and determinations have been made, regarding the number of days necessary for emergence, the percentage of emerged plants, the growing rhythm of the aerial part and at random the growing dynamics of carrot roots.

RESULTS AND DISCUSSIONSS

It has been discovered that emergence in the flowerpots fertilized with green solution has been more rapid, as compared to the flowerpots fertilized with blue solution, and the same in the development of the rosette.At the same time with the tuberization of the carrot roots, visible differences have appeared in the flowerpots fertilized with blue solution.

The concentration of the nutritive solution is a characteristic element in the growth and development of the carrot roots as, in fact, of all the plants cultivated in the hydroponic system. The control of total concentration and the pH of the nutritive solution is assured by permanently measuring the electric conductivity of the solution and of its pH.

The correction of the nutritive solution is made function of the parameters determined by the gauge sensors. The periodical correction of the reaction in the nutritive solution is necessary (Saavas,2002) for the following reasons: in most of the cases, the pH of the solution tends to grow, on the one hand, because of the intense activity of the carrot roots extracting most of the nitrogen necessary in nitrate form, leaving excess bicarbonate ions that raise its pH, on the other hand, the water source used in preparing the solutions, most of the times coming from the public network, contains a large amount of Ca bicarbonate imprinting a basic pH to the nutritive solution from the very moment of preparation.

Solar radiation, too, is responsible for the pH modifications, especially in the nebulousness days. In order to avoid precipitation of certain microelements (Fe, Mn) in the nutritive solution, it is recommended to maintain an acid pH around the value of 6.5 so that the carrot roots may absorb the microelements from the nutritive solution.

In order to correct this phenomenon, it is recommended that when preparing the nutritive solution to use the water coming from rainfall and introduce amoniacal N in the solution to maintain its acidity. The temperature of the nutritive solution must be maintained around the value of 21 º C. Smaller values of it determine amendments of the measured electroconductivity (increase the value) and at the same time determine the reduction of the growing rhythm of the carrot roots, the absorption of the nutritive solution and plant perspiration (Atanasiu, 2009).

Further to the determinations made, it has been discovered that the evaporation of the nutritive solution decreases its temperature by 1°C. In order to maintain a constant growing and developing rhythm of the carrot roots, the temperature of the nutritive solution must be maintained around the value of 21-22º C. Smaller values of it determine the slowing down of the growing and developing rhythm of the carrot roots, the minimum threshold being 18°C, at 17º C the growth is found to stop.

The measured parameters (electroconductivity, pH) in the tested nutritive solutions may be found in the table 4 and the influence of the nutritive solutions on the rosette and on the variation of the root length are to be found in the tables 5 and 6.

CONCLUSIONS

Based on the presented results, the following conclusions may be formulated:

The carrot culture on perlite sublayer is possible even while using a technical and material base with an average level.

The complex fertilizers used represent basic ingredients to prepare some nutritive solutions to which, to be complete, source admixtures have been necessary for two macro elements: Ca and Mg.

The influence of the two types of solutions on the vegetative growth of the carrot is noticeable within relatively reduced limits. The influence of the experimented assortment is visible even in the case of determinations made at random before the best cropping moment.

* * *

We believe that it is necessary to continue and elaborate this research until the end of the culture season and during the next years.

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TABLES

Table 1

Chemical composition of Universol fertilizer (prospectus after Scotts)

%N,P,KMg / Nutritive elements	Green Universol 23+6+10+2	Blue Universol 18+11+18+2
Total nitrogen, (N) of which	23	18
N nitric	11.5	7.7
N ammoniacal	11.5	10.3
Phosphorum (P2O5)	6	11
Potassium (K2O)	10	18
Magnesium (MgO)	2.5	2.1
Iron (Fe) EDTA	0.06	0.06
Boron (B)	0.01	0.01
Copper (Cu) EDTA	0.01	0.01
Manganese (Mn) EDTA	0.04	0.04
Molybdenum (Mo)	0.001	0.001
Zinc (Zn) EDTA	0.01	0.01
Conductivity (EC) for solution with concetration 1g/l la 21 º C	1.5 mS/cm²	1.3 mS/cm²
Maximum solubility grams/liter	250	350

Table 2

Biological materials used for study

Variety	Vegetation period		Root shape
	No. of days	maturity	
Purple Haze F1	95	Semi late	cylinder
Rainbow F1	95	Semi late	cylinder
Baby Carrot F1	65	Extra early	conical
Rondo F1	80	Semi early	round
Danvers F1	75	early	conical
Gigante Flakkee F1	150	late	conical

Table 3

Phenophases calendar

Week 1 from seedling	East 90 %
Week 2 from seedling	Fisrt appearance of true leaves; 1-2 leaves/plant
Week 3 from seedling	Growth true leaves ; 5.5 cm the higher leaf
Week 4 from seedling	Rosette formation; 4-5 leaves per rosette
Week 5 from seedling	Growth rosette and higher leaf have 10.4 cm
Week 6 from seedling	Growth rosette and higher leaf have 15.7 cm
Week 7 from seedling	Growth rosette and higher leaf have 24.8 cm
Week8 from seedling	Growth rosette and higher leaf have 33.4 cm
Week 9 from seedling	Growth rosette and number of leaves at 7
Week10 from seedling	Growth of root; pencil dimension at 5.7 cm lenght

Table 4

Mesurement of nutritive solution parameters

A – from sowing to the east; B – leaf emergence seed-lobe; C – vegetative growth, 30 days from east; D – vegetative growth, 60 days from east

Phenophase	Solution 1		Solution 2	
	Nutrient solution conductivity in substrate mS/cm² at 21°C	pH	Nutrient solution conductivity in substrate mS/cm² at 21°C	pH
A	1.74	7.1	1.69	7.1
B	1.86	6.8	1.76	6.5
C	3.1	6.9	2.94	6.5
D	2.67	6.8	2.54	6.5

Table 5

Nutrient solution influence on rosette height and number of leaves

No	Cultivar	S1		S2	
		Rosette height (cm)	No of leaves	Rosette height (cm)	No of leaves
1	Purple haze F1	20.7	6	22.7	6
2	Rainbow F1	25.1	5	28.9	5
3	Baby Carrot	26.8	4	27.3	4
4	Rondo	19.6	7	20.2	7
5	Danver	27.5	8	30.5	8
6	Flakkee	35.2	7	36.6	7

Table 6

Influence nutrient solution on root length and girth variation (intermediate results)

L= length of root; Ø= thickness of root

No	Cultivar	S1		S2		Characteristic dimension of cultivar	
		L (cm)	Ø (cm)	L (cm)	Ø (cm)	L (cm)	Ø (cm)
1	Purple Haze F1	18.1	8.3	16.0	7.8	22-25	10-12
2	Rainbow F1	20.3	8.2	19.7	8.1	25-27	10-12
3	Baby Carrot	9.7	4.7	8.9	4.5	10-11	6
4	Rondo	4.1	10.4	4.2	10.2	4-5	12-15
5	Danvers	18.3	14.6	18.2	12.4	18-20	15-16
6	Gigante Flakkee	24.6	13.5	22.7	12.2	27-35	17-20

Influence of peat unconventional substrate on the use of economic resources materials to tomatoes grown in greenhouses

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Keywords: tomato greenhouse, peat substrate, fertirigation in open circuit

ABSTRACT

Unconventional culture of tomatoes is well known by vegetables horticultures in Romania. With the exception of companies operating modern greenhouses fertiirigation in closed system (total of 20ha in the entire country), the vast majority of growers interested in these high-tech solutions are less interested high costs, such as those used as substrates, peat, fiber coconut and perlit, with fertirigation in open system. Basic advantages such as high productivity, relatively easy to maintain plant health and the possibility of using even older building greenhouses old and outdated, are supported by a range of modern technology, the use of preparation and management stations and nutritional solutions supplementary pollination by bumble bees. To reduce production costs, most small producers using greenhouses and conservatories cold. Extending this culture system is subject to much higher productions than for soil cultivation technology. It was and is necessary to establish the experimental basis of unconventional culture technologies, adapted to the conditions provided by the spaces of culture used.This paper presents a comparative study of culture technologies applied in greenhouses block, built in the 70s of last century, soil and peat substrate, resulting in production results can be as good appreciated (152 500kg/ha in cycle I briefly).

INTRODUCTION

The aim of achieving higher production than those obtained in classical culture of tomatoes on the ground (70 - 80t/ha in the cycle, with delayed planting) in our country have been tried and subsequently extended conventional culture technologies towards which were used as substrates priority peat, coir or perlit with a short cycle similar cultural calendar of solariums.

Based on these considerations, research presented in this works, compare the results obtained from culture production on soil and peat in greenhouse culture cycle, the biological material using two cultivars of hybrid, growing due to the main stem is formed only 6 -7 flowers, enough to cover the timing of specific culture partially heated solariums early cycle (Table 1).

In parallel gave special attention to monitoring water consumption and fertilizer, because they are reported in kilograms of fruit harvested and not land area. This reporting of water consumption is very topical in a country where rules are still present irrigation for vegetable crops in thousands of cubic meters or in liters of water per square meter. In the case of fertigation of conventional crops, saving water consumers entails and economic use of fertilizers used as sources of macro and micronutrients for nutrition unconventional culture of tomatoes.

MATERIALS AND METHODS

Research undertaken two consecutive years - 2009 - 2010 were made using the following materials and specific items of technology:

Hybrid cultivars - Platus F1 and Vulkanus F1 - created by Dutch company De Ruiter Seeds, which due to the increase determined are suitable for short cycle crops in greenhouses and conservatories.

Technology applied to cultivated soil variants was the classic, but excluding chemical soil disinfection, specific cultures for many years operated in greenhouses.

Technology applied for variants grown **on peat** had the following features:
- **Culture substrate** - Terra Cult coarse peat, brewed specifically to be used as a substrate was placed in buckets with a capacity of 10litri, in which two seedlings were planted, drainage holes were applied to a height of 6cm to bottom of the buckets.
- **Fertigation** was applied by spreading the culture substrate with a nutritive solution prepared by an automatic station, monitored by computer. Nutrient solution was distributed by an installation of drip irrigation nozzles mounted on small diameter storm, type spaghetti, one for each plant.
- **Electroconductivity get out of the station** was 2.5 to 2.7 mS/cm^2 and maximum 3.2 to 3.3 mS/cm^2 for the drained. Diurnal consumption varied between 0.15 and 1.7 liters/plant/day, discharge outside the substrate of about 15-20% of the administered solution.
- **Density culture** - 31,200 plants/ha

In the experience has been applied to specific care work early tomato crops in greenhouses and conservatories in the cycle (short).
- **Culture was planted** during March 10 to 15, with heating in the first three weeks, meat (which was the case) and harvested in late May to late June.

At the experience were made observations and measurements of vegetative growth, fructification characteristics, production levels, consumption of water and fertilizer on the plant.

RESULTS AND DISCUSSIONSS

As a result of those observations and measurements were obtained several novel and interesting results of which will be presented in detail only the most important.

The timing of culture results show that both cultivars have an earliness which allows coverage I cycle calendar of greenhouse warming and delayed planting only the first 3-4 weeks of culture.

When making sausage culture, the number of flowers on plants (Table 2) varies in very close limits, between 6.6 (F1 Platus (soil) and 6.9 (Vulkanus F1 (peat)). The differences show that Platus F1 is a little late than Vulkanus F1, without values determined to be consistent.

Biggest differences are recorded in the number of fruit harvested from plants capitalized at variants studied. This element is found that large differences are created by the rooting substrate. In the same substrate, the differences between the numbers of fruit of both cultivars are very low.

Average weight of fruit (Table 3), also vary in very low limits within the same substrate (111.3 g Platus F1 and 108.8 g F1 Vulkanus on ground). Regarding the differences created by culture substrate, we emphasize that this parameter is more consistent with the substrate on peat from the ground (136.2 g at Plates F1 on peat compare with 111.3 g from the same hybrid soil).

The statistical interpretation of production results recorded from this bifactorial experience highlight the following aspects:

The influence of cultivar on creating differences in production is low, meaningless (Table 4). Differences between average yields on both substrates at Vulkan F1 (113, 805 kg/ha) is that only 625kg/ha is higher than in Platus F1.

Meanwhile, similar difference between the average yields of both cultivars on soil and peat is very high, 77,965 kg/ha. This very significant positive difference shows that using conventional technology of culture of tomatoes in the cycle I can certainly get a doubling of total production compared to culture on the soil.

Regarding water and fertilizer consumption data table 6 highlight the following aspects:

At the variants grown on soil, water consumption in both hybrids exceed 68 liters (Vulkanus F1) and 66.5 liters/kg fruit Platus F1, resulting in consumption of 125, respectively 129g/kg harvested fruit.

When grown on peat alternatives, water consumption is about 50% lower than those recorded in soil culture. Please note that about 20% of these amounts to drain out the plant rooting substrate are lost in the environment.

CONCLUSIONS

- Peat culture substrate can be achieved with good production results also in universal type greenhouses built block in the years 1970 - 1975;
- Between the production performance of the two cultivars there are no significant differences in total production;
- The total production of the two hybrids grown on peat is over 150,000kg/ha and is almost two times higher than the production of variants grown on the soil;
- Peat culture is distinguished by the average fruit weight increased by 10-12% compared with that obtained from culture on the soil;
- Consumption of water and fertilizer reported per kilogram of quality fruit which can be exploited are much lower in peat culture compared to the soil one.

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TABLES

Table 1

Experimental variants
Tomato cultivated on soil and peat substrate

Variant number	Culture substrate (a)	Cultivar (b)	Destination
1(Ct)	Soil (a1)	Platus F1 (b1)	Greenhouse and solarium culture, fresh consume
2		Vulkanus F1 (b2)	Greenhouse and solarium culture, fresh consume
3	Peat (a2)	Platus F1 (b1)	Greenhouse and solarium culture, fresh consume
4		Vulkanus F1 (b2)	Greenhouse and solarium culture, fresh consume

Table 2

Number of flowers and fruits on the plant

Variant number	Culture substrate (a)	Cultivar (b)	Number of flowers on plant	Number of fruits harvested on a plant
1(Ct)	Soil (a1)	Platus F1 (b1)	6.6	22.35
2		Vulkanus F1 (b2)	6.8	22.07
3	Peat (a2)	Platus F1 (b1)	6.8	35.85
4		Vulkanus F1 (b2)	6.9	37.29

Table 3

Number of fruits, medium weight and crop

Variant number	Culture substrate (a)	Cultivar (b)	Number of fruits on the plant	Medium weight, g/fruit	Crop	
					Kg/plant	Kg/ha
1(Ct)	Soil (a1)	Platus F1 (b1)	22.35	111.3	2.487	74160
2		Vulkanus F1 (b2)	22.07	108.8	2.401	74910
3	Peat (a2)	Platus F1 (b1)	35.85	136.2	4.882	152300
4		Vulkanus F1 (b2)	37.29	131.3	4.896	152700

Table 4

The synoptic of experimental results
The influence of assortment on the total production

No	Cultivar	Medium production – kg/ha of the cultivars on the both substrates	Difference of production kg/ha	Production, %	Difference of production %	Significant
1 (Ct)	Platus F1	113,230	-	100,00	-	-
2	Vulkanus F1	113,805	+625	100,50	+0,50	ns

DL 5%= 3,460 kg/ha
DL 1%= 7,050 kg/ha
DL 0,1%= 12,510 kg/ha

Table 5

The synthesis of experimental results
The influence of culture substrates on the total production

No	Substrate	Medium production – kg/ha of the cultivars on the both substrates	Difference of production kg/ha	Production, %	Difference of production %	Significant
1 (Ct)	Soil	74.535	-	100,00	-	-
2	Peat	152.500	+77965	195.60	+95.60	ns

DL 5%= 3,460 kg/ha
DL 1%= 7,050 kg/ha
DL 0,1%= 12,510 kg/ha

Table 6

Water and fertilizers consumption

Variant number	Culture substrate (a)	Cultivar (b)	The consumption of water – L/kg/fruits	The consumption of fertilizers, g/kg fruits
1(Ct)	Soil (a1)	Platus F1 (b1)	66.5	125
2		Vulkanus F1 (b2)	68.8	129
3	Peat (a2)	Platus F1 (b1)	43.4	80
4		Vulkanus F1 (b2)	45.3	84

Research regarding the influence of planting material on the quantity and quality of potato production, in Braşov area

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Keywords: potato, planting material, varieties, production

ABSTRACT

The special importance that the potato has for the human nutrition determines the approach of this culture from many points of view. Therefore, a bifactorial experiment, in subdivided parcels was conducted at INCDCSZ Braşov. The two studied factors were: the variety, Roclas and Christian, created at INCDCSZ Braşov and Ostara, created in Netherlands and the size of the planting material, the categories 30 mm-45mm and 45mm-55mm. The interaction of these factors over the total potato production, the structure of the obtained production, the number of tubers per nest and the average weight of the tubers was observed. From the processing of the data obtained from the study, it was noticed that the tubers from the 45mm-55mm size category, used for planting, influenced the total potato production for all the analyzed varieties, obviously for the Ostara variety, for which a production increase of 85 % was recorded compared to the 30mm- 45mm size category. Analyzing the structure of the obtained production, it could be observed that the largest production was obtained for the 30 mm–55 mm size category for all varieties, which demonstrated that the 45mm– 55mm size category was the best. The number of tubers per nest and their average weight were influenced by the 45mm – 55mm size category and it is recommended for the culture of the analyzed varieties.

INTRODUCTION

The potato culture is one of the most important cultures in Romania, the potato being considered as the second bread of the country. The potato is a complex aliment, rich in vitamins and minerals, which can be consumed during the entire year in different states. It is a productive species, which through optimum technologies can reach productions over 35-40 t/ha. The potato production is influenced by many factors, but the size of the tubers used for planting has a very important role (Ianoşi and Ianoşi Maria,1991) In Romania, the potato culture recorded a series of fluctuation, the potato being cultivated on small areas, except for the period 1970-1990, when it was cultivated in an industrial, merged system (Chiru, 2010). Nowadays, the area cultivated with potato is dispersed to more than 2 million individual cultivators, who own up to 0.3 ha with potato cultures (Chiru, 2009). Moreover, the quality of the planting material, the lack of necessary funds and the elimination of the subsidies for the seed producers led to a decreased production. Taking into consideration all these, the perspective of the potato culture provides that in 2013 the average production would be 23.0 t/ha, the total area 200000 ha, and the total production would reach 4.6 million tones, increasing the share of the early and summer potato and of the potato used for processing and seed production.

MATERIAL AND METHOD

The research was conducted at I.N.C.D.C.S.Z. Braşov, in order to study the influence of the size of the planting material on the production, for the new potato varieties Roclas and Christian and for the known variety Ostara, for autumn – winter consumption, in order to establish optimum planting density and to establish certain technological elements necessary to introduce in the technological package.

For this purpose, a bifactorial experiment was conducted in subdivided parcels, with two factors:

factor a – the variety: a1 Ostara, a2 Roclas, a3 Christian;

factor b – the caliber of the planting material: b1 – tubers with 30–45 mm in diameter, b2 – tubers with 45–55 mm in diameter.

The experiment was conducted in the experimental field of the technological laboratory, where a 4 year rotation was applied with the following cultures: 2007-peas, 2008-grains, 2009-silage corn and 2010-potato. The normal preparation works for the soil were applied, and for the fertilization the fertilizer Complex 15.15:15, 1000 kg/ha was used.

The planting was done semi-mechanized, on April 18th 2010. The channels were mecanically opened, at a distance of 75 cm between rows, and the distribution of the tubers was manually done at 22 cm, reaching a planting density of 60.6 thousand nests per hectare. 14 days after planting, the soil was reworked, having as a result a billon with the section of 14-15 cm. Immediately after, the herbicide Stomp 5 l/ha was applied, then Metripaz 1.2 l/ha+Select 1 l/ha. Eight phyto-sanitary treatments were applied for the Colorado bug, aphids and manna.

During the research period, determinations were made regarding the influence of the size of the planting material on the total production, its structure, the number of tubers per nest and the average weight of the tubers etc.

RESULTS AND DISCUSSIONS

Analyzing the effect of interaction between the variety and the size of the planting material on the total production (table 1), it could be observed that while for the varieties Roclas and Christian the production differences due to the size of the planting material were not significant, only 1.5–1.0 t/ha (4.9–3.4 %) in favor of planting the tubers from the higher size category, for the variety Ostara the production obtained through planting the tubers from the higher size category was with 14.0 t/ha (85%) higher that the one obtained from the smaller size tubers.

The average values of the production from the different varieties per size category indicates significant differences only for the production from tubers larger than 55 mm. The productions from this category were significantly larger for the varieties Roclas and Christian, for which 7.1 t/ha and 6.9 t/ha were obtained, compared to 2.6 t/ha for Ostara (table 2).

The medium effect of the size of the planting material is manifested through significant increase of the production from the seed size category with 6.9 t/ha in the case of planting the tubers from the higher size category, compared to the planting of the tubers with smaller size.

The interaction between the variety and the caliber of the tubers higher than 55 mm showed that small increases of the production obtained from large seed tubers, not statistically significant for the Ostara variety. For the varieties Roclas and Christian, through planting the tubers from the higher size category, productions obtained with large tubers were 2.5–6.0 t/ha smaller, statistically significant only for the Christian variety.

The productions from the 30-55mm size category were larger for all varieties through planting the tubers from the higher size category, reaching levels of 25–28 t/ha. For the varieties Ostara and Christian the differences were significant, of 10.8 and 6.3 t/ha.

The production of tubers with a diameter smaller than 30 mm did not significantly differentiate between varieties, calibers and their interactions.

After comparing the number of harvested tubers for the two calibers for the studied varieties, differences between 6.5 and 17.6 tubers/sm can be noticed. The highest differences were recorded for the variety Ostara, for which the number of tubers was 17.6 tubers/sm higher in the case of planting 45-55mm tubers, compared to the 35-45 mm diameter tubers (table 3).

The size of the tubers at planting influenced the average weight of the resulting tubers for the variety Roclas, for which through planting tubers with 35–45 mm diameter the average weight was 74 g/tuber, compared to 62 g/tuber recorded for seed tubers with 45-55mm diameter and Ostara variety (table 4).

As a result of the research conducted in Braşov area, in 2010, using 3 potato varieties, with 2 size categories, for the autumn-winter consumption, the following conclusions can be drawn: the size of the planting material influenced the total tuber production for all the analyzed varieties, the best productions being obtained for the 45-55 mm size category. The rate of production due to the size of the planting material was significant only for the variety Ostara (14.0 t/ha), the varieties Roclas and Christian recording only 1.5 t/ha and 1.1 t/ha respectively; the varieties differentiated significantly through the level of production, with tubers larger than 55mm, the varieties Roclas and Christian reaching 7.1 and 6.9 t/ha, compared to Ostara, for which the production from this category was only 2.6 t/ha.

The increase in size of the planting material had as significant effect the increase of the production with medium tubers, from the 30–55mm size category, from 19.5 t/ha to 26.4 t/ha.

Greater alterations in the size structure of the production obtained after using seed tubers of different size were recorded for the variety Christian. For this variety, at a density of 60.6 thousand nests per hectare, through planting 45-55mm tubers, the tuber production decreases significantly, together with the significant increase of the production with medium size.

Regarding the number of tubers, the 45-55 mm seed size category is noticed, and also the variety Christian with 53.2 tubers/sqm;

The average weight of the tubers was less influenced by the size of tubers at planting and by the cultivated variety.

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TABLES

Table 1

The effect of the interaction between the variety and the size of the planting material on total production (Braşov, 2010)

Variety	Caliber: Diameter of the tubers	Total production			
		Average	Absolute difference compared to the control	Relative difference compared to the control	Significance
	mm	t/ha	t/ha	%	
Ostara	30 – 45	16.4	-	100	-
	45 – 55	30.4	+14.0	185.4	**
Roclas	30 – 45	30.8	-	100	-
	45 – 55	32.3	+1.5	104.9	
Christian	30 – 45	32.2	-	100	-
	45 – 55	33.3	+1.1	103.4	

DL 5 % = 5.1 t/ha
DL 1 % = 7.7 t/ha
DL 0,1% = 12.3 t/ha

Table 2

The effect of the size of the planting material for different potato varieties on the structure of the production (Braşov, 2010)

Variety	Caliber: Diameter of tubers mm	Diameter of tubers: over 55 mm t/ha	Duncan Test	30 – 55 mm t/ha	Duncan Test	under 30 mm t/ha	Duncan Test
Ostara	30 – 45	0.9	D	14.7	C	0.8	A
	45 – 55	4.4	BCD	25.5	AB	0.6	A
Roclas	30 – 45	8.4	AB	21.8	B	0.7	A
	45 – 55	5.9	ABC	25.6	AB	0.8	A
Christian	30 – 45	9.9	A	21.9	B	0.4	A
	45 – 55	3.9	CD	28.2	A	1.2	A
Average	30 – 45	6.4	-	19.5	-	0.6	-
	45 – 55	4.7	-1.7	26.4	+6.9*	0.9	+0.3
Average	Ostara	2.6	B	20.1	A	0.7	A
	Roclas	7.1	A	23.7	A	0.7	A
	Christian	6.9	A	25.1	A	0.8	A

LSD 5 %$_{(variety)}$ = 2.0 t/ha; 5.2 t/ha; 0.6 t/ha
DL 5 %$_{(caliber)}$ = 2.4.t/ha; 2.8 t/ha; 0.4 t/ha;
LSD 5 %$_{(variety * caliber)}$ = 4.2 t/ha; 4.8 t/ha; 0.6 t/ha

Table 3

The effect of interaction between variety and size of the planting material on the number of tubers (Braşov, 2010)

Variety	Caliber: Diameter of tubers mm	Number of tubers per sm: Average tubers/sm	Difference tubers/sm	Relative %	Significance
Ostara	35 – 45	29.1	-	100	-
	45 – 55	46.7	+17.6	160.5	*
Roclas	35 – 45	38.2	-	100	-
	45 – 55	50.4	+12.2	131.9	
Christian	35 – 45	46.7	-	100	-
	45 – 55	53.2	+6.5	113.9	

DL 5 % = 12.6 tubers/nest
DL 1 % = 19.1 tubers/nest
DL 0,1 % = 30.7 tubers/nest

Table 4

The effect of interaction between variety and size of the planting material on the average weight of the tubers (Braşov, 2010)

Variety	Caliber: Diameter of the tubers mm	Average weight of the tubers: Average g	Difference g	Relative %	Duncan test
Ostara	35 – 45	56	-	100	-
	45 – 55	61	+5	109.7	
Roclas	35 – 45	74	-	100	-
	45 – 55	62	-12	84.0	*
Christian	35 – 45	61	-	100	-
	45 – 55	60	-1	98.4	

DL 5 % = 10 g
DL 1 % = 15 g
DL 0.1 % = 25g

Research regarding the influence of fertilization systems on the tomato production in the Bărăgan Plain

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Keywords: hybrid, tomato, fertilization.

ABSTRACT

The research monitored the influence of fertilization on the production capacity of the tomato culture in the Rămnicelu area, Brăila County.

In order to determine the influence of the dose of fertilizer on production efficiency, the culture has been made using the classical methods and was set on the same soil type for 2 years.

Through this experiment there have been studied two hybrids, Sultan and Campbell 33, which showed good suitability to the pedoclimatic conditions of the area in which the experiment took place.

The observations made revealed that the Sultan hybrid has registered greater production values in all fertilization versions, the maximum recorded value was for the version fertilized with $N_{60}P_0K_0$, while the Campbell hybrid has had a greater production in the first year in the unfertilized version compared to the a_2b_2 variant.

INTRODUCTION

Tomatoes (Lycopersicon esculentum Mill) are obviously one of the most studied species grown on the planet, from genetics and improvement, to the most laborious cultivation technologies. (Stan et al., 2003).

Nowadays, almost all the countries on Earth grow tomatoes, on all latitudes, from the Equator to 55 degrees north latitude (near the Polar circle), these vegetables being one of the most widely consumed on this planet.

Due to the ecological plasticity they have, tomatoes can easily adapt to temperate, warm and wet tropical climates. (Atherton and Rudich, 1986).

Post harvest qualities of tomatoes partly depend upon preharvest factors such as cultural practices, genetic and environmental conditions (Hobson, 1964). Cultural practices such as nutrient, water supply and harvesting methods quality of tomato before and after harvest (Fischer and Richter, 1986).

The current global assortment, like the one in Romania, is extremely mobile, meaning that there are always new varieties that are increasingly efficient, the ones that can't face current requirements being eliminated.

Tomatoes contain valuable nutritional components like: vitamins, antioxidants and minerals (Kopec, 1998).

The NPK complex fertilizers are applied as basic fertilizers, are soluble in water and are easily assimilated by plants. The dosing is strictly dependent to the type of culture, the type of soil and the climatic conditions (Berar et al., 2002).

MATERIALS AND METHODS

The experimental field was placed in the crop year 2009 where, during two years, the level of fertilization on the tomato production was monitored, in the context of sustainable development of the ecosystem.

The "subdivided plots method" was used as a way of layout, the experimental scheme containing the following factors:

Factor a, the hybrid with two graduations:

a1 – Sultan F1 hybrid

a2 – Campbell 33 hybrid

Factor b, the dose of fertilizer, with three graduations:

b1 – unfertilized $N_0P_0K_0$

b2 - fertilized with $N_{30}P_0K_0$
b3 - fertilized with $N_{60}P_0K_0$

The biological material used had the same genetic potential, offering the possibility to monitor the influence of the fertilization factor on the production, for 2 years on the same soil type.

The harvesting has been done by hand. The first yield was harvested in the second decade of August when the fruits reached the maturity for consumption. The harvesting ended in the second decade of October.

RESULTS AND DISCUSSIONSS

Monitoring the influence of the climatic factors, which along with the fertilization dose had an important role in obtaining production increases, it can be observed that they have directly influenced the production efficiency.

Thereby, according to graph no. 1, the rain values registered in the crop year of 2008/2009, in the vegetation phenophases of the tomatoes, show a poor period in rain, the months of April, May and June showing significantly smaller values in comparison with the average values.

The rain values registered in the crop year of 2010 indicate a deviation of +102mm from the average values usually registered in June, in comparison with the negative values registered in the crop year of 2009, leaded to the conclusion that rainfall had an important role to play in the production increases. Thus the overall rainfall recorded in the last experimental year exceeded the normal average of 270 mm.

After the laboratory tests on the soil on which the experiment was placed, it has been found that the type of soil specific to this area is the aluviosoil which has remarked itself through a maximum content of humus of 2.98% while the Mobile P (ppm) reached a maximum of 48 ppm on the collection depth of 0-10cm (table no. 1).

You can see, from the collected data, that in the crop year of 2009-2010 the total Mobile P content was bigger in both cases while the percent of $CaCO_3$ was smaller.

The observations and measurements made show that the productions obtained oscillated between 39.3 t/ha and 53.6 t/ha (table no. 2) where the a_1b_2 variant was chosen as the control version due to the fact that the genetic potential of the hybrids is similar.

Following the average of the productions obtained on each repetition it was found that it was uniform in all variants, except the third repetition of the a_2b_2 variant where the production obtained was with 2.1 t/ha smaller.

Although the technological conditions were the same in the crop year of 2009, it can be seen that, according to the data in table no. 1, the production obtained under the influence of the b2 factor was with 0.2 t/ha smaller in comparison with the production obtained for the a_2b_1 variant, where the agrofond on which the experimental variant was set was unfertilized.

The influence of the interaction of factors, hybrid and fertilization dose, on the production obtained in the crop years of 2008-2009 and 2009-2010 was more visible for the a_1b_3 variant (hybridx$N_{60}P_0K_0$) and the increase from the control version (a_1b_1) was very significant in both experimental years.

The a_2b_1 variant (hybridx$N_0P_0K_0$) has registered a distinct significant decrease from the control version in the crop year of 2010 while in the first experimental year it hasn't registered any statistical signification, the difference from the control version being of 1.7 t/ha.

The a_1b_2 version has registered an increase of 5.4 t/ha in production in the first experimental year, which is very significant, while in the last experimental year the production increase was of 1.8 t/ha, being statistically significant.

The a_2b_2 version has registered negative deviations in comparison with the control version in both experimental years, registering statistical signification just in the crop year of 2010.

The a_2b_3 variant has also registered increases in comparison with the control version, thus, in the first experimental year, the deviation was very significant while in 2010 the productions obtained were only significant.

CONCLUSIONS

For a bigger production in the agropedological conditions of Rîmnicelu area, where the experiment was placed, it is recommended a $N_{60}P_0K_0$ fertilization dose due to the result obtained.

Although the genetic potential of the hybrids is approximately equal, the Kambela hybrid which was fertilized with $N_{30}P_0K_0$ has registered negative production values in comparison to the control version which wasn't fertilized.

The natural factors (climate, soil, relief) must be taken into consideration in order to create a useful and productive technology.

During the two crop years that were analyzed, the average production for the Sultana hybrid was superior to the one for the Campbell 33 hybrid.

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TABLES AND FIGURE

Table 1

The physical-chemical characterization of the soil

Crop year	2008-2009		2009-2010	
Specification/Horizon	Ap	Ao	Ap	Ao
Deepness (cm)	0-10	15-25	0-10	15-25
Texture	LA	LA	LA	LA
Apparent density(g/cm^3)	1.38	1.43	1.39	1.41
Water pH	7.52	7.63	7.68	7.01
CaCO3 (%)	5.4	5.8	5.3	5.7
Humus (%)	2.93	2.75	2.98	2.91
Mobile P (ppm)	48	46	45	44
N index	2.94	2.77	2.98	2.8

Table 2

The productions registered in the experimental field for each factor combination

DL5%=3.23 t/ha DL1%= 4.70 t/ha DL0,1%=7.06t/ha

No.	Version	Average production (t/ha)		Difference		Signification	
		2009	2010	2009	2010	2009	2010
1	a_1b_1	39.4	46.3	Control version		-	-
2	a_1b_2	44.8	48.1	5.4	1.8	***	**
3	a_1b_3	53.6	48.7	14.2	2.4	***	***
4	a_2b_1	41.1	41.3	1.7	-5.0	-	000
5	a_2b_2	40.9	49.6	1.5	3.3	-	*
6	a_2b_3	47.3	49.9	7.9	3.6	***	*

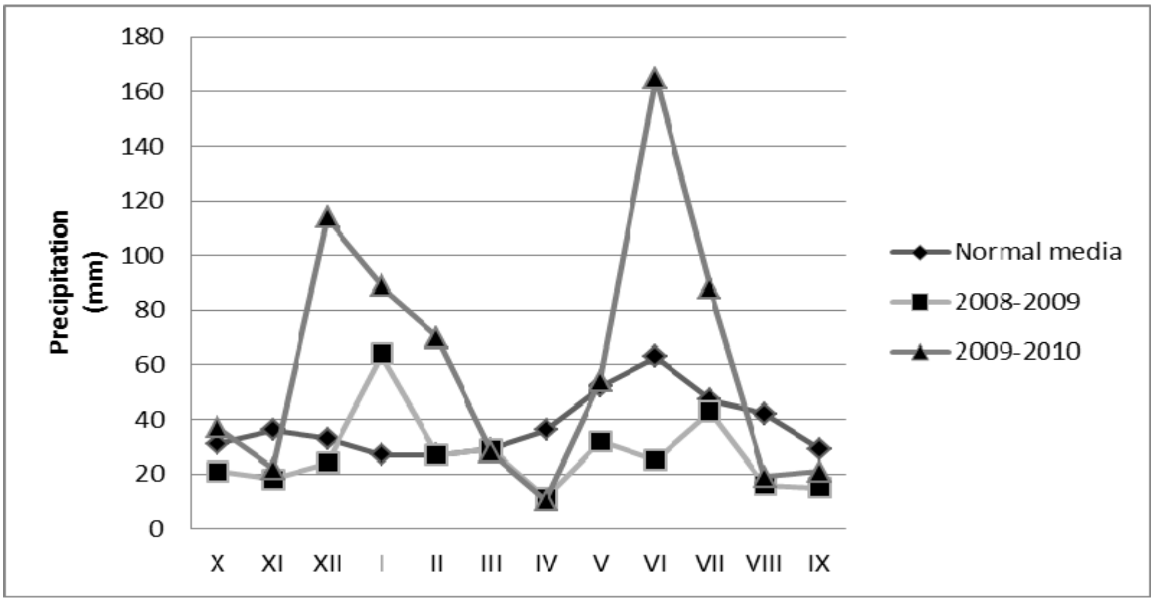

Fig.1. Climate elements - precipitation

Research on the methodology of extraction of chlorophyll and carotene content of tomatoes grown in the south of Romania area

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Keywords: tomatoes, qualitative determination, pigments.

ABSTRACT

The study was carry on nine samples on tomatoes grown in Romania. For the determination of chlorophyll and carotene were selected three known organic solvents (diethyl ether, acetone, methanol) and the methodology of dosing was a spectrophotometrical one. Values depending on the variety and on the solvent used regarding both chlorophyll a and b, as well as carotene.

INTRODUCTION

There are three basic classes of pigments: chlorophyll, carotenoids and phycobilins. In the paper presented by Henriques et al. (2005), were described extraction and identification of the first two. A large number of different molecules, including chlorophyll, anthocyanins and porphyrins (responsible for most of the existing colors, from yellow to red) were identified and characterized by the scientists. After Britton and Goodwin (1971), these compounds are found in fruits and flowers to animals, when there are treated with diet food. About 600 molecules are known but only 50 can be assimilated by humans through diet.

Chlorophyll is a family of related molecules, described as chlorophyll a, b, c and d (present only in red algae). Chlorophyll is the most abundant pigment in nature. The main natural sources of chlorophylls are green leaves and vegetables but are also are founded in green algae such as *Chlorella* microalgae, which is the major source for nutritional products (Higdon, 2003).

Chlorophyll is the most abundant pigment in existing plants (Bohn et al., 2004) and the pigment that gives plants their green color. Plants use chlorophyll to capture light needed for photosynthesis (Matthews & van Hold, 1996), but perform functions other important biological (Henriques et al., 2005). Chlorophylls a and b are natural compounds, soluble in fat.

Alpha-carotene and beta-carotene are carotenoids of provitamin A, which means they can be converted in the body into vitamin A. The orange and yellow vegetables are rich sources of alpha and beta-carotene (USDA, 2009).

Carotenoids can be obtained by extraction of fruits and even the production of microorganisms by chemical synthesis or enzymatic one (Margalith, 1992; Goodwin, 1992; Khachick et al., 1986, Ong and Tee, 1992; Bureau and Bushway, 1986).

While carotenoids are widely used as colorants, they also play an important role as precursors of vitamin A and antioxidants (Heinonen et al., 1989, Philip and Chen, 1988, Hulshof et al., 1997; Bauernfeind, 1972) and can be considered as preventive factors against several diseases such as cardiovascular, renal cancer, cataracts and blindness. Recent studies on other diseases such as arteriosclerosis, rheumatism, Parkinson's disease and infertility have shown new features of these molecules (Pfander, 2004, Mera Pharmaceuticals, 2004).

Carotenoids are compounds very sensitive to different environmental factors such as light (especially solar and UV light), heat, oxygen from the air, peroxides (solvents) and acids. Carotenoids are natural compounds, naturally occurring pigments with particular interest in terms of chemistry, extraction and analysis for life sciences and bio-engineering considering restoring high quality value added to natural compounds compared with the synthetic compounds.

MATERIALS AND METHODS

For research samples were collected from different tomatoes cultivars and at different sizes (Table 1).

The experiment was conducted in three repetitions. Tomatoes were cut and then were converted into mashed with a mixer. Tomatoes puree was weighed at about 1 g sample analytical balance which was introduced in a test tube 20 ml with glass stopper for specific analysis. For extraction were used three organic solvent petroleum ether (diethyl ether), methanol and acetone, extraction ratio was 1:50. Samples were agitated for 10 minutes.

Dosing was taken over part of the supernatant and was analyzed by spectrophotometer at wavelengths λ = 662 nm for chlorophyll b, 646 nm for carotene and 470 nm.

To calculate the results of chlorophyll a, b and carotene there were used formulas presented by Dere et al. (1997).

RESULTS AND DISCUSSIONSS

The results are shown in Figures 1, 2, 3.

Etraction with diethyl ether showed in all samples studied that the **chlorophyll a** content was identical and the **chlorophyll b** has low variations, between 0.072 and 1.323 µg/g fresh product, indicating low levels of chlorophyll content in tomatoes.

In Fig. 1 was presented the results of the tomatoes chlorophyll content (µg/g fresh product) after extraction with petroleum ether, methanol and acetone.

Extraction with methanol presented different values and this may be based on extraction efficiency. Chlorophyll was between 0.622 to 0.928 µg/g fresh product limits. Chlorophyll b was between 2.70 to 13.2 µg/g fresh products. Winona F1 (red big tomatoes) presented value of the highest chlorophyll b respectively 13.52 µg/g fresh product.

Content in chlorophyll b **extracted with acetone** was constant in all tomatoes samples of 0.07 µg/g fresh products and content of chlorophyll a of 0.7762 µg/g fresh products, also showing the same low concentrations of chlorophyll.

Instead, the **content of carotene** in petroleum ether extract shows different values with great variations. The highest values were recorded in red tomatoes Muscato F1, Camelia, Katerina F1 and Winona F1 respectively 16.93, 15.54, 11.95 and 21.91 µg/g fresh product. The results showed that yellow tomatoes studies Mirabell and Dulcia presented lower values in carotene content than red tomatoes, namely 1.39 and respectively 1.19 µg/g fresh products. This may be due to their lighter color.

Extraction with methanol showed that total carotene was determined to have values between 3.39 µg/g fresh product to midi yellow cherry Mirabell and 5.98 µg/g fresh product to Dulcia (big yellow cherry).

Values in carotene content begin to increase beginning with 7.77 µg/g fresh product at Lady Rosa F1 and go up to 20.52 µg/g fresh product at Winona F1.

High values were observed to Muscato F1, Diamante F1, Camelia, Clarabella F1, Lady Rosa F1 and Winona F1 respectively 14.34, 11.95, 10.76, 10.96, 12.55 and 20.52 µg/g product fresh.

Note that all yellow tomatoes presented lower values of carotene than red tomatoes.

After extraction with acetone, high values were recorded in all tomatoes samples analyzed. The lowest values in carotene content were observed again at yellow cherry tomatoes Mirabell and Dulcia, respectively 6.37 and 2.99 µg/g fresh product. Diamante F1 tomatoes (red round midi cherry) presented the highest content of carotene respectively 54.78 µg/g fresh product, followed by Muscato F1 (grape-shared red cherry) with 52.79 and Winona F1 (normal red tomatoes) with a content of 48.80 µg/g fresh product. The other tomatoes cultivars Camelia, Clarabella F1, Katerina F1, Lady Rosa F1 presented high values respectively 32.62, 34.26, 37.69 and 26.89 µg/g fresh product.

CONCLUSIONS

Analyzes the different cultivars on tomatoes grown in southern Romania showed:

1. Extraction with petroleum ether was moderate in terms of content contents of chlorophyll and carotene levels were low and fairly close in terms of chlorophyll content but showed higher values of carotene.
2. In all three extractions, chlorophyll a and b content was at similar values indicating that the solvents are equally effective.
3. By comparison, the best extraction was with acetone, where the total carotene values was higher in most samples studied but those of chlorophyll a and b was equal and smaller than in other extractions performed.
4. After extraction with acetone, red tomatoes showed a higher carotene content than yellow tomatoes.
5. After extraction with petroleum ether all yellow tomatoes presents lower values in terms of carotene content than red tomatoes that showing high values.
6. Extraction with methanol showed that this was the most complex solvent because it presented very different values act all pigments, but the values were higher than if we used other two solvents.

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TABLE AND FIGURES

Table 1

Description of the investigated tomatoes

Nr. crt.	Sample
1.	**Muscato F1** (Grape-shaped red cherry tomatoes)
2.	**Mirabell** (Yellow cherry, midi)
3.	**Dulcia** (Big yellow cherry, 110-130 g)
4.	**Diamante F1** (Round midi cherry for greenhouses and solariums)
5.	**Camelia** (Small red early cherry, 15 -20 g)
6.	**Clarabella F1** (Dutch hybrid. new)
7.	**Katerina F1** (Red extra-early, 100-120 g)
8.	**Lady Rosa F1** (Common red extra-early tomato, 180-200 g)
9.	**Winona F1** (Common tomato for protected areas, fruits medium to large, 140-180 g)

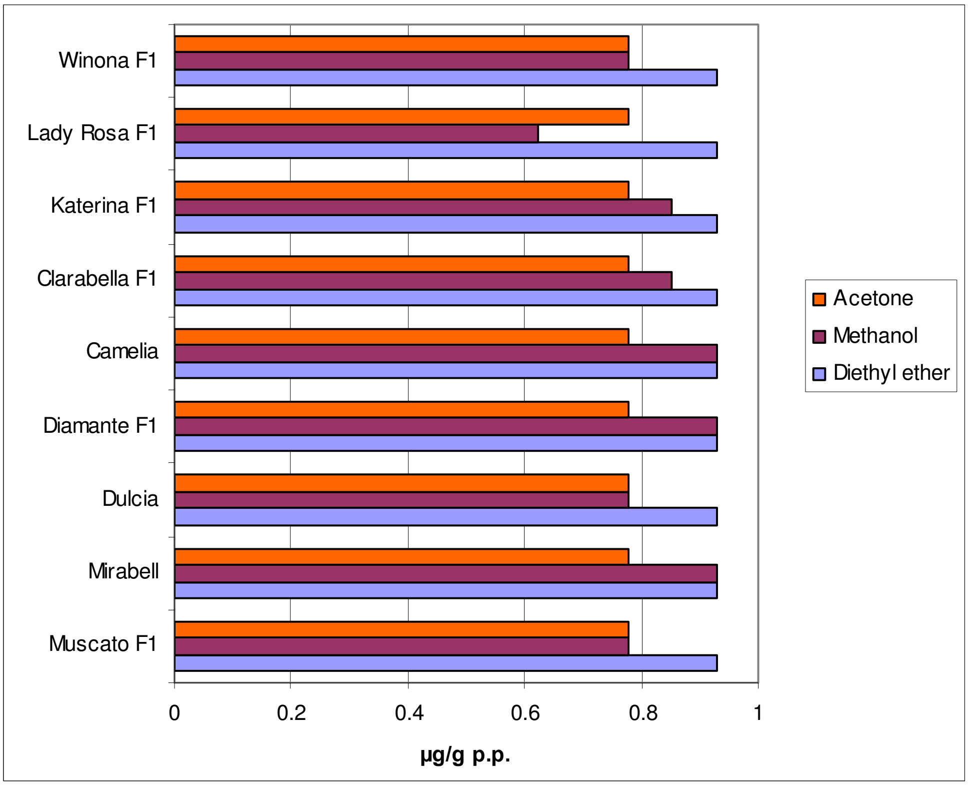

Fig. 1. Variation of chlorophyll content of analyzed cultivars

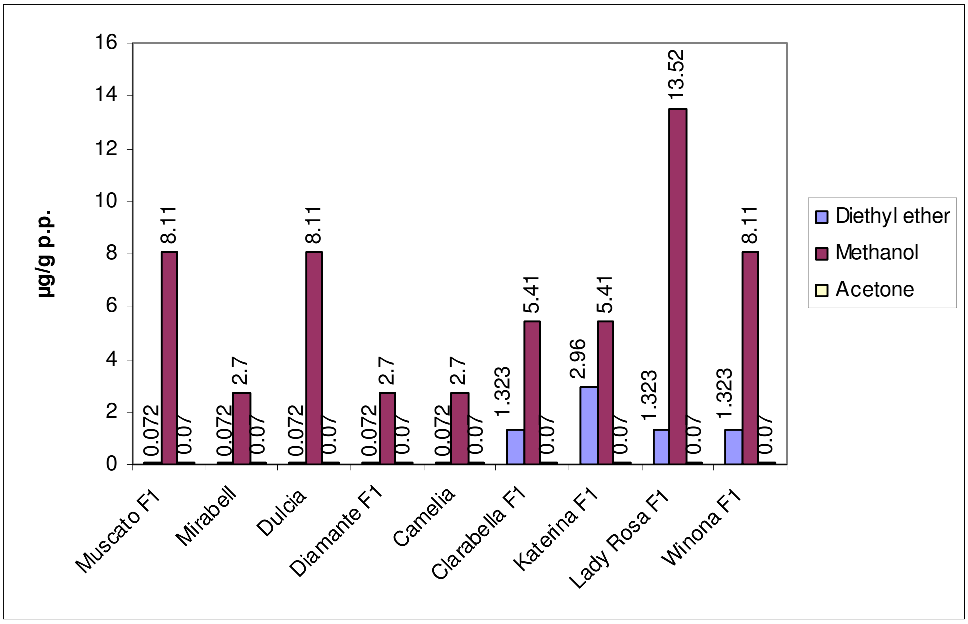

Fig. 2. Variation of chlorophyll b content of analyzed cultivars

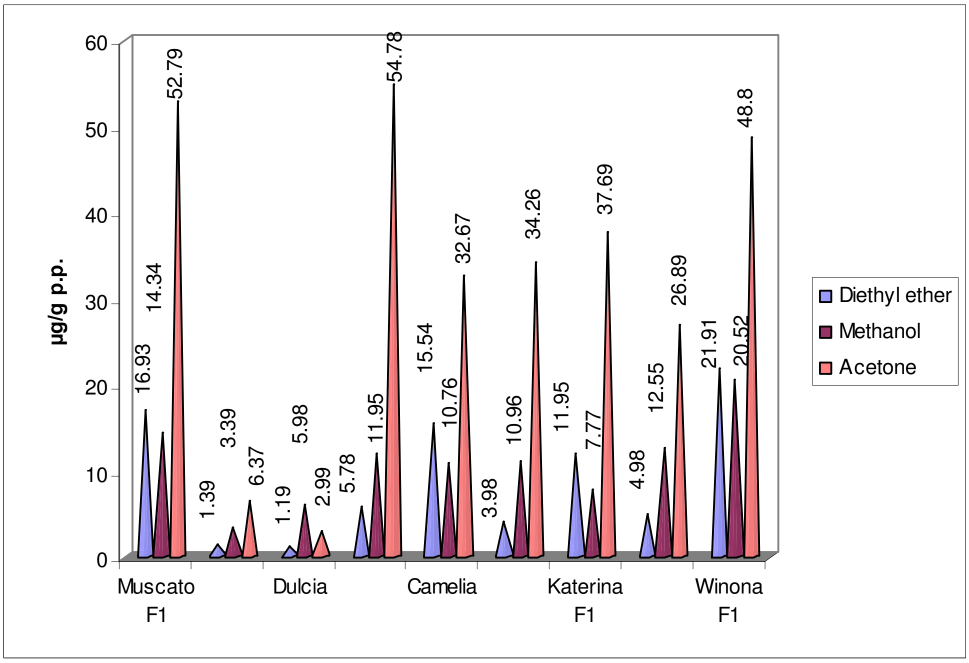

Fig. 3. Carotene content of cultivars analyzed variation

Plant regeneration through indirect shoot formation from different explants of red cabbage

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Keywords: *Brassica oleracea, red cabbage,* regeneration, caulogenesis.

ABSTRACT

In this paper, the authors have proposed a study on the variation in efficiency of micropropagation in vitro due to the influence of donor genotype and explants type used red cabbage head. In this test three commercial varieties of red cabbage seeds were tested for the ability of regeneration by organogenesis from hypocotyls, cotyledons, and stem segments. Our results have shown us that the intensity of red cabbage head regeneration depends on the genotype used but also the type of explants.

Our observations on the effect of phytohormones on the evolution of red cabbage explants cultured "in vitro" have led to the conclusion că benzilaminopurina BAP concentration of 2 mg/l, in the presence of low concentrations of acetic acid naphthyl ANA-0, 4 mg/l is the supplement optimal hormone not only to stimulate the formation of callus and adventitious buds of developing and subsequently to develop long-term multiple shoots able to be included in the next steps of micropropagation, respectively rhizogenesis induction and acclimatization.

Hipocotil fragments taken from seedlings to "Cabeza Negra 2"had the greatest total capacity to produce shoots than the other two genotypes tested when the combination of phytohormones was used consisting of 2 mg/l 6-benzyl-aminopurine (BAP) and type auxine ß indolilacetic acid (IBA) and α naftilacetic acid (NAA) at concentrations of 0.2 to 0.4 mg/l. The inoculated cotyledons explants also developed regenerative callus in about 6-8 weeks after initiation of cultures.

Subculturing was performed every 3-4 weeks in culture medium variant used in initiation, as it has demonstrated its effectiveness in stimulating the development of multiple shoots and in the lengthening them.

INTRODUCTION

Vegetables biennial cabbage plants, valued for the content of valuable minerals, carbohydrates, protein substances, provitamin A and vitamins C, B1, B2. Red Cabbage is different white cabbage in that it is red-purple, the heads smaller, stuffed, thin leaves, tender, with fine ribs. It is used less as cabbage, usually in salads and pickles. Red Cabbage has been shown to have an even greater nutritional value than fresh. It has more antioxidants vitamin C and a quantity of at least five times higher (Cristea T. O., et al., 2005.).

Micropropagation of plants using cultured cells and tissues in vitro is one of the methods most effective in obtaining copies of the plant donor. The success of the micropropagation process depends, however, a number of factors that influence the rate of plant regeneration and the maintenance of genetic stability of the biological material donor. Among these factors are mentioned: type of explant, sampling time, plant health of the donor plant genotype and perhaps most important. (Narasimhulu S.B. and V.L. Chopra. 1988; Khan M. M. A., et al., 2010.). Finally cultures "in vitro" enables storage, material conservation, respectively, establishing a starting material for obtaining healthy, usable in micropropagation operations and maintenance of a stock of plants.

Therefore, present study was undertaken to establish a suitable and reproducible protocol for *in vitro* regeneration of *Brassica* ***oleracea var. capitata rubra form*** varieties. Also, the authors have proposed a study on the variation of efficiency of micropropagation in vitro due to the influence of donor genotype in red cabbage head.

MATERIALS AND METHODS

Biological material submitted micropropagation "in vitro" is represented by three genotypes of red cabbage for cabbage purchased from chain stores to market seeds.

Red Cabbage Black Head 2 is a variety extremely resistance to cold, easy to cultivate. Produces many large, round, compact heads of dark red color, foliage slightly wavy on the edges. It is a plant with a medium stalk. Red Cabbage RED Amager is a vegetation period: 110 days from planting to form round belly, weighing 2-3 kg. Shows a low and high temperature resistance and is suitable for storage.

The experiment was conducted at the tissue culture laboratory of the Department of Biotechnology, Faculty of Biotechnologies, Bucharest, during the period from October 2010 to April 2011.

The biological material used is represented by seeds germinated in controlled conditions, on Murashige-Skoog (1962) culture half strength solid medium without hormones (ph 5,8), containing 3% sucrose and 0,8 % Agar Noble (Figure 1.a) or on sterile filter paper (Figure 1.b). After seed germination, the resulting plants, seed-lobe are in phase, the source of explant donor, such as: meristenatic apex, hipocotyl fragment and cotyledons.

a.)  **b.)** 

Fig. 1. Red cabbage seeds germinated in controlled conditions:
a.) in vitro solid medium condition; b.) germination on sterile filter paper in Petri dishes

Culture medium. Inoculation was achieved by placement of explants on the medium variant chosen for experimentation culture, distributed in sterile culture vessels, these operations are performed in a laminar flow hood. Basal medium Murashige - Skoog (1962), rich in nitrogen meets the nutritional requirements of the explants cultured in vitro with most species. This was the formula for optimal nutrition and adventitious shoots initiating cultures red cabbage with a hormonal supplement (Roşu, A., Huazong J.- 1997; Murashige T. and F. Skoog. 1962).

In these experiments series for initiated each red cabbage varieties we used the basal medium Murashige-Skoog (1962) supplemented by various concentrations and combinations of citokinins and auxins. For callus induction and shoot regeneration,two different combinations each containing MS (1962) culture with fitonormons: benzyl-aminopurine (BAP) and type auxine ß indolilacetic acid (IBA) and α naftilacetic acid (NAA) we use.

When the seedstalk was grown for 2 weeks after initial bolting in the plant box, the hipocotile were cut into pieces approximately 3-5 mm and were placed on 2 variants shoot inducing solid medium (ph 5,8),containing Murashige & Skoog medium (1962) supplemented with 0,4mg/l NAA + 2mg/l BAP (**BR1**) and Murashige & Skoog medium (1962) 0,2mg/l IBA + 2mg/l BAP (**BR2**), 3% sucrose and 0,7% Agar Noble.

The surface sterilization of the explants: an aquaous solutions of sodium hiphocloride (0,5%) for 20 min. followed by 3 rinses with sterile distilled water.

The incubation conditions: photoperiod was 16 h of light provided by cool white fluorescent bulbs with 8 h in shadow. Temperature condition: 25 ± 2 °C in light period.

Multiplication phase. There were applied a few subcultures with a period of 3-4 weeks of culture medium variant used for initiation, because it has proven so effective in stimulating the development of multiple shoots and in terms of their elongation. The main goal was to increase the multiplication rate for this work material by increasing the cytokine quantity in the medium.

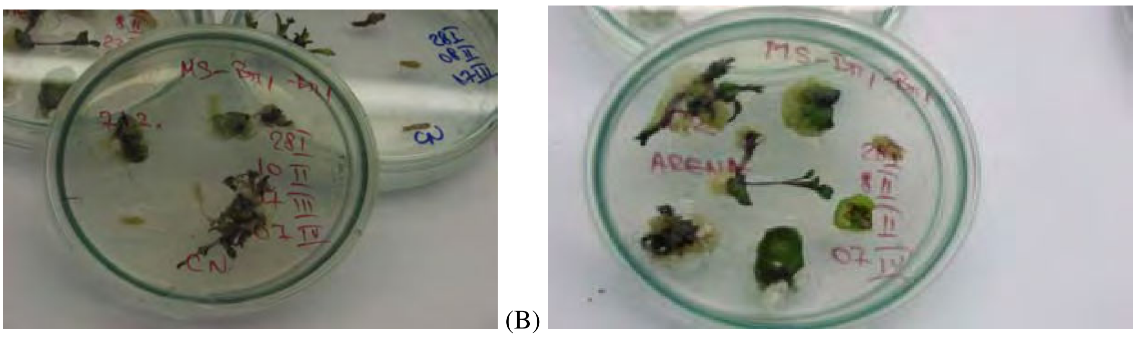
RESULTS AND DISCUSSIONSS

Investigations conducted in the preparation of culture *in vitro* experimental protocol aimed at study on the regeneration capacity of these three genotypes were made with red cabbage callus induction and maintenance of calli, organogenesis, and finally regeneration of plants acclimatized and transplanting them into pots with organic substrate. (Figure *no.*2)

A.) B.) C.)

Fig. 2 Different steps of in *vitro* regeneration of *Brassica oleracea var. capitata rubra form* genotypes via callus induction
(A) (B) Callus initiation of Black Head 2 genotype on MS+ 0,2mg/l IBA + 2mg/l BAP (**BR2**), 3% sucrose and 0,7% Agar Noble; (C) Callus initiation of Arena genotype on MS+ 0,2mg/l IBA + 2mg/l BAP (**BR2**), 3% sucrose and 0,7% Agar Noble.

Our observations on the effect of phytohormones on development of *Brassica* ***oleracea var. capitata rubra form*** varieties explants cultured in vitro have led to the conclusion as benzilaminopurine (BAP) at concentrations of 2 mg/l in the presence of low concentrations (0,2 mg/l) of auxine ß indolilacetic acid it is more optimal (IBA) than naphthyl acetic acid (NAA) in 0,4 mg/l hormonal supplement to stimulate shoot preformat the initial bud but also for the development of multiple shoots on long-term fit to be included in later phases of the micropropagation process, namely induction and acclimatization root development process. Number of shoots regenerated varied widely from one type of explants to another, especially from one genotype to another (Figure 3).



(A) (B)

Fig. 3 In *vitro* shoot initiation of *Brassica oleracea var. capitata rubra form* genotypes from cotyledonary explant
(A) Shoot initiation of Black Head 2 genotype on MS+ 0,4mg/l NAA + 2mg/l BAP (**BR1**); (B) Shoot initiation of Arena genotype on MS+ 0,4mg/l NAA + 2mg/l BAP (**BR1)**

Experimental results after 3 -4 subcultures for each experiment shown that in all genotypes used with maximum efficiency explant hipocotile multiplier is that not only allows a large amount of plants but a small percentage of vitrified plants or other morphological changes.(*Figure 4*).

Fig. 4. Adventitious shoots developed after3 -4 subcultures on MS+ 0,2mg/l IBA + 2mg/l BAP (**BR2**), 3% sucrose and 0,7% Agar Noble (genotype Cabeza Negra 2)

Rooting and plant regeneration phase.

Rooting shoots of red cabbage, differentiation "*in vitro*" did not raise particular problems in these varieties under study. This could be achieved either by inserting shoots differentiated from 1.5 to 3 inches long, in a agarizat or by placing them in a liquid substrate with phytohormones or in their absence. (Figure 5).

Fig. 5. Appearance settling shoots differentiated in vitro in culture medium varieties studied Murashige & Skoog agarose gel.

Some cabbage varieties do not require auxinic hormones for rhizogenesis induction, but for the vast majority of varieties auxinic adding in low concentrations ensured the rapid (7-10 days) of a vigorous root system. Initiation of roots was not influenced by salt concentration, but root growth could be stimulated by reducing the salt concentration in the rooting medium (Stoian, L., et al., 1992).

The new leaves that were formed in the vitroplants obtained from red cabbage during acclimatization were normal anatomical, morphological and physiological. Red cabbage seedlings roots removed from the culture dish were first washed with tap water to remove any agarizat environment. They can promote the rapid onset of bacterial or fungal contaminants that endanger the survival of the plant already aware of the shock transition from the culture medium bowl stabilized in septic conditions.

Transplantation was performed in pots in a sterilized mixture of soil, sand and perlite (1:1:1). Our observations have established the need for strengthening state intercalation of a plant before transferring it into the soil by maintaining their hydroponic solution over a period of 14 days correlated with system protection foliar dehydration by covering with a clear coat.

CONCLUSIONS

The process of improving plant brassicas can advantageously benefit from biotechnology vegetative multiplication in vitro.

Meristematic apexes with 1 cm dimension not assure a significant percent of survival of adventitious shoots red cabbage explants (3-5 pieces/explants) comparing the hipocotil cultures (25-30 pieces/explants).

The highest number of shoots were obtained for genotype Cabeza Negra 2 and Red Amager- (~ 300 shoots), while genotype most "recalcitrant"to these techniques was Arena who have won only 25 shots from inoculated explants. In conclusion we can say that the efficiency of micropropagation in vitro for the cabbage red cabbage *Brassica oleracea* var. capitata rubra form varies widely, depending on the influence of strict donor genotype.

Higher concentration of cytokine in the recipe BR2 (MS+30 g/l sucrose +7 g/l agar +2 mg/l BAP+0,2 mg/l IBA) determined the formation of a high percent of adventitious shoots (*Figure no.4*).

Based on these results we consider that the experimental model of multiplication by culture hipocotyl fragments and obtaining vitroplants red cabbage, established and optimized as a result of our researches, is a method of multiplying the yield and reproducibility, which can be used with the efficiency practically.

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The behavior of some new cultivars of sweet pepper in Braila's vegetable basin

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ABSTRACT

Sweet pepper is part of the traditional assortment of vegetables grown with good results in the south part of Romania, mainly on fertile soils and irrigation conditions. The assortment of traditional sweet pepper created and bred in Romania until 1990 corresponded to the time requirement for fresh consumption and industrialization. After 1990, on the domestic market there were many cultivars having new Western European origin (from countries like Holland, France, Spain, Italy and even the Middle East, Israel), which compete as effectively as its production and the local range. Extending these cultivars in good areas of culture can be done in safe conditions only after a detailed study of their behavior in areas of interest. This work presents the results of testing in Braila's vegetable basin of a new assortment made up of varieties and hybrids of native and Western European origin. It is distinguished by the results obtained the following cultivars: Opal 32551 kg/ha of native range and Barbie F1 52957 kg/ha and 47216 kg Blondy F1/ha in Western Europe range.

INTRODUCTION

The vegetable production in the county Braila has grown and is developing only in specialized micro zones or in which the conditions are very favorable for growing vegetables in terms of soil and climate.

Characteristic of vegetable growing after 1990 is that is practice on scattered areas, applying traditional technologies that result in getting small productions.

There are also large vegetable farms and efficient technologies and practices that result in obtaining high\yields economically competitive. In this context, the first important vegetable species, pepper is agreed and cultivated by many manufacturers both small areas and by sole high.

The present work aims to establish the production and the quality performance of some cultivars of peppers for the assortment cultivated in the field in Braila County.

Based on the results it is intended to complement and diversify the range of green pepper in that area, with hybrids and new varieties with high productivity and high quality fruit (Zbarciog at al 2005).

MATERIALS AND METHODS

The research conducted in 2010 was organized by field of study behavior of six cultivars, which majority is tested first in Braila (Table 1).

The experience has been fitted in production conditions, in a sole cultivated with green pepper in Traianu village, in 4 repetitions, without randomization.

The 6 types of experience were established by introducing the experimental grid of three cultivars of native origin (Yellow Superior, Export and Opal), and three hybrid cultivars F1 produced and traded by the company's Syngenta (http://www.syngenta.com;) and Enza Zaden (http://www.enzazaden.com;) Western-Europe.

As a witness of the experience it was established Yellow Superior variety, an assortment that is grown in large areas of Braila's vegetable basin (Andronicescu and Angelescu 1968; http://www.gazetadeagricultura.info;).

Culture technology applied to the experience has special features. Preparatory work for the land, the establishment of the culture, maintenance and harvesting were carried out respecting the standard technology of green pepper grown in the field (Atanasiu, 2005).

The experience was founded on May 12, 62 days old transplants produced in solar, with the nutrient layer placed on fresh manure (Neata, 2002).

Planting distances of 70 cm between rows and 20 cm between plants per row have provided a density of 71.400 plants/ha (Ciofu et al, 2003).

Among the most important works of care we mention integrated control weeds by combining herbicides with hoeing, watering the ditches, treatment to prevent/control disease and pests and the crop specific area (Cristea and Neata, 2004).

The harvesting was done manually. The production harvested, recorded quantitatively and evaluated qualitatively, was interpreted statistically. In the experience were made observations regarding the establishment of the vegetation period of the six cultivars and determinations of the average number of fruits per plant, average fruit weight and the total production per plant and per hectare.

RESULTS AND DISCUSSIONSS

Following the recording data of the main phenophase (Table 2) it was found that between emergence date time (recorded to produce seedlings) and the onset of the first harvest, have switched to 117 days Export local varieties, 123 days in Superior Yellow, Opal 125, hybrids of foreign origin and 121 days Orion F1, 124 days Blondy F1 and 126 days Barbie F1. In terms of the vegetation period, is highlight the local Export variety that can fit into the group average of cultivars with the vegetation.

Among the results achieved during the vegetation season (Table 3), are shown the main component of production data: the average number of fruit harvested on the plants, their average weight and production per plant and per ha.

The presented data in the said table, points out that, in terms of the number of fruit highlight the variety Opal (5.1 fruit/plant) and Superior Yellow (4.8 fruit by/plant). Blondy F1 hybrids and Barbie have a smaller number of fruits because plants consume large quantities of assimilated material needed to increase the existing fruits of the plant.

Average weight of fruits (Table 3) at the local range is aligned with the requirements of the domestic market where requires fruit pepper about 100g. Superior Yellow responds to this requirement (104.5 g), Export (91.8 g) and Opal (89.48 g)

Among Western European hybrids stand out in terms of average fruits weight, Barbie F1 (176.6 g) and Blondy F1 (194.5 g). Orion F1 is similar in size to Superior Yellow.

Production by plant (Table 3) highlights the fact that it varies between 422.8g to Export and 741.7g to Barbie.

The total production in the experience, expressed in kg/ha (Table 4), can be estimated to be good for the Romanian and very good assortment for Barbie F and Blondy F1 hybrids.

The total production data were interpreted statistically by variance analysis method. The table summary of experimental results indicates that compared the witness (Superior Yellow 35814 kg/ha), the negative difference Export production of -5627 kg/ha is significantly distinct, and for variants 3 (Opal) and 6 (Orion F1), negative differences of 3263 kg/ha respectively 3335 kg/ha are significant.

In case of variants 4 (Barbie) and 5 (Blondy), positive differences are very significant compared to the control.

CONCLUSIONS

Based on the experimental results held, the following conclusions can be drawn:

1. Recorded vegetation periods vary between 117 days to Export variety, and 126 days in Barbie F1 variety. Among new cultivars F1 stands out, from point of view of the vegetation period (early), F1 Orion variety.
2. Among the cultivars used into the experience is distinguished from point of view of the average fruit weight, the hybrids Barbie F1 (176.6g) and Blondy F1 (194.5g), which significantly exceeds the average weight of the fruits witness (Yellow Superior 104.5g).
3. Total production of the witness Yellow Superior (35814kg/ha) is higher than that made in Export (30187kg/ha), Opal (32551kg/ha) and Orion F1 (32479kg/ha) and lower than that observed in Barbie F1 (52957 kg/ha) and Blody F1 (47216 kg/ha).
4. The production differences referred previously cover both statistics when compared to the control negative differences from versions 2, 3 and 6, and the positive differences in versions 4 and 6.
5. In order to obtain enhanced results, we consider necessary to continue the experience for another two years.

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TABLES

Table 1

Experimental variants
New assortment, pepper in field, Braila 2010

Variants no.	Cultivar	Source
1	Galben Superior	UE, Romania, ICDLF Vidra
2	Export	UE, Romania, ICDLF Vidra
3	Opal	UE, Romania, ICDLF Vidra
4	Barbie F1	UE, Syngenta
5	Blondy F1	UE, Syngenta
6	Orion F1	UE, Enza - Zaden

Table 2

The calendar of the culture and the main phenophase
New assortment, pepper in field, Braila 2010

Version no.	Cultivar	Calendar Dates on the			Vegetation period (no. of days)
		Emergence Date	Date of plantation	First harvest	
1	Galben Superior	21.03	12.05	13.07	123
2	Export	20.03	12.05	07.07	117
3	Opal	19.03	12.05	15.07	125
4	Barbie F1	20.03	12.05	16.07	126
5	Blondy F1	20.03	12.05	14.07	124
6	Orion F1	22.03	12.05	11.07	121

Table 3

The main components of the production
New assortment, pepper in field, Braila 2010

Version no.	Cultivar	The average number of fruits harvest/plant	The average weight of fruits(g/fruit)	Production g/plant	Production kg/ha
1	Galben Superior	4.8	104.5	501.6	35814
2	Export	4.6	91.8	422.8	30187
3	Opal	5.1	89.4	455.9	32551
4	Barbie F1	4.2	176.6	741.7	52957
5	Blondy F1	3.4	194.5	661.3	47216
6	Orion F1	4.3	105.8	454.9	32479

Table 4

The synthesis of experimental results
Total Production
New assortment, pepper in field, Braila 2010

Version No.	Cultivar	Production Kg/ha	The output gap kg/ha	Production %	The output gap %	Significance
1	Galben Superior	35814	-	100.00	-	-
2	Export	30187	-5627	84.28	-15.72	00
3	Opal	32551	-3263	90.88	-9.12	0
4	Barbie F1	52957	+17143	147.86	+47.86	XXX
5	Blondy F1	47216	+11402	131.83	+31.83	XXX
6	Orion F1	32479	-3335	90.68	-9.32	0

DL-5%=2746kg/ha
DL-1%=5327kg/ha
DL-0.1%=8415kg/ha

The use of different types of pots for the Chinese cabbage seedlings production

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Keywords: plastic material, transplantation, polyhydroxybutyrate, biodegradable

ABSTRACT

The quality of the seedling represents an important premise for doing a rentable vegetable culture. The paper present the results obtained by the use of different type of pots with a different grade of biodegradability upon the Chinese cabbage seedling development. Compared with the control variant – the nutritive pot, the best results were obtained in the case of the plastic pots in which the majority of the morphometric and physiologic indicators surpassed the other variants (16 cm height, 8 leaves, the best average weight of the plant and of the assimilatory pigments from seedlings leaves), followed by the Biomer pot, based on a new bioplastic materials like PHB (polyhydroxybutyrate). PHB is a natural biological storage material which can be used as a feeding source for the bacterial and fungus microorganisms.

The different type of pot had a specific substrate volume and implicit a significant influence on the growth and quality indicators for the seedling of the Chinese cabbage: root height, leaf number, aerial plant weight and implicit total weight. The explanation for the weak results in the case of Jiffy strip transplantation variant could be the smaller volume of substrate and the nutrient quantity given to the seedlings for this type of pot.

INTRODUCTION

Now a day, the pollution with plastic material issued from agricultural activities, have an important impact on the medium. In countries with large vegetables production are used other types of pots, especially biodegradable, which have the advantages of being non pollutant for the soil, offer optimum conditions for seedlings growing, easy planting and increased planting viability as a result of stress less transplantation (Ciofu et. all., 2003; Florescu et. all., 1998; Hoza, 2003). Very good results were obtained for Jiffy pots (Ciofu, 2007).

For replacing the ordinary plastic pot, worldwide has appeared a new biodegradable plastic materials like PHB (polyhydroxybutyrate), a biological storage material which can be used as a feeding source for the bacterial and fungus and it is biodegradable (Râpă, 2008).

MATERIALS AND METHODS

The aim of the experiment was to study the influence of different types of pots on Chinese cabbage (*Brassica pekinensis*) seedlings growing and was set up in the vegetable growing department in greenhouse from the University of Agronomic Sciences and Veterinary Medicine, Bucharest.

The seedlings were produced during 2008 February – March period, by sowing in wood-caskets filled with nutritive mixture (40% fermented manure, 30% garden soil, 20% peat, 10% sand) at 18th February 2008.

The experimental biological materials used were seeds of *Mirako F1* Chinese cabbage hybrid.

The experimental cultures were set up at transplanting time (April the first). Were used plastic, peat and nutritive pots of different sizes resulting the experimental variants described on the table 1.

Biomer, is a new material from which the pots are made, is a biodegradable polymer as PHB basis. The Biomer products, respectively PHB, made by hot injection and extrudation, are considered biodegradable only in some special compost conditions. In normal conditions their biodegradation rate is very low (a few years), and as a result they can be used for a multiple production cycles (ICERPLAST s.a., Bucureşti, 2008)

The nutritive substrate used for filling up the plastic, peat and for the nutritive pots manufacturing was made of by RS II.

The experiment was organised as linear blocks beds, with 4 repetitions. The total number of plants in this experiment was 480 (80 plants for each variant for every species, resulting 20 plants per repetition).

During the vegetation period, specific agro technical methods for seedlings production were applied: daily aeration, watering, a chemical fertilisation with Cropmax solution with a concentration of 0.3 %, specified measures for protection against pests, and weeds clearing (Ciofu et. all.., 2003). Maintenance crop work was applied to all variants studied evenly.

Observations and determinations of the effect of different pot types on growth and development parameters were made such as:

- seedlings growing - before planting were measured: - total length and weight of seedlings; - length and weight of aerial vegetative part; - length, weight and volume of radicular system. The 10 plants from each repetition were analysed.
- physiological processes: - permeability index was calculate as the fraction between the plasmatic membrane permeability and the total concentration of free ions measured by a conduct metric method, using OK-102 conduct meter; - pigment content from leafs was measured by 80% acetone extraction and by colorimetric measurements at wave lengths by 663nm, 646 nm and 470nm; - water and total dry weight, by weighting the fresh vegetal material and 24 hour drying at 105 Celsius, desiccator cooling and re-weighting the dry vegetal material; - ash contents was measure after 8 hours calcinations at 570 Celsius for the dry material resulted previously, cooling in the dessicator and re- weighting the creosote.

For results statistic interpretation was used Tuckey tests (multiple comparisons) and trend/regression line (by Excel).

RESULTS AND DISCUSSIONSS

Results concerning seedlings growth are shown in table 2 and figures 1, 2 and 3.

From the interpretation of data obtain, the pot type had a significant influence for the principal growing indicators of Chinese cabbage seedlings growing.

The best results were obtained for V6 (transplanted in plastic pot), in which all the growing indicator analyzed, were superior for other variants. These variant give one of the best ratio between the aerial parts and the root system (1:1.42), and the best leaves number (7.8), prove a good quality for the seedlings which are vigorous and equilibrate. Under this aspect, was observing the same Biomer pot, in which was obtained the superior results for the other variants. For this variant, the big leaf frequency (0.55 per cm for the aerial part) shows that the seedling are equilibrate, no elongate. This favourable effect on the seedling quality, can be explain by the best capacity of nutrition as follow for the power developed root system, which exploited a bigger volume of nutritive substrate (110 and 100 cc respectively - table 1) Concerning the cabbage seedlings, the statistical interpretation, meaning that the distinct significant difference between the plastic pot and the other pot types with a view for the growing root system. Between the different variants of pots, the differences concerning the height of the seedling were significant (figure 1)

We can appreciate that the pot type influenced the growing root and implicit for the seedling, by the size of the nutritive substrate in which we put to the plant disposition, concluding that the powerful linear correlation between the root growing and the root height (r^2=0.6392), in the time that, on the root volume, the influence is much weak, with the value of the correlated coefficient r^2=0.288 (figure 2)

Regarding the pot volume and the leaves number, the bigger value of the correlation coefficient (r^2=0.8407), indicate the powerful influence of the pot type on these growing indicator (figure 3). By the comparison, the weakest results were obtain for the transplanted variant in Jiffy strip 7 pot in which the seedling have had a reduce vigor (9.20 cm height, 6.4 cm root height and only 5 leaves per plant) comparative with all the other variant. For this variant, and for the Jiffy pot, was registered the weakest value for the ration aerial parts and those of the root system (1:0.69 and respectively 1:0.64), indicating the weak developing of the root system and the reduce capacity of the nutrition.

The results obtained on the influence of pot types on seedlings total weight (table 3) showed that the optimal variant, plastic cup, in which was received a growing of the total weight of 1.2 time compared with seedling transplanted in nutritive cube (control). This variant is also distinguished by the high volume of the root system (1.2cc), as important following on the absorption growing capacity of water and the nutritive elements.

The correlating calculus existing between the pot type, respectively the substrate volume of the plant (figure 4), and the weight indicator of the seedling evidenced the act that this influenced powerful and direct (r^2=0.7935) weight of the aerial part, and the influence of the weight of the root is non significant (r^2=0.1458). This has a powerful influence on the pot type on the weight of the aerial weight and affecting also on the total weight of the plant.

The analysis of the assimilatory pigments from seedlings leaves of Chinese cabbage (table 4) shows, that the plastic pots V6 give for the total chlorophyll 78.76 mg/100 gfm and respectively 1.33 mg/100 gfm of carotene which demonstrate the increasing of the photo protector pigments synthesis, in the oxidative stress of the seedling.

The total chlorophyll/carotene as a biochemical parameter which defined the photosynthetic intensity has a maximum value in the case of transplanting variants Jiffy pot (71.56) and nutritive pots (59.97). These results sustain the anabolic process with direct implication on the favorable growth of the Chinese cabbage seedling (Gherghi et. al., 2001; Burzo, 2004).

CONCLUSIONS

The different type of pot used in the production of Chinese cabbage seedling influenced their growth and development

Concerning the growth of the Chinese cabbage seedling, the best results were obtained in the case of transplanting in plastic pot (equilibrate ratio between the aerial parts and the root system- 1:1.42; leaves number- 7.8), followed by the Biomer pot

The transplanting in Jiffy strip 7 pot has inhibited the root growth, those have had an inferior quality of seedlings as the other variant

Compared with the control – the nutritive pot, PVC pot and Biomer, used for the seedling Chinese cabbage transplanting, conduced to the growth of the root weight for about 1.2 time and the root volume for 1.3 time about.

The specific substrate volume in each type of pot had significant influenced the quality indicators for the seedling of the Chinese cabbage: root height, leaf number, aerial plant weight and implicit total weight.

Photosynthesis, done by the ration total chlorophyll-carotene, has had a maximum intensity of the transplanted cabbage seedling in jiffy pot; a similar result has also obtained for the nutritive pots.

As followed, for the obtained results in this stage, can be recommended using plastic, PVC and Biomer pots in view to obtain the cabbage seedlings of superior quality.

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TABLES AND FIGURES

Table 1

The experimental variants and the pot characteristics

Variant	Type of pot	Form	Height cm	Breadth superior/ base cm	Diameter superior/ base cm	Substrate volume (cc)
V1	Alveolar blades	rectangular with 70 alveolus	2,6	4,6		50/alveol
V2	Jiffy strip 7	cylindrical	7		6/6	60
V3	Nutritive pot	cubic	5	5		90
V4	Biomer pot	tronconical	4,5		7,5/5	100
V5	Jiffy pot- peat	tronconical	5		6/3,5	85
V6	Plastic pot – PVC	tronconical	8		7/4,5	110

Table 2

Growing indicators of Chinese cabbage seedlings at the plant period

Variant	Specification	aerial part tall HPA (cm)	radix length HRAD (cm)	ratio aerial part/radix	leaves nr.	leafs density (nr/cm. aerial part)
V1	Alveolar blades	10,60	10,70	1:1,01	5,80	0,55
V2	Jiffy strip 7	9,20	6,40	1: 0,69	5,00	0,54
V3	Nutritive pot	15,10	15,20	1: 1,01	6,80	0.45
V4	Biomer pot	13,00	16,00	1: 1,23	7,20	0,55
V5	Jiffy pot- peat	13,70	8,80	1: 0,64	6,40	0,47
V6	Plastic pot – PVC	16,60	23,50	1: 1,42	7,80	0,47

Table 3

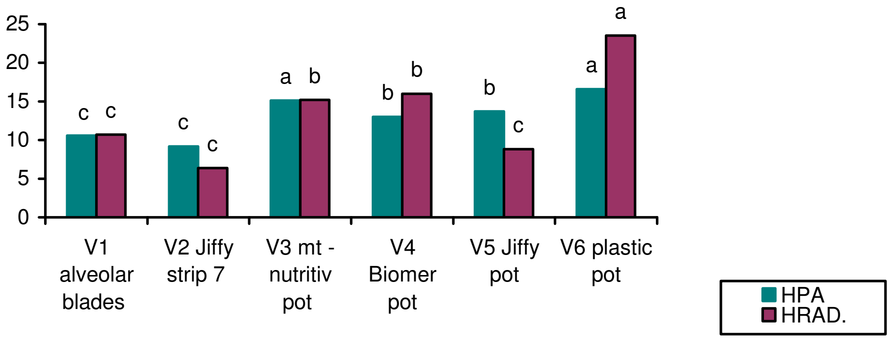
Weight indicators of Chinese cabbage seedlings at planting

Variant	Specification	Total weight MTOT (g)	Aerial part weight MPA (g)	Radix weight MRAD (g)	Ratio aerial part/ radix	Radicular volume cm^3
V1	Alveolar blades	3,20	2,60	0,60	1: 0,23	0,8
V2	Jiffy strip 7	1,96	1,80	0,16	1: 0,09	0,4
V3	Nutritive pot	8,00	7,40	0,60	1: 0,08	0,9
V4	Biomer pot	6,00	5,60	0,40	1: 0,07	0,6
V5	Jiffy pot- peat	5,42	5,20	0,22	1: 0,04	0,7
V6	Plastic pot – PVC	9,80	9,00	0,80	1: 0,09	1,2

Table 4

The influence of pots on leaves content in assimilator pigments

Var.	Specification	Clorofyl a mg/100 g f.m.	Clorofyl b mg/100 g f.m.	Total clorofyl mg/100 g f.m.	Clorofyl a/clorofyl b	Carotenoid mg/100 g f.m.	Total clorofyl/ carotenoid
V1	Alveolar blades	49,71	18,98	68,69	2,62	1,242	55,30
V2	Jiffy strip 7	45,56	17,00	62,56	2,68	1,121	55,79
V3	Nutritive pot	52,51	19,16	71,67	2,74	1,195	59,97
V4	Biomer pot	44,20	16,04	60,24	2,76	1,107	54,40
V5	Jiffy pot- peet	45,96	17,02	62,98	2,70	0,880	**71,56**
V6	Plastic pot – PVC	**57,31**	**21,45**	**78,76**	2,67	**1,333**	59,08



Tuckey test

sd = 0.51 GL = 20 DL 5% = 2.26

sd = 1.04 GL = 20 DL 5% = 4.628

Fig. 1 The Influence of pot type on the Chinese cabbageseedlings growing indicators

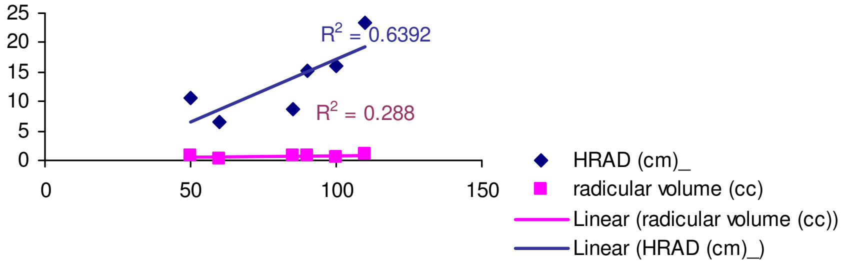


Fig. 2 The influence of volume pot on the radix length and radicular volume

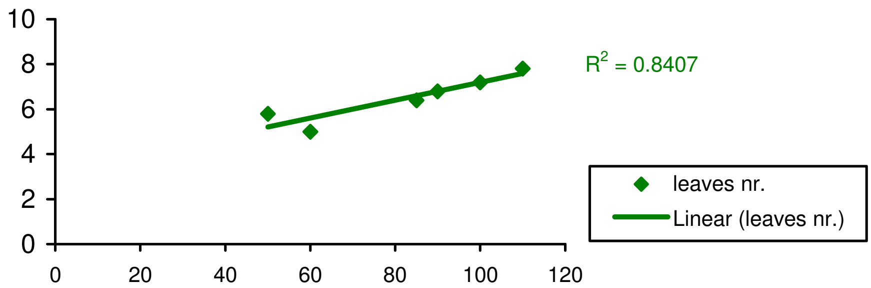


Fig. 3 The influence of volume pot on the leaves number of seedlings

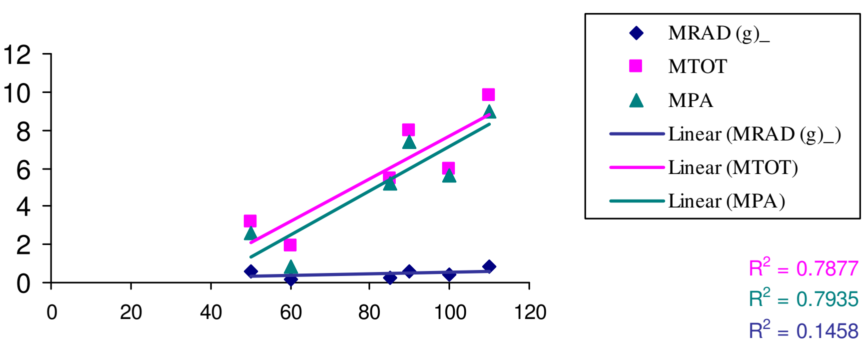


Fig. 4 The influence of the pots volume on the weight indicators of the Chinese Cabbage

Studies on the behaviour of some Japanese tomato cultivars in Romania, under specific climatic conditions and technology

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Keywords: Japanese, cultivars, tomato

ABSTRACT

This preliminary study was made at the Vegetables Department from the Horticultural Faculty at University of Agronomical Sciences and Veterinary Medicine Bucharest in the period of May-September 2011. We tested six tomato cultivars of Japanese origin, provided by the seed company Kaneko Seeds. The experiments were settled up in high tunnel condition. We had remark that these cultivars responded favorably to high tunnel cropping conditions in the south of the country. The following yields were obtained: 9.400 kg/m2 at Candel Light F1 and 11.968 kg/m2 at V3 - Pasta F1. Upon our recorded results, we are encouraged to conclude that all tested variants can properly respond to our Romanian growing conditions, like natural light amount and high temperature, under plastic film protection.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is one of the most important vegetable species.

The number of newly created cultivars, which high productivity, with a good early production also resistance against diseases and pests are a priority (Burnichi F. and colab., 2007). All production is sold for fresh market and often transported over long distances.

The production of high quality fruit is also controlled by climate factors - light intensity, temperature (day/night) etc. For early yield and high quality of tomato production in Romania, the most limiting climatic factors are low light (in autumn) and high temperature in summer season (Drăghici Elena and colab. 2008).

Choosing a new tomato variety suitable type of culture needs to be done properly and the local climate and soil. This state of permanent attention of researchers in Romania they paying more attention to the recommendation of tomato varieties suited for the climatic conditions of the area, varieties resistant to diseases and pests as good.

The main purpose of a farmer is to obtain early and total production as well as large market to ensure a diverse assortment of tomatoes. Also, I intend to recommend the best hybrids for growing in Romania.

MATERIALS AND METHODS

The comparatively studies were realised inside the warm greenhouse from U.Ş.A.M.V Bucharest, in period June September 2011 on six "Japanese tomato hybrids". The variants cultivated were: V_1- Shofuku Power F1; v_2 – Shifuku F1; v_3 – Pasta F1; v_4 – Mr. Mimi F1; v_5 – Candle light F1 and v_6 – Sweet Ruby F1 (table no 1).

The nurseling for realising tomato crop in greenhouse in the first cycle was produced in hothouse. From each hybrid were planted in high tunnel twenty-five plants at 80 cm distance between rows and 50 cm between plants on row.

Each fruit harvested from the cultivated hybrids was separately weighed and recorded in a file. In the final of harvest recorded in file fruit on hybrids were groped on categories of quality. Early and total productions were recorded on each hybrid.

Was calculated the total number of flowers and fruits on inflorescence also the average fruit mass and total mass on plant. In this work we present the production dates reported at the surface of 1 m^2.

RESULTS AND DISCUSSIONSS

If we analyze the hybrids we can appreciate that: in the period from June to September the percentage of fruit linked per plant were different to a hybrid to another. Thus, the Paste hybrid (V3) had linked rate of 98,0 % fruit during June - September, when the temperatures in Bucharest area were over 35 °C; the hybrid Shifuku (V2) had presented a percentage of 74,07% fruits linked on plant. Also, at the cerise tomato type, the percent of fruit formatted on plant was between 62.78 % at the V4 - Mr. Mimi F1 and 95,42 % at V5 - Candle light F1. The total number of fruits on plant was between 20 fruits at V2 - Shifuku F1 and 49 at V3 -Pasta F1. At the cerise tomato type the number of fruits formatted on plant was very big that made between 420 at the V4 - Mr. Mimi F1 to109 at the V6 – Sweet Ruby F1 (table 2).

In the basis of the production dates realised in high tunnel for those six tomato hybrids we found out that the biggest total production was recorded at Pasta hybrid (11.968 kg/m^2) and the smallest one at V2 - Shifuku F1 (*8.193* kg/m^2). The biggest early production was recorded at Pasta hybrid (5.647 kg/m^2) with a percent of 32.44% comparatively to the total production that means we can appreciate it as a very good hybrid for the crop in the first cycle. The smallest early production was recorded at Shofuku Power hybrid (3.105 kg/m^2) with a percent of only 26.02% comparatively to total production (table 3).

At the cerise tomato type we had recorder the biggest production on V4 - Mr. Mimi F1 (*6.733 kg/*m^2) and the smallest production at the V6 – Sweet Ruby (*6.661 kg/*m^2). The smallest early production was recorded at the V6 – Sweet Ruby (*2.225 kg/*m^2) that being 33.40% from total production and the biggest early production was reordered at the V4 - Mr. Mimi F1 (55.89%).

At the V5 - Candel Light, tomato cerise with yellow fruit, the early production recorder was 3.455 kg/m2 and total production of 9.400 kg/m2. On the plant we had recorder of 3.759 kg (table 3, fig. 5).

CONCLUSIONS

The following outcomes were drawn from our data analysis:

All variants of tomato were indeterminate type;

The hybrids V1- Shofuku Power F1, V2 – Shifuku and V3 Pasta could be recommended for the high tunnel growing in the first cycle. The yield output per sq. m of these varieties is the highest.

The yield per plant varies between 4.787 kg at V3 - Pasta F1 and 3.277 kg at V2 - Shifuku F1;

For cherry tomato type the yield varied between 2.693 kg (V4 - Mr. Mimi F1) and 3.759 kg (V5 - Candel Light);

The early variety is V4 - Mr. Mimi F1 in comparison with the other variants (69.14%);

The fruit mass was in average between 98.4 g (V3 - Pasta F1) and 199.42 g (V1- Shofuku Power F1) also between 7.40 g (V4 - Mr. Mimi F1) and 25.84 g (V5 - Candel Light).

AKNOWLEDGEMENT

The author is grateful to Kaneko Company and to Dr. Anastase IORGU, Director of Technical & Development Unit of Summit Agro Romania SRL, to make available the assortment of new Japanese hybrids.

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TABLES AND FIGURES

Table 1

Experimental variants

Variants	Cultivars	Variety type	Resistence
V1	Shofuku Power F1	Indeterminate	Fusarium (race1,2) TMV (Tm 2a); Verticillium; Nematode; has tolerance to Leaf Mold and Stemphylium.
V2	Shifuku F1	Indeterminate	Fusarium (race1); TMV (Tm 2a); Nematode; tolerance to Verticillium and Leaf Mold.
V3	Pasta F1	Indeterminate	Nematode; TMV (Tm 2a); Verticillium;tolerant to physiological diseases
V4	Mr. Mimi F1	Indeterminate	Fusarium (race1); TMV (Tm 2);
V5	Candle light F1	Indeterminate	Fusarium (race1,2); TMV (Tm 2a);
V6	Sweet Ruby F1	Indeterminate	Fusarium (race1,2);TMV (Tm 2a); Verticillium

Table 2

Total number of inflorescences, flowers and fruits on the plant and percent of fruit binding

Hybrids	Total number of inflorescence on plant	Total flowers formed on the plant	Total fruit formed on the plant	Percent of fruit stetted
	No.	No.	No.	%
V1- Shofuku Power F1	6	32	24	84.38
V2 - Shifuku F1	5	27	20	74.07
V3 -Pasta F1	4	50	49	98.00
V4 - Mr. Mimi F1	5	669	420	62.78
V5 - Candle light F1	7	153	146	95.42
V6 – Sweet Ruby F1	7	122	109	89.34

Table 3

Assessment of total and early tomato production (kg/m^2)

Hybrids	Average fruit weight ^{x}	Total yield on plant ^{xx}	Early yield of fruits obtained on 1 m^2	Production of fruits obtained on 1 m^2	Percent early yield of total production
	g	kg	kg/m^2	kg/m2	%
V1- Shofuku Power F1	199.42 ***	4.773 *	3.105	11.933	26.02
V2 - Shifuku F1	163.1 *	3.277 oo	2.455	8.193	29.96
V3 - Pasta F1	98.4 OOO	4.787 *	3.883	11.968	32.44
V4 - Mr. Mimi F1	7.40 OOO	2.693 N	4.655	6.733	69.14
V5 - Candel Light	25.84 ***	3.759 *	3.455	9.400	36.76
V6 – Sweet Ruby	24.44 ***	2.664 N	2.225	6.661	33.40

^{x} Average fruit weight DL5% = 6.100 DL5% in % = 3.9703 DL1% = 13.250 DL1% in % = 8.6241 DL01% = 44.890 DL01% in %= 29.2176	^{x} Average fruit weight at the cerise tomato DL5% = 0.700 DL5% in % = 3.6408 DL1% = 1.520 DL1% in % = 7.9057 DL01% = 5.150 DL01% in %= 26.7857
^{xx} Total yield on plant DL5% = 0.350 DL5% in % = 8.1795 DL1% = 0.760 DL1% in % = 17.7612 DL01% = 2.570 DL01% in %= 60.0608	^{xx} Total yield on plant at the cerise tomato DL5% = 0.700 DL5% in % = 23.0364 DL1% = 1.520 DL1% in % = 50.0219 DL01% = 5.150 DL01% in %= 169.4822

Fig.1.- V1**-** Shofuku Power F1

Fig. 2. - V2 - Shifuku F1

Fig. 3. - V3 - Pasta F1

Fig. 4. - V4 - Mr. Mimi F1

Fig. 5. - V5 - Candel Light

Fig. 6. - V6 – Sweet Ruby

Research regarding the biochemical and chemical contents of industrialization process of tomatoes

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Keywords: tomato products, diet, helth

ABSTRACT

Tomato consumption in Romania is growing every year and expect a growing health benefits because people use in daily diets.Tomatoes ranked 16 in the world among all fruits and vegetables consumed as a source of vitamin A, the 13 th place for vitamin C (Gerster, 1997). Tomatoes also contain appreciable quantities of lycopene, ß-carotene, magnesium, iron, phosphorus and potassium, sodium and thiamine. (Di Mascio et al., 1989, Angela R. Da' is et al., 2002). For research were taken in nine trial paste samples of tomato juice, ketchup, and tomato juice, slicedor whole canned tomatoes. All samples taken in the studio are sold in supermarkets and shops for household consumption or fast foods and pizzeria. The samples were purchased randomly within the consumer and were analyzed of the views of many biochemical and chemical characteristics.

INTRODUCTION

In Romania, tomatoes are grown mainly in the field, but there is a fairly large area of protected land in production (greenhouses, solariums). According to EUROSTAT, in 2008 the tomato was allocated about 30 thousand hectares, the production volume of 536 thousand tons. This is 40% less than the peak in 2004. In the early 2000s there was an intense process of restructuring the activities of Agricultural so volume production of tomatoes in batches of the household was significantly decreased, while the volume of production by farmers grew even professionals. Share subject to industrial processing tomatoes is 20-30%.

In 2008, EU production volume was 16.3 million tone1 tomatoes, Italy is the main producer (38%), followed by Spain (23%), Greece and Portugal (both 9% each). In all these countries the share of tomatoes for industrialization is high (Italy - 70%, other countries - 50%). This is in contrast to the situation in countries such as France, Bulgaria and Romania, where the rate of industrialization is much lower (15-25%) and in countries located further north (Netherlands, Belgium, Germany), where production costs are relatively large, almost all tomatoes are intended to be eaten fresh.

Tomato consumption in Romania is growing every year and expects a growing health benefits because people use in daily diets.Tomatoes ranked 16 in the world among all fruits and vegetables consumed as a source of vitamin A, the 13 th place for vitamin C (Gerster, 1997). Tomatoes also contain appreciable quantities of lycopene, ß-carotene, magnesium, iron, phosphorus and potassium, sodium and thiamine. (Di Mascio et al., 1989, Angela R. Da' is et al., 2002)

While tomatoes have entered all the fresh food diets and as pasta, juice, ketchup, etc.. Effectuate the purpose of research was to determine the limits of variation of chemical and biochemical characteristics of tomatoes pasta, juices, etc. sold in our country.

MATERIALS AND METHODS

For research were taken in nine trial paste samples of tomato juice, ketchup, and tomato juice, slicedor whole canned tomatoes. All samples taken in the studio are sold in supermarkets and shops for household consumption or fast foods and pizzeria. The samples were purchased randomly within the consumer and were analyzed of the views of many biochemical and chemical characteristics.

In terms of biochemical analysis were: the content of carbohydrates, vitamin C, titrable acidity and lycopene, and the chemically sought to pH, dry matter and content

included nitrate, chemical elements phosphorus, potassium, sodium, calcium and magnesium. Determination of biochemical components was performed as follows:
- Carbohydrates content by refractometry Abbe;
- Acid content by titration method with NaOH;
- Vitamin C determination by iodometric method;
- Lycopene LVHEM method (Fish et al., 2002).

Determination of pH by potentiometric method, nitrate by colorimetric method with 2,4-DFS method, spectrophotometric method was used to determine the chemical elements.

RESULTS AND DISCUSSIONSS

For the normal course of daily activities and maintain health, the body needs a certain amount of energy and nutrients like protein, carbohydrates, lipids, vitamins, minerals, water, etc. Particularly appreciated is the juice and tomato paste as it is an energy food and a method of disease prevention.

Tomatoes are one of the most important vegetable species in our country. This is because it can be consumed in many ways: fresh or processed juice industry as simple or additives.

The low quality of tomato juice and tomato products from general is closely related to the cultivation of tomatoes. In most cases the cause is the inefficient use or reduced use of mineral fertilizers.

Industrial tomato varieties that are used to produce juice and tomato paste often do not correspond to physiological parameters, nutritional and organoleptic. Low acidity and high density are other important parameters of tomatoes that must take into account.

Harvesting tomatoes during ripening and density affect the acidity of tomatoes, and their intensive color. Do not allow the production of tomato juice if the tomatoes are processed only when they were not sold in time fresh.

Within a year, consuming an average European about 20 gallons of tomato juice and this figure may increase by 10-20% according prediction of the next 10 years. Germany is the world leader in the consumption of tomato juice (43.1 liters per year). Austria is the second-33 liters, followed by US-30 liters, Switzerland-28, 6 liters -26 liters and the Netherlands.

Evaluating the quality of raw materials used in the manufacture of tomato juice is made taking into account the conditions imposed by the processing technology, quality fresh tomatoes being defined by general indicators of individual species and variety.

Freshness and taste is given by the free acids in balance with natural aromatizants and soluble sugars. Fruit firmness and consistency, fit for transport and storage are provided by the protein content, amino acids, pectin substances, cellulose and hemicelluloses.

Tomato fruit color is due to the proportion found in fruit pigments carotene and lycopene. Fruit peel does not turn red, but only in yellow or remains colourless, in combination with the skin color resulting pulp color different varieties of tomato fruit.

Quality standards for products made from tomatoes are not very strict and did not take much into consideration except conservation products lately have kindled the imagination of consumers.

Analysis to effectuate more Products on the Romanian market will brings some clarifications on the content of their benefits.

Biochemical analyses are related to products from tomato taste. So the sweet taste is determined by the amount of sugar in juices and pasta existing tomato. From the 9 samples examined can be seen that carbohydrates have content that ranges between 3.9% and 4.8%. There is a law on this compound because the processes of obtaining these products (pasta, juice, ketchup) do not involve concentration or added sugar, however it can be said that the values provide a good content in this compound and does not affect people who suffer diabetes and thus their consumption.

Sour taste of tomatoes used as raw material is transferred and prepared products examined. Thus this feature is due to titrable acidity of tomato products manufactured in our case the acidity is low ranging between 0.5 and 0.8% balancing the taste of the products. Vitamin C is present in appreciable quantities mg/100g fresh weight, respectively 32.45 and 50.25 mg/100g fresh weight.

Vitamins are substances that control catalytic role in several metabolic and physiological processes of man. There are needed in very small quantities (2-5 mg/day), except vitamin C (50 mg/day - the dose needed, 60-75 mg/day - the recommended dose). The results show that vitamin C paste and juices can provide to some extent human daily intake.

Another valuable compound is a very powerful antioxidant lycopene (Di Mascio et al. 1989), it causes the red color of tomatoes. Tomatoes are one of the highest levels of lycopene of all fruits and vegetables grown. Lycopene is the main carotenoid in tomatoes that exist (Ellis & Hamner 1943). Tomatoes and products of processing tomatoes are the main sources of diet unite man (Stahl & Himself 1996). Only fresh tomatoes make a contribution of 50% of total lycopene over man (Rao et al. 1998). Average lycopene from all sources taken in Spain, England, Ireland and France was 3.5 mg/day in 1997 (Olmedilla et al., 2000).

Processed tomato products examined in this paper shows a load of lycopene between 78.3 mg/kg and 345.2 mg/kg. As seen less processed products in terms of their concentration (tomato juice and peeled tomatoes) have a lower content of lycopene close to the fresh tomatoes. However it should be noted that even though pasta has been processed at high temperatures have not yet lost the least concentration of lycopene than they represent a real source of food for this compound.

Other characteristics examined were pH, nitrates and quantity of certain chemicals in the samples examined (Table 2). For the pH values ranged between 3.7 and 4.2, low acidity characterized products, juices and sauces have a better acidity and it is because they are intended for consumption while fresh pasta had a more acidic pH because the consumer is mixed with water and other products with a basic pH.

Nitrates are compounds that can harm consumers in respect of accumulated high amounts in fruits, vegetables and the products thereof are given as the limit value of Ordinance No. 1 of 2002, the Ministry of Health of Romania. Thus if canned tomatoes and products made from these MAL is 150ppm.

Examination of analysis results show that the nitrate content is between 56.9 and 142 ppm, good values which do not affect those products are not excluded from consumption. In terms of phosphorus and potassium contents are providing good food value corresponding tomato preparations.

The calcium, sodium and magnesium in pasta have higher values than the juice, but in this case involved the addition of salt required technological process and content of the water used in these elements. However, these high contents do not affect consumer health.

CONCLUSIONS

1. Evaluating the quality of raw materials used in the manufacture of tomato juice is made taking into account the conditions imposed by the processing technology, quality fresh tomatoes being defined by general indicators of individual species and variety;
2. Analysis to effectuate more products on the Romanian market will brings some clarifications on the content of their benefits;
3. From the 9 samples examined can be seen that carbohydrates have content that ranges between 3.9% and 4.8%, however it can be said that the values provide a good content in this compound and does not affect people who suffer diabetes and thus their consumption;

4. Titrable acidity of tomato products manufactured in our case the acidity is low ranging between 0.5 and 0.8% balancing the taste of the products;
5. Vitamin C is present in appreciable quantities mg/100g fresh weight, respectively 32.45 and 50.25 mg/100g fresh weight. Processed tomato products examined in this paper shows a load of lycopene between 78.3 mg/kg and 345.2 mg/kg. As seen less processed products in terms of their concentration (tomato juice and peeled tomatoes) have a lower content of lycopene close to the fresh tomatoes;
6. The pH values ranged between 3.7 and 4.2, low acidity characterized products, juices and sauces have a better acidity and it is because they are intended for consumption while fresh pasta had a more acidic pH because the consumer is mixed with water and other products with a basic pH. The nitrate content is between 56.9 and 142 ppm, good values which do not affect those products are not excluded from consumption;
7. The calcium, sodium and magnesium in pasta have higher values than the juice, but in this case involved the addition of salt required technological process and content of the water used in these elements. However, these high contents do not affect consumer health.

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TABLES

Table 1

Biochemical characteristics of tomato pasta, juice and other commercialized in our country

Variant	Carbohidrates, %	Acidity, %	Vitamin C, mg/100g fresh weight	Lycopene, mg/kg fresh weight
Ketchup, Bulgaria	4.2	0.6	37.25	166.4
Pizza juice Italia	4.8	0.5	43.25	328.7
Speghetti juice, Romania	3.9	0.7	45.13	175.4
Tomato pasta (Olimpia), 33%	4.5	0.5	36.89	345.2
Tomato pasta (Sultan), 24%	4.3	0.5	32.45	287.3
Pomodore for pizza	4.3	0.6	44.56	214.5
Pasta Maxim 22-24%	4.7	0.7	50.25	214.7
Tomato juice, Romania	4.2	0.5	43.12	78.3
Peeled tomato	4.2	0.8	52.14	89.3

Table 2

Chemical characteristics of tomato pasta, juice and other commercialized in our country

Variant	pH	N-NO3, ppm	P, ppm	K, ppm	Ca, ppm	Mg, ppm	Na, ppm
Ketchup, Bulgaria	4.2	60.7	86.5	1970	168.4	213.7	70.2
Pizza juice Italia	4.2	58.9	80.7	2110	176.5	243.5	67.5
Speghetti juice, Romania	4.0	60.2	98.7	2450	210.2	324.5	68.2
Tomato pasta (Olimpia), 33%	3.9	142.0	1631.0	10400	1234.5	634.2	124.7
Tomato pasta (Sultan), 24%	3.7	115.9	1767.0	22400	1154.8	598.3	146.7
Pomodore for pizza	4.0	102.6	95.7	4200	978.4	367.2	79.2
Pasta Maxim 22-24%	3.9	95.0	1942	9000	1067.8	432.6	116.8
Tomato juice, Romania	4.2	56.9	98.7	2740	123.7	256.9	65.3
Peeled tomato	4.1	95.6	115.34	2540	134.5	267.5	70.4

The study of the climbing pod beans regarding the influence of the cultivar and plant density per hectare on seed production per hectare under the environmental conditions of SCDL Iernut

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Keywords: *climbed bean pods, cultivar, density, production*

ABSTRACT

There have been studied four cultivars: the Mădăreşeni variety, L-Alina, L-Grasa of Iernut (Ghibolească) and L-Viola-2. The plant density per hectare was distinguished by the number of plants per hectare. It was maintained the distance between rows and was varied the number of plants on the planting hole. A great importance has the seed production on the planting hole depending by the number of plants on the planting hole and also the quality indices (EG, FG).

INTRODUCTION

The bean is an important vegetable species for both pods and berries. This paper refers to the production of pods per unit area. Local populations were studied and were created through the ameliorative selection, under the conditions from Transylvania area, valuable branches of climbing beans for pods.

MATERIALS AND METHODS

The biological material used, is part of the Măldăreşeni cultivar and of some ameliorative branches which are valuable for Transylvania's conditions (L-Alina, L-Grasa of Iernut (Ghiboleasca) and A_4-L-Viola-2.The experiment has been organized on parcels subdivided into four rehearsals with two factors:

- the A-factor (the cultivar), with four graduations, where: A_1-Măldărăşeni (fig.1, fig.2), A_2 - L-Alina (fig. 3, fig.4), A_3 - L-Grasa of Iernut (Ghiboleasca: fig.7) and A_4 - L-Viola-2 (fig. 8);
-the B-factor, the number of plants/planting hole, with three graduations: b1 - 2 plants/planting hole, b2 - 3 plants/planting hole and b3 - 4 plants/planting hole. The distance between rows was of 80 cm and the distance between the planting holes was of 25 cm.

It was determined the productions on the planting hole and on unit area.

RESULTS AND DISCUSSIONSS

The biological material used was characterized by specific features of the cultivar (table 1, table 2).

From the analysis of the influence of factor "A", it was found that compared to witness "A_1" cultivar was a difference: very significantly negatively for "A_2" cultivar and significantly positively for "A_3" cultivar (Table 2).

The analysis of the multiple comparisons of factor "B" at the same graduation of "A" showed the significant positively differences between (Table 3) "B_1" and "B_3" from all cultivars, distinctly significant from the other comparisons especially for L-Ghimbolesca cultivars, L-Viola-2 or significant in the case of Mădărăşeni and L - Alina (Table 4) cultivars.

The meanings of the differences between the variants (seed production per hectare) have shown very clearly and also through the analysis of comparing two "A's" average at the same graduation of B or at different graduations of B (Table 5).

CONCLUSIONS

The four cultivars are highly valued by consumers, although they are differentiated by different quantitative and qualitative features.

As result of the capacity of seed production, the cultivars can be classified in the following order: L-Ghimboleasca, L-Viola 2, Mădărăşeni, L-Alina.
In all cultivars, we obtained the highest seed production for B_1 (2 seed/the nest) the establishment saving biological material culture.

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TABLES AND FIGURES

Table 1

Cultivars' description

The cultivar	Precocity	Vegetation period	The moment of establishing a crop	
			For beans	For seed
Mădărăşeni	Early	77	1 – 10.05	20.04
L – Alina	Belated	115	30.04 – 05.05	25.04
L – Ghibolească	Semi early	78	05.05 – 10.05	30.04
L – Viola-2	Semi late	85	03.05 – 10.05	20.04

Table 2

The influence of factor "A"

The factor	Production		Diff. t/ha	Meaning
	t/ha	%		
A_1	3.4	100	Mt	Mt
A_2	2.76	81.17	- 0.64	000
A_3	3.9	114.7	0.5	***
A_4	3.66	107.6	0.26	*

DL 5% = 0.104 x 2.26 = 0.235 t/ha
DL 1% = 0.104 x 3.25 = 0.338 t/ha
DL 0.1% = 0.104 x 4.78 = 0.497 t/ha

Table 3

Multiple comparisons of factor B

Clasification	Production (t/ha)	The difference between the variant from the ...place		
		III – B_3	II – B_2	I – B_1
I – B_1	4.6	2.35**	1.15	-
II – B_2	3.45	1.2	-	
III - B_3	2.25	-		

DL 5% = 0.761 x 2.06 = 1.567 t/ha
DL 1% = 0.761 x 2.8 = 2.13 t/ha
DL 0.1% = 0.761 x 3.75 = 2.85 t/ha

Table 4

Multiple comparisons of factor "B" at the same graduation of "A" regarding production of seed/he

Clasification		Production (t/ha)	The difference between the variant from the place		
			III	**II**	**I**
A_1	**I**	4.5	2.2***	1.1*	-
	II	3.4	1.1*	-	
	III	2.3	-		
			III	II	I
A_2	**I**	3.7	1.9***	0.9*	-
	II	2.8	1.0*	-	
	III	1.8	-		
			III	II	I
A_3	**I**	5.2	2.6***	1.3**	-
	II	3.9	1.3**	-	
	III	2.6	-		
			III	II	I
A_4	**I**	5.0	2.7***	1.3**	-
	II	3.7	1.4**	-	
	III	2.3	-		

DL 5% = 0.416 x 2.06 = 0.857 t/ha;
DL 1% = 0.416 x 2.8 = 1.165 t/ha
DL 0.1% = 0.416 x 3.75 = 1.56 t/ha

Table 5

Comparison of two "A's" average at the same graduation of "B" or "B's" different graduations (the production of seed per hectare)

The factor	t/ha	The difference between the variant from the ....place										
		XII	**XI**	**X**	**IX**	**VIII**	**VII**	**VI**	**V**	**IV**	**III**	**II**
I–A_3B_1	5.2	3.4***	2.9***	2.9***	2.6***	2.4***	1.8***	1.5***	1.5***	1.3***	0.7**	0.2
II–A_4B_1	5.0	3.2***	2.7***	2.7***	2.4***	2.2***	1.6***	1.3***	1.3***	1.1***	0.5*	-
III–A_1B_1	4.5	2.7***	2.2***	2.2***	1.9***	1.7***	1.1***	0.8***	0.8***	0.6**	-	
IV–A_3B_2	3.9	2.1***	1.6***	1.6***	1.3***	1.1***	0.5*	0.2	0.2	-		
V–A_2B_1	3.7	1.9***	1.4***	1.4***	1.1***	0.9***	0.3	0	-			
VI-A_4B_2	3.7	1.9***	1.4***	1.4***	1.1***	0.9***	0.3	-				
VII–A_1B_2	3.4	1.6***	1.1***	1.1***	0.8***	0.6**	-					
VIII–A_2B_2	2.8	1.0***	0.5*	0.5*	0.2	-						
IX–A_3B_3	2.6	0.8***	0.3	0.3	-							
X–A_1B_3	2.3	0.5*	0	-								
XI-A_4B_3	2.3	0.5*	-									
XII-A_2B_3	1.8	-										

Fig. 1 - Măldărăşeni Variety- plants

Fig. 2 – Măldărăşeni variety - pods and flowers

Fig.3 - L-Alina - plant

Fig.4 - L-Alina - pods and flowers

Fig. 5 – Bean seeds

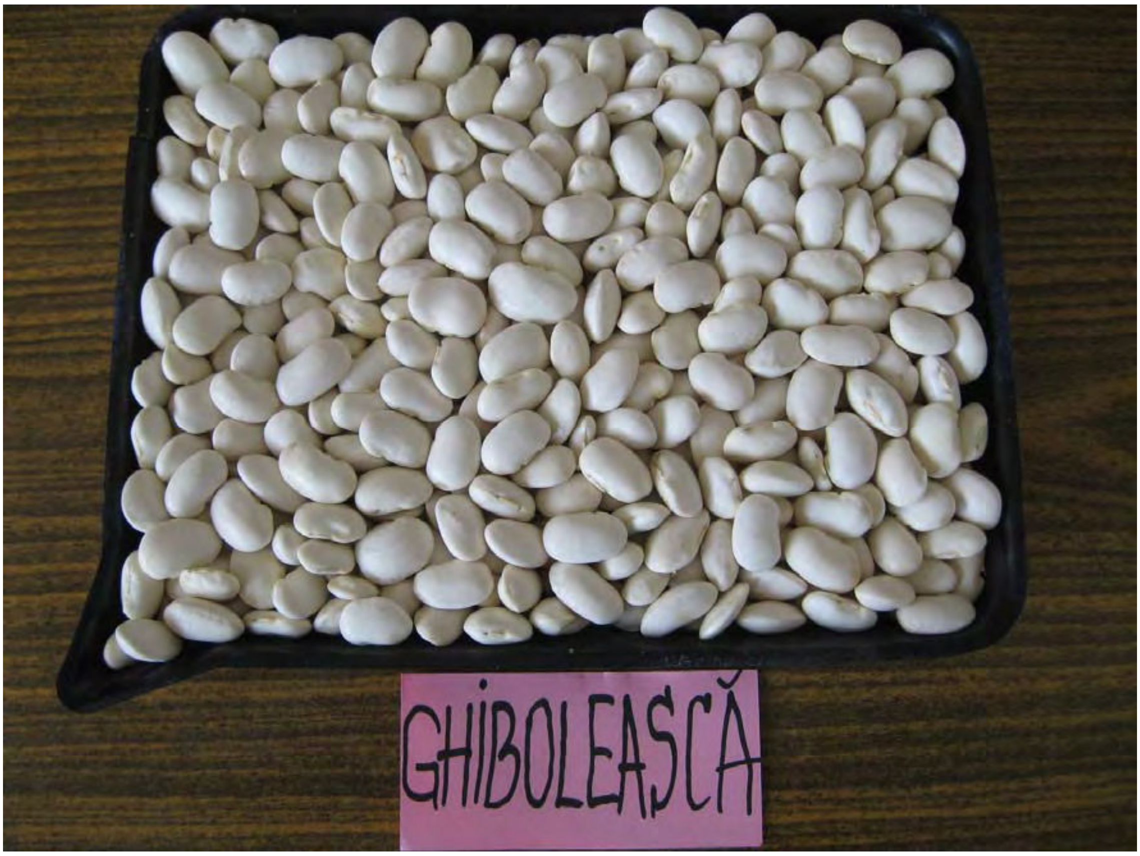

Fig. 6 – Bean seeds

Fig. 7 – L Ghiboleasca

Fig. 8 – L.Viola

The effect of some organic fertilizer resources on the production of tomatoes grown in the solar

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Keywords: semi fermented manure, poultry dejection, mushroom compost, oligotrophic peat

ABSTRACT

The research has mainly aimed the study influences of organic fertilization of tomatoes with some organic resources from livestock waste (semi fermented manure, semi fermented poultry dejection), natural sediments (oligotrophic peat) and waste compost (compost from mushrooms) on the productivity and quality of tomato fruits, on the foliar diagnosis and also on the main indicators of argic phaezem, for using them in the technological process of tomatoes production from protected space.

INTRODUCTION

The organic fertilizers are routinely used in the fertilization systems of horticulture, especially in combination with mineral fertilizers of complex type or became part of the "greenhouse soil" composition or of the multitude of nutritive substrates. In the biological alternatives of the agriculture and horticulture systems the organic fertilization is intended to mobilize "the microbiologically complex" from the soil to release nutritive elements through biological processes throughout the growing season. Regardless the involvement of organic fertilizing resources, this application is considering a management of the organic matter of soil (OSM = Organic Soil Matter) and its relationship with qualitative indicators of soil, water, air, and finally with the quality and productivity's soils, measured and evaluated by the quantity, quality and safety of food of the vegetable production. (Lal et al, 1999; Janzen et al., 2002, etc.). (fig. 1).

The introduction of organic resources in the fertilizers system of agricultural and horticultural crop is a crucial requirement of complex traits and their effects on the maintenance and support sustainable of soil fertility and crop nutrition, but in recent decades has emphasized their need to be use and for the analytical found reason of the ground reduction of C-organic content and of the humus from the soil, of the nature of the mineralization against the humidity, the imbalance caused by the limited character of organic fertilizer's reserves at the global and locally level. It's speak more often by the "cascade decomposition" activation of organic soil matter, maintaining or reducing the C-organic content from soils at levels of 1-3% (slightly higher in histosoils), reducing quantitative and qualitative of inputs of organic soil matter and increasing the atmospheric CO2 emissions. (Paustian, 2002, Post, 2002). Therefore became very a present "sequestration" of carbon in organic forms from soils and a rational and profitable management of organic soil matter. (Izaurralde and Cerri, 2002). Thus developed a real management of organic soil matter that provides and shape for the XXI century a special program to reduce losses of C-organic and offsetting them with inputs that can support a management of a lasting and sustainable agriculture.

MATERIALS AND METHODS

The researches were conducted in the area of SCDL Iernut in the 2007-2010 periods.

The seed was used as biological material for producing the seedlings of the Cronos variety.

The physico-chemical traits of fertilizing organic resources in solarium tomatoes are presented in table 1

The experiences were placed in solars protected with foil.

The experimental variants were composed from those four types of organic material:
V1 – Semifermented farmyard manure
V_2 – Mushroom compost
V_3 – Poultry manure
V_4 - Oligotrophic peat
were arranged in four repetitions,randomized.(figure.2)

RESULTS AND DISCUSSIONSS

The organic resources applied to the technological conditions of solar of tomatoes received uniform a complex fertilizer's basis $N_{80}P_{80}K_{80}$ and weekly 3-4 fertilization with nutrient Piper solution, along with the irrigation water, bringing into the composition of this essential macro elements and micronutrients contribution. Tomato production results show a significant effect of organic fertilizers application supported by a basic mineral fertilization and the input of nutritive complex solutions, but also some differences of the effect on the amount of fruit produced per unit area. (table 2).

The applied organic fertilizers have significant effects on the quantity of tomatoes fruit production, close to the level of significance, yet different in terms of differences of production. From the applied organic resources the semi fermented poultry dejection provides the highest yields of tomatoes followed by the poultry manure, and then the compost waste from mushrooms and finally, the mixture of oligotrophic peat and manure.

Clearly, the effect is based on the complex contribution of these nutrient resources (macro and micro elements), but also on the interaction between these organic fertilizers, NPK fertilization base and nutrient solution that maintains consumption and crops need of nutrition elements and can achieve a potentiating and a mobilization of elements held by organic fertilizers.

After the obtained production results, after the significance of production differences any of organic resources used can be an efficiently variant of tomatoes' fertilization which may be supplemented or maintained either by complex nutritional solutions or simply by mineral basic or additional NPK's fertilization during the growing season.

Fertilized organic resources are sign up significantly and through positive effects on the quality of tomato production. (table 3).

In terms of influence of fertilized resources on the quality of tomato production can signal the opposite effects on some quantity of fruit production. General finding is that all the organic resources with their interaction with organic mineral complex basic fertilization (NPK) and nutrient solutions applied ensure a quality production prevailing Extra and 1st Quality fruits and the fruits from 2nd Quality have a insignificant representation.

From the experimented organic resources is found that the highest prevalence of Extra Class fruits is ensure by mushroom composting and poultry manure, an effect attributable to their quality to be the most concentrated organic resources in nutrients (macro and micro elements). As qualitative effect the mentioned resources are followed by a combination of peat + manure and the manure variant.

Quantitative and qualitative effects of organic resources on fruit production are explained by their involvement in agrochemical soil-plant system with determinate effects on the main indicators of agrochemicals. (table 4, table 5).

Soil reaction is maintained in the neutral noticing, however, that manure have ameliorative effects as the compost mushroom. In contrast, the treatment with peat + manure has a slightly acidifying effect (peat being a corrected pH with a 6.0 value) as semi fermented poultry manure (mixed with wood flour) also with acidifying effects. In all alternatives the soil reaction is maintained in an area for growth and development of tomatoes. (PH optimum = 5.5-7.2).

The organic treatments applied to substantially change of organic matter accumulation, observing the highest values when applying peat + manner, then through the application of mushroom compost, of manure and almost constant values toward the witness to the application of semi fermented poultry manure.

Mobile phosphates regime changes significantly, with the highest accumulated levels of applied poultry manure, then to the mushroom compost then followed by other variants in which manure is applied.

Obviously, this change is primarily dependent on the initial supply of organic phosphorus' resource and its interaction with nutrient fertilization as a potential mobilization.

Further changes are noted in favor of K-life supplies that prevail in the interference with residual compost and poultry manure and then the application of manure.

These agrochemical changes of soil have favorable effects on soil fertility status and also on the tomato plant nutrition.

In the accumulation of nutrients from the tomato plants a decisive role is played by the elements' stocks such applied organic resources. Therefore it is found high concentrations of total nitrogen (N_t) from plants grown in provided nutrient support by the mushroom compost and poultry manure. Normal and specific concentrations of nitrogen are found in the presence of peat that contains insignificant phosphorus. The potassium accumulation in vegetation following the same rule of contribution of this cat ion by organic resource applied to the observed higher values of poultry manure and compost mushroom use. A little more constant concentration regime is established and maintained for CaO and MgO slightly favorable the same organic resources from poultry manure and mushroom compost.

The nutrients accumulation from plant determine the differentiated formation of organic substance (dry matter) ascertaining the causality and effect of the nutrients in the synthesis of useful substances from plant tissues, a phenomenon observed both in tomatoes' field culture and also to the crop technology from solar. There is significant that a directed fertilization (as is the organic resources + nutritive solution from irrigation water), dry matter accumulation that follows the progress and the level of nutrients (N, P, K) determinants of fertility and fruit production of tomatoes. (fig.3, fig.4, fig.5).

The nutrient accumulation level of tomatoes plants grown in solar confirms that this technology approach the values of the plants' analyzed indicators of the soil.

CONCLUSIONS

The accumulation of nutrients along with organic substances (dry matter) shows that a gravimetric unit dries matter (d.m.) from solar gain with consumption and accumulation of nutrients higher in field crops by about 15-20%. This is different to those three essential macro elements (N, P, K).

The level of representation of nutrients, their mobility and translocation (as specific consumption of tomatoes) exceeds the same indicator obtained from tomatoes in the greenhouse culture.

The accumulation of dry matter and nutrients in tomatoes grown in solar has the character of the weak accumulation in primary phenophase and with accumulation of exponential type in phenophase of vegetative increases and of inflorescence and fruit's formation.

The nitrogen and potassium differences between the parallels of these accumulations are higher and the phosphorus element with reduced mobility, the accumulation of dry matter and the accumulation of nutrients are almost identical. This interpretation related of N and K may have phenomena of the access of these elements, but also prevent this process by balancing the nature and role of the nitrogen function of the potassium.

The accumulation of nutrients and their availability in larger solar tomato's culture, the application of organic fertilizers and nutrient solution, predicts the emergence of impact states attributed especially to the nitrogen.

Because of the solar technology at all three essential elements(N, P, K) the accumulation of nutrients precede the one of dry matter (or even exceed it) is necessary especially to the nitrogen, then potassium and less phosphorus delimitation of some risk areas (excess of nitrogen and potassium, phosphorus deficiency), to facilitate finally the obtaining of high yields and fruit quality of tomato.

Following this parallelism - nutrient storage and dry matter storage - allows control and management of nutrition and fertilization for all cultures share more important in intensive technologies to promote productive use of high doses of fertilizer application and prevention of some disorders caused by fertilization.

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TABLES AND FIGURES

Table 1

Physico-chemical traits of fertilizing organic resources in solarium tomatoes

The variant	Organic fertilizer	Initial pH	N %	P_2O_5 %	K_2O %
V_1.	Semifermented stable manure	6.4	0.48	0.30	0.62
V_2	Poultry manure	5.9	2.12	1.20	1.70
V_3	Mushroom compost	7.2	1.88	1.00	1.40
V_4	Oligotrophic peat	3.0	0.22	0.06	pH 0,03 corectat la 6.0

Table 2

Effect of organic fertilizers on tomato production (the Cronos hybrid) - (2007-2009)

Nr. crt.	Fertilization variant	Production		Difference	
		t/ha	%	t/ha	Significance of difference
1.	Unfertilized organic control + $N_{80}P_{80}K_{80}$	68.5	100	-	-
2.	30 t/ha semi-fermented stable manure + $N_{80}P_{80}K_{80}$	108.7	150	40.2	***
3.	10 t/ha oligotrophic peat + 20 t/ha semifermented stable manure + $N_{80}P_{80}K_{80}$	92.6	135	24.1	**
4.	12 t/ha semifermented poultry manure+ $N_{80}P_{80}K_{80}$	98.7	144	30.2	***
5.	12 t/ha residual mushroom compost + $N_{80}P_{80}K_{80}$	96.4	141	27.9	***
	Average of organic resource production	99.1	145	30.6	

DL 5% - 15.7
DL 1% - 22.4
DL 0,1% - 27.4

Table 3

Effect of organic fertilizers on the quality of production (the Cronos hybrid)

Nr. crt.	Fertilization variant	Fruit quality (%)		
		Extra	1st quality	2nd quality
1.	Unfertilized organic control + $N_{80}P_{80}K_{80}$	68.8	20.2	11.0
2.	30 t/ha semifermented stable manure + $N_{80}P_{80}K_{80}$	73.9	22.3	3.8
3.	10 t/ha oligotrophic peat + 20 t/ha semifermented stable manure + $N_{80}P_{80}K_{80}$	74.3	20.9	4.8
4.	12 t/ha semifermented poultry manure+ $N_{80}P_{80}K_{80}$	75.4	21.0	3,6
5.	12 t/ha residual mushroom compost + $N_{80}P_{80}K_{80}$	76.8	21.7	1.5
	Average of organic resource production	75.1	21.5	3.4

Table 4

Effect of organic fertilizer application on the main indicators of argic phaeozem

Nr. crt.	Fertilization variant	Agrochemical indicators			
		pH H_2O	MO %	P-AL ppm	K-AL ppm
1.	Unfertilized organic control + $N_{80}P_{80}K_{80}$	7.05	3.90	25	266
2.	30 t/ha semifermented stable manure + $N_{80}P_{80}K_{80}$	7.15	4.20	52	294
3.	10 t/ha oligotrophic peat + 20 t/ha semifermented stable manure + $N_{80}P_{80}K_{80}$	6.82	6.12	42	278
4.	Unfertilized organic control + $N_{80}P_{80}K_{80}$	6.75	3.95	68	310
5.	12 t/ha residual mushroom compost + $N_{80}P_{80}K_{80}$	7.10	4.25	62	312
	Average of organic resource production	6.96	4.63	56	299

Table 5

Value of foliar diagnosis in tomatoes fertilized with organic fertilizers (upon the first flowering)

Nr. crt.	Fertilization variant	Nt %	Pt %	Kt %	CaO %	MgO %
1.	Unfertilized organic control + $N_{80}P_{80}K_{80}$	2.38	0.21	2.08	2.00	0.36
2.	30 t/ha semifermented stable manure + $N_{80}P_{80}K_{80}$	2.92	0.28	2.77	2.42	0.38
3.	10 t/ha oligotrophic peat + 20 t/ha semifermented stable manure + $N_{80}P_{80}K_{80}$	2.72	0.26	2.64	2.12	0.34
4.	12 t/ha semifermented poultry manure + $N_{80}P_{80}K_{80}$	3.44	0.38	2.98	2.44	0.40
5.	12 t/ha residual mushroom compost + $N_{80}P_{80}K_{80}$	3.58	0.32	2.84	2.50	0.42

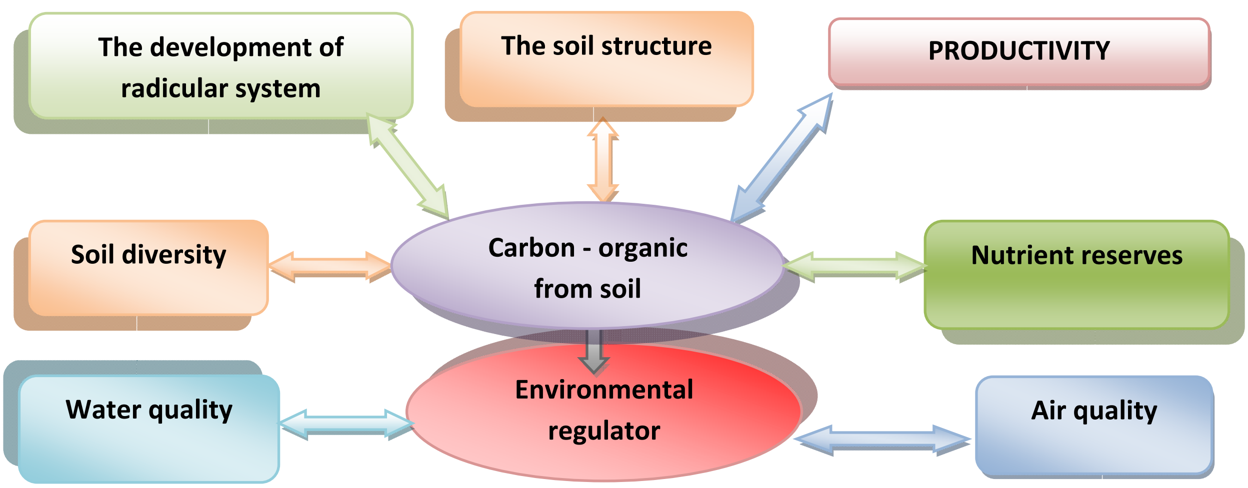

Fig. 1 – Relations of the soil organic matter with air, water and soil quality

	V_4	V_3	V_3	V_3	
	V_2	V_3	V_4	V_1	
	V_3	V_4	V_1	V_2	
	V_1	V_2	V_3	V_4	

Fig.2 - The placement's scheme of experience

- (protection band)

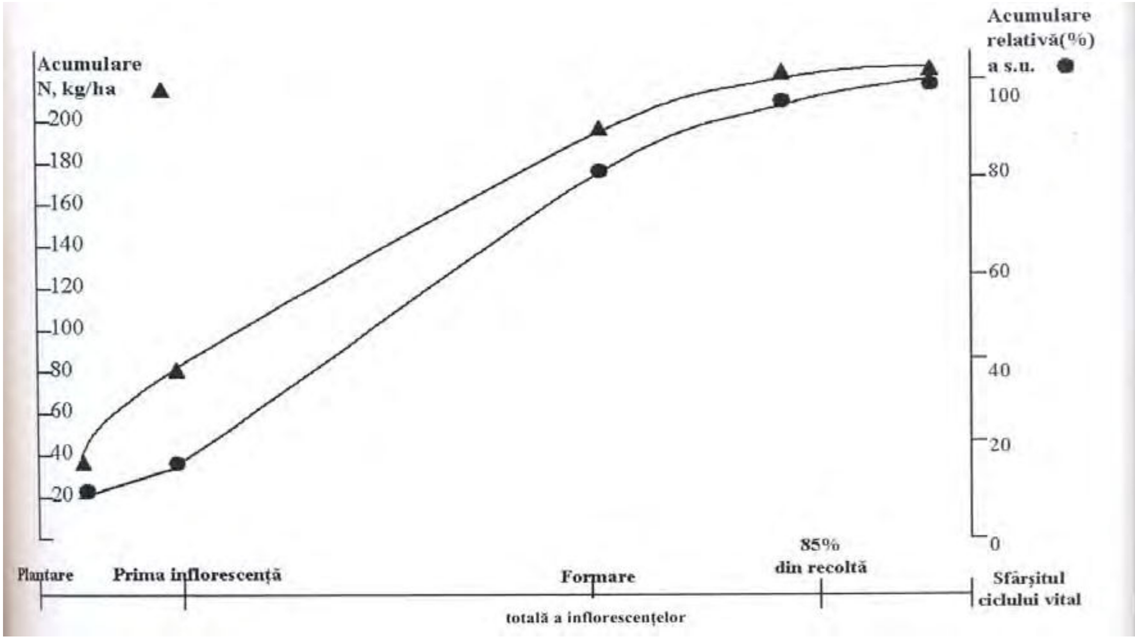

Fig. 3. Dry substance accumulation in solarium tomatoes

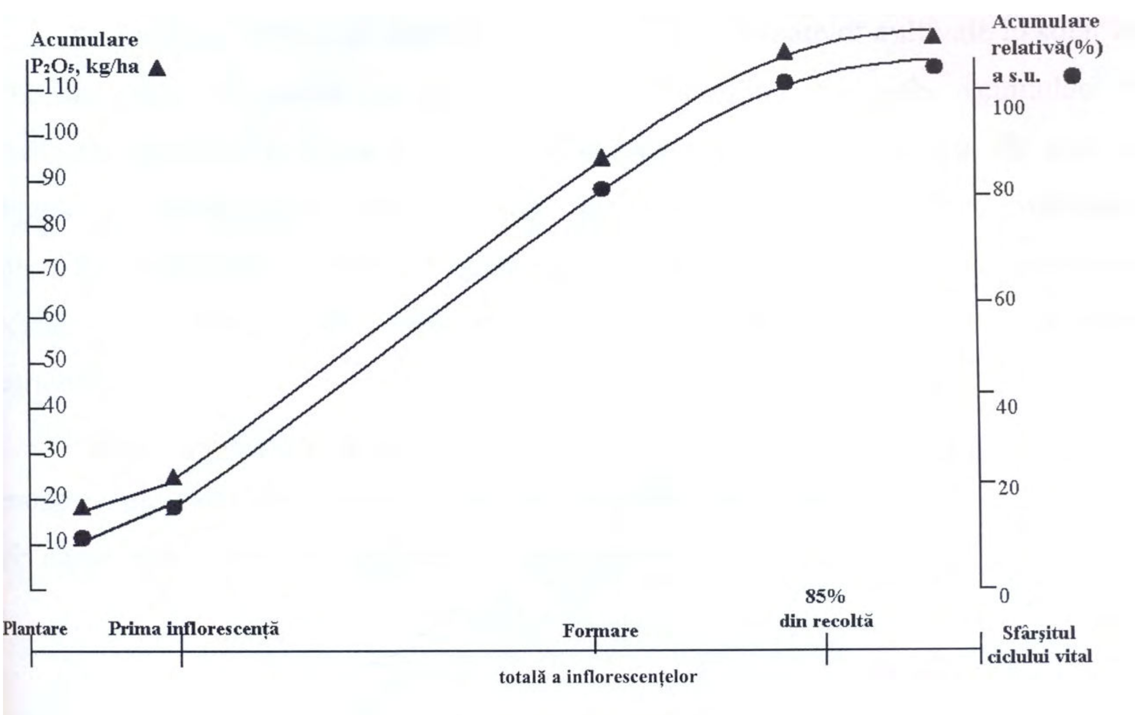

Fig. 4. Dry matter accumulation (d.m.) and phosphorus accumulation in solarium tomatoes

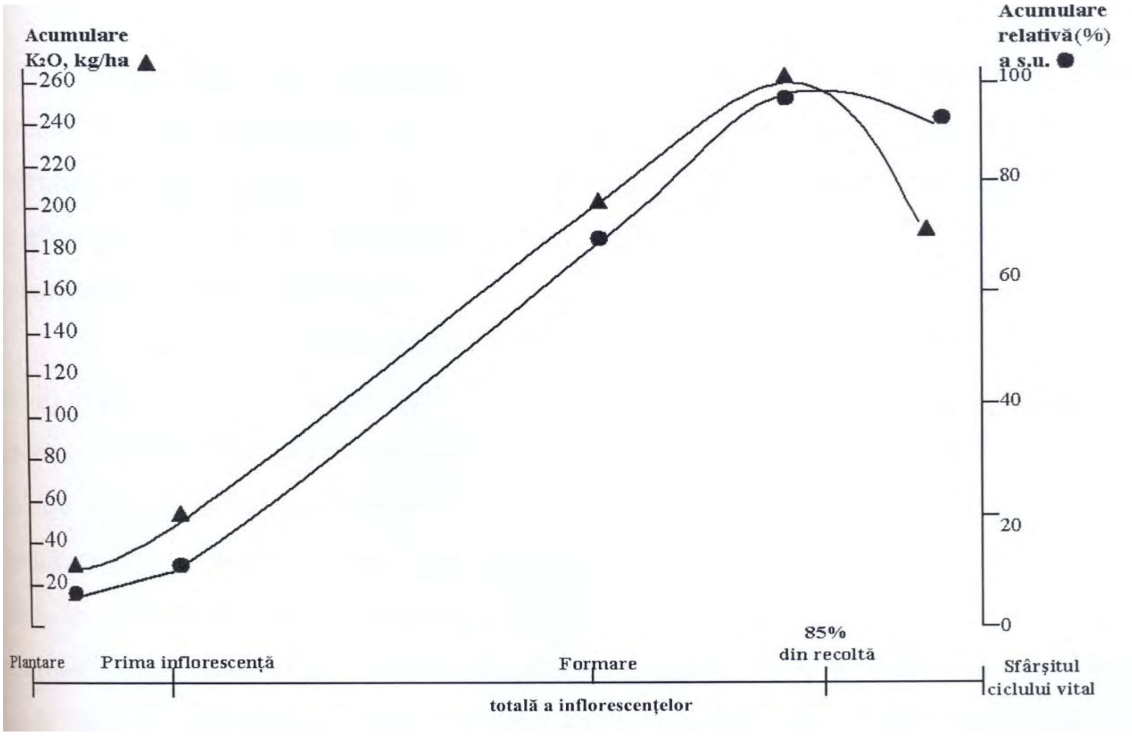

Fig. 5. Dry substance accumulation (d.m.) and phosphorus accumulation in solarium tomatoes

Preliminary studies regarding the carrot culture on billon

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Keywords: carrot, billon, production, culture

ABSTRACT

The culture of carrot on billons is a new culture technique in order to obtain quality roots, especially without ramifications, when the soil does not entirely meet the requirements of the species. The presence of this species intercalated in a young fruit growing plantation is also an advantage in order to obtain certain revenues until fructification starts. The nectarine plantation from Râmnicu Vâlcea has 5 m between rows and 1.5 m between trees on the same row, which allowed the manual making of billons for carrots at a distance of 1.2 m between them and 1.3 m between the tree and billon, the soil being mechanically maintained using the tiller, whose working width was 1 m. The sowing was manually made, each billon with one row, on its top, in the first days of April, while the uniform appearing of the plants took place between 25th and 26th April. Two cultivars were used, an earlier one but less vigorous, and a late one but more vigorous, both having special qualities for fresh consumption, but also for storage; the two cultivars reacted very well to this culture method. The largest roots, both in weight and in length, and the largest production were obtained for both cultivars, on a land with billons. Nebula F1 recorded a production rate of 1 kg/m^2, while Nantes 0.8 kg/m^2. The ratio between the diameters of the root and central cylinder highlighted the quality of the roots, element highlighted by the value of the correlation coefficient of 0.833.

INTRODUCTION

Carrot culture is one of the main cultures of root vegetables, which are cultivated on land shaped as high layers, with the width in the upper part of 94 and 104 cm, or on unshaped land, technique that is currently applied for this species (Indrea, 2007). The biometric characteristics of the carrot roots and their quality are influenced by some environmental factors, by the soil texture or by the content in organic matter (Saviţchi, 1894).

An element that is present at the roots in the harvesting phase, which affects the optimum capitalization of the roots, is the ramification, which can have many causes such as: cultivation on hard soils, on soils fertilized during the culture year with not decomposed manure, the weak water supply during the first growth phases (Raleigh, 1942, quoted by Horgoş, 2003) or the cultivation on soils infested with nematodes.

A new technique for carrot culture, which comes to support the elimination of root ramification, determined by the culture on hard soils, is the culture on soils with billons. This cultivation method provides other advantages, such as: better control of weeds, elimination of water excess (where needed) and earlier and better quality production.

MATERIALS AND METHODS

The culture was founded at Râmnicu Vâlcea, on a gently sloping land, at the base of the hill, cultivated for seven years with alfalfa. On that land, in 2010-2011, a nectarine plantation was founded, with planting distance of 5 m between rows and 1.5 m on rows, which allowed the cultivation of carrots in intercalated system, between the rows of trees. The system of intercalated had been used for a long time, in order to obtain revenues from vegetable culture, reducing the costs with the maintenance of fruit growing plantation in the first 2-3 years.

The scheme of founding the carrot culture on billons consisted of 3 billons on an interval of 5 m between two rows of trees, 1.2 m between billons and 1.3 m between a billon and trees. This distance between billons was imposed by the need for mechanical maintenance of the soil with the tiller, whose working width was 1m. The height of the billon was of 40-45 cm. The preparation of the soil was made through plowing and very good shredding, the uniform appearing of the plants being highly conditioned by the manner in which the soil was prepared. The two cultivars were manually sowed, on land both with and without billons.

The sowing was made manually, each billon with one row, on its top, the cultivated area being small, at the beginning of April, and the mass appearing of the plants took place between 25th and 26th April. The biological material used was represented by two cultivars: Nantes variety, one of the best carrot varieties for fresh consumption and storage, semi early, with cylindrical roots of 16-18 cm in length, intensely colored, and Nebula F1, hybrid, semi late, with vigorous foliage and a high productive capacity, cylindrical, uniform and very vigorous roots of 20-25 cm in length, formed in any condition and at any density.

During the vegetation period, accent was put on the maintenance works of the soil through works with the tiller, especially at the beginning, and localized irrigation, only two times, the first part of the year being characterized by local rainfall, which led to the interruption of the irrigation. Also, two thinning works were made manually, the average distance between plants being of 4 cm.

The harvesting started at different moments, because the cultivars had different vegetation periods; for Nantes the harvesting started at 15th July, while for Nebula F1 at 1st August. The harvesting was manually made in phases, depending on the market demand. At harvesting, determinations were made especially for the roots, regarding their weight and length, diameter of the roots at packaging and diameter of central cylinder. The ratio between the diameter at package and diameter of the central cylinder was computed and the weight of the leaves and of the entire plant was also determined.

RESULTS AND DISCUSSIONSS

From the observations made on the carrot culture with and without billons, during the entire vegetation period, and from the processing of data, it can be appreciated that this culture system led to good results in the fruit growing plantation, this being the beginning. The two carrot cultivars reacted very well to the preparation of the land with billons, because the carrot prefers loose soils; the risk of obstacles that might determine root ramification is almost entirely eliminated and the growth of roots is optimum (table 1).

In intercalated culture, the carrot cultivated on billons reached an average weight of the root of 293.8 g and 226.4 on flat land for Nebula F1, this being a very vigorous hybrid, with large roots. The variety Nantes was noted in the culture with billons, where the roots had an average weight of 136.6 g, compared to 84.6 g on flat land. As compared to Nebula F1, Nantes has a lower vigor and the roots had a lower weight. The weight of the leaves was correlated with the weight of the roots, Nebula F1 being on the first place, being more vigorous. It could be observed that for the culture on billons, the growth was faster that for the culture on flat land, and the variety Nantes had weaker growths and without differences between the two culture methods. The ratio root/leaf showed a very strong correlation between the two elements, aspect demonstrated also by the value of the correlation coefficient 0.943 (fig.1).

Carrot roots were analyzed at the moment of harvest also from the point of view of the length, this being a very important characteristic that directly influences the harvesting and indirectly the storage of roots and the aspect of the section (table 2). It was obvious that Nebula F1, having a higher vigor, formed longer roots (209 cm on land without billons and 265 cm on land with billons), while Nantes formed shorter roots (148 cm on land without billons and 190 cm on land with billons). The diameter of the roots at package recorded small variations between the carrots cultivated with billons and the plants without billons, large variations being recorded between varieties, Nebula F1 exceeding 4 cm, aspect that must be taken into account for sowing and thinning works.

The carrot roots are appreciated from the point of view of quality and before the biochemical determination, through color of roots, size and intensity of color of the central cylinder. For the studied cultivars, the diameter of the central cylinder varied between 1.4 cm and 2.5 cm, was intensely colored; the roots also had an intense orange color. Analyzing the ratio between the diameter at package and diameter of the central cylinder, a very good correlation was observed between the two elements, the correlation coefficient having a value of 0.833 (fig.2).

The root production was influenced by the cultivar and by the method of culture of the carrot (table 3). It varied between 1.3 kg/m^2 for Nantes without billons and 4.4 kg/m^2 for Nebula F1 with billons. Also, it was observed a rate of production of 0.8-1 kg/m^2 for the carrot on billons compared to the plants without billons.

CONCLUSIONS

The cultivation of carrot on land with billons, in culture intercalated in a young fruit growing plantation, led to good results, which demonstrated that it was a good method to use the land. The making of the billons must be made mechanically, because it is a difficult work and requires a lot of labor.

In the present conditions, it can be said that the sowing of the carrot on billons is a good alternative and can lead to obtaining corresponding results. Thus, on land with billons, a significant growth of the roots was noted, especially for Nebula F1 (293.8 g and 265 cm in length). For Nantes, the roots were smaller, being a less vigorous variety as compared to Nebula F1 (136.6 g and 190.8 cm in length).

Computing the correlation coefficient between the weight of roots and weight of leaves, it was demonstrated that there was a very strong correlation between them, the value being 0.943. The diameter of the roots at package was different between cultivars, the highest values being also for Nebula F1, respectively 43 mm on land with billons and 40,8 mm without billons. For the variety Nantes, the diameter was of 32.2 mm and 28.4 mm respectively.

The ratio between diameter of roots and diameter of central cylinder highlighted the quality of roots, element highlighted also for the studied cultivars, through the value of the correlation coefficient of 0.833.

All these characteristics influenced also the root production, which was 4.4 kg/m^2 for Nebula F1 on land with billons, with a rate of 1 kg/m^2 compared to the land without billons, and 2.1 kg/m^2 for Nantes with billons, with a rate of 0.8 kg/m^2 compared to the land without billons.

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TABELS AND FIGURES

Table 1

Appreciation of the degree of growth of plants using their weight

Cultivar	Method of culture	Weight (g)		
		root	leaves	ratio root/leaves
Nebula F1	With billons	293.8	80.9	3.63
	Without billons	226.4	54.8	4.13
Nantes	With billons	136.6	23.6	5.78
	Without billons	84.6	23.2	3.64

Table 2

Characteristics of carrot roots at harvesting

Cultivar	Method of culture	Length of roots (cm)	diameter of roots at package (mm)	diameter of central cylinder (mm)	Ratio between diameter of roots at package and diameter of central cylinder
Nebula F1	With billons	265	43	25	1.72
	Without billons	209	40.8	20.3	2
Nantes	With billons	190.8	32.2	14	2.3
	Without billons	148.2	28.4	15.3	1.85

Table 3

Estimated root production

Cultivar	Method of culture	Weight of roots (g)	Number of marketable roots/m^2	Root production kg/m^2	Production difference kg/m^2
Nebula F1	With billons	293.8	150	4.4	+ 1
	Without billons	226.4	150	3.4	0
Nantes	With billons	136.6	150	2.1	+ 0.8
	Without billons	84.6	150	1.3	0

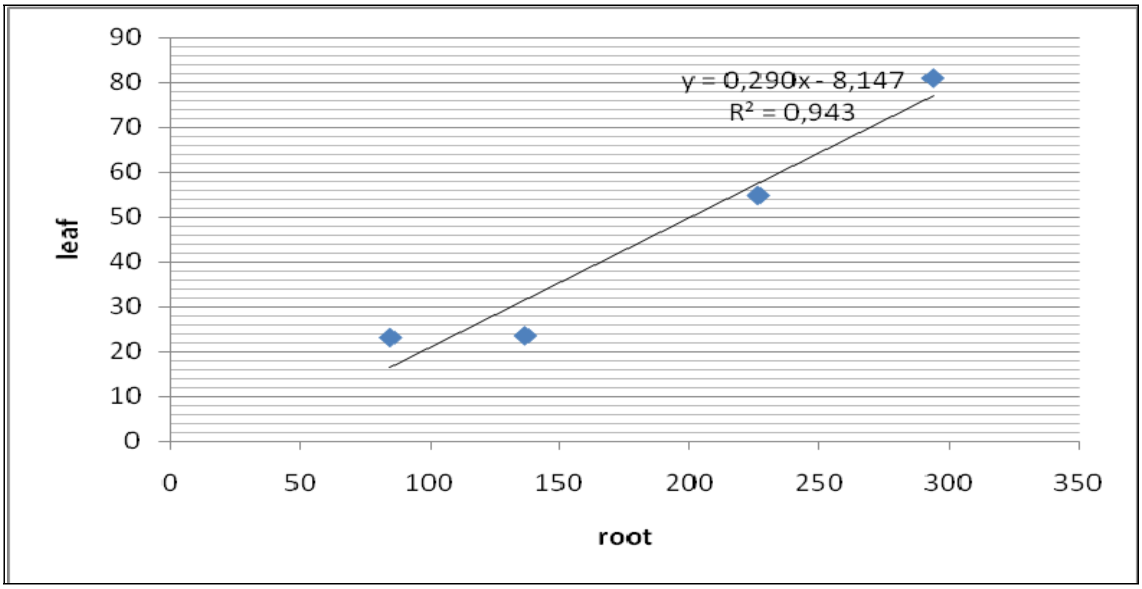

Fig. 1. Correlation between weight of root and of leaf

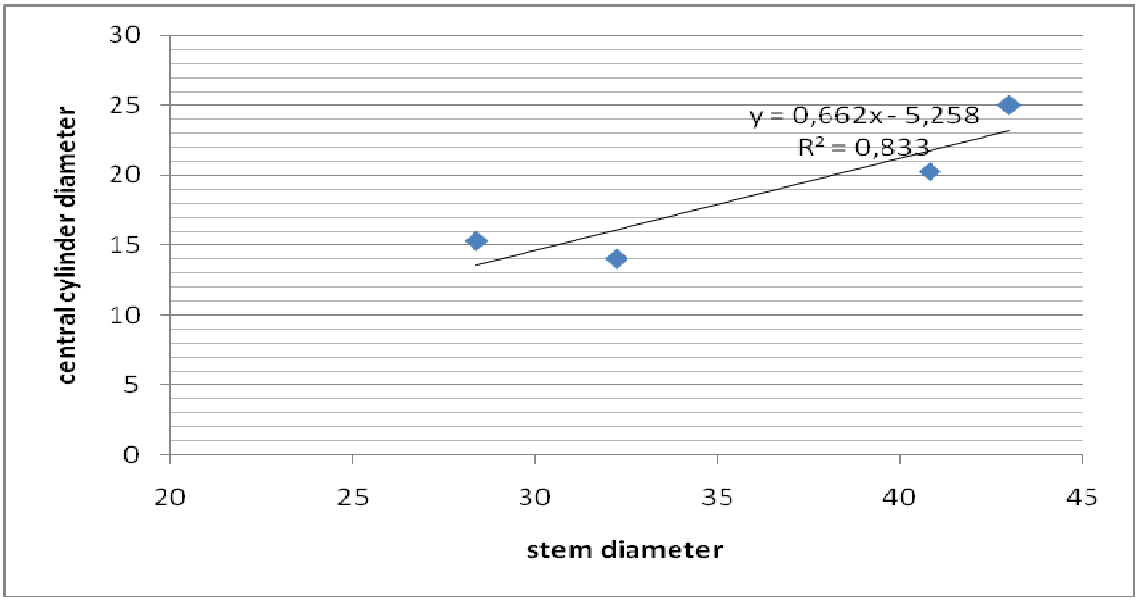

Fig. 2. Correlation between diameter of roots at package and diameter of central cylinder

Assortment influence on the dynamics of harvesting production upon pickling cucumber hybrids grown spring in solarium

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Keywords: *Cucumis sativus L.*, density, evaluation, quality, production.

ABSTRACT

The *Cucumis sativus* is highly influenced by the culture techniques and hybrids in solarium. Solarium experiment was conducted in 2010 using the next density: 41.600 plants/ha which corresponds to row spacing 80 cm and 30 cm between plants inside the row, grown for manual harvest. On this experience we try to show the Optimum density required to maximize the revenue. Results of this study suggest that hybrid *Karaoke F1* have the biggest production at the density of 4.16 pl/sqm., with 96,346 to/ha.

INTRODUCTION

The research wants to demonstrate how pickling cucumber quality may be influenced by culture techniques. Most of the pickling cucumber in our country is grown for fresh alimentation use. To optimize the quality of commercial size fruits, most growers use low planting densities. We found that some growers used row spacing as narrow 100 cm with 30 cm between plants inside the row, which corresponds to a density of about 33.333 plants/ha. The experiment conducted in 2009 with density of 48.000 plants/ha, row spacing 70 cm and 30 cm between plants inside the row suggest that hybrid Kybria have the biggest production at density of 4.76 pl/sqm. On this experiment we try to show the influence of hybrid and the plant density using the next density: 4.16 pl/sqm which corresponded to row spacing 80 cm and 30 cm between plants inside the row, grown for manual harvest. High plant density could have significant impact on plant disease incidence (Popescu, Atanasiu, 2000). Relative humidity may increase and on the same time high plant density can have a huge influence reducing air movement and sun light penetration. *Pseudoperonospora cubensis* and *Spaerotheca fuliginea* was reported with a significant increase on incidence. Several studies have been conducted on Romania regarding the influence of technological elements upon the production of pickling cucumber. The purpose of those researches was to introduce in the cultivation technology of cucumbers grown in solarium some new elements of intensification and identifying the hybrids that are the best adapted for those areas (Bei, Apahidean and Carburar, 2007).

Main objectives of this experience are as follow:

- Determining the production potential of some new hybrids has been in the culture in Tartasesti-Racari area.
- Comparison of productivity and quality of fruit obtained in comparative culture conducted in 2010.

MATERIALS AND METHODS

The researches want to demonstrate how pickling cucumber quality may be influenced by culture techniques and hybrids. For achievement were established experience variations presented in Table 1. The experiment was conducted at the farm personal property, formed by 200 sqm solarium tunnels and 5 ha open field. The soil pH was 8.06, and soil analysis **N-NH4**:29.58, **N-NO3**:33.25, **P-PO4**:60.20, **K**:145 and soluble salts 0.049.

Specific elements of technology: culture was established by planting seedlings on 12.04.2010 with distance between rows of 80 cm and 30 cm between plants per row. Plant spacing and row spacing were selected on the basis of Dambovita County current practices. Experimental culture was harvested by hand, gradually, with registration of production for each variant. Quantities harvested were pooled to establish production in accordance with experimental scale. Pickling hibryds used: Karaoke, Kybria, Componist, Pasarebo and Alibi were planted on 12.04.2010. Immediately after planting, foliar fertilizer (Bionat) were applied and then soil fertilizer (Agroblen) at a rate of 300 kg/ha in concentrations 20+10+10+4MgO. For research were used in culture in 2010 three next-generation hybrids: Kybria F1, Karaoke F1, Componist F1 with two hybrids: Pasarebo F1 and Alibi F1 used in the vegetable area of Tartasesti, Dambovita County. They are the parthenocarpic type hybrids, with spikes, used for palisate crops in greenhouses, of Dutch origin produced by Rijk Zwaan.

Data collection: pickling cucumbers were harvested manually on period of 08.05.2010 (26 days after planting day) up to 08.08.2010 (3 month after first day of picking). Fruit were harvested when about 30% of them have about 9-12 cm in long and sorted according to market standards. For harvesting production dynamics in solar with pickling cucumber type, data were collected regard number of fruits per plant, average weight of fruits, production per plant, production per square meter, output gap and significance.

RESULTS AND DISCUSSIONSS

Number of fruits per plant increased as plant growing up in good condition. With increased density of fruit on terminal part of plant the fruit weight per unit area increased. The performance of individual plants is directly linked to plant density. Fruit quality is dependent of warm condition in harvest period. With increased plant density the low fruit set are directly linked to hybrid used and to net photosynthesis (Schapendonk and Brouwer, 1984). In this study we try to show the optimum density required to maximize the revenue. Results of this study suggest that hybrid Karaoke F1 have the biggest production at the density of 4.16 pl/sqm, 41.600 plants/ha which correspond to row spacing 80 cm and 30 cm between plants inside the row, grown for manual harvest. Regarding number of fruit per plant, hybrid Karaoke F1 is in top and for average weight of fruit, the heaviest one are hybrid Componist F1 and the smallest Karaoke F1. The highest production per plant was for hybrid Karaoke F1 and the lower production per plant was for hybrid Alibi F1.

CONCLUSIONS

Regarding number of fruit per plant, hybrid Karaoke F1 is in top with average of 29.29 fruith (Table 4.)

For average weight of fruit, the heaviest one are hybrid Componist F1 with 90.13g in average and the smallest Karaoke F1 with 79.14g (Table 4.)

The highest production per plant was for hybrid Karaoke F1 with 2,318 kg and the lower production per plant was for hybrid Alibi with 1,144 kg (Table 4.)

The highest production per sqm was for hybrid Karaoke F1 with 9,6346 kg and lower production per sqm was for hybrid Alibi F1 with 4,6315 kg (Table 4.)

Hybrid Karaoke F1 have the biggest productivity from four hybrids used, comparing with the control hybrid Alibi F1.

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TABLES

Table 1

Experimental variations in solar with pickling cucumber type, Tartasesti, Dambovita, 2010

Variant	Cultivar	Origin	Comments
1	Karaoke F1	Netherlands	Rijk Zwaan Hybrid. Variety not officially listed in Romania
2	Kybria F1	Netherlands	Rijk Zwaan Hybrid
3	Componist F1	Netherlands	Rijk Zwaan Hybrid
4	Pasarebo F1	Danish	F1 Hybrid
5	**Alibi F1**	Netherlands	F1 Hybrid

Table 2

Harvesting production dynamics in solar with pickling cucumber type, Tartasesti, Dambovita, 2010

Var.	Cultivar	10-20.05		21-31.05		1-10.06		11-20.06		21-30.06		1-10.07		11-20.07		Total
		Kg/m²	%	Kg/m²	%	Kg/m²	%	Kg/m²	%	Kg/m²	%	Kg/m²	%	Kg/m²	%	Kg/m²
1	Karaoke F1	0.2163	2.2450	0.2496	2.5907	0.9873	10.2474	0.9707	10.0751	2.8011	29.0733	2.9120	30.2244	1.4976	15.5440	9.6346
2	Kybria F1	0.1442	1.5194	0.4937	5.2022	1.3589	14.3188	0.9429	9.9354	2.4572	25.8917	2.7345	28.8136	1.3589	14.3188	9.4903
3	Componist F1	0.1276	1.7461	0.3550	4.8578	1.0594	14.4966	0.6963	9.5280	2.0523	28.0833	1.9968	27.3239	1.0205	13.9643	7.3079
4	Pasarebo F1	0.0444	0.5751	0.1054	1.3651	0.9318	12.0684	1.0261	13.2897	2.1466	27.8021	2.1521	27.8733	1.3146	17.0263	7.7210
5	**Alibi F1**	0.0777	1.6776	0.2441	5.2704	0.8154	17.6055	0.7765	16.7656	0.8043	17.3659	0.9152	19.4019	0.8986	19.4019	4.6315

Table 3

Number of fruits per plant and their average weight of pickling cucumber type, grown in solar, Tartasesti, Dambovita, 2010

Var.	Cultivar	10-20.05		21-31.05		1-10.06		11-20.06		21-30.06		1-10.07		11-20.07		Total	
		N.F.	A.W.	N.F.	A.W.	N.F.	A.W.	N.F.	A.W.	N.F.	A.W.	N.F.	A.W.	N.F.	A.W.	N.F.	A.W.
1	Karaoke F1	0.6933	75.0g	1.1200	53.6g	2.8133	84.4g	2.0400	114.4g	8.4267	79.9g	8.9467	78.2g	5.2533	68.5g	29.29	79.14g
2	Kybria F1	0.4933	70.3g	1.2533	94.7g	3.7467	87.2g	2.4800	91.4g	6.9467	85.0g	7.8133	84.1g	3.9600	82.5g	26.69	85.03g
3	Componist F1	0.3333	92.0g	0.8800	97.0g	2.9467	86.4g	1.8933	88.0g	5.8133	84.8g	5.4933	87.4g	2.5733	95.3g	19.93	90.13g
4	Pasarebo F1	0.1600	66.7g	0.3600	70.4g	2.7867	80.4g	1.9733	125.0g	6.9067	74.7g	7.4267	69.6g	4.3467	72.7g	23.96	79.93g
5	**Alibi F1**	0.2000	93.3g	0.6400	91.7g	2.8000	78.6g	2.0400	91.5g	2.1600	89.5g	2.7200	80.9g	2.6000	83.0g	13.16	86.93g

N.F. – number of fruits
A.W. – average weight

Table 4

Total production of pickling cucumber type, grown in solar, Tartasesti, Dambovita, 2010

Variant	Cultivar	Number of fruits per plant	Average weight of fruits (g)	Production per plant (kg)	Production per square meter (kg)	Production per hectare (t)
1	Karaoke F1	29.29	79.14	2,318	9.6346	96,346
2	Kybria F1	26.69	85.03	2,269	9.4903	94,903
3	Componist F1	19.93	90.13	1,796	7.3079	73,079
4	Pasarebo F1	23.96	79.93	1,915	7.7210	77,210
5	**Alibi F1**	**13.16**	**86.93**	**1,144**	**4.6315**	**46,315**

Table 5

Total production t/ha compared to the control differences.

Variant	Cultivar	Production per square meter (kg)	Production (%)	Output gap	Significance
1	Karaoke F1	9.6346	208.02	+108.02	***
2	Kybria F1	9.4903	204.90	+104.90	***
3	Componist F1	7.3079	157.78	+57.78	***
4	Pasarebo F1	7.7210	166.70	+66.70	***
5	**Alibi F1**	**4.6315**	**100.00**	**-**	**-**

DL-5% = 0.45; DL-1% = 0.98; DL-0,1% =2.03

Pickling cucumber hybrids. The fruit photography on the moment of growing and harvesting.

The influence of seed position on the number of days required for emergence to cucumbers gherkins type grown in greenhouses in Tărtăşeşti area, Dâmboviţa County

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Keywords: *Cucumis sativus L.*, position, seed, germination, influence.

ABSTRACT

The process of germination is a very complex physiological process, the process by which the embryo of the seed plant vegetation starts after a period of rest (Burzo et al. 1993). Following in the shortest time will appear sprout, a major advantage in growing vegetables to obtain early spring productions, getting very high production per unit of surface of products and getting high income.

INTRODUCTION

Once the seed meets the conditions conducive to germination: moisture, temperature and airy, they begin a series of complex changes that will transform the biochemical nature of inaccessible reserve substances in assimilable forms compounds for the embryo (Florescu, Popescu, Ciofu, Atanasiu. 1998). The *Cucumis sativus* species embryo radicle is oriented so that looks to micropil, is placed in the plane of symmetry of the seed. Seed germination in some vegetable species is features such as fast east (Fam. Brassicaceae), east slow (Fam. Apiaceae), or is directly influenced by some factors such as soil quality technology, the degree of grinding, planting depth and position seeds. Research on seed position and its influence on germination were made for the most important cultivated species, both abroad (Zeraim Gedera - Israel) and the Faculty of Horticultura in Bucharest. Valid general conclusion drawn from the results refers to the fact that by placing seeds in a favourable position to shorten the time between sowing and east while decreasing the percentage of seeds that do not come. The high cost of a hybrid seed, the need to obtain uniform seedlings and reduce the time needed to produce seedlings can be modified by applying this method. For research were used in culture in 2010 three next-generation hybrids: Kybria F1, Karaoke F1, Componist F1 that are the parthenocarpic type hybrids, with spikes, used for palisate crops in greenhouses, and two parthenocarpic type hybrids: Promisa F1 and Trilogy F1, without spikes, used for palisate crops in greenhouses, all of them with Dutch origin produced by Rijk Zwaan. Based on these considerations we performed research on the influence of the sowing of seed position emergence for gherkins cucumber grown in greenhouses in 2010. The main objectives of the experience are:

- Establishing the influence of seed position on percentage emergence;
- Establishing the influence of seed position on the number of days from sowing to mass emergence;
- Establish methods to reduce the number of days needed to obtain seedlings.

MATERIALS AND METHODS

To achieve the research were studied three types of seed position for five hybrids (Table 1). Using two types of pots with different capabilities seeds were sown in special substrate in order to obtain seedlings. Substrate is a mixture of: 70% peat whit, 30% black peat granulate, clay 20 kg/m² providing a good time in order to absorb water, good aeration of the substrate and that a constant release of nutrients by granulated clay decreases when their concentration in the substrate are low. Substrate is medium acidity, pH 5.5-6.5. Pots used were 200ml and 150ml capacity and is made of white material to avoid overheating the substrate and decreasing humidity in sunny days. Were each sown seed of each hybrid 150

being made every three positioning options with two different sized pots. The three positioning options are:
- V1 - seeds were planted upright with the top down;
- V2 - seeds were planted obliquely with the tip inclined at 45°;
- V3 - seeds were planted horizontally.

Data collection. During the experiment in spring 2010 observations and measurements were made on the number of days contained in the interval between sowing and east following the daily evolution of crops and during the entire emergence noting the number of plants appeared.

RESULTS AND DISCUSSIONSS

Determinations were made following the daily evolution of crops and during the entire emergence noting the number of plants occurring on the surface of nutrient mixture. Examining the dynamics we find some emergent differences appearing on each side just in case hybrid seeds were seeds were planted upside down, hybrid Karaoke F1 begins with the 10th seeded day in season March-April 2010. Regarding of mass emergence are also best represented hybrid Karaoke F1 and Componist F1 since the 12th day from sowing followed and Trilogy F1, Kybria F1 where mass emergence occurs once a day 13 from the sowing. End of emergence occurs faster on Karaoke F1 hybrid case. The end of the east is more alert Promised F1 hybrid, which between the first appearance of plants (day 07/04/2010 - 10/04/2010) and mass emergence is recorded 4 days. A Karaoke F1 hybrid, F1 Kybria east end is slower. Karaoke F1 hybrid rising 10th day from sowing to emergence and mass emergence needs only two days. Promised F1 hybrid east harder, the 13th day, and the emergence of mass take place after 2 days.

CONCLUSIONS

Following observations and determinations made on 5 gherkins hybrids emergence can conclude the following:
- Time to differ depending on the cultivar east are on average 10 days to cultivate Karaoke F1, primarily due to differences in biological peculiarities of the East but and the period to obtain seedlings with cold temperatures.
- Experimental factors: position range and gherkins cucumber seeds have influenced the following parameters of rise plants: number of days between sowing and early rise, number of days between sowing and emergence mass and number of days necessary to end rise.
- Time required to achieve the three phases of rise position is influenced by seed. The plants rise fastest when seeds are placed upside down.
- Parameters are influenced rise visible range, a longer time to rise (7days) and F1 hybrid Trilogy shorter (4 days) Promise F1 hybrid.
- Based on these findings it may be advisable when gherkins produce seedlings, seeds to be placed upright in nutrient layer upside down.

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Table 1

TABLES AND FIGURES

The influence of seed position on the number of days required for emergence to cucumbers gherkins type grown in greenhouses in Tartasesti area, Dambovita County in 2010

Hybrid	Date of sowing	The seeds sowed upside down			Seeds sown in a 45° angle			The seeds sown horizontal		
		Early emergence	Mass emergence	Late emergence	Early emergence	Mass emergence	Late emergence	Early emergence	Mass emergence	Late emergence
Karaoke	25.03	4.04	6-7.04	9.04	6.04	8-9.04	11.04	7.04	9-10.04	11.04
Kybria	25.03	5.04	7-8.04	10.04	6.04	9-10.04	12.04	7.04	10-11.04	13.04
Componist	25.03	5.04	6-7.04	9.04	7.04	9-10.04	11.04	8.04	10-11.04	13.04
Promisa	25.03	7.04	8-9.04	10.04	9.04	11-12.04	14.04	10.04	12-14.04	15.04
Trilogy	25.03	6.04	7-8.04	10.04	8.04	10-11.04	14.04	9.04	11-13.04	15.04

Table 2

The dynamics of emergence for seed sown upside down for cucumbers gherkins type grown in greenhouses in Tartasesti area, Dambovita County in 2010
V1

Hybrid	Date of sowing	Observation days											Total seeds east	Percentage east
		4.04	5.04	6.04	7.04	8.04	9.04	10.04	11.04	12.04	13.04	14.04		
Karaoke	25.03	7	12	17	10	2	1	-	-	-	-	-	49	98%
Kybria	25.03	-	5	9	15	14	4	1	-	-	-	-	48	96%
Componist	25.03	-	9	14	18	5	2	-	-	-	-	-	48	96%
Promisa	25.03	-	-	-	10	16	19	1	-	-	-	-	46	92%
Trilogy	25.03	-	-	8	13	17	6	4	-	-	-	-	48	96%

Table 3

The dynamics of emergence for seed sown in a 45° angle for cucumbers gherkins type grown in greenhouses in Tartasesti area, Dambovita County in 2010

V2

Hybrid	Date of sowing	Observation days											Total seeds east	Percentage east
		4.04	5.04	6.04	7.04	8.04	9.04	10.04	11.04	12.04	13.04	14.04		
Karaoke	25.03	-	-	4	9	15	13	4	3	-	-	-	48	96%
Kybria	25.03	-	-	7	5	11	16	5	1	2	-	-	47	94%
Componist	25.03	-	-	-	8	7	13	12	7	-	-	-	47	94%
Promisa	25.03	-	-	-	-	-	4	6	17	15	2	4	48	96%
Trilogy	25.03	-	-	-	-	3	8	11	10	6	7	1	46	92%

Table 4

The dynamics of emergence for seed sown horizontal for cucumbers gherkins type grown in greenhouses in Tartasesti area, Dambovita county in 2010

V3

Hybrid	Date of sowing	Observation days											Total seeds east	Percentage east
		5.04	6.04	7.04	8.04	9.04	10.04	11.04	12.04	13.04	14.04	15.04		
Karaoke	25.03	-	-	6	7	14	16	3	-	-	-	-	46	92%
Kybria	25.03	-	-	3	1	9	17	12	2	2	-	-	46	92%
Componist	25.03	-	-	-	5	9	13	15	2	4	-	-	48	96%
Promisa	25.03	-	-	-	-	-	2	8	16	11	7	3	47	94%
Trilogy	25.03	-	-	-	-	4	3	13	14	12	1	1	48	96%

Pickling cucumber hybrids. Photos from the moment emergence and growth

The influence of protecting artichoke upon the productive potentiality and the economic effectiveness

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Keywords: *Cynara scolymus* L, protection, production, lucrativeness

ABSTRACT

Since artichoke, a Mediterranean species is sensitive to negative temperature and therefore prone to freeze in the wintertime of our country, protection through different methods is necessary before the cold season comes. The results presented in the paper prove the benefical effects of protecting the plants with different materials upon the productive potentiality and the economic effectiveness in the case of the "Unirea" artichoke. A three weeks' advance is gained in comparison with the witness as well as a growth in the number of inflorescences formed on the plant. In comparison with the unprotected witness, the inflorescence mass was by 10.1-15.6 % bigger in the case of the samples protected with earth and straw and the production reached 11.88 tons per hectare and respectively 12.47 tons per hectare, with considerable differences. The protection of the plants during the winter influenced the profitabilioty of the artichoke culture favourably through the growing of the income achieved by the production sale as well as by the reducing of the expenses, which meant 1000 lei production. In the case of "Unirea" variety, the protection with straw can reach to a 2.3 bigger profit rate in comparison with the unprotected artichoke culture.

INTRODUCTION

The young artichoke inflorescences will be used freshed or canned. Before the flowering, the receptacle and the fleshy basis of the bracts are used in a wide series of food (salad, different types of sauce, cooked rice or pickled.) After Roger Phillips, Martyn Rix, 1995 and Horgoş, A., 1999, the very young petiole of the flowers and leaves is also edible.

The great nourishing value is given by the biochemical content of these edible parts. (1.7-3.6% raw proteins, 0.5-0.8% fats, 6-8% unnitrogenous extracted substances, natrium and magnesium salts, organic acids, polyphenols, cynarine (Hristos M., Olimpios, 1994; Chaux Cl., şi Foury Cl., 1995, Ruxandra Ciofu, 2003). Thanks to this content, artichoke, as part of food, assures normality in the metabolic processes of the human body and is really valuable from the physiologic point of view.

In the European countries the areas and the productions of artichoke evolved continouously at the level of 2005. The best cultivators are Italy with over 50 thousand hectares and 470 thousand tons, followed by Spain, France and Greece (Faostat Citation © FAO 2006). Comparingly, in Romania this plant is best known as medical, with a cultivated area of 200 hectars, and a 2000 tons production (FAO, 2005). At present, artichoke is little cultivated as a vegetable plant in our country. This happens only in the Reasearch Agricultural Stations and in the didactic collections of the Agronomic Universities, while only sporadically and on very small surfaces by the ammateur cultivators in the south counties like Ilfov, Ialomiţa, Teleorman, Giurgiu, Olt, Dolj (Constantin Pârvu, 2000). There are no private cultivators that should deal with it in an organised way.

Taking into account that artichoke has got to be sold in supermarkets as either fresh or tinned vegetable, which makes it well-known and appreciated by people; we have an explanation for the necessity of studies in what respects the technological measures that have to be taken for extending the artichoke cultures in Romania.

The study of the influence that the protection methods have on the resistance of the plants in winter as well as on the growth, development and productive potentiality of the plants has been necessary because of the well-known sensitiveness of artichoke in case of negative temperature in consequence of the mediteranean origin of this species.

In our country, where there is danger of freezing in winter, Elena Florescu, Ruxandra Ciofu, Gabriela Doru (1980) recommend that, before cold weather comes, the stalks and two thirds of the length of the leaves should be cut and the plants should be protecting by covering with sand or by covering with earth using mechanized technology at a 20 centimetres from the basis height. During snowless frosty winters the plants can be entirely covered with straw, manure or other light materials (leaves, sawdust, shavings), which creates a stratum that isolates them from air, still permits it to penetrate the roots and thus diminishes the losses of plants.

The main objectives of the research was:

- settling some technologic methods to afford adaptability to the climate in our country and the achievement of high quality big productions made under the circumstances of a good economic effectiveness.

The paper presents some partial results regarding the influence that the protection of plants in winter has upon the productions and the economic effectiveness in the case of artichoke.

MATERIALS AND METHODS

The experiments were made in 2007-2008 in the didactic and experimental field from USAMV Bucharest.

The bilogic experimental material was represented by the Romanian species ''Unirea'' and the materials used for protecting the plants were straw, cardboard and earth.

During the experiments a lot of observations, measurements and calculations were achieved by specific methods such as:

- The climatologic characterization of the experimenting period was made through the daily registration of the air temperature, the calculation of the monthly averages from between December 2007 and March 2008 and their comparison to the multiannual values (climatological normal) specific of Romania.
- The determination of the resistence of the plants under the Romanian winter temperature was made through protection with different materials at the end of the vegetation. The next springtime, the number of plants that resisted over the winter was compared with that of the unprotected plants. For each variant, the interval for the restarting vegetation of the plants in spring was registered.
- Morphometric determinations: for each variant there were observations and determinations for every 5-20 plants, in four repetitions, regarding the percentage of the plants that resisted over the winter. This was calculated through the relating of the viable plants to the total number of the analysed plants;
- The productive potentiality was determined by registering the number of the flowerings produced on the plant, of their average mass and the calculation of the average production per plants and per hectare, for each variant studied. The results were interpreted statistically through the analysis of the variation and the test ''Sudent''.
- The analysis of the economic efectiveness of the artichoke culture when protected was made through the determination of the main economic indicators: production expenses, income, gross profit, profit rate etc., using the specific calculating formulas. The costs and prices were taken into account at the level of 2008.

The technology used for the experiments respected the indications of the specialized literature for the examined species.

In autumn, at the end of vegetation, the plants from the culture achieved in 2007, were protected accordingly to the experimental variants as follows:

- the straw was set in a uniform stratum that was 10-12 centimeters thick, along the line and around the plants;

- the cardboard recovered from the packages was tied around each plant;
- from mound, a 20-25 centimeters high earth hill was made at the bottom of the plants.

For each variant, the protecting materials used in the winter were put away during the next spring (the end of March), when it grew warmer.

RESULTS AND DISCUSSIONSS

Results of the influence that the protecting method has on the artichoke flowers production:

As shown in table 1, figure 1, the variants protected with straw and cardboard evidentiate through both the earliness of the flowering (2 and 1.6 in the third decade of May), and the largest number of inflorescences produced on the plant within two months. Comparingly, in the case of V1 witness, unprotected, the first inflorescences appeared in around three weeks.

Analysing the daily rhythm of flowering within two months, one can appreciate that it was the most rapid in the case of the control, whose first inflorescence appeared only in the second decade of June and was formed in a concentrated way in shorter time (44 days, whereas in the case of the other variants in took 64 days.) The variants protected with straw and earth had an equal daily rhythm of flowering, while the variant protected with cardboard had an inferior rhythm.

The protecting of the plants over the winter also had an impact on the mass of inflorescences. During the whole harvesting period it was between 60.5-71.7 g, with the highest values in V3 and V4, for which 10.1 – 15.6 % increases were acheived in comparison with the control (table 2).

The results achieved by the variant protected with cardboard are inferior to the control in consequence of the unwanted effect of this protecting material which raised a lot the humidity at the level of the portion from the root to the first leaves of the plants, making the growth stop and even leading to the rottening of this portion. In all the variants studied we can see that the average mass of the inflorescences is bigger on the first harvesting sessions and smaller with every step of the vegetation process.

These influences are to be found in the dynamics and value of the production of inflorescences achieved per plant and per hectar in the case of different variants of plant protecting (table 3 and fig.2)

We can see that in the case of the protected variants the production has a ballanced distribution, with a 25 - 28% share in May and a 34 - 40% share in June and July. Comparatively, in the case of the unprotected witness we can notice the distribution of the production lacks uniformity. Thus, this variant achieved only 27.7 % from the production, its major share (72.3%) being achieved at the end of the harvesting, in July.

The synthesis of the production results as presented in table 4 shows that protecting plants with straw and by covering their bottoms with earth has a significant impact on the production of inflorescences, while the differences appeared in the case of the unprotected witness are insignificant in what regards the variant protected with cardboard.

Results of the influence that some plant protecting methods have on the economic effectiveness of the artichoke culture:

The main elements of expense taken into account in what regards the experiment made in USAMAV in 2008 are shown in table 5.

According to the data presented, the differences between variants owe to the costs required by the manual work that was done to protect the plants through different methods and collect the used materials. These differences are shown in the volume of the total expenses, which grow by 2.2 – 3.7 % in the case of the protected variants if compared with the unprotected witness. The biggest differences appeared in the case of V4, where the covering of the plant bottom with earth demanded the biggest additional work volume (30 man days per hectare).

In table 6 there are the results regarding the value of the main indicators of economic effectiveness in what respects the artichoke culture when protected in winter. As shown, the protecting methods have influenced the production of inflorescences per hectare, because of differences regarding the number of plants that can be harvested and the average number of marketable inflorescences per plant. The best results were obtained for the variant that has been protected with straw, which has been evaluated to have achieved 21750 flowerings per hectare 81% more than the unprotected witness. The variant protected with earth comes the second, while the cardboard protection reduced the production of flowerings by 8.3%. These differences between variants are to be seen in the value of the gross profit and the profit rate (fig.3).

The data obtained prove the effectiveness of protection over the winter in what regards the artichoke culture. Except for the variant protected with cardboard, in the case of all the variants the expenses are reduced to 1000 lei production.

The best results were achieved in the case of the protection with straw, which can lead to an increase by 2.3 of the profit rate in comparison with the one obtained for an unprotected culture of artichoke.

CONCLUSIONS

- The results obtained have proved the protection of plants over the winter has had a favourable impact upon the production of artichoke inflorescences.
- The variants protected with straw and cardboard achieved a three weeks' advance in comparison with the unprotected witness and the largest number of inflorescences per plant.
- The protection of the plants over the winter has influenced the mass of the inflorescences, which reached a 71.7 g weight per sample in the case of protection with straw, and 63.8 grams per sample in the case of protection with earth, which means a 10.1-15.6% increase in comparison with the control. Comparatively, the cardboard protected variant's results were inferior to the control by 2.4%.
- In comparison with the 8.15 tons per hectare production in the case of the unprotected control, the straw and earth protected variants achieved 12.47 tons per hectare and, respectively, 11.88 tons per hectare, the differences being very significant.
- The ways of protecting the plants influenced the economic effectiveness of the artichoke culture.
- The total expenses have grown bigger by 2.2 – 3.7 % in the case of the protected variants, in comparison with the unprotected control, as a consequence of the rising costs with the manual works that were done with the aim of setting and collecting the used materials. The work of mound of the plants with earth involved the highest costs.
- The protection of the plants over the winter had a favourable impact on the artichoke culture through the increase of the number of marketable inflorescences and as a consequence of the income achieved through the of the production sale and also by reducing the expenses to 1000 lei production.
- In what regards the ''Unirea'' variety, the straw protection can lead to an increase of the profit rate by 2.3 times in comparison to the one achieved in the case of unprotected artichoke culture.

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TABLES AND FIGURES

Table 1

The influence of protection on the dynamics of the artichoke inflorescences (Number per plant – "Unirea" variety, - USAMV 2008)

Var.	22.05	28.05	07.06	11.06	18.07	25.07	Difference (no. in 64 days)	The Daily Forming Rhythm (no)
V1- unprotected control	0	0	0	3	3,6	4.8	4.80	0.075
V2- protected with cardboard	1.33	1.33	3.25	3.4	3.6	4.4	3.07	0.047
V3- protected with straw	2	2.6	3.8	4.2	5.6	5.8	3.80	0.059
V4- protected with earth	1.6	3	4	4.4	4.8	5.4	3.80	0.059

Table 2

The influence of protection on the artichoke inflorescence mass (g/inflorescence – "Unirea" variety, USAMV 2008)

Variant	22.05	28.05	07.06	11.06	18.07	25.07	Average Mass	
							g	%
V1-unprotected control	0	0	0	75.382	62. 133	48.505	62.007	100
V2- protected with cardboard	98.518	73.165	61.000	50.125	42.070	38.154	60.505	97.58
V3- protected with straw	119.830	73.500	66.530	64.250	55.225	50.628	71.660	115.57
V4- protected with earth	117.055	72.442	68.019	60.562	51.025	40.560	68.277	110.11

Table 3

The influence of protection on the dynamics of the artichoke inflorescence (g/plant - "Unirea" variety, USAMV 2008)

Variant	UM	22.05	28.05	07.06	11.06	18.07	25.07	Total
V1 –unprotected control	g	0	0	0	226.1	259.7	328.8	814.6
	%	0	0	0	27.7	31.9	40.4	100
V2- protected with cardboard	g	131.0	97.3	198.2	170.4	151.4	167.9	916.2
	%	14.3	10.6	21.6	18.6	16.6	18.3	100
V3- protected with straw	g	239.7	191.1	252.8	269.8	309.3	293.6	1556.3
	%	15,4	12,3	16,2	17,3	19,9	18,9	100
V4- protected with earth	g	187.3	217.3	272.1	266.5	244.9	235.2	1423.3
	%	13.2	15.3	19.1	18.7	17.2	16.5	100

Table 4

A synthesis of the artichoke production results
(kg/ha - "Unirea" variety, USAMV 2008)

Variant	Average production t/ha	Relative production %	Difference t/ha	Signification
V1- witness, unprotected	8.146	100	-	
V2- protected with cardboard	9.163	112.48	1.017	N
V3- protected with straw	12.474	153.13	4.328	***
V4-protected with earth	11.883	145.87	3.737	***

Dl 5%=1,265 t/ha; Dl 1%=2,522 t/ha; Dl 0.1%= 3,075 t/ha

Table 5

The influence of protection on the artichoke culture expenses
("Unirea" variety, USAMV 2008)

Variant	Elemente de cheltuieli (lei/ha)*							
	mechanical works	manual works	irrigation	seedlings	pesticide	fertilizers	Total expenses	
							lei/ha	%
V1- unprotected control	2800	10620	7500	2872	450	200	24442	100
V2- protected with cardboard	2800	11280	7500	2872	450	200	25102	102.7
V3- protected with straw	2800	11160	7500	2872	450	200	24982	102.2
V4- protected with earth	2800	11520	7500	2872	450	200	25342	103.7

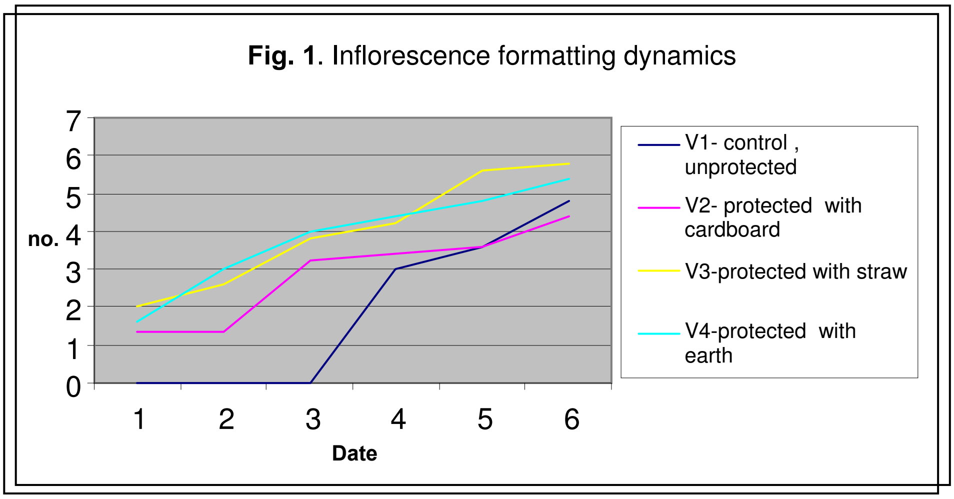
* The value of the expenses elements from this table is the result of the multiplication between the specific volume of works and the cost per the volume unit, as follows:
- the mechanic works specific of the preparation of field (ploughing, cutting and partially overthrowing the soil, moulding) : 28 days/ha x 100 lei = 2800 lei per hectare;
- manual work (producing the seedlings, planting, protecting the plants) : 354 ZO/ha x 30 lei = 10620 lei per hectare – for the witness variant. For the protected variants there are also costs for setting and collecting the material (around 18-30 ZO/ha x 30 lei = 150-400 lei per hectare);
- irrigations: 2500 mc/ha × 3 lei = 7500 lei per hectare;
- seedlings (10000 plants +10% reserve = 11000 plants per hectare). The cost of the seeds are included (570 lei), nutrient mixture (1222 lei), recipients for repicat, (980 lei), = 2872 lei per hectare;
- pesticides: 15 l/ha × 30 lei = 450 lei per hectare;
- fertilizers: 8 l/ha Folimax × 25 lei = 200 lei per hectare;
- the protecting materials were recovered as waste materials (straw, cardboard), thus they did not include any costs.

Table 6

How the protection of plants influences the economic indicators
of the artichoke culture ("Unirea" variety, USAMV 2008)

Variant	Total expenses lei/ha	Production achieved infloresc/ha	Production value lei/ha*	Expenses of 1000 lei production	Gross profit lei/ha	Profit rate %
V1- unprotected control	24442	12000	60000	203.7	35558	145
V2- protected with cardboard	25102	11000	55000	228.2	29898	119
V3- protected with straw	24982	21750	108750	114.8	83768	335
V4- protected with earth	25342	16200	81000	156.4	55658	220

* Unit sale price (production price) at the hypermarket was 5 lei/inflorescence



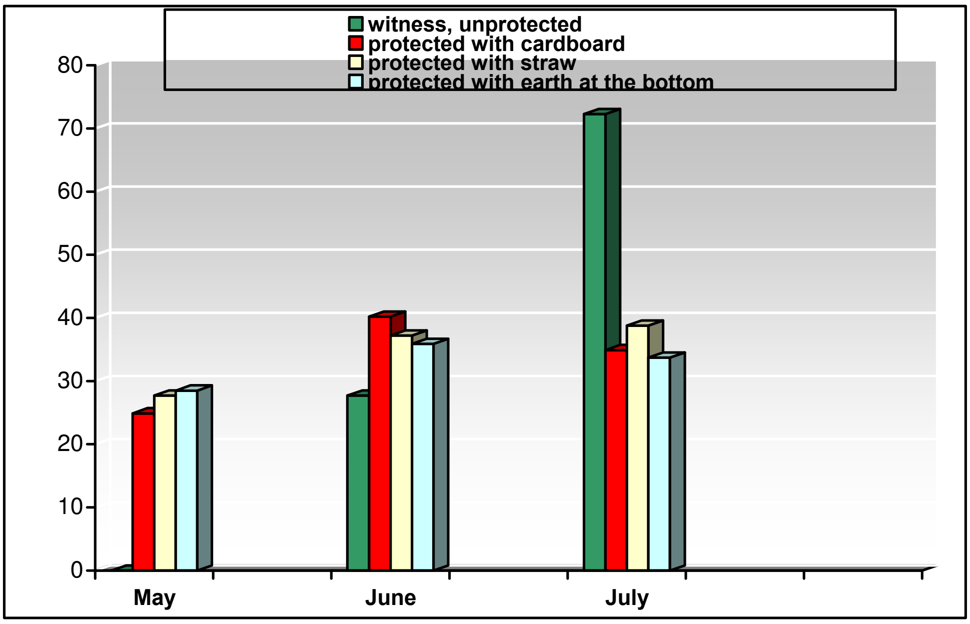


Fig. 2. The influence of plants protection on the dynamics of artichoke production (% from the total)

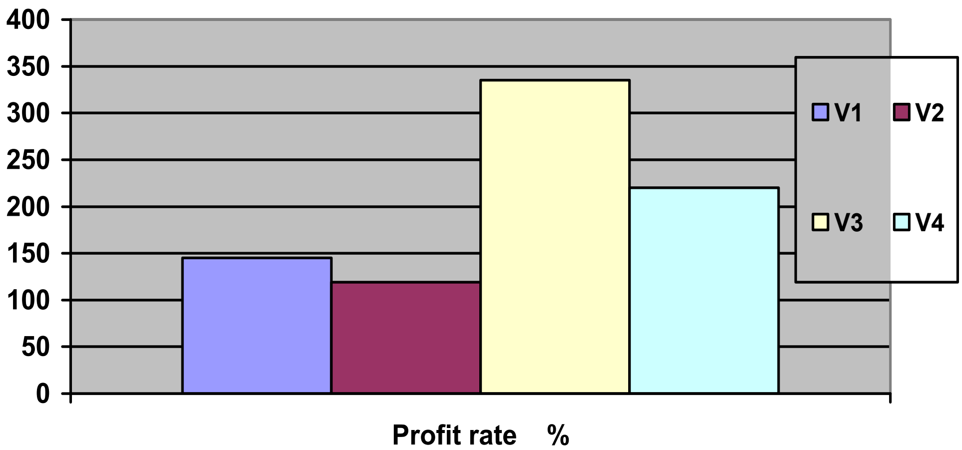


Fig. 3. The influence of plant protection on the some economic indicators of the artichoke culture ("Unirea" variety USAMV 2008)

The influence of the fertilization upon the growth of the plants and the production obtained on salted soil, in potato summer culture

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Keywords: *potato,foliar and organic fertilization, growth, production*

ABSTRACT

The results presented in the work show the influence that both the systems of fertilization (organic and foliar) and the doses of fertilizers applied have upon the growth of the potato plants and upon the production of tubers, in the case of the potato cultivated on salted soil in south Romania. Using a mixt fertilization with half fermented chicken manure in doses of 20t per ha and Folimax in doses of 8 l per ha, the size of the plants exceeded with 62% the height of the unfertilized witness. In what concerns the influence of the fertilization upon the production it was observed that the genetic potential of the Santé variety was best pointed out when using 20 t/ha of halffermented chicken manure, a dose which determined an increase of 122% as compared to the control. All doses of Folimax produced a synergic effect with that of the halffermented chicken manure, the greatest increase of 138% as compared to the unfertilized control being achieved at a dose of 8 l/ha. Combining the two systems of fertilization during the vegetation period, the growth of potato production was generally in direct proportion to the applied doses, the greatest increase in comparison to the unfertilized control being observed in the case of fertilization with 20t chicken manure per hectare and 8 l/ha Folimax, being obtained 41,4 t potato tubers per hectare.

INTRODUCTION

Many authors underliny the importance of the fertilization upon the growth of the plants and upon the productive potential of the potato culture. Besides the basic fertilization, the one applied during the vegetation period represents an extremely important technological element, which ensures the plants with a constant supply of nourishing elements during all the phases of development, in order to obtain high productions.

During the vegetation period, the mineral fertilization may alternate with the organic one, which is to be applied as dilution. Thus, Mănescu şi Nistor (1966) recommend the following dilutions in water of the organic fertilizers: 1/10 cattle dejection or 1/15 chicken manure.

The manure obtained from drying the chicken dejections is an organic, natural fertilizer with rapid action, rich in azote, phsophorus and potassium. The medium values of nourishing elements in the case of chicken manure, in dry form, is 3-5% N, 2-3% P_2O_5 (0,8-1,3% P) şi 1,1-2,5% K_2O (0,9-2% K (Davidescu, D., Velicica Davidescu, 1992). The authors recommend the using of this fertilizer as a phasic fertilizer, in water dilution or in dilution with stable manure water or urine, in a quantity of 1 to 4-6 or 20 parts water.

The phasic fetilization with foliar fertilizers, extraradicular applied, has extremely important effects among which, Ciofu, Chilom and others (2003), mentiones the economy of fertilizers as a consequence of small concentrations and quantities as well as a variate nutrition with nourishing elements, according to the necessities of the vegetables during the vegetation periods.

The foliar fertilizer with microelements *Folimax* produced by I.C.L.F. Vidra, is one of the products which ensures the potato with the most part of the necessary noorishing elements, being easy to apply and ecological. In our previous experiments on potato summer culture, (Neculae, 2010), it was proved the benefic effect of the phasic administration of this fertilizer which determined the growth of the number of the tubers per hole and of their medium mass. At the same time, there could be observed significant increases of the production.

The paper presents the results of some researches whose purpose was to emphasize the effect that the fertilization with halffermented chicken manure and foliar fertilizer *Folimax*, applied during the vegetation period, both individual and combined, has upon the growth of the plants and upon the production in the case of the potato summer culture on salted soil.

MATERIALS AND METHODS

The experiment took place in Poiana, a village situated at 12 km from Slobozia, on a soil with a rich content of salts and which had not been fertilized with chemical or organic fertilizers in the previous years.

The biologic material was represented by tubers from the Santé variety, the biologic category Basic class E, with a diameter of 42 – 45 mm. This variety is a semitardif one (with a vegetation period of 120 days) and the tubers are oval elongated with yellow peel and pulp. The following elements had been used for the phasic fertilization of the plants:

- Half fermented stable manure – taken from the SC Avicola Slobozia, Farm Nr. 2 Amara. It was applied once, on ridge, in dilution obtained from 1 part manure and 4 parts water.
- The foliar fertilizer *Folimax* - with microelements, with the following composition: total azote = 44 g/l (N), phosphorus = 105 g/l (P_2O_5), potassium = 80 g/l (K_2O), magnesium = 5 g/l (MgO), boron = 52 g/l (B), molybdenum = 18 ppm (Mo), iron = 155 ppm (Fe), manganese = 100 ppm (Mn) and 6 essential aminoacids and biostimulators. This fertilizer had been applied in spraying, in two phases, as it follows.

The bifactorial experiment had been organized using the method of parcels in linear blocks, in 4 repetitions and it had 16 variants resulting from the combination of 2 experimental factors:

- Factor A – halffermented chicken manure in 4 graduations:
  a_1 - 0 t/ha; a_2 - 10 t/ha; a_3 - 15 t/ha; a_4 - 20 t/ha
- Factor B – foliar fertilizer with microelements *Folimax*, in 4 graduations:
  b_1 - 0 l/ha; b_2 - 4 l/ha; b_3 - 6 l/ha; b_4 - 8 l/ha

The agrotechny that was applied followed the technological phases recommended in the technical literature. The planting took place on the 14th of April 2007, following a schema of 70/30 cm, at a density of 47.619 plants per hectare. The following works had been realized: 10 wettings through beds, with wetting normes of aproximatively 250 – 350 m^3, 3 preventive chemical treatments, at an interval of 10 days with specific pesticides, 3 hand hoeings, followed up by new ridgings.

The morphometric observations consisted in measumerements of the potato size for each variant, on repetitions, at 4 holes for each repetition, in two periods of time: after 7 days from the first and respectively from the second fertilization with Folimax.

The obtained production had been noticed through weighings, on repetitions and variants. The coefficients of determination had been calculated and it had been established the level of significance for the correlations existing between the doses of fertilizers applied and the increase of the potato production.

RESULTS AND DISCUSSIONSS

The results concerning the influence of the fertilization system upon the the growth of the potato are presented in table 1. Analysing the data one can draw the conclusion that the fertilization system had influenced the height of the plants. Two months after the planting (11.06.07) the bushes were about 41,69 cm at the unfertilized control and they reached the highest dimenssions (58,31 cm) at V16 which had been fertilized with organic and foliar fertilizer in maximum doses.

In the following 10 days the differencies between the variants remained in the same frame.

Taking into account only the influence of the chicken manure upon the growth of plants (V5, V9, V13) one can notice that in comparision to the control (V1), the increase of the applied doses determined an increase in the growth of plants with 44-180%.

In comparision, the fertilization based only on *Folimax* (V2, V3, V4) led to differencies in growth of 74-109%.

The combined influence of the two types of fertilization was proportional to the increase of the chicken manure doses, the greatest growth of the stems plants (128-180% as compared to the unfertilized control), being observed in the case of the variants fertilized with foliar fertilizer, having as basis an organic fertilization with 20t chicken manure per hectare.

At the time the data had been registered (11.06.2007 şi 22.06.2007) there could be established a direct and very significant correlation between the system of fertilization and the height of the potato bushes. This significance is proved by the high value of the relation coefficients, $r^2 = 0,8833$ and respectively 0,829 (fig.1).

The growth of the plants is proportional to the fertilization, so that it could be observed an intense growing of the plants when increasing the concentration of chicken manure and of *Folimax*.

The results presented in table nr.2 emphasize the fact that both the system of fertilization and the quantities of fertilizers strongly influence the potato production.

Generally, the organic fertilization had a stronger effect than the foliar one. Thus, as compared to the unfertilized control (V1), the chicken manure applied in doses of 10 t/ha (V5), 15 t/ha (V9), 20 t/ha (V13), had determined a growth in production with 10,79 t/ha (62%), 16,62 t/ha (95,5%) and respectively 21,26 t/ha (122,2%). In comparision, applying only the foliar fertilizer *Folimax*, in doses of 4, 6, 8 l/ha (V2, V3, V4), determined increases in production of 4,2 – 60,2%.

When combining the two types of fertilizers, the growth in production was generally direct proprotional to the increase of the applied doses. The greatest growth in production as compared to the unfertilized control had been noticed at variants 13-16 (122 -138 %), number one being the variant fertilized with 20 t chicken manure per hectare and 8 l *Folimax*. Figure 2 desplays a direct linear correlation between the quantity of the fertilizers doses and the production obtained, the overwhelming majority of the productions obtained being situated in the interest area. The value of the correlation coefficient $r^2 = 0,9913$, indicate a very significant correlation between the doses of fertilizer applied and the growth of the potato production obtained on salted soil in the case of fertilization with halffermented chicken manure and foliar fertilizer *Folimax*.

In the case of organic fertilization, the use of the foliar fertilizer has more visible effects. Thus, in comparison with the unfertilized control (V1) the production increased with maximum 60% when applying 8 l/ha *Folimax*, and the variants fertilized with 20 t halffermented chicken manure per ha and 4,6,8 l/ha *Folimax*, V14, V15, V16, showed an increased production situated between 131 and 138%.

Analysing the effects of the fertilization with *Folimax* against the background of fertilization with chicken manure in different doses (fig. 3), the following emphasis can be drawn:

In the case of fertilization with *Folimax* against the background of fertilization with 10 t halffermented chicken manure per hectare one can notice increases in production of 7,6, 9,2 şi 22,3 % at V6, V7 şi V8.

In the case of fertilization with *Folimax* against the background of fertilization with 15 t halffermented chicken manure per ha, one can notice increases of 4,7; 10,4 şi 8,3 % at variants V10, V11 şi V12 due to the use of the foliar fertilizer *Folimax*.

There can be observed a decrease of the influence of the foliar fertilizer *Folimax* in the case of applying 20 t of halffermented chicken manure per hectare, in this case the increase due to the use of Folimax being only 3,9; 5,45 şi 7,13 % at variants V14, V15 şi V16.

The greatest increase (22,3%), resulting from the use of the foliar fertilizer *Folimax,* against the background of fertilization with chicken manure as compared to V5 which was fertilized only with 10 t halffermented chicken manure per ha, is noticed at the V8, variant fertilized with *Folimax* in a quantity of 8l/ha and with 10 t halffermented chicken manure per ha.

CONCLUSIONS

- The system of fertilization influence the growth of the potato plants cultivated on salted soil. The best results had been obtained when applying a mixt fertilization with 20 t halffermented chicken manure per ha and a quantity of 8 l foliar fertilizer *Folimax* per ha, in this case the size of the plants exceeding with 62% the unfertilized control.
- There is a very significant direct correlation between the system of fertilization and the height of the potato bushes (r^2 = 0,8833).
- A dose of 4 l *Folimax* per hectare, in experimental conditions, hadn't pointed out very well the potential of the soil and of the plants, the production being close to that of the unfertilized control.
- A dose of 8 l *Folimax* per ha, when not applying also chicken manure, had determined increases in production of 60 % as compared to the control.
- When applying 10 t/ha halffermented chicken manure, the potato production increased with 62 % as compared to the control, and in the case of mixt fertilization there could be noticed a synergic effect with the *Folimax* when using it in doses of 4, 6, 8 l/ha (increases in production between 74 - 98 %).
- At a dose of 15 t/ha halffermented chicken manure, the increases in production, as compared to the control, were 95 – 116 %, the best effect being noticed when the fertilization had been combined with a quantity of 6 l/ha *Folimax*.
- The potato plants from the Santé variety, cultivated on salted soil had there genetical potential best pointed out when there had been applied 20 t halffermented chicken manure per ha (an increase of 122 % as compared to the control), situation in which there was best emphasized the synergic effect with the foliar fertilizer *Folimax* (the greatest increases of 138 % in comparison to control, at a dose of 8 l/ha).
- There had been noticed a very significant correlation (r^2 = 0,9913) between the doses of fertilizers applied and the increase of the potato production cultivated on salted soil, in the case of fertilization with halffermented chicken manure and with foliar fertilizer *Folimax*.

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TABLES AND FIGURES

Table 1

The influence of the system of fertilization upon the height of the potato plants

Var.	Significance		The height of the bush - cm					
	Chicken manure	Folimax	11.06.07		22.06.07		Difference	
	kg/ha	l/ha	cm	%	cm	%	cm	%
V1	0	0	41.69	100	49.38	100	7.69	100
V2	0	4	41.75	100	55.88	113	14.13	184
V3	0	6	43.81	105	59.88	121	16.07	209
V4	0	8	45.00	108	58.38	118	13.38	174
V5	10	0	43.06	103	58.69	119	15.63	203
V6	10	4	45.75	110	60.31	122	14.56	189
V7	10	6	47.88	115	61.13	124	13.25	172
V8	10	8	45.75	110	57.88	117	12.13	158
V9	15	0	46.81	112	57.88	117	11.07	144
V10	15	4	46.88	112	60.81	123	13.93	181
V11	15	6	49.88	120	63.81	129	13.93	181
V12	15	8	56.50	135	70.38	142	13.88	180
V13	20	0	55.75	134	73.31	148	17.56	228
V14	20	4	55.31	133	73.38	149	18.07	235
V15	20	6	55.00	132	74.69	151	19.69	256
V16	20	8	58.31	140	79.88	162	21.57	280

Table 2

The influence of the system of fertilization upon the potato production

Variant	Significance		Productions obtained		
	Chicken manure t/ha	Folimax l/ha	t/ha	Difference	
				t/ha	%
V1	0	0	17.40	-	100
V2	0	4	18.13	0,73	104.2
V3	0	6	21.84	4,44	125.5
V4	0	8	27.88	10,48	160,2
V5	10	0	28.19	10,79	162,0
V6	10	4	30.35	12,95	174.4
V7	10	6	30.80	13.40	177.0
V8	10	8	34.49	17,09	198.2
V9	15	0	34.02	16,62	195,5
V10	15	4	35.63	18,23	204.7
V11	15	6	37.59	20,19	216.0
V12	15	8	36.87	19,47	211.8
V13	20	0	38.66	21,26	222,2
V14	20	4	40.19	22,79	231.0
V15	20	6	40.77	23,37	234.3
V16	20	8	41.42	24,02	238.0

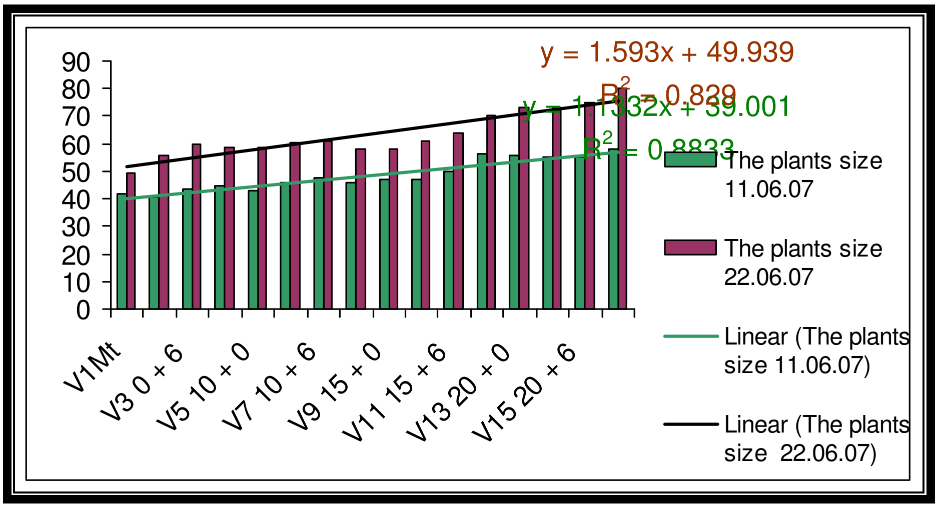

Fig. 1 - The influence of the fertilization upon the size of the potato plants

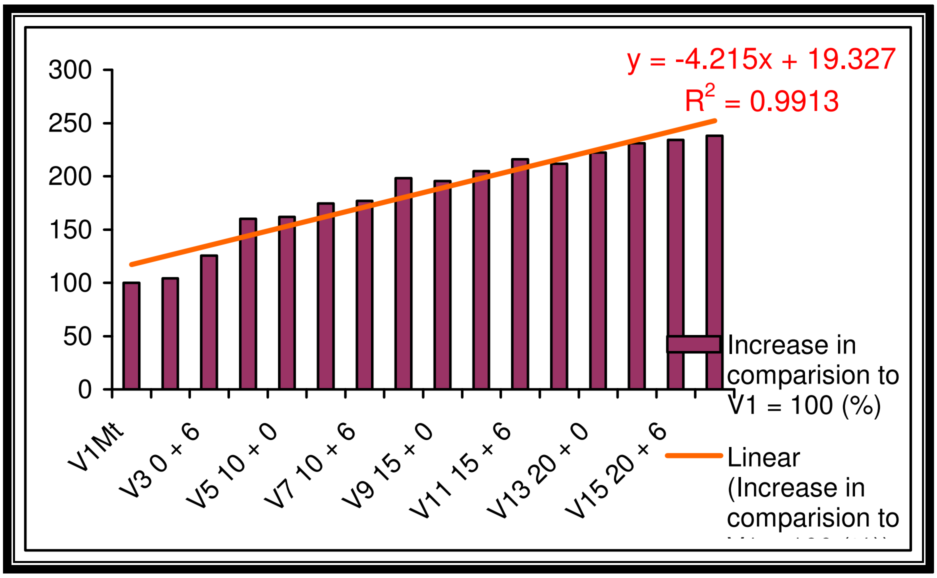

Fig. 2. Correlations between the doses of organic and foliar fertilizer and the potato productions obtained

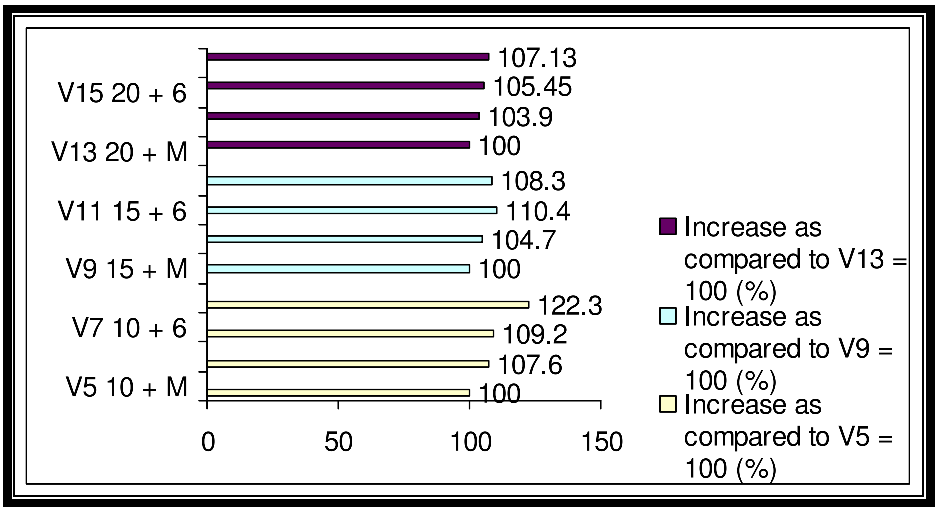

Fig. 3. The increase in production obtained through fertilization with the foliar fertilizer *Folimax*, having a basis of halffermented chicken manure

Study about the influence of the fertilization upon the nutrition of the potato cultivated on salted soil

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Keywords: *potato, phasic fetilization, salted soil, plants nutriton*

ABSTRACT

In the conditions of a salted soil, the fertilization with chicken manure and that with foliar fertilizers during the vegetation period, allow the improvement of ensuring the plants with the nourishing elements and the obtaining of high productions. The work presents the influence that the fertilization with various doses of halffermented chicken manure and foliar fertilizer *Folimax* has upon the the nutrition of the potato plants and the production on salted soil, in the conditions of a low supplying with phosphorus and azote, but a good one of potassium. At harvesting, the level of potassium from the soil was decreased at all the variants (from the initial level of 140 ppm to 42 ppm), as a result of the fact that the plants extracted it from the soil. The smallest quantity of potasssium in leaves (5080 ppm) had been determined at the variant fertilized with big quantities of chicken manure (20 t/ha) and Folimax (8 l/ha), there being emphasized a more intense metabolisation of this element. In this variant, there had been obtained the biggest productions, with increases of 122 - 138 % as compared to the unfertilized control. The concentrations of the potassium from the soil and from the plants at harvesting have a decreasing tendency, as well as an increase of the production caused by the increasement of the doses of the applied fertilizers.

INTRODUCTION

The accumulation of salts (especially sodium salts) represents one of the main physiological threats for the ecosystems, becuase it affects the metabolism of the organisms from the soil, causing an extremely low fertility of the soil. The surplus of salts produces skiddings in the development of the plants, by limitting the assimilation of nourishing substances and by diminishing the quality of the water available for the plant (Sandu, Vlas, Mladin, 1986).

Among the causes which can cause the desalination of soils, Davidescu and Davidescu (1992), mentions the irrigation hard water, as well as the water coming from the low depth groud-water table, which constitute fertilization sources for the surface soil with mineral salts (such as: bicarbonates, carbonates, chlorides, magenesium and sodium sulphates), as well as the excessive doses of fertilizers.

Throughout the world, the salinity affects about 1 thousand milion hectares, the majority being situated in the semiarid and arid regions of the Earth (Statistic data FAO, 2006), and in our country the saltness processes (salinisation and sodium excess) occupies in present aproximatively 300.000 hectares, being spread especially in the East of the Romanian Plain and in the West Plain (I.C.P.A. - A.S.A.S., 1980). In Ialomita County the salted soils, the solonchacks and the solonetz occupy a surface of 800 hectare.

The soil conditions can be strongly restrictive in what concerns the poatato culture, because the plant reacts considerably to all the soil characteristics and qualities, amog which the agrochemical ones (the supplying with nourishing elements, the accesibility of the nourishing elements, the content of organic substance, the pollution degree) have a particular influence. (Ciofu, Stan, Berar, Popescu şi colab. 2003). As referring to the nutrition of the potato, as well as in the case of other plants, each nourishing element plays a well defined role, and its lack or its presence in excess in soil can cause severe physiological disturbances in plants, the diminishing of the production and of the tubers. (Burzo and colab. 2005, Ianoşi and colab. (2002). In what concerns the level of the salts from the soil Sandu, Vlas, Mladin, (1986), Benavides, Marconi and others (2001), recommend a value smaller than 2 deciSimens/m.

In the conditions of a salted soil, many authors mention that the fertilization with chicken manure during the vegetation period represents one of the technological measures which can contribute to obtaining profitable and economical productions. At the same time, the extraradicular fertilization of the plants with foliar fertilizers ensures the plants with most of the necessary nourishing elements. (Davidescu and Davidescu, 1992, Benavides, Marconi, 2001, Rusu and colab., 2005).

MATERIALS AND METHODS

The experiment took place in 2007 at a familiy farm in Pioana, Ialomita county, on a salted soil, the solonetz molic type, moderate gleic and slightly salted at the surface. The analysis of the soil, which was realized in October 2005, emphasized the following caractheristics: a slight alkaline reaction (pH – 7,6); a good supplying with organic substance (MO - 5%); a concentration of the soluble salts above the optimum level for the potato culture (CS – 5,5 DS/m, faţă de 2 DS/m recommended in the technical works).

The year 2007 was a droughty, so that during the vegetation period in the potato culture (April-August) there been registered a cumul of precipitations of only 140 mm, a value placed under the multiannual values which are characteristic for this region. There had been 40 days with a temperature over 35º C, with a direct negative effect upon the processes of accumulation of amidon in the potatoes tubers.

The biological material was represented by tubers from the semitardif Santé variety, the biological cathegory Base E, diameter 42 – 45 mm.

During the vegetation period, the following fertilizers had been used:

- the halffermented stable manure – only one application, on the ridge, as dilution obtained from 1 part chicken manure and 4 parts water.
- the foliar fertilizer *Folimax* - with microelements, produced at I.C.L.F. Vidra, which has the following composition: 44 g/l total N ; 105 g/l P_2O_5 ; 80 g/l K_2O ; 5 g/l MgO ; 52 g/l B ; 18 ppm Mo ; 155 ppm Fe ; 100 ppm Mn, and 6 essential aminoacids and biostimulators. This fertilizer is recommended for the foliar fertilization of the potato and it had been applied, spraying it on plants, in two phases: at blossoming and at the beginning of tubers forming.

There had been developed a bifactorial experiment, after the method of parcels in linear blocks, with 4 repetitions, which had 16 variants resulting from the combination of the two experimental factors:

- Factor A – halffermented chicken manure, in 4 phases:

  a_1 - 0 t/ha; a_2 - 10 t/ha; a_3 - 15 t/ha; a_4 - 20 t/ha
- Factor B – the foliar fertilizer with microelements *Folimax*, in 4 phases:

  b_1 - 0 l/ha; b_2 - 4 l/ha; b_3 - 6 l/ha; b_4 - 8 l/ha

In the experimental field, the previous culture was silo corn, unfertilized, unerbicided, unirrigated.

The preparation of the land started in the previous autumn, by works of mechanical ploughing at 28 cm depth, and in spring there had been done two harrows, after which there had been created drains manually, on which seed tubers had been planted.

The work was realized on the 14.04.2007, after the 70/30 cm scheme, being achieved a density of 47.619 plants per hectare. After the planting, there had been done the first ridging at the height of 15 cm.

During the vegetation period the following maintenace works had been realized: wettings through beds, with wetting norms of aproximatively 250 – 350 m^3 water per hectare, using the water from the village alimentation source of slope water; 3 preventive chemical treatements, at the interval of 10 days with specific pesticides (Calypso 100 ml/ha, Curzate - Manox 2 kg/ha, Mospilan 0,06 kg/ha şi Dithane 2,5 kg/ha); 3 hand hoeings, followed up by 3 ridgins again.

In order to study the influence of the fertilization upon the characteristics of the culture soil, upon the plant nutrition and upon the quality of the tubers, in the conditions of a salted soil, there had been done biochemical, pedological determinations, and soil analyses,

The determinations concerning the temporary fertility of the soil aimed at emphasyzing the level of the azote, phosphorus and potassium EA 1:2,5 (g/g) concentration from the soil. At each experimental variant, in three distinct moments, depending on the applied fertilization, there had been used methods which can determine the phosphorus and the potassium that can be extracted in the soluble form of the amonium acetate-lactate (P-AL), and the azote had been determined through the calorimetrical method.

The biochemical observations and determinations aimed at establishing the level of the azote, phosphorus and potassium, which had been determined through foliar diagnosis, using the leaves of the potato plants, on each experimental variant, in three distinct moments, depending on the applied fertilization. The methods of analysis had been specific for the studied parameters: the content of the phosphorus and of the azote from the leaves had been determined through the calorimetrical method and the potassium from the leaves had been determined using the flanphotometric method. There had been realized a foliar diagnosis of the content in what concerns the microelements (N, P, K) whch remined unmetabolised in leaves.

RESULTS AND DISCUSSIONSS

The analysis of the soil at the beginning of the experiment (20.03.07), indicates a very good supplying of the soil with potassium, a very low supplying with phosphorus and a medium supplying with azote (table 1).

As one can see in table 2, the determinations made on the 06.08.07 at all the variants had emphasized that the soil had a low content of extractible azote and phosphorus caused by the fact that the soil had a low content of these elements from the very beginning.

Regarding the postassium, an element which plays an important role in the synthesis of the carbohydrates (starch) and which is consummed in big quantities by the potato, we notice that in comparision with the initial content (140 ppm K) at the control unfertilized variants, the content decreased at a value of 42 ppm K, due to the consumption of the plants. The plant extracted from the soil the potassium and this element could be observed in leaves (table 3) in the biggest quantity (7480 ppm K).

In the case of the variants fertilized with chicken manure 10 t/ha (V5, V6, V7, V8) at which there had been also applied the three levels of *Folimax* we can notice the following:
The chicken manure which is a fertilizer with rapid action, due to the potassium supply it brings, ensured a part of the plants necessity for this element (V5), the decrese of this element at the soil level, as compared to the beginning analysis, being of 142 ppm K at 101 ppm K, the content of potassium in leaves reaching a value of 7240 ppm, which is superior to that obtained in the case of variants V6, V7, V8, which han been fertilized with 4, 6, 8 l/ha Folimax. On the other hand, the level of potassium in soils at variant 6 fetilized with 4 l/ha *Folimax* reached a value of 216 ppm K;

In the case of the fertilization with 15 t/ha chicken manure one can notice a slight decrease of the potassium level from the soil as compared to the initial analysis of the soil (140 ppm K) and also a higher level of the potassium in leaves at variants 10 and 11 which had been fertilized with 4 şi 6 l/ha *Folimax*, and the values of the potassium in leaves were of 7000 ppm K (V10 - 4 l/ha Folimax) and 7120 ppm K (V11- 6 l/ha Folimax);

At variants fertilized with 20 t/ha chicken manure the level o the potassium in soil decreased as compared to the initial analysis (140 ppm) in case of V13, V14, V15, which proves that the plants had taken the necessary of potassium from the soil stores and it also proves that the effect of the *Folimax* in the thee doses applied was less felt, because the content of potassium in leaves was of 5080 ppm K at V16; 5760 ppm K at V15; 5960 ppm K at V14 and 6880 ppm K in the case of the V13 fertilized only with a quantity of 20 t/ha chicken manure. The production obtained was of 41,42 t/ha at V16, 40,77 t/ha at V15 respectively 40,19 t/ha at V14 (table 4).

The application only of *Folimax* during the vegetation period ensured the neccesary potassium so that at variants (2, 3, 4) the content of potassium from the soil hadn't decreased, thus it registered an increase of 41 %, 21% respectiv 31 % as compared to the analysis of the soil realized at the beginning (142 ppm K).

At V2, there had been noticed an accumulation of 6680 ppm potassium in plant, a value which is nevertheless inferior to that of the control variant. It can be observed that the foliar fertilizer applied in a dose of 4 L/ha supported the potato consumption of potassium, and the obtained production of 18,13 t/ha (V2) shows that the plant had taken benefit of the fertilizers at its genetical potential.

At V4 (8 l/ha Folimax), the production had dubbled as compared to the control variant (V1). The content of 5880 ppm K in plant shows that its metabolism had been more intense, without a decrease in the soil stores.

The results regarding the analysis of the relations between the production of tubers on each fertilization variant and the concentrations of azote, phosphorus and potassium from the soil and from the plant at harvesting are presented in table 4.

The increases of the production at variants 5, 6, 7, 8, which had been fertilized with 10 t/ha chicken manure and Folimax, in raising doses, had been of 62; 74; 77 and 98 % as compared to the unfertilized control variant (V1).

Having a background of 10 t/ha chicken manure, the variant fertilized with 8 l/ha Folimax had registered an increase of 22% in comparison with the control V5 (which hadn't been fertilized with foliar fertilizer).

The effects upon the production of the foliar fertilizers applied on a background of 15 t/ha chicken manure had brought increases of 95 – 116 % as compared to the unfertilized control V1. Variant 11 registered an increase of 116 % in comparison with V1 and of 10% as compared to variant 9, which had been fertilized only with 15 t/ha chicken manure.

When the dose of 20 t/ha chicken manure had been applied together with the the raising doses of *Folimax* (variants 14; 15 and 16) there been registered the biggest production values, with increases of 130; 134 and respectively 138 % in comparison with the control V1. The contents of potassium from the soil decreased at V13; V14; V15 more than half of the initial content of potassium (140 ppm K), excepting variant 16 at which the soil content was 125 ppm K, and in the leaves of the plants the potassium registered a value of 5080 ppm, which shows that this element had been metabolised more intense leading to the biggest increase in production as compared to the control.

The highest value of unmetabolised potassium in the plant is to be seen at the unfertilized V1 (7480 ppm), with a production of 17,40 t/ha. In comparison, the lowest value (5080 ppm) had been determined at V16, at which there had been applied the biggest doses of fertilizers (20 t/ha haffermented chicken manure and 8 l/ha Folimax), thus being proved an intense consumption of potassium which had been taken benefit of in the big production obtained, of 41,42 t/ha.

As one can see in figure 1, the trend of the productions is increasing in the same time with the increase of the concentrations of the fertilizers used. There is a reverse linear relation between the level of the production and the unmetabolised content of the potassium in the plant.

The consumptions of potassium from the soil and from the plant at harvesting are not in direct proportional relation with the obtained production, but one can notice nevertheess in both situations, a decreasing trend of the potassium content, in the same time with the increase of the production caused by the increasement of the fertilizers doses.

At harvesting, the biggest values of the potassium concentation in plant had been registered at the control unfertilized variant, at which the smallest production had based on the consumption of potassium from the soil, which could be seen in leaves as fraction, in unmetabolised form. In the same time, a low level of the potassium in the soil and in the plant had been registered at V13 – V16, due to the fact that it had been used in obtaining big productions.

CONCLUSIONS

At the beginning of the vegetation period, the experimental soil had as a characteristic a very good supplying with potassium, a very low supplying with phosphorus and a medium supplying with azote.

Depending on the fertilization system and on the applied doses, the potassium content decreased in soil (from 140 ppm initial value, to 42 ppm), as a result of the fact the plants had extracted this element, a nourishing element which plays an important role in the synthesis of the carbohydrates (amidon), and which is consumed by the potato in great quantities.

The potassium extracted from the soil was to be seen in leaves, the biggest quantity (7480 ppm) being registered at the unfertilized control variant (5080 ppm) and the smallest at the variants fertilized with big doses of chicken manure and *Folimax,* being emphasized a more intense metabolisation of this nourishing element.

In the conditions of the fertilization during the vegetation period with halffermented chicken manure and Folimax, the trend of the potato productions is increasing in the same time with the increase of the concentrations of the fertilizers used.

The biggest values of the productions, with increases of 122 - 138 % as compared to the unfertilized control variant, had been obtained when there had been applied a dose of 20 t/ha chicken manure together with *Folimax* (2-8 l/ha).

The concentrations of the potassium in the soil and in the plant at harvesting are not in direct relation with the obtained production, but they have a decreasing trend in the same time with an increase of the production determined by the increasement of the fertilizers doses.

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TABLES AND FIGURE

Table 1

The initial content of the experimental soil (20.03.07)

Determination	Content	Interpretation
$N\text{-}NO_3$	11 ppm	medium
P_{H2O}	5 ppm	very low
K_{H2O}	140 ppm	very high

Table 2

The influence of the fertilization during the vegetation period upon the consumption of N,P,K at soil level - 2007

Variant (t/ha manure + l/ha Folimax)	Soil content (ppm)					
Element	N-NO3		P-PO4		K	
Date	09.07	06.08	09.07	06.08	09.07	06.08
V1 - 0+0 - Control	145	8	traces	traces	97	42
V2 - 0 + 4	79	72	2	traces	76	198
V3 - 0 + 6	98	81	traces	traces	103	170
V4 - 0 + 8	77	60	1	traces	108	184
V5 -10 + 0	64	24	4	traces	120	101
V6 -10 + 4	82	176	2	traces	223	216
V7 -10 + 6	73	41	1	traces	135	138
V8 -10+ 8	76	57	traces	traces	133	120
V9 -15 + 0	87	21	traces	5	199	102
V10 - 15 + 4	103	43	traces	2	191	108
V11 - 15 + 6	71	22	1	3	58	102
V12 - 15+ 8	33	43	traces	traces	117	86
V13 - 20 + 0	56	26	traces	3	112	59
V14 -20 + 4	54	15	1	traces	97	61
V15 - 20 + 6	120	23	traces	8	143	55
V16 - 20 + 8	105	63	traces	5	138	125

Table 3

The influence of the fertilization upon the consumption of N,P,K at foliar level - 2007

Variant (t/ha manure + l/ha Folimax)	Leave content (ppm)								
Element	N-NO3			P-PO4			K		
Date	22.06	05.07	18.07	22.06	05.07	18.07	22.06	05.07	18.07
V1 - 0+0 - Martor	90	25	60	159.2	82	136	7400	7200	7480
V2 - 0 + 4	83	66	80	160.8	112.8	98.4	6900	7740	6680
V3 - 0 + 6	111	102	94	192	107.2	141.2	7000	7440	6240
V4 - 0 + 8	128	162	82	206.4	81.6	110.8	6800	6660	5880
V5 -10 + 0	59	87	54	201.6	86.4	110.8	7040	7140	7240
V6 -10 + 4	40	85	84	167.6	74.4	182.8	6980	7620	6880
V7 -10 + 6	38	55	64	202	138.4	114.8	6400	7320	6040
V8 -10+ 8	41	69	65	186	67.2	140.8	7440	7620	6160
V9 -15 + 0	47	64	99	175.2	75.2	118.4	6980	7200	5680
V10 - 15 + 4	59	136	67	194.4	124	136.4	7080	7020	7000
V11 - 15 + 6	66	117	111	207.2	111.6	242.8	6900	7020	7120
V12 - 15+ 8	54	60	145	191.2	177.6	136.4	6960	6540	5680
V13 - 20 + 0	42	77	79	184	157.2	114	7360	7140	6880
V14 -20 + 4	47	33	66	193.6	149.6	76.8	7000	6540	5960
V15 - 20 + 6	40	55	47	189.6	50.4	79.2	6900	7140	5760
V16 - 20 + 8	90	147	95	193.2	33.2	92	6000	7020	5080

Table 4

The relation between the content of N, P, K from the soil, and the plants, the productions and the increases registered at harvest period

VARIANTA (t/ha gunoi + l/ha Folimax)	Soil content (ppm)			Leave content (ppm)			Production t/ha	Increase from (%)	
	N-NO3	P-PO4	K	N-NO3	P-PO4	K		V1 = 100	V5, V9, V13 = 100
V1 - 0+0 - Martor	8	urme	42	60	136	7480	17.40	100	-
V2 - 0 + 4	72	urme	198	80	98.4	6680	18.13	104.2	-
V3 - 0 + 6	81	urme	170	94	141.2	6240	21.84	125.5	-
V4 - 0 + 8	60	urme	184	82	110.8	5880	27.88	160,2	-
V5 -10 + 0	24	urme	101	54	110.8	7240	28.19	162	100
V6 -10 + 4	176	urme	216	84	182.8	6880	30.35	174.4	107.6
V7 -10 + 6	41	urme	138	64	114.8	6040	30.80	177	109.2
V8 -10+ 8	57	urme	120	65	140.8	6160	34.49	198.2	122.3
V9 -15 + 0	21	5	102	99	118.4	5680	34.02	195.5	100
V10 - 15 + 4	43	2	108	67	136.4	7000	35.63	204.7	104.7
V11 - 15 + 6	22	3	102	111	242.8	7120	37.59	216	110.4
V12 - 15+ 8	43	urme	86	145	136.4	5680	36.87	211.8	108.3
V13 - 20 + 0	26	3	59	79	114	6880	38.66	222.18	100
V14 -20 + 4	15	urme	61	66	76.8	5960	40.19	230.97	103.9
V15 - 20 + 6	23	8	55	47	79.2	5760	40.77	234.31	105.45
V16 - 20 + 8	63	5	125	95	92	5080	41.42	238.04	107.13

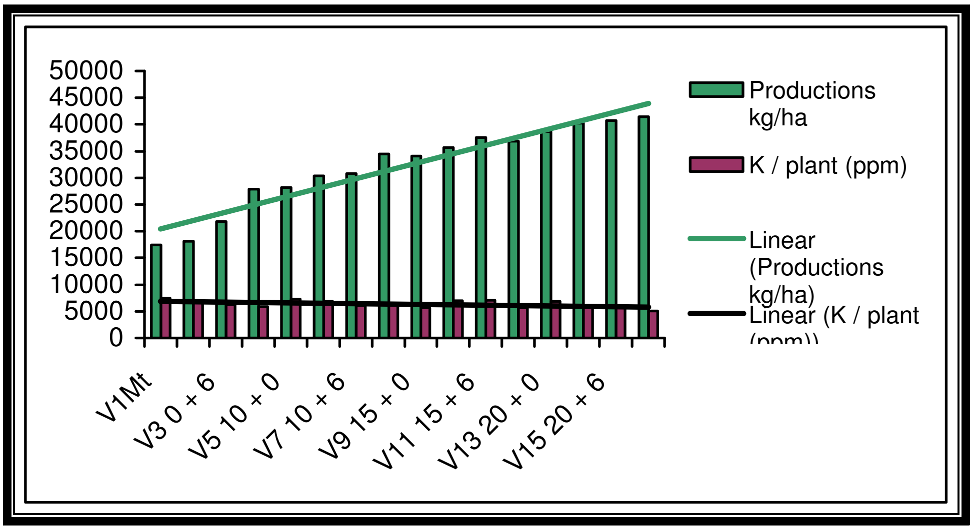

Fig. 1. Relation between the fertilzers doses, the potato production and the unmetabolised potassium content in plant

Influence of seeding period on production of dill

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Keywords: *Anethum graveolens,* seeding period, dill leaves, biometric traits

ABSTRACT

In order to achieve objectives during the years 2009-2010 field experiments were conducted monofactorial type. The experiences have been located in the experimental teaching of field, Department of vegetable production, State Agrarian University of Moldova. The biological material used in experience is represented by variety of dill: Gribovskii-early variety, created in Russia, approved and included in the register of plant varieties, intended for use in fresh and for technical purposes. The effect of age on production of sowing throughout the cycle of experimental dill, indicates that the highest average production was recorded in the first decade of June 1,290 kg/m^2, and the lower production of 1,224 kg/m^2 in the first fall in April.

INTRODUCTION

Full meet of the consumption of vegetables among current and prospective demands lead to the permanent concern for finding new solutions to increase production and distribution enhancement production, enlarging the assortment and increase business efficiency.

In ancient times it was known, dill and widely cultivated by the Egyptians, Greeks and Romans (Patron 1992; Pantielev 1979; Komorova 1984, Gonceriuc 2008).

Dill is a food of plant origin as an important source of nutritional factors, carbohydrates, minagel salts and vitamins. This culture in fresh or processed product is an indispensable because of the nutritional value and taste.

In addition to the economic importance and their nutritional properties, dill has a significant thagepeutic value, which must in particular draw strength in the warm season.

According to the Academician Kiselev E.P. quoted by Merzlyakov L.I. in China and Japan greens consumption per capita is 25-33 kg, so it's not by chance that entered the top five countries by time life. As condimentar-temperate plants and aromatic dill is cultivated from ancient times, currently cultivated almost everywhere, with the exception of the far North (Starodub, 2008).

The age of sowing vegetable plants is determined by the particularities of the species with other grapes and climatic conditions of the area of crop varieties or hybrids grown, time of delivery of production, depending on consumption.

The sowing is a particularly important step in the technological chain of culture dill and represents the period when the sowing is done. Executed in optimal conditions, the sowing ensures a uniform pre-emergence herbicide, the normal development of the vegetative period.

Optimal sowing period in our country is dictated by the heat and the compliance factor they ensure normal completion of the phases of plant vegetative, climatic stages of stress avoidance, maturation and harvesting in a timely manner.

Processes of plant growth and development are influenced not only by the strength and composition of light, but also the duration of the exposure to light during the day.

The duration of illumination being different in the world depending on latitude, plants have adapted to these conditions. For this reason each plant needs certain durations in certain phases of their lives, called “stages” of light and of a certain ratio between the duration of illumination and the darkness he called “fotoperiodism”. As the report claims to the length of the day, dill fits into the Group of long day plants, vegetables, 14-16 hours.

Knowing the requirements of the plant towards the light we can that through certain means of management practices to increase the usability of it. Among these means are primarily location plants including varieties and hybrids based on variation of luminous energy flow throughout the year.

The Republic of Moldova has the highest part of the territory of the natural conditions for practicing agriculture performing lavish, able to cope with competition on the European market success.

The need and importance for human health consumption of vegetables makes this vegetable sector does not need much defense.

MATERIAL AND METHODS

In order to achieve objectives during the years 2009-2010 field experiments were conducted monofactorial type.

The experiences have been located in the experimental teaching of field-vegetable production Department of the State Agrarian University of Moldova.

The geographical location of the place where took place the experiences, corresponding to the coordinates: 47^0 20^1 North latitude and 28^0 50^1 East longitudes, temperate-continental climate specific.

Ground experimental batch is loamy carbonate chernozem, pH 7,35-7,90, humus content in the upper layers of soil reaches 2.91- 3.91% and gradually shrinks in the lower layers. It is necessary to note that the soil has a low content of organic substances.

The biological material used in experience is represented by variety of dill: Gribovskii-early variety, created in Russia, approved and included in the register of plant varieties, intended for use in fresh and for technical purposes.

During the period of vegetation have made observations of phenological and biometric measurements in accordance with the experimental technique on plant height, number of the leaves of the plant from the weight of the plant, etc.

Experiences were held under conditions of rigorous experimental technique is located randomized in three repetitions each.

Experimental plot area was $3m^2$, applying specific cultivation technologies of dill culture.

The experiences have been carried out according to the methods of Belik V.F.(Belik, 1992) and Moiseychenko V.F. (Moiseychenko, 1994).

RESULTS AND DISCUSSIONS

Parallel with the development of agriculture, vegetable gradually organize scientific production, with a view to supplying the population with rhythmic vegetables throughout the year, and to the creation of availability for the processing industry and export.

Vegetable plants through the specifics of biology and technology in different systems and methods of cultivation, ensures the supply of products throughout the year. Systems and methods of cultivation are included in the unit groups of species or species on this path with the staggering production and processing industry throughout the year.

Dill is a species with moderate requirements versus temperature.

Maintaining the average of temperature within the limits of $10\text{-}12^0$ C slows the growth and development of plants to the detriment of the production of leaves, and in the case when remains highest temperature of $16\text{-}18^0$C it fosters the growth and development of plant production favoring increase.

The optimum temperature, vegetation varies in relation to the species cultivated. According to research conducted by Kozlov G. in 1991, the optimal temperature for intensive development of leaf dill is $15\text{-}17^0$ C.

Dill is a plant with lower requirements than light, but there are insufficient light leads to getting plants elongated and less flavorful Tsiunel (1999).

After Maier (1969) and Bălaşa (1973), depending on the sensitivity to light intensity, dill falls in the Group vegetables least demanding plants to light and require a lighting of 4000-6000 luxes.

The long day, coupled with high temperatures the plants form faster stems of flowering to the detriment of the leaf. (Patron, 1992; Girenko, 2007; Ponomarev, 1989).

In a dim light plantation, dill poorly branch or not weak at all branches (Starodub, 2008).

Capitalizing on the best luminous energy can be done by choosing the plants growing under conditions of environmental data, improvements in nutrition, by choosing the sowing, row orientation, density etc.

The plants of long day if artificial day length shortens, are increasing but not develops, as it happens and short day plants if the measurement length of the period of enlightenment. If the snake grows from lighting to long day plants or shortened to short day plants, plants thrive faster and shorten the duration of vegetation.

Dambrauskene et. al. (2007) argues that different varieties of dill are different after ageing, where productivity and biochemical content depending on the setting up of culture.

To get the production of fresh dill for a long period it is necessary to set up this culture in different epochs of sowing.

The success of sowing culture mentioned depends on a whole range of technological measures, of which it has an essential role during sowing.

In table 1 are given summary results on the dill plant has pre-emergence herbicide depending on the period of sowing. Comparing the data in the table it is observed that the smallest period has pre-emergence herbicide from the variety Gribovschii was recorded in the first decade of June, it was due time with abundant rainfall. The longest of the sown until the plant has pre-emergence herbicide registered in the first decade of July.

Analyzing the data from table 2 experience it appears that the total length of the plant at 15 days of the pre-emergence herbicide varies within the limits of 15.22 cm in the first decade of April and 16,92 cm in the first decade of June. The length of the minimum and maximum air performance is kept in the same era of sowing, respectiv11.1 cm – 12.49 cm. The number of leaves in the rosette formats range from 3.3 in the first decade of June and 3.7 in the first decade of May. The length of the root is from 4 cm in the first decade of May until 4.53 cm in the first decade of July.

At 30 days of the pre-emergence herbicide biometric indices to report retains its period of 15 days from sowing, with the exception of the number of leaves that is higher in the first decade of June and the length of the root which is from 9.20 cm the first decade of July until the first decade in cm cell in April.

According to data presented in table 3, the total mass of the plant at 15 days of the pre-emergence herbicide is 0.58 g in the first decade of June and 0.75 g in the first decade of April.

In this period the plants of the rosette formation dill develops slowly and builds up a quantity of air mass average of 0.48 g in the first decade of June and 0,60 g in the first decade of April. Root mass ranged from 0.11 g in the first decade of June up to 0.15 g in the first decade of April.

The results of the total mass of the aerial part of table 4 is from 2.36 g in the first decade of April up to 2.45 g in the first decade of June. The total mass of the air varies from 2.04 g in the first decade of April up to 2.15 g in the first decade of June. Biometric indices to ribbed ranges from 0.34 g in the first decade of June up to 0.96 g on first decade of April. Information relating to the mass of the blade are between 0.82 g in the first decade of

July and 1.08 g in the first decade of April. The plants sown during may, June, July, flower stalk emerges which ranges from 0.21 g in the first decade of May till 0.92 g in the first decade of June. Root mass range from 0.29 g in the first decade of May up to 0, 36 g the first decade of July.

Analyzing the results from table 4, on production of dill observe a difference depending on the era of sowing.

A high harvest was obtained in the first decade of June-1.290 kg/m^2, the lowest harvest was obtained in the first decade of April was 1.224 kg/m^2. In rest periods were obtained production of 1.236 kg/m^2 in the first decade of the months of July and 1.272 kg/m^2 in the first decade of May.

CONCLUSIONS

A key role in increasing production of dill posed the sowing. The seeding influence gives production raw material, both as dill in quantity and quality. The optimum seeding to ensure a qualitative production of green mass is the first decade of April. The effect of age on production of sowing throughout the cycle of experimental dill indicates that the highest average production was recorded in the first decade of June 1.290 kg/m^2, and the lower production of 1.224 kg/m^2 in the first fall in April.

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TABLES

Table 1

The period of establishment of the culture of dill

Cultivar	Period of sowing	Sowing date		Days until pre-emergence herbicide
		2009	2010	
Gribovschii	I dec. april	04.04	02.04	11
	I dec. may	07.05	10.05	11
	I dec. iune	05.06	08.06	10
	I dec. iuly	10.07	06.07	12

Table 2

Biometric indices average dill plants depending on the period of sowing

Cultivar	Period of sowing	The total length of the plant, cm	The length of the aerial part	The length of the root	Number of leaves per plant
15 days at the pre-emergence herbicide					
Gribovschii	I dec.april	15,22	11,10	4,12	3,5
	I dec. may	15,32	11,32	4,00	3,7
	I dec. iune	16,92	12,49	4,43	3,3
	I dec. iuly	16,17	11,64	4,53	3,4
30 days at the pre-emergence herbicide					
Gribovschii	I dec.april	30,78	20,77	10,01	6,7
	I dec. may	32,77	23,01	9,76	6,5
	I dec. iune	34,35	24,43	9,92	7,3
	I dec. iuly	33,03	23,83	9,20	6,5

Table 3

The average mass of dill plants depending on the era of sowing, 15 days at the pre-emergence herbicide

Cultivar	Period of sowing	The average mass of the plant, g	The average mass of the aerial part			The average mass of roots, g
			Total	Petioles	Leaves	
Gribovschii	I dec. april	0,75	0,60	0,26	0,34	0,15
	I dec. may	0,66	0,54	0,23	0,29	0,13
	I dec. iune	0,58	0,48	0,22	0,26	0,11
	I dec. iuly	0,62	0,50	0,22	0,28	0,12

Table 4

The average mass of dill plants depending on the era of sowing, 30 days at the pre-emergence herbicide

Cultivar	Period of sowing	The average mass of the plant, g	The average mass of the aerial part				The average mass of roots, g
			Total	Petioles	Strain	Leaves	
Gribovschii	I dec. aprilie	2,36	2,04	0,96	-	1,08	0,32
	I dec. mai	2,41	2,12	0,85	0,21	1,06	0,29
	I dec. iunie	2,45	2,15	0,34	0,92	0,89	0,30
	I dec. iulie	2,42	2,06	0,37	0,87	0,82	0,36

Table 5

Production by dill depending on the period of sowing

Cultivar	Period of sowing	Production kg/m^2
Gribovschii	I dec.aprilie	1,224
	I dec. mai	1,272
	I dec. iunie	1,290
	I dec. iulie	1,236

The influence of cultivars parsley on production of green mass

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Keywords: *Petroselinum hortense*, variety, biometric traits, harvest indices

ABSTRACT

The experiences were carried out in 2009-2010 years, on experimental plots of the State Agrarian University of Moldova. The biological material was represented by four cultivars of parsley: V1 Comun, V2 Titan - cultivars with flat-leaf and V3 Triplex, V4 Caderava - cultivars with curly-leaf. The cultivars Comun and Triplex are approved and included in the register of plant varieties of RM. Experimental variants were situated randomized in three repetitions; experimental plot area was 3m^2. Production of parsley depending on the cultivars constituted: 2,750 kg/m^2 cultivar Comun; 1,705kg/m^2 cultivar Titan; 1,580kg/m^2 cultivar Triplex; 1,315kg/m^2 cultivar Caderava.

INTRODUCTION

Particular importance has parsley in feeding the population is a key factor for increasing production, expansion of assortment, improving technologies to improve the quality of culture and increase business efficiency.

Now in the world is a great diversity of varieties and hybrids of parsley, for special nutritional qualities of leaves and seeds, which are used in food processing and pharmaceuticals. In the Republic of Moldova are known and are included in the register of plant varieties the following varieties of leaf parsley: Comun - cultivar with flat-leaf and Triplex – cultivar with curly-leaf, which it is grown on relatively small areas.

Cultivating cultivars of parsley with the vegetative shorter period and more resistant to adverse environmental conditions can make successive cultures, achieve a better scheduling of harvest and the use of production. Some varieties more resistant to diseases and pests reduce the consumption of pesticides and getting organic products.

Thus, the use of valuable varieties with increased productivity and higher quality properties, is one of the most effective means for boosting production, staggering, diversification and qualitative improvement (Cunavin, 2008).
The main producers of parsley are the USA, Canada and European countries (Georgescu Magda) (http://gastronomie.ele.ro/).

The parsley has special importance in human diets due to content-rich vitamins, mineral salts and etheric oils, is consumed raw, in salads, ensuring full use of vitamins and the chlorophyll which has important properties antianemic. (Apahidean, 2003; Bajureanu et al. 1980; Girenco et. al. 2007; Meserecova, 1997; Cunavin et. al., 2008; Kolota et Winiarska, 2004).

Local market demand for parsley is not satisfied of the production plants and in recent years seen a massive import of fresh parsley production outside the country.

Lack of intensive technology for producing the parsley and varieties with high yield, resistant to adverse conditions, diseases and pests generates the need for testing and deployment in the production of new varieties of parsley to reduce imports.

Experts in agribusiness are think that expanding the areas of parsley, is a business that has prospects, because the internal market is ensured with a foreign production. (The Farmer, 2004)

In recent years researchers in the field was headed towards the efforts to create new varieties of vegetables, and introduction in culture of some of the most valuable varieties created worldwide, in so far as they are adapted to the soil and crop conditions in our country.

Experience and practice of many vegetable plants units have shown that new varieties, made important advancements usually harvest, 15%-30%.

Introduction to the culture of different cultivars and hybrids of leaf parsley for sourcing requires testing in condition pedo-climatic in our country. For each cultivar is necessary to establish a specific technology, technology witch to highlight genetic potential and at the same time, achieving the highest economic efficiency.

MATERIALS AND METHODS

The research was conducted during the years 2009-2010, as monofactorial experience.

Experimental variants it was situated randomized in three repetitions. Experimental plot area was $3m^2$, applying specific technology culture parsley (Moiseicenco et. al., 2007).

The experiences have been located in the experimental plots of Department of Vegetable, State Agrarian University of Moldova.

The geographical position of the place where conducted experiments corresponding to the coordinates: $47^0 20^1$ Nord latitude and $28^0 50^1$ East longitudes, temperate-continental climate specific.

Ground experimental batch is loamy carbonate chernozem, pH 7,35-7,90, humus content in the upper layers of soil reaches 2,91- 3,91%-and gradually shrinks in the lower layers. It is necessary to note that the soil has a low content of organic substances.

In the experience has been pursued the reaction of two cultivars of parsley with the usual form of the leaves V1cultivar Comun, V2 cultivar Titan and two cultivars of parsley with curly-leaf V3 Triplex, V4 Caderava. To all cultivars were studied the same issues.

V1 cultivar **Comun** is included in the register of plant varieties of RM. The variety is very productive, with large leaves used for a wide range of cuisine (Register of plant varieties of the RM, 2010).

V2 Titan F1 hybrid is average maturity – is not included in the register of plant varieties. Recommended for leaves, can be harvested and roots. Supports repeated harvesting.

V3 cultivar **Triplex** of Dutch origin, with the shape of the curly leaves. Approved and included in the register of plant varieties. Vigorous plant growth. High production capacity, recover quickly after harvesting (Register of plant varieties of the RM, 2010).

V4 cultivar **Caderava** is average maturity, of Czech origin, with the shape of the leaves very curly, is not included in the register of plant varieties of RM. The variety has a good growth of leaves after cutting (Girenco, 2007).

Biological material taken in research has been noticed and measured in different periods of research to determine the changes while under the influence factors research.

The experiences have been carried out according to the methods of Belik and Moiseychenko (Belik, 1992; Moiseychenko, 1994).

RESULTS AND DISCUSSIONS

Starting from the well-known fact that, under the same conditions by using the same technology, and to obtain various quantitative and qualitative production if different varieties are grown, we can say that the "biological", variety or hybrid, has a special role in the best use of all technological factors.

Introduction of varieties and hybrids in culture should answer several requirements: provide genetic resistance to as many pathogens; to submit a good adaptability to natural light conditions; to be precocious, offering an early as higher production.

During carrying out of researches have been carried out observations of phenological phases on each variant of the experience.

The beginning of the emerging plants shall be considered when 10-15% of young plants appear on the surface of the ground (Moiseicenco et al., 2007). The results of research have shown that plants of parsley depending on variety have sprung on average over 14-15 days.

The production quality of parsley affects not only the pedo-climatic, level agrotehnic but also the behaviour of cultivars representing genetic features such as: the vegetative period, shape and number of leaves formed rosettes, the height of plant, the origin of the cultivar or hybrid, knowing these features can achieve quantity and quality results.

In terms of growth and development of plants of parsley, are presented in table 1 biometric, 50 days after sowing, on the average length of plants, root, and the average number of leaves per plant. The major indicators characterizing plant growth and development of parsley are root length and the aerial part of the plant.

For the cultivation of green parsley is used as the aerial part of plant is an important index characterizing plant development and determines the optimal harvesting time.

A comparison of the four cultivars of parsley is a difference from all biometric indices. The average total length of plants varies from the cultivar Titan 23.97 cm up to the cultivar Comun 29.86 cm. This trend is observed and the length of the aerial part of plants, ranging from the cultivar Titan 14,66 cm up to the cultivar Comun 29.86 cm.

Root length ranges from the 31.05 cm cultivar Comun up to 38.80 cm cultivar Titan. The average number of leaves formed per plant ranges from 4.17 cultivar Triplex to 4.87 cultivar Comun.

Of data table 2, we note best results on average total plant mass they obtained cultivars Comun 1.88 g and Caderava 1.67 g, the opposite is 1.49 g cultivar Triplex and cultivar Titan 1.32 g. The average weight to the total aerial part varies from 1.11g cultivar Titan up to 1.65 g cultivar Comun. The average weight of the leaves without petioles is an important production character that showed average variations between 0.56 g cultivar Triplex and 0.78 g cultivar Comun. Comparing the average mass of roots with a little difference is observed between cultivars, maxim was recorded at cultivar Caderava 0.26 g and the minimum 0.21 g cultivar Titan.

Analyzing the results presented in table 3, we find that cultivars of parsley Triplex with curly-leaf and Comun with flat-leaf detaches as having the greatest total length of plant 38.40 cm and 38.25 cm respectively.

The length of the aerial part, an important character for both production and marketing, presented the appearance of variations of the average values calculated in the two years of study. The results obtained at the length of the aerial part, cultivar Comun outlined with the highest average 26 cm, it can be explained by the fact that this variety is characterised by the shape of the robust plant and long petioles, which has given rise to significant differences when compared to other varieties considered in the study.

Synthesis of data on growth of vegetative propagation of plants (total mass of the plant, the average mass of petioles, the blade of a leaf, root mass) of parsley is shown in table 4.

On the evolution of the total weight of the plant is found to have average to above average control variations posted to other variants considered in the study.

The highest value of the average of the total weight of the aerial part is registered as cultivars Titan and Comun with fleat leaf being 3.41 g and 5.50 g.

In terms of quantity in parsley leaf is important to share the weight of the leaves without petioles relative to the weight of petioles, from the data presented in table 4, shows that variations the weight of the leaves without petioles exceeds the values registered the mass of petioles.

The results obtained from the processing of data relating to the production of parsley are shown in figure 1.Comparing the results of the culture of parsley to the two varieties are found big differences.

On the basis of the results obtained in average years of study, shows that the highest yield at m^2 of cultivars with flat-leaf has been obtained to V1 cultivar Comun 2.75 kg and cultivars with curly-leaf 1.58 kg cultivar Triplex.

CONCLUSIONS

Cultivars of parsley studied differ by the number of leaves in the rosette and the characters: the length of the aerial part and root part, of the mass of aerial part and root. The most senior biometric indices at the time of harvest party at the length of the aerial part have been V1 cultivar Comun 26.45 cm and V3 cultivars Triplex 24.80 cm, being considered a controls. Root length varies from 11.80 cm cultivar Comun up to 13.60 cm cultivar Triplex. Number of leaves in the rosette ranges of 5.4 cultivar Caderava to 6.3 cultivar Comun. Observations on biometric parameters showed that the amount of parsley production varies according to cultivar. Harvest leaf parsley depending on the cultivar was: 2,750 kg/m^2 cultivar Comun; 1,705 kg/m^2 cultivar Titan; 1,580 kg/m^2 cultivar Triplex; 1,315 kg/m^2 cultivar Caderava. According to data obtained on the years of study, we propose to cultivation cultivar Comun, with flat-leaf and cultivars with curly-leaf cultivar Triplex.

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TABLES AND FIGURE

Table 1

Biometric indices of parsley depending on cultivar, 50 days after sowing

Cultivar	The total length of the plant, cm	The length of the aerial part		The length of the root		Number of leaves per plant
		cm	% of the total length of the plant	cm	% of the total length of the plant	
V1 Comun (C)	29,86	20,54	68,95	8,72	31,05	4,87
V2 Titan	23,97	14,66	61,20	9,31	38,80	4,63
V 3 Triplex (C)	25,04	15,43	61,70	9,62	38,30	4,17
V 4 Caderava	26,90	16,54	61,26	10,36	38,74	4,30

Table 2

The mass of plants of parsley depending on cultivar, 50 days after sowing

Cultivar	The average mass of the plant, g	The average mass of the aerial part					The average mass of roots, g
		Total	Petioles		Leaves		
			g	% of the total weight	g	% of the total weight	
V1 Comun (C)	1,88	1,65	0,87	52,87	0,78	47,13	0,23
V2 Titan	1,32	1,11	0,55	49,39	0,56	50,61	0,21
V 3 Triplex (C)	1,49	1,25	0,56	44,29	0,70	55,71	0,23
V 4 Caderava	1,67	1,41	0,66	47,26	0,75	52,74	0,26

Table 3

Biometric indices in environments of cultivars parsley, 70 days after sowing

Cultivar	The total length of plant, cm	The length of the aerial part		The length of the root		Number of leaves per plant
		cm	% of the total length of the plant	cm	% of the total length of the plant	
V1 Comun (C)	38,25	26,45	69,72	11,8	30,28	6,3
V2 Titan	36,45	24,05	66,08	12,4	33,92	5,9
V 3 Triplex (C)	38,4	24,8	64,91	13,6	35,09	5,8
V 4 Caderava	34,5	22,15	64,21	12,35	35,79	5,4

Table 4

The average mass of the plants of parsley depending on cultivars, 70 days after sowing

Cultivar	The total mass of the plant, g	The mass of the aerial part					Root mass, g
		Total	Petioles		Leaves		
			g	% of the total weight	g	% of the total weight	
V1 Comun (C)	6,7	5,5	2,65	48,48	2,84	51,52	1,2
V2 Titan	4,2	3,41	1,69	48,78	1,72	51,22	0,79
V3 Triplex (C)	4,22	3,16	1,42	46,33	1,74	53,67	1,06
V 4 Caderava	3,27	2,63	1,28	48,83	1,36	51,17	0,64

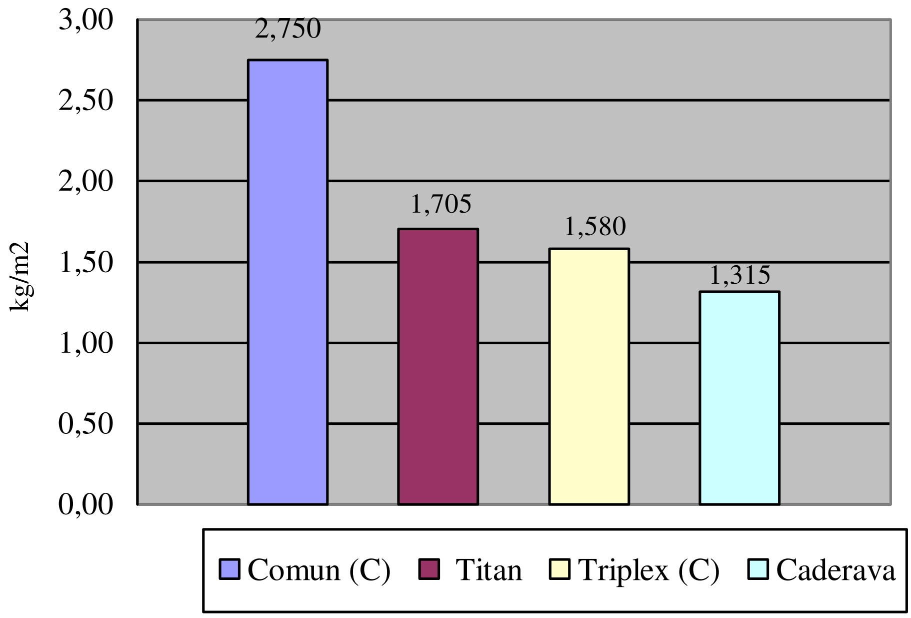

Fig. 1 The production of parsley depending on cultivars

Sweet corn ear properties growth in sandy soil

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Keywords: ear quality, nutrient supply, overdose NPK

ABSTRACT

In our experiment we have studied the effect of nutrient supply, as an important technological element, on earlier sweet corn. In the same time we searched the answer, if the double incresing of nutrient elements (NPK) dosis, more than recomanded by nutrient balance approach system, we can improve yield's quantity and quality of sweet corn. The treatment without fertilization – based on symptoms, because of nitrogen deficiency – produced weak results, but in case of sugar content it has the highest values. The plants of fertilized treatments did not produce any deficiency or overdose symptoms. Compared to control treatment, the application of higher fertilizer doses did not influence significantly seeds emergence or plant's development, so we consider adequate to apply, in similar growing circumstances the fertilizer dosis included into control treatment. Double increased NPK dosis did not increased significantly the yield of sweet corn. In this experimental year, 2008, we could not reached the planned yield quantity.

INTRODUCTION

The sweet corn is the vegetable grown on the largest acreage in Hungary. In 2003 the growing area was 38,000 hectares according to the Hungarian Interprofessional Organization for Fruit and Vegetables and Product Board. After 2003 however a sudden and sharp decline took place and this way in 2005 production was carried out only on 24,000 hectares, while in 2006 and since then is situated around 30,000 hectares, again.

The nutrient supply is perhaps the most important component of the cropping system in plant production. Berzsenyi and Györffy (1995), after the analysis and evaluation of a long term trial over 35 years, concluded the fertilization 31% and the genotype to be the most important yield increasing factors, followed by the optimal plant density, attentive plant care and tillage. Nagy (1995) ranked the cropping system components according to the impact on corn yields as follows: fertilization 48%, irrigation 28%, tillage 18% and plant density 6%. A continuous fertilization influences not only the nutrient processes of the current year but will modify the soil nutrient processes during the subsequent years which is to be considered in determining fertilizer rates (Lásztity and Csathó, 1994).

Among the three main nutrients, it is the nitrogen that is considered to have the biggest importance, as it has a decisive influence on yield, but in the event that a dose of over 60-120 kg/ha is applied, depending on soil type, a harmful accumulation of NO_3 may occur (Sárvári, 1995). Cultivation of high yielding quality crops including sweet corn is dependent on adequate and balanced nutrient fertilization (Prokeš, 2008). In this respect nitrogen is of crucial importance (Berenguer *et al.*, 2009; Gallais, 2008) particularly in raising yields and fodder production. The movement of P and K fertilizers differs from that of N fertilizers. According to Szirtes and Gál (1980) P and K fertilizers should be tilled into the soil to a depth of 15 to 25 cm. In point of sugar content, after Herrmann (2001) notification 100g fresh kernels contents about on average 2,16g (1,6-2,7) g sucrose.

MATERIALS AND METHODS

The experiment was set up in 2008 on an area equipped for irrigation at the Experimental Farm of the Faculty of Horticulture of the Corvinus University of Budapest. The soil sample collected from the site of the trial prior to the direct seeding had a pH of 8.03, an organic material content of 1.31%, a plasticity index according to Arany <30, an ammonium lactate soluble P_2O_5 content of 293 mg/kg, an ammonium-lactate soluble K_2O content of 205 mg/kg and $CaCO_3$ <1%.

The test variety was Spirit, a normal sweet corn variety with a very early growing period (85 days) and yellow kernels.

The method of propagation was direct seeding, at a depth of 3 cm on April 24th. The cornstand was formed to have a plant spacing of 75 by 22 cm (60,607 plants per hectare) in accordance with the recommendations of the owner of the variety. Each treatment had an area of 6x7 m (8 parallel rows and 30 seeds sown in each row). The edge was the outer 2 rows, respectively on both sides, of the 8 rows of the plot. 4 replications were applied.

The treatments were applied by way of fertilizers. No farmyard manure was applied. A combination of ammonium nitrate (34%), superphosphate (19.5%) and potash (60%) was used for the treatments and approximately half of the N rate and the total of the P and K rates were applied as starter fertilization on April 11th, while the remaining part of the N rate was applied in two parts as top dressing: at the 6 to 7 leaf stage (June 9th) and at tasselling (June 16th).

The treatment G3 was an exception where the 2N fertilization, besides the aforementioned dates, was applied on two further occasions (May 28th and June 2nd). The area received one herbicide application (April 30th) and one mechanical weed control treatment (June 12th). A crop protection took place on May 23th, using Decis (0.15 l/ha).

The following treatments (active ingredients) were applied during the experiment besides the untreated control (no fertilizer application):

G1 = untreated control N_0, P_0, K_0.
G2 = $N_{222.5}$, $P_{22.5}$, K_{143}
G3 = N_{445}, P_{22}.5, K_{143}
G4 = $N_{222.5}$, P_{45}, K_{143}
G5 = N_{445}, $P_{22.5}$, $K_{143.}$

The NPK requirement according to the soil test was determined in the system using the nutrient balance approach, with **a (planned) unhusked ear yield of 16 tons per hectare**.

The harvest was carried out on July14th. In the course of the harvest the ears were picked together with their husks and then 20 ears were selected from each treatment in a random fashion and the following observation and measurements were carried out:

- beginnig of germination, mass (80%) germination, tassels appearance, tasseling (pollination), stigma appearance (2 cm), stigma „flowering", harvesting (at milky stage),
- unhusked ear weight (gram),
- husked ear weight (gram),
- length of seeds (mm),

as well as determining possible parameters through calculation from these data: average yield per unit area and netto ear weight ratio.

One of the most important internal quality component, total sugar content (= compound sugars, mainly sucrose, was determined also.

The statistical analysis of the results was carried out by using the programme *RopStat 1.1.* When the standard deviations were identical the mean values were compared by pairs using the *Tukey-Kramer* test, while in the case of the non identical standard deviations the means were compared using the *Games-Howell* test (Vargha, 2007).

RESULTS AND DISCUSSIONSS

Rhytm of emergence and the observed phenological stages are represented in Table 1.

We observed the beginning of emergence on 7days after sowing, but we could not observe significant difference among the treatments. In consequence the difference in speed of emergence between treatments was insignificant. In the occurrence of generative phenophases we hadn't found major differences, the possible explication is the good temperature/water relation which was properly for sweet corn, in the water uptake and nutrition, in consequence in process of assimilation were not important defficiencies.

The first measured parameter after picking was the weight of unhusked ear, which results are illustrated on Figure 1.

Based on the figure it can be seen that the ears of the treatment G3 had the greatest weight as compared to the other treatments. There was no significant difference between the husked ear weight measured among the other treatments, on the other hand, the result of all treatments had significantly, at (*$p<0,01$* level), higher weight than the untreated control G1.

After removing the ear husks, the husked ears were measured, illustrated by Figure 2.

By this measured parameter we found the same tendences as by unhusked cob weight, so treatment G3 results was the highest. Compared to G1 (untreated) all treatment's cob weight netto results were significantly at (*$p<0,01$* level) higher.

In case of another important measured parameter, length of seeds (Figure 3), the best results was produced by G2 treatment. The *nullkontroll* (G1), was overtaken by each treatment. Between G2. and G5 *no statistically demonstrable differences,* but G2 and G5 treatments compared to other treatments we found significant difference at (*$p<0,01$* level), confirmed by statistics.

Based on the results of the measurements, the calculated average yield per unit area is illustrated in Figure 4.

Relative to the *average yield*, the greatest yield in terms of weight was obtained in treatment G3, which was calculated on the basis of unhusked ear weight. Interestingly, the statistical analysis failed to reveal any significant differences between the treatments. On the other hand, compared to the untreated control, all treatments resulted in a significantly higher yield at (*$p<0,01$* level).

The *netto ear weight ratio* is another important data (Figure 5) which was calculated through dividing the husked ear weight by the unhusked ear weight, and this time G3 and G5 treatments were found to produce the best ratio. However, no statistically demonstrable significant difference was evident between the treatments.

On figure 6 is rerepresented the complex sugars (especially sucrose) quantity.

We measured the highest average quantity of complex sugars by untreated kontroll (G1). The results, excepted treatment G2, were significant higher, at (*$p<0,01$* level), compared to the other treatments.

CONCLUSIONS

Based on the results of the experiments, in 2008, the following conclusion can be made:

Relative to *the untreated control* (G1) (no fertilization) it can be concluded that it is not possible to have profitable production without any artificial supply of nutrients, due to the low average yield.

For all the parameters measured, significantly lower values were measured than in the other treatments, but in case of sugar content it produced the highest values.

No markedly different results were found in the *N:P:K (G2) treatment*, either in the positive or in the negative sense in comparison with the other treatments, excepted length of seeds, where the measured results were significantly higher compared to other treatments (excepted G5).

The *2N:P:K (G3) treatment* produced good results in terms of unhusked ear yield, husked ear yield and netto ear ratio. The favourable result, on the other hand, was not in harmony, either from economical considerations or from the point of environmental protection, with the amount of the applied fertilizer quantity.

The results of the *N:2P:K (G4) treatment* are somewhat similar to the results or the treatment G2, the treatment did not manage to be the best in any of the parameters.

High length of seeds, yield quantity and sugar content were measured in the *N:P:2K (G5) treatment*.

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TABLE AND FIGURES

Table 1

Rhytm of emergence and the observed phenological stages

	Day of sowing	Beginning of emergency	Tassels appearance by 50%	Beginning of tasseling	Flowering by 50 %	Harvesting
2008	**IV. 24.**	**7 (V. 1.)**	**48 (VI. 11)**	**58 (VI. 21.)**	**62 (VI. 25.)**	**81 (VII. 14.)**

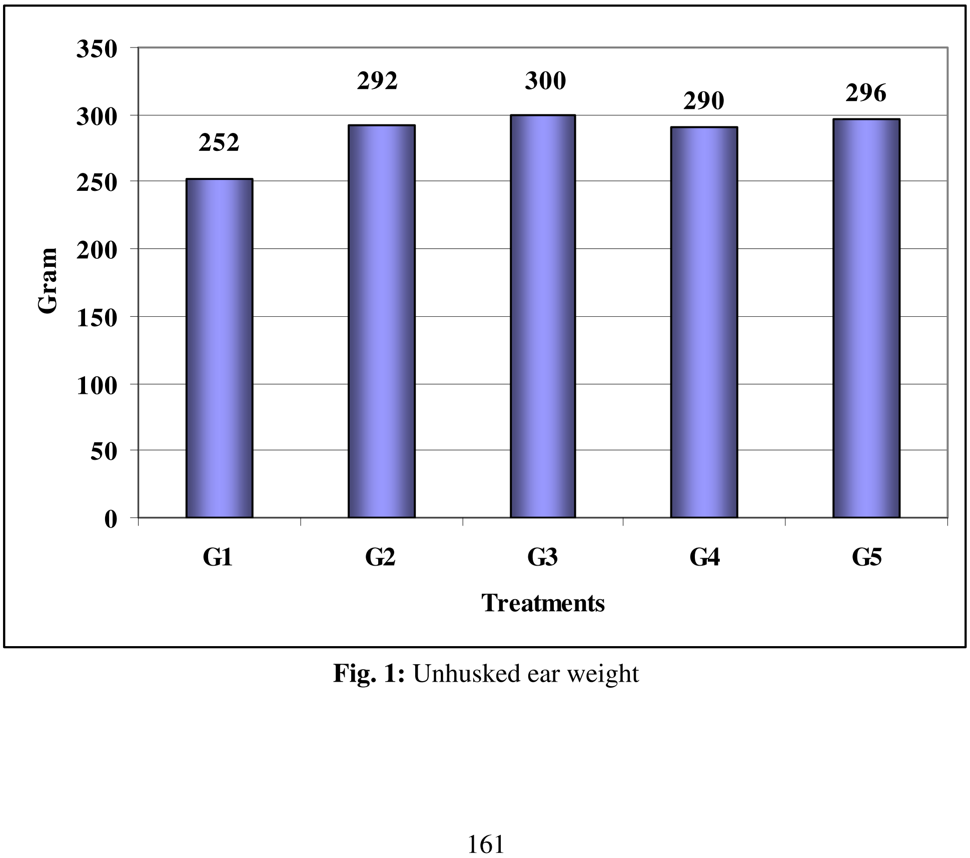

Fig. 1: Unhusked ear weight

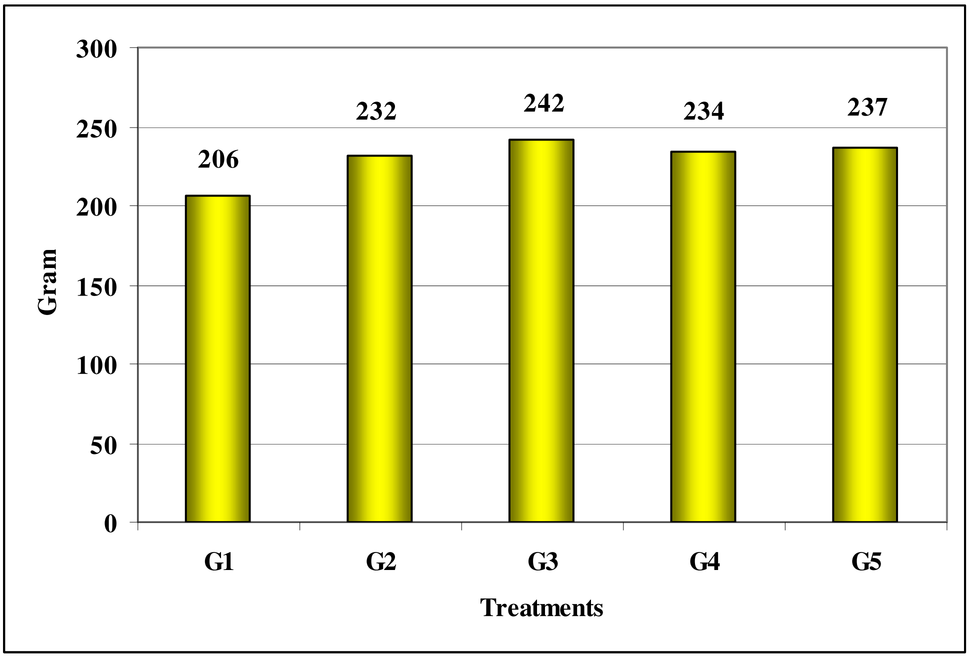

Figure 2: Husked ear weight

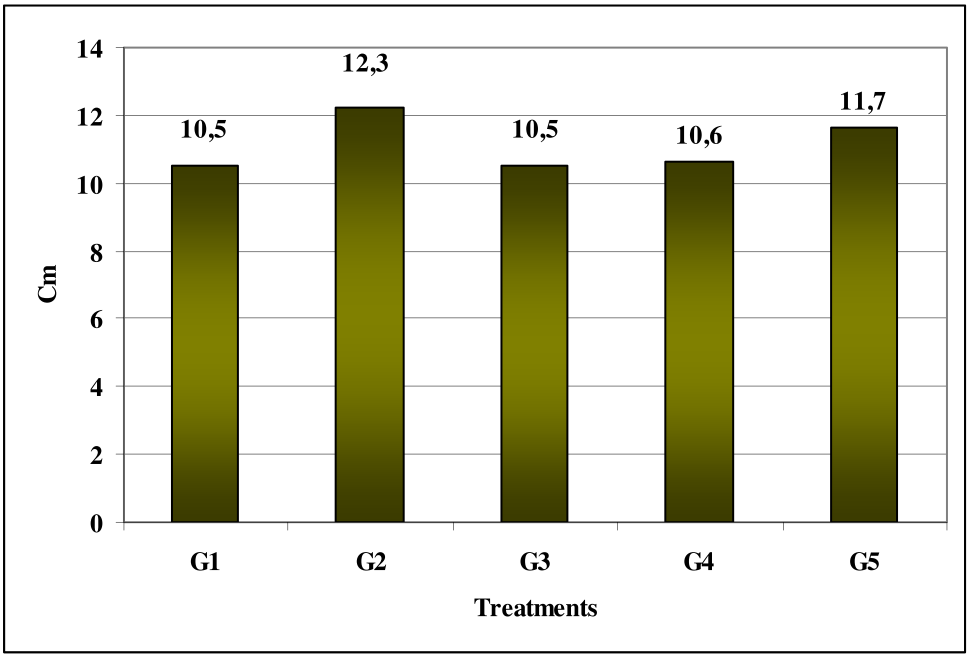

Figure 3: Length of seeds

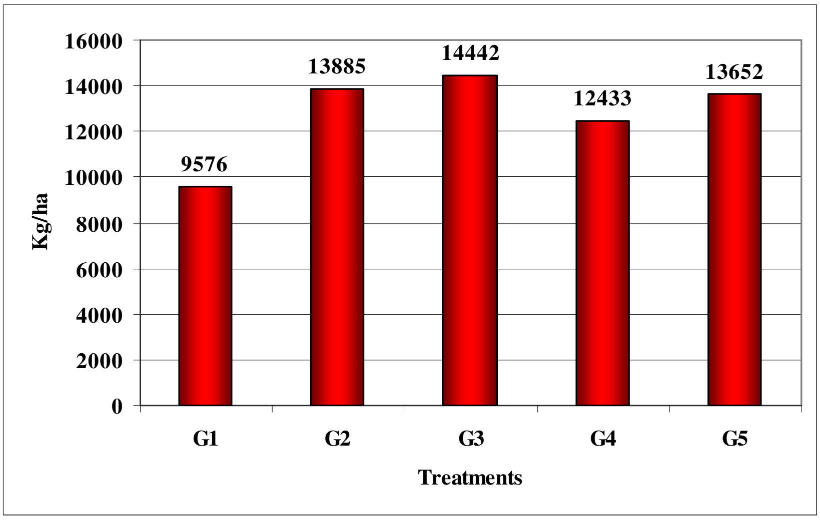

Figure 4: Average yield

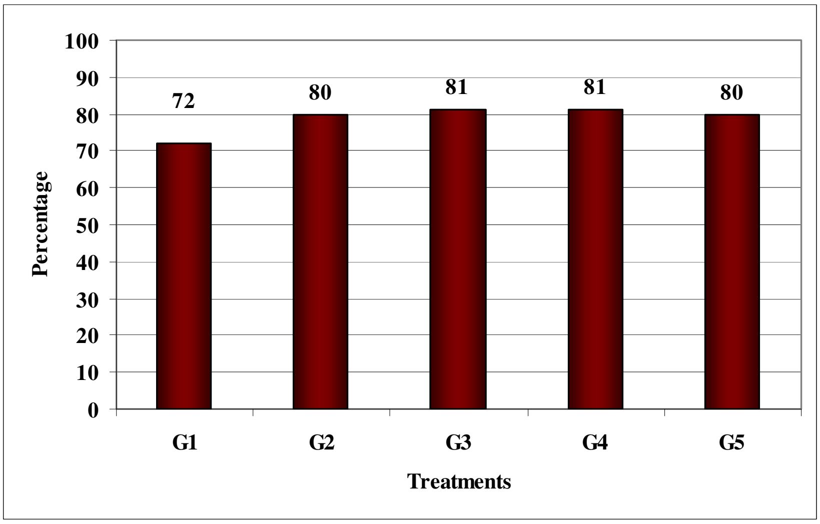

Figure 5: Netto ear ratio (husked/unhusked ear weight)

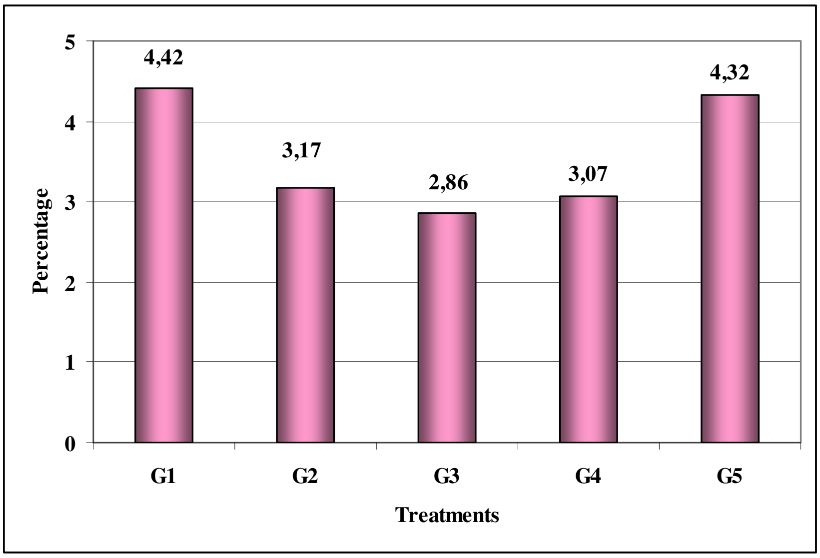

Figure 6: Complex sugar content

Research on agrochemical and biochemical characteristics of onion crop cultivated in Southern Romania

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Keywords: cultivar, onion, sensitive characteristics, production

ABSTRACT

The research was conducted in Dobrogea County, in an irrigated agricultural area bordering Danube-Black Sea Canal, holding the Glade. Experience has been placed in sole dry bulbs grown for the production of the sown directly in five variants. Tendency of countries with modern agriculture is to maintain or even reduce the surface with onions, but to increase production per hectare by applying the best technologies that include mandatory use of the best drill (varieties and hybrids). The results of measurements at the onions cultivars show that the size of the largest onion vegetables were recorded at Banko, Daitona F1 and Tamara F1;The degree of coating of onions varied range limits between 4.20 and 5.83 that, the latter being characteristic to cultivar Banko; A good phosphorus content over 200ppm value was insured at cultivars Banko, Daitona and;The nitrate accumulation varied between 56ppm and 75ppmN-NO_3.; Biochemical characteristics of onion ensure their sensory quality. Carbohydrates, acidity and vitamin C were accumulated in the normal range and ensuring good quality of onions; Production of onions harvested, average variation ranged from 27.30 t/ha and 35.78 t/ha. Statistical interpretation of the degree provided shows that very significant insurance.

INTRODUCTION

Onion crop in our country occupies third place among the vegetable species, as tomatoes and cabbage, with an area of 35,000 ha. Being a vegetable species so important, not too pretentious to the conditions of climate and soil, are grown in the world between 5 degrees north latitude and 60 degrees south latitude, onion acreage in the last 10 years increasing from 1.825 million hectares in 2670 (146%) hectares (FAO Statistics 2009), being on the fourth place among the main species grown vegetables.

The importance of food, medicines and therapeutic results in the recommendation that in a rational diet, daily, to consume at least 20-25g of onion, which is an average year about 8-9 kg.

Tendency of countries with modern agriculture is to maintain or even reduce the surface with onions, but to increase production per hectare by applying the best technologies that include mandatory use of the best drill (varieties and hybrids).

Culture onion is relatively expensive, caused by the high cost of seed or chives, fertilizers, herbicides, substances to combat diseases and pests, the use largely manual labor (thinning, hoeing, harvesting by hand).

In our country's economic efficiency is still low so the onion crop because of high consumption hour-man/ha (550-600 to direct sown onions in the field, and 700-750 in the onion chives), and because of low yields achieved per hectare (9.5 tons/ha - average production achieved over the last ten years).

MATERIALS AND METHODS

The research was conducted in Dobrogea County, in an irrigated agricultural area bordering Danube-Black Sea Canal, holding the Glade. Experience has been placed in sole dry bulbs grown for the production of the sown directly in five variants, four repetitions resulting in 20 plots repetitive. All plots had a length of 3.6 m, width 5.6 m and the area of $20m^2$. Recurrence plots of each variable were separated by wide 50cm, experimental variants paths are shown in Table 1.

During the growing season were applied work on specific care and treatments were applied to prevent plant and weed and pest and disease attacks. Sampling was performed at 8/15/2010 onion.

Observations and tests carried out aimed onions harvested height, their weight, the number of protection sheaths, number of fleshy sheaths and the number of buds.

Analyzes the quality onions were agrochemical analysis (nitrates, phosphorus and potassium) and biochemical (total sugars, acidity, vitamin C, dry matter). Production has been on repetition and variations and the results were interpreted statistically.

RESULTS AND DISCUSSIONSS

Measurements effectuate at the onions harvested (Table 2) show both types of larger and smaller pieces. Thus in terms of **height** cultivar Daitona F1 had the highest average height of 6.30 cm followed by 5.75 cm Tamara F1. **Diameter** of the onion was close in value, onion cultivars with higher average diameter was 6.20 cm and Tamara F1 and Daitona F1 with 6.10 cm and Diamond cultivativar had the lowest average diameter of 5.75 cm.

Number of protection sheaths ensures the quality of the onions storage, so their number ranged between 2.00 and 2.56, which shows that if consumption during winter onions is best kept Daitona F1followed by Tamara F1.**The degree of coating of onions** varied range limits between 4.20 and 5.83 that, the latter value being characteristic of cultivar Banko.

Quality characteristics followed by **agrochemical analysis** (Table 3) respectively the contents of nitrates; phosphorus and potassium can specify the retention period of onions. For storage must examine the phosphorus contents that oscillates between 117.64 ppm value and 278.16 ppm, good content being provided to over 200ppm at cultivars Banko, Daitona and Tamara.

The potassium element which ensures the quality to the storage of onions accumulated in high amounts varying between 1960ppm and 2620ppmK.

Nitrates are compounds that can downgrade the quality for consumption of vegetables and for onions the accumulation of this compound varied between 56ppm and 75ppmN-NO_3. As a compound that may affect consumer health, nitrates are limited by law (Order No. 1 of 2002) to onion to 80ppmN-NO_3. By comparing the values obtained from the analysis of onion cultivars and allowed limit imposed by law, can be said that the production of onions is good for consumption.

Biochemical characteristics of onion (Table 4) provide their sensory quality. The amount of carbohydrate determines the sweetness of the onion, cultivars examined have a quantity varying between 4.9% and 8.7%, an appreciable content being at cultivars Tamara F1 and Daitona F1, respectively 8.7% and 7 2%.

The acidity values oscillate within limits, 0.16% and 0.23% respectively and characterized low values. The contents of vitamin C are lower than 10 mg/100g fresh matter, oscillating between 6.7 and 8.2 mg/100g fresh matter.

Dry matter of onions determine the storage capacity, so a higher content shows that splashing were more frequent and larger quantities of water which can reduce the period of storage. At the cultivars examined dry matter varies between 17.20% and 22.12%, the highest value was recorded at Diamond and the lowest value was obtained from cultivation Daitona F1.

Production of onions (Table 5) harvested, average variation ranged from 27.30 t/ha and 35.78 t/ha. Statistical interpretation of the degree provided shows that very significant variants were V1 (Leone), V2 (Banko), V3 (Daitona F1) cultivars and F1 Tamara is provided distinct statistically significant.

CONCLUSIONS

Research effectuate at the five cultivars of onions show:

1. The results of measurements at the onions cultivars show that the size of the largest onion vegetables were recorded at Banko, Daitona F1 and Tamara F1;
2. The degree of coating of onions varied range limits between 4.20 and 5.83 that, the latter being characteristic to cultivar Banko;
3. A good phosphorus content over 200ppm value was insured at cultivars Banko, Daitona and Tamara which shows improved onion storage capacity;
4. The nitrate accumulation varied between 56ppm and 75ppmN-NO_3. As a compound that may affect consumer health, nitrates are limited by law (Order No. 1 of 2002) to onion to 80ppmN-NO_3. By comparing the values obtained from the analysis of onion cultivars and allowed limit imposed by law can be said that the production of onions is good for consumption;
5. Biochemical characteristics of onion ensure their sensory quality. Carbohydrates, acidity and vitamin C were accumulated in the normal range and ensuring good quality of onions;
6. Production of onions harvested, average variation ranged from 27.30 t/ha and 35.78 t/ha. Statistical interpretation of the degree provided shows that very significant insurance are in variants V1 (Leone), V2 (Banko), V3 (Daitona F1) and at F1 Tamara cultivar is provided with statistically distinct significant insurance.

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***FAO Statistics 2009

TABLES

Table 1

The sheme of experimental variants

Variants	Cultivars	Consume
Mt	Diamont	Fall, Winter
V1	Leone	Summer, Fall, Winter
V2	Banko	Summer, Fall, Winter
V3	Daitona F1	Fall, Winter
V4	Tamara F1	Fall, Winter

Table 2

Determinations on some characteristics of cultivars of onion

Variants	Cultivars	Observations				
		H, cm	Φ, cm	No. of protection sheaths	No. of fleshy sheaths	No. of buds
Mt	Diamont	4,12	5,75	2,12	4,20	1,18
V1	Leone	4,01	6,01	2,33	4,66	1,66
V2	Banko	5,56	6,35	2,00	5,83	1,83
V3	Daitona F1	6,30	6,10	2,56	5,45	1,70
V4	Tamara F1	5,75	6,20	2,46	5,65	1,35

Table 3

Agrochemical characteristics of onion cultivars

Variants	Cultivars	Content, ppm		
		N-NO3	P-PO4	K
Mt	Diamont	75	156,21	2010
V1	Leone	71	117,64	2620
V2	Banko	71	278,16	2020
V3	Daitona F1	65	215,36	1960
V4	Tamara F1	56	208,32	2100

Table 4

Biochemical characteristics of onion cultivars

Variants	Cultivars	Carbohidrates %	Acidity %	Vitamin C, mg/100g fresh matter (acid ascorbic)	Dry matter content, %
Mt	Diamont	6,8	0,23	7,6	22,12
V1	Leone	6,5	0,18	7,2	20,02
V2	Banko	4,9	0,16	8,2	18,13
V3	Daitona F1	7,2	0,20	6,7	17,2
V4	Tamara F1	8,7	0,22	6,8	19,87

Table 5

The crop of onion cultivars

Variants	Cultivars	Crop, t/ha	Procent	Dif. +/-	Signification
Mt	Diamont	27,30	100,00	-	-
V1	Leone	35,78	131,06	+8,48	***
V2	Banko	33,25	121,79	+5,95	***
V3	Daitona F1	34,18	125,20	+6,88	***
V4	Tamara F1	30,85	113,00	+3,55	**

DL5%= 1.8362t/ha
DL1%= 2.1678t/ha
DL0.1%= 3.6017t/ha

Effect of shoots pruning and plant spacing on fruit yield and quality of sweet pepper grown under greenhouse

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Keywords: shoot pruning, pepper, fruit quality, plant density

ABSTRACT

In greenhouse pepper crops, fruit yield and quality can be increased by managing shoot pruning and plant density. An experimental study was conducted at Sakha Protected Cultivation Center, Kafr El-Sheikh governorate during the winter seasons of 2007/08 and 2008/09 on "Titanic" sweet pepper hybrid under unheated plastic house. The effect of shoot pruning (without pruning, one or two main stem) and plant spacing (25 and 50 cm) was studied for effect on vegetative growth, fruit yield and quality of greenhouse grown pepper. Shoot pruning and plant space affected both and yield. The results revealed that the pruning treatments increased plant height, leaf area and decrease number of leaves and stem diameter. The significantly higher yield per m^2 was recorded in plants pruned to one shoot at spacing of 25cm followed by unpruned plants, pruned plants to two shoots at 50 cm then pruned plants to one shoot (50 cm) which gave the lowest values in both seasons. Plants pruned to one shoot and planted at spacing of 25 or 50 cm gave the highest average fruit weight compared to another pruning treatment and unpruned plants in the first season. Pruning treatments decreased nitrate content in fruits than unpruned plants treatment which gave the highest values. The highest ascorbic acid content of fruit juice was obtained when plants were pruned to one shoot at spacing of either 25 or 50 cm.

INTRODUCTION

Sweet pepper (*Capsicum annuum* L.) is one of the most popular and favorite vegetable crops cultivated under plastic green houses in Egypt for both export and local consumption. It occupies the second rank among vegetable crops area grown under plastic houses. In vegetable green house production profits are greatly dependent on high yield and quality per unit area. Pepper fruit development is controlled by restricted the brunching pattern to 2, 3 or 4 main stems. The reasons for pruning sweet pepper under green house condition are to train plant growth to facilitate light penetration throughout the leaf canopy for more efficient interception of light. Plant density and plant arrangement have a pronounced influence on plant development, growth and marketable yield of many vegetable crops (Stoffella and Bryan 1988). Because pepper plants have a branching habit, two or four main branches are left on a plant and are trained in a U or V shape. It is recommended to remove the inner weak shoots as often as possible. A number of studies have indicated a linear increase in fruit yield when plant density is increased (Decateau and Graham 1994 and Jovicich et al. 2006). Pruning and plant density are very important for the optimization of plant spacing per unit area (Dasgan and Abak 2003), therefore, the main objective of this study was to determine the effect of pruning and plant spacing on yield and fruit quality of sweet pepper grown under unheated plastic house

MATERIALS AND METHODS

The experiment was conducted at Sakha protected cultivation center, ministry of Agriculture, Kafr el sheikh governorate during the winter season of 2008 and 2009 under unheated plastic house on sweet pepper "Titanic hybrid". Seeds were sown on July 15th in both seasons in seedling trays. Seedlings were transplanted in the soil of plastic house on September 15th in both seasons on two side of the ridge (40 m length and 1.5 m width). Two plant density 5.2 and 2.6 as function of in row plant spacing 25 and 50 cm, respectively and three shoot pruning (one and two as well as without pruning) thus make four treatments:

1. Pruning to leave one shoot per plant at spacing of 25 cm between plants within the ridge (plant density 5.2 plants per square meter)

2. Pruning to leave one shoot per plant at spacing of 50 cm between plants within the ridge (plant density 2.6 plants per square meter)
3. Pruning to leave two shoots per plant at spacing of 50 cm between plants within the ridge (plant density 2.6 plants per square meter)
4. The control (without pruning at spacing of 50 cm between plants.

Experimental design and statistical analysis

The experiments included 4 pruning and plant spacing treatments. The various treatments were arranged in a randomized complete block design with three replications. Data were tested by analysis of variance (Little and Hills 1972). Duncan's multiple range test (DMRT) was used for the comparison among treatment means (Duncan 1955).

Data recorded

Vegetative growth, flowering, fruit yield, fruit quality and chemical analysis of the leaves and fruits were determined as follows:

Vegetative growth

Plant height (cm), number of leaves, leaf area and stem diameter (cm) and leaf area were determined at 60 and 90 days after transplanting.

Fruit yield

Early yield was considered as the number and weight of all harvested fruits during the first 45 days of harvesting. Data of early and total yields included the following parameters:

a) Fruits yield as number and weight per square meter.
b) Average fruit weight (g).
c) Total number of marketable fruits per square meter.
d) Total number and percentage of nonmarketable fruits per square meter.

Fruit quality

Ten fruits were randomly taken from each treatment of the fourth picking to study the morphological and chemical characters of the fruits in both seasons.

Fruit length (cm) and fruit diameter (cm) fruit were measured

The percentage of Soluble Solids Content (SSC %) in juice of the fresh sweet pepper fruits was estimated by a hand refractometer according to A.O.A.C (1965).

Ascorbic acid content (mg/100g fresh weight) was estimated by titration with 2, 6-Dichlorophenolendophenol blue according to A.O.A.C. (1965).

Nitrate content (ppm) was estimated according to Singth (1988).

Leaf chlorophyll content (mg/dm^2) of the fifth leaf from the growing tip of plant were estimated by spectro-colorimeter as described by Moran and Porath (1982) after 60 days from transplanting in both seasons.

RESULTS AND DISCUSSIONSS

Vegetative growth

a. Plant height

Data presented in Table (1) reveal that shoot pruning and plant spacing treatments caused a significant increase in plant height at both sampling dates (60 and 90 days after transplanting) in both seasons. Therefore, pruned plants which were pruned to one shoot and planted either at 25 or 50 cm spacing gave the highest values compared to another pruning treatment and unpruned one in most cases. Similar results were obtained by Hamed (1997) who found that pruning pepper plants exhibited the highest height compared to unpruned one. Moreover, Maya et al (1997) reported that pepper plant height was the highest when planted at the closest spacing.

b. Number of leaves

The differences among treatments were significant in both sampling dates for number of leaves in both seasons. The control (unpruned plants) produced the highest number of leaves per plant in both seasons followed by two shoots, one shoot with 50 cm spacing then one shoot with 25 cm spacing which showed the lowest number. In this concern, Hamed (1997) found that shoots pruning treatments had non- significant effect on leaves number compared to unpruned plants. On the other hand, Dasgan and Abak (2003) showed that wider within row spacing and higher shoot numbers per plant increased the number of leaves.

c. Stem diameter

Data presented in Table (1) demonstrate that there was significant effect among pruning and plant spacing treatments on stem diameter at all sampling dates after transplanting in both seasons, although the differences were non-significant at 60 days in the first season only. The highest value was obtained from plants pruned to two shoots at spacing of 50cm or unprunned plants compared to the other two treatments that showed the lowest records. Similar observations on some vegetable crops were obtained by Jovicich et al. (2006) and Cebula (1995) on pepper and Ambroszczk et al. (2008) on eggplant.

d. Leaf area

Concerning leaf area/plant, unpruned plants gave the largest leaf area per plant at all sampling dates compared with the pruning treatments, especially plants pruned to one shoot at either 25 or 50 cm which had the lowest values in both seasons. Similar results were obtained by Hamed (1997) on pepper, who showed that shoots pruning treatments decreased leaf area/plant. In contrast, Ambroszczk (2008) on eggplant, showed that plants pruned to one shoot were characterized by greater single leaf area than two shoots.

e. Chlorophyll content of the 5^{th} leaf.

Data presented in Table (2) indicate that there were highly significant differences among treatments in leaf chlorophyll (a, b and a+b) content in the first season only. The highest values were obtained from plants pruned to one or two shoots with wider spacing (50cm) compared with the other two treatments that did not significantly differ of each other. The results are in the same line with those found by Hamed (1997) on pepper and Ambroszczyk et al (2008) on eggplant who found that the method of pruning (1 and 2 shoots/plant) had no significant effect on the pigments content in leaves.

Fruit yield.

a. Early fruit yield.

Data in Table (3) and show that there were highly significant differences among pruning and plant spacing treatments in both seasons in number and weight of early fruit yield per m^2. Plants pruned to one shoot at spacing of 25 cm produced the highest early fruit yield as weight and number/m^2 followed by unpruned plant and then those pruned to either one or two shoots with 50 cm spacing which had the lowest values in this concern. Similar trend was observed by Ahmed (1984), Guo *et al.* (1991), Anez and Figueredo (1994), Hamed (1997) and Dasgan and Abak (2003) on pepper .They found that the highest early fruit yield (kg/m^2) was obtained from the highest plant density with two shoots per/plant. On the other hand, Maniutiu et al. (2010) found no significant diference between pruned plants to three shoots and pruned plants to two shoots.

b. Average fruit weight

Data presented in Table (3) indicate that the shoots pruning and plant spacing treatments had no significant effect on average fruit weight in both seasons.

c. Total fruit yield.

Data in Table (3) show that shoots pruning treatments had highly significant effect on total fruit yield as weight and number per m^2. The total fruit yield as weight and number/m^2 was the highest in plants pruned to one shoot at spacing of 25cm followed by unpruned plants, pruned to two shoots 50 cm then pruned plants to one shoot (50cm) which gave the lowest values in both seasons. These results are in accordance with those obtained by Cebula (1995) and Dasgan and Abak (2003) on pepper and Mantur and Patil (2008) on tomato.

d. Number of unmarketable fruits.

Data presented in Table (3) indicate that there were significant differences among pruning treatments for number of nonmarketable fruits/m^2. The highest number was recorded from plants pruned to one shoot and planted at 25 cm within plant followed by unpruned plants, and those pruned to two shoots (50 cm) then pruned plants to one shoot (50 cm) which gave the lowest values. This response may be due to that high plant density caused high number of fruits per unit area.

The percentage of nonmarketable was higher in plants pruned to two shoots with spacing of 50 cm or unpruned plants compared to other two pruning treatments (one shoot) in the first season, while in the second one the highest number was obtained from plants pruned to one shoot at spacing of 25cm followed by unpruned plants, two shoots (50 cm) and finally one shoot (50 cm) which gave the lowest percentage.

e. Average fruit weight

Data in Table (3) show that there were highly significant differences among treatments in both seasons. Therefore, plants pruned to one shoot and planted at spacing of 25 or 50 cm gave the highest average fruit weight compared to another pruning treatment and unpruned plants in the first season. In the second season, the pruning treatment of one shoot at spacing 50cm gave the highest average fruit followed by treatment of one shoot also, but with 25 cm spacing and finally both two shoots (50 cm) and unpruned control which showed the lowest records.

Fruit quality.

a) Fruit length and diameter

Data in Table (4) show that there were nonsignificant differences among pruning treatments in fruit length and diameter in both seasons, except fruit length in the second season only as the differences were significant. The highest fruit length was resulted by plants pruned to two shoots and planted at 50cm, while the lowest one was from unpruned plants. In this connection, Hamed (1997) declared that plants pruned to three shoots gave the highest fruit length compared to unpruned plants . Moreover, on eggplant Srinivasan and Huang (2009) showed that the longest fruits were recorded with 30% shoot pruning but fruit diameter was not significantly differed.

b) Chemical constituents.

Soluble solids content.

Data in Table (4) reveal that the pruning treatments had no significant effect on soluble solids content (S.S.C) of fruit juice in both seasons. Similar observation was obtained by Hamed (1997) who showed that total soluble solids percentage of pepper fruit juice was not significantly affected by shoots pruning treatments.

Ascorbic acid (Vit. C) content

Data presented in Table (4) reveal that the differences among treatments in this parameter were highly significant in both seasons. Thus, highest ascorbic acid content of fruit juice was obtained when plants were pruned to one shoot at spacing of either 25 or 50cm. Similarly Hamed (1997) and Cebula et al. (1998) found that pruning sweet pepper plants, to one shoot increased fruit ascorbic acid content.

Nitrate content

Data in Table (4) demonstrate that pruning treatments decreased nitrate content in fruits than unpruned plants treatment which gave the highest values, while the lowest ones were obtained by plants pruned to one shoot at 25 cm spacing in the two seasons.

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TABLES

Table 1

Effect of shoots pruning and plant spacing on vegetative growth of sweet pepper plant "Titanic" cv. 2007/08 and 2008/09 seasons.

Means followed by the same letters are not significant at 0.05 level according to Duncan's test.
NS,*, and ** indicate non significant, significant and highly significant differences respectively, according to F test

Treatments	Plant height (cm)		Number of leaves/plant		Stem diameter (cm)		Leaf area (cm^2)	
	60 days	90 days	60 days	90 days	60 days	90 days	60 days	90 days
2007/08								
One shoot (25cm)	49.67a	61.08b	11.83d	16.37d	0.96	1.22b	949.08c	1411.93b
One shoot (50cm)	48.63ab	63.73a	13.93c	18.40c	0.91	1.20b	1076.47bc	1438.23b
Two shoots (50cm)	46.17b	56.87c	18.13b	25.40b	1.14	1.47a	1293.23b	1603.19b
Unpruned (cont)	47.03ab	57.53c	33.70a	45.30a	1.04	1.55a	2155.87a	2905.21a
F.Test	*	* *	* *	* *	N.S	* *	* *	* *
2008/09								
One shoot (25cm)	48.86ab	60.81ab	11.10d	16.26c	0.93b	1.18bc	1363.8c	1577.9bc
One shoot (50cm)	50.22a	62.08a	13.85c	17.05c	0.89c	1.13c	1385.7c	1415.7c
Two shoots (50cm)	44.28c	55.61b	16.93b	24.75b	1.00a	1.26b	1544.8b	2140.6b
Unpruned (cont)	45.98bc	55.67b	33.78a	46.22a	1.02a	1.42a	2744.9a	3202.5a
F. Test	*	*	* *	* *	* *	* *	**	* *

Table 2

Effect of shoots pruning and plant spacing on chlorophylls content in leaves of sweet pepper plant (mg/dm^2) during 2007/08 and 2008/09 seasons

Means followed by the same letters are not significant at 0.05 level according to Duncan's test.
NS,* and ** indicate non significant, significant and highly significant differences respectively, according to F test

Treatments	Chl.(a)	Chl.(b)	Chl.(a+b)
2006/07			
One shoot (25cm)	2.42b	1.57b	3.66b
One shoot (50cm)	2.60a	1.65a	4.26a
Two shoots (50cm)	2.58a	1.63a	4.21a
Unpruned (cont)	2.45b	1.59b	3.65b
F. Test	* *	* *	*
2007/08			
One shoot (25cm)	2.71	1.43	4.14
One shoot (50cm)	2.64	1.50	4.02
Two shoots (50cm)	2.54	1.32	3.87
Unpruned (cont)	2.71	1.38	4.21
F. Test	N.S	N.S	N.S

Table 3

Effect of shoots pruning and plant spacing on early fruits yield and average fruit weight of sweet pepper plants during 2007/08 and 2008/09 seasons.

Means followed by the same letters are not significant at 0.05 level according to Duncan's test.
NS and ** indicate non significant and highly significant differences respectively, according to F test

Treatments	Early fruits/yield per m^2			Total fruit yield			Non-marketable fruits	
	Number	(kg)	Average fruit wt (g)	Number	(kg)	Average fruit wt (g)	Per m^2	%
2007/089								
One shoot (25cm)	18.80a	2.55a	133.75	148.60a	9.620a	64.54a	26.40a	17.8b
One shoot (50cm)	7.42c	1.17c	132.23	60.90d	4.090c	65.18a	10.40d	17.0c
Two shoots (50cm)	8.24c	1.14c	138.70	79.90c	4.350c	54.77b	14.60c	18.3a
Unpruned (cont)	11.14b	1.52b	137.08	102.10b	5.180b	50.76c	19.00b	18.6a
F. Test	**	**	N.S	* *	* *	* *	* *	* *
2008/09								
One shoot (25cm)	19.89a	2.87a	143.67	185.40a	11.060a	60.05b	35.20a	19.1a
One shoot (50cm)	8.32c	1.15c	139.77	71.30d	4.730d	66.35a	12.30d	17.2d
Two shoot (50cm)	4.84c	1.27c	143.42	95.10c	5.192c	52.11c	17.00c	17.9c
Unpruned (cont)	12.32b	1.72b	139.40	114.50b	6.038b	52.75c	21.10b	18.5b
F. Test	**	**	N.S	* *	* *	* *	* *	* *

Research regarding influence of fertilization regime on the quality and production of cucumbers type cornichon in solarium

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Keywords: cucumber cornichon type, fertilization, solarium, F1 cultivars.

ABSTRACT

Among the methods of intervention on the production of cucumbers in greenhouses is cornichon type, one of the most important positions, the problem of optimal fertilization of this crop. Technological progress in recent years in domestic vegetable, made available to producers and complex fertilizers, total soluble allowing accurate management of fertilization regime and cucumbers grown in greenhouses cornichon type in the autumn cycle.

INTRODUCTION

In Romania there are companies specialized in marketing of certified seed of the latest varieties and hybrids of the world market. Horticulturists and small farmers have a wide range of hybrid type cornichon, most use are the ones with flowering and fruiting Gino parthenocarpic. Gino hybrids are those that emit only female flowers with direct influence in increasing the number of fruits formed on a plant.

This paper aims to establish highly productive cultivars performance in terms of optimization of fertilization, which can be recommended for expansion in successive crops in greenhouses. This scientific paper presents the results of fertilization with Yara fertilizer type on the production for 4 cultivars of European origin and native F1.

MATERIALS AND METHODS

- Variants included in the experimental grid are presented in Table 1. By combining two types of fertilization with four cultivars, the result of experience bifactorial Type 2 x 4 to 8 variants. As a witness was established by fertilizing cultivated cultivation F1 classic Triumph.
- Biological material used in experience includes four cultivars, namely:
  - F1 Triumph SCDL Buzau product by Costel Vanatoru Ph.D., type fruits with firm flesh and cornichon with taste. Shows good resistance to attack pathogens and is perfectly adapted to the agro-soil of the area and can be grown both in protected areas and in open field.
  - F1 Mirabelle from Seminis is one of the most popular type of parthenocarpic cucumber hybrid cornichon art. Multiple destinations is a hybrid, grown for both fresh consumption and for industrialization.
  - F1 Pasalimo from Syngenta, parthenocarpic hybrid type semi-early for summer crops in field or under protection. Retains the high quality fruit and are harvested from 8 to 10 cm.
  - F1 Kybria from Rijk Zwaan, hybrid parthenocarpic with spikes, cylindrical fruit, for protected areas and fields, cycle I and II. Shows a high percentage of commercial high quality fruit.
- Fertilizers used for the graduations **a**:

For **a1** graduation:

- 20 tons/ha applied mranita winter of 2008/2009;

- Fertilizer complex 15 - 15 to 15 applied as follows: 250 kg/ha at soil preparation, twice fazial in quantities of 100 kg/ha at two and six weeks after planting.

For **a2** graduation, these fertilizers were used:
- Ferticare (S, I, II)
- Calcium-nitrate
- Magnesium nitrate

Research objectives:

This paper presents the performance achieved in solar production in Buzau area, using a variety of new cultivars, culture fertilized with some fertilizer, and marketed by the company Yara. (Table 2)

Stands by results, Mirabelle hybrids with 91 tons/ha and 84.33 Pasalimo with t/ha, a agrofont achieved through basic and faziala fertilization with fertilizers such as Ferticare, calcium nitrate, potassium nitrate.

The results are presented in full in this scientific paper.

Experimental conditions:

The experience was made into a solar production of SC Mogos Agro SRL, located in the bordering city of Buzau, DN 2B Buzau - Braila, a soil texture class protisoils intercede with fine, which have improved and evolved to the variety of soft alluvial soils. So the type of soil is soft aluviosoil epilcarpic (AS mo - ka) - TT/TT.

Soil which is placed SC Mogos Agro SRL Company is favorable for growing vegetables such as cucumbers type species cornichon, tomatoes, cabbage, bell pepper and less suitable for deep-rooting crop roots.

The most important properties of soils in this area are that:

- Have relatively young age and formed under simultaneous action of pedo-genetic factors;
- In terms of agroproductivity it would form a single group, with medium texture, good permeability and heavy and can be irrigated without large loss of water.
- Soil reaction is neutral or slightly alkaline, which is determined by soil carbonate content.

Climate of the city of Buzau fall in SouthEastern area of our country's climate, including steppe of SouthEastern Moldova, Baragan, Ialomita and Central Dobrogrea. This area is characterized by a continental climate with hot summers exceeding 22 º C average in the warmest months with low rainfall and unevenly distributed throughout the year and winters are very harsh.

Culture-specific technology applied on this experience is characterized by:

- The crop cycle autumn, July 18 to October 28;
- Seedlings produced by direct seeding in alveolar size trays 6 cm/6 cm, height 8 cm, at a depth of 2 cm on 18 June, planted aged 27 to 29 days.
- Density recommended for cucumbers grown in companies producing solar is between 20000-24000 pl/ha. To achieve the experimental culture, seedlings were planted according to the following schedule:

$$\frac{1.40\text{ m} + 0.60\text{m}}{2} + 0.45\text{m between plants per row} = 22\ 222\text{ plants/ha.}$$

Planted in rows and not balanced at 1 m, but in strips $\frac{1.40\text{ m} - 0.60\text{ m}}{2}$, because we considered it more practical (not walking between rows of 0.60 m, even if there is likely not to use the most sunlight).

- Maintenance work performed were the same as for cucumber crop production in the Buzau.
- Application of nutrient solutions - for fertigation, using disposable droppers lines.

The experience and observations were made determinations on:

- The timing of culture;
- Registration dates for the main phenophase;
- Record key data on production (rescheduling, quantity, quality structure).

RESULTS AND DISCUSSIONS

The most important results concerning the production and its quality are presented in Table 3. Relatively low average weight of fruit harvested is generated by that production was valued for semiindustrializare (pickles in the family system).

Production versions made from fertilization after conventional technology is about 30% lower than modern fertilization. In this group vary from the control (V1 - Triumph F1 - 4.730 kg/m^2), stands 2 and 3 variants: Mirabelle F1 - 5.925 kg/m^2 and Pasalimo F1 - 5.276 kg/m^2.

The variant type fertilizers Yara fertirigate with production varying between 6.808 kg/m^2 V5 (Triumph F1) and 9.100 kg/m^2 V6 (Mirabelle F1).

Production data were interpreted statistically by variance analysis method. The significance of the differences is presented in Table 4. Production results recorded on variations and repetitions were pooled, obtaining specific values of the average weight of fruit of the plant production and production per unit area (m^2).

Synthesis results obtained, presented in Table 4, highlights the following:

- Against a witness (Triumph classic F1 fertilization) in versions 2 and 3 production differences are positive, with different meanings.
- From the same witness, all variants fertilized with fertilizers Yara, positive differences are very significant.
- When compared to the witness 2, the whole set of variants with fertilization classic displays distinct differences significant or very significant negative.

In versions 6 and 7 from the same positive differences are very significant witness that significant distinct.

CONCLUSIONS

- Fertilization faziala with type Yara fertilizer increases production determine statistical coverage, compared to the control fertilized in the classical manner.
- The highlight in this regard hybrids: F1 Mirabelle, F1 Kybria and F1 Pasalimo with production of 9.1 kg/m^2, 8.4 kg/m^2 and respectively 6.6 kg/m^2 exceeding a witness to the differences + 4.370 kg/m^2, 3.703 kg/m^2 and 1.967 kg/m^2.
- Answers the same hybrids differ fertilization technology. In both fertilization, Mirabelle F1 hybrids and F1 Pasalimo, exceed very significant or significant production of both witnesses.
- With the total production of hybrids is remarkable results Mirabelle F1 - 9.100 kg/m^2 and Pasalimo F1 - 8.433 kg/m^2 on fertilized with fertilizers Yara agrofondul.

We considered necessary to continue and further research.

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TABLES

Table 1

Experimental variants
Fertilization of cucumber type cornichon in greenhouses, SC Mogos Agro SRL, Buzau – 2009

Var.	Cul Fertilization (a)	Cultivars (b)	Observations
V_1	Classic (a1)	Triumph $F_1(b_1)$	Culture consumption fall
V_2		Mirabelle $F_1(b_2)$	Culture consumption fall
V_3		Pasalimo $F_1(b_3)$	Culture consumption fall
V_4		Kybria $F_1(b_4)$	Culture consumption fall
V_5	Fertirigation with Yara fertilizer (a2)	Triumph $F_1(b_1)$	Culture consumption fall
V_6		Mirabelle $F_1(b_2)$	Culture consumption fall
V_7		Pasalimo $F_1(b_3)$	Culture consumption fall
V_8		Kybria $F_1(b_4)$	Culture consumption fall

Table 2

Fertilization with fertilizers Yara faziala
Cucumber type cornichon in greenhouses, SC Mogos Agro SRL, Buzau – 2009

Fertirigation Stage	Period	Number of days	Fertilizer	Cantity	
				g/pl/day	g/pl/stage
I	21 july-30 july	10	Ferticare S	0.5	5.00
II	31 july -19 aug.	20	Ferticare I	0.5	10.00
III	20 aug.-24 aug.	5	Ferticare II	0.5	2.5
IV	25 aug.-31 aug.	7	Calcium-nitrate	1.00	7.00
V	01 sept.-10 sept.	10	Magnesium- nitrate	1.5	15.00
VI	11 sept.-20 sept.	10	Ferticare II	1.00	10.00
VII	21 sept.-30 sept.	10	Calcium-nitrate	1.00	10.00
VIII	01 oct.-10 oct.	10	Ferticare II	1.00	10.00
IX	11 oct.-20 oct.	10	Ferticare II	0.5	5.00

TOTAL:
- Ferticare (S, I, II) = 42.5 g/pl/production cycle
- Calcium-nitrate = 17.00 g/pl/production cycle
- Magnesium-nitrate = 15.00 g/pl/production cycle

Table 3

Number of fruits, medium weight and total production
Fertilization of cucumber type cornichon in greenhouses, SC Mogos Agro SRL, Buzau – 2009

Var.	Fertilization	Cultivars	Nr. fruits/pl	Medium weight g/fruit	Production			Differences compared to the witness
					kg/pl	kg/m^2	to/ha	
V_1	Classic	Triumph $F_1(mt_1)$	41	52.45	2.150	4.730	47.30	-
V_2		Mirabelle F_1	48	50.16	2.408	5.925	59.25	+
V_3		Pasalimo F_1	52	46.12	2.398	5.276	52.76	+
V_4		Kybria F_1	43	42.94	1.846	4.060	40.60	-
V_5	Fertirigation with Yara fertilizer	Triumph $F_1(mt_2)$	57	54.37	3.094	6.808	68.08	+
V_6		Mirabelle F_1	72	57.13	4.136	9.100	91.00	+
V_7		Pasalimo F_1	78	48.80	3.833	8.433	84.33	+
V_8		Kybria F_1	63	48.51	3.044	6.697	66.97	+

Table 4

Experimental results synthesis
Fertilization of cucumber type cornichon in greenhouses, SC Mogos Agro SRL, Buzau – 2009

Var.	Fertilization	Cultivars	Production kg/m^2	Productiondifferences compared to the witness 1	Semnification	Production differences compared to the witness 2	Semnification
V_1	Classic	Triumph F_1(mt_1)	4.730	_	_	-2.078	000
V_2		Mirabelle F_1	5.925	+1.195	xx	-0.883	00
V_3		Pasalimo F_1	5.276	+0.546	x	-1.532	00
V_4		Kybria F_1	4.060	-0.670	0	-2.748	000
V_5	Fertirigation with Yara fertilizer	Triumph F_1(mt_2)	6.808	+2.078	xxx	_	_
V_6		Mirabelle F_1	9.100	+4.370	xxx	+2.292	xxx
V_7		Pasalimo F_1	8.433	+3.703	xxx	+1.625	xx
V_8		Kybria F_1	6.697	+1.967	xxx	-0.111	_

DL - 5 % = 0.394
DL - 1 % = 0.879
DL - 0.1 % = 1.643

Researches regarding the behavior of some new cultivars of cornichon cucumbers in solarium

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Keywords: cornichon cucumbers, cultivars, solarium, autumn consume culture

ABSTRACT

Cucumbers, cornichon type are in Romania a performance culture in greenhouses, both for early production and for fall production. After 1990, the technology culture of this species have entered in our country elements of technological progress such as total flowering cultivars F1 with gino and parthenocarpic fruiting, resistance and/or tolerant to diseases, drip irrigation systems, soluble fertilizers used for fertirigation, systemic fungicide performance, and others. This scientific paper presents results obtained in autumn crops production in solar for a wide range of F1 cultivars recently introduced in the supply of seeds for the our country. Through production results are remarkable: Mirabelle F1 with 91 t/ha, Pasalimo F1 with 84.33 t/ha, Sirius F1 with 72. 4 t/ha and Triumph F1with 68 t/ha, which is of particular importance for the modernization of the range of type cornichon cucumbers in greenhouses recommended for extension, producing for consumption fall.

INTRODUCTION

Cucumbers grown in greenhouses in Romania are the second ranks in areas cultivated with vegetables in solarium. With a long period of relatively low vegetation cornichon cucumbers type can be grown in greenhouses both consumption early summer crops, and in successive crops grown for fall, used by consumers for both fresh consumption and for pickles. After 1990, offering materials required to achieve the culture of cucumber production has diversified a lot, especially about material with biological performance, consisting of recent generation hybrids, created in countries with advanced technology, such as Holland and France (Atanasiu, 1999, 2002). The behavior of solar production in various areas of culture in our country is different. Take view of these considerations, the aims of this paper is to establish the cultivars with outstanding performance of the production that will be recommended for expansion in successive cultures in full solarium .The material which is part of this scientific paper presents detailed results on the production and quality for the 9 cultivars F1, from the local and European origin in the solar in Buzau vegetable basin.

MATERIALS AND METHODS

Variants studied (Table 1), includes two local cultivars created at SCDL F1 Buzau and seven Holand cultivars F1. The entire assortment used to accomplish the experience is characterized by ginoic flowering and predominant partenocarpic fructification.As witnesses were choose cultivar Sirius F1and F1 Triumph of indigenous origin, which are well known by all farmers in the area, which grow cucumbers in greenhouses for winter consumption.

The objectives of the research were:

- Timing of vegetation and cultural calendar for cultivars to work;
-Establishment of vegetative plant growth parameters of the experimental assortment;
-Determination of total production and the quality of its structure, of the experimental assortment;
-Development of some recommendations and conclusions on the best options for growing cucumbers cornichon type in greenhouses;

Experimental conditions:

The experience was mounted in a solar block wrapped during the cold season, an endowment of SC Mogos Agro SRL, located outside the Buzau city, in Gălbinaşi respectively DN 2B (Buzau- Braila), at 7 km, on the right side.

The soil of the experiments is a form of protisoils class, presenting medium-fine texture, recent river deposits formed on (sand dust, sand clay) which have improved and evolved to a variety of molic alluvial soils.

So the soil is alluvisol molic epicalcarpic (AS mo-ka)-TT/TT.

The most important properties of soil in the area are:

- Soils are relatively young age and formed under simultaneous action pedo-genetic factors, vegetative factors dominating the landscape. So for example in the vicinity of Buzau evolved alluvial soil fallow, and soil sandy alluvial frame low-clayey nisipo fallow frame.

- Depending on the degree of range and fallow soil profile. The poor fallow soil, horizontal thickness is 22-25 cm, humus content and fertilizing elements are in low quantities, while the average fallow soil horizon A thickness is 35-40 cm and the humus and nutrient content is in larger quantities. Agroproductiv-speaking, the soil would form one group, medium hard texture and good permeability. Can be irrigated without large loss of water.

- Soil reaction is neutral or slightly alkaline. This is determined by soil carbonate content. Soil salinity is low, not exceeding 0.05%.

The soil which is placed SC Mogos Agro SRL is favorable for the culture of vegetable species such as tomatoes, bell pepper, cabbage and less suitable for deep-rooting crop roots.The farmer has a wide range of total soluble fertilizers, simple or complex products, Yara, Finland, who`s program was used for the fertilization of culture.The crop was evalueted on local market, taking into account the needs of consumers (relatively small fruit, with length of 7-9 cm for fresh consumption or preparation of pickles in conditions specific family households).

The main elements of culture technology experience applied were:

- cancellation of pre-culture (tomatoes in short cycle) in early June, with removal of plant debris field and production of specific materials;
- Basic fertilization was performed with 7-8 kg manure/m^2, 150 g superphosphate at m^2 and 50 g potassium sulphate at m^2;
-plowing base - the land was thoroughly prepared by plowing done with monoculture (tractor V445 + MSS-1, 4) at 20 cm depth;
- shredding was conducted with motofreza (tractor V445 + FV-1, 4);
- installation of fertilization system;
- experimental planting of the crop-executed on July 18 at a depth of 2 cm, with 4-week-old seedlings, made in farm, according to the following schedule:

$$\frac{1.40\ \text{m} + 0.60\ \text{m}}{2} \times 0.45\ \text{m between plants on a row} = \mathbf{22.222\ plants/ha.}$$

Planted in rows not equidistant from 1 m row, but in strips $\frac{1.40\ \text{m} - 0.60\ \text{m}}{2}$ because we considered it more practical (not walked between rows of 0.60 m, although there is likely not to use the most sunlight).

Number plants/m^2 = 2.2

After planting experience, there were these works care:

-filling gaps;
-palisade;
-application of cuts to guide growth and fructification;
-fertirigation;
- surface for loosening soil, cultivate and weed control;
-treatments to prevent and control diseases and pest attacks;
- the harvest was done manually in stages, at intervals of 2-3 days, picking the fruit with a length of 7-9 cm and average weight of 45-57 g.

At the experience there were made determinations and observations on:
- calendar-culture and the vegetation period;
- vegetative-growth dynamics and harvesting;
- total production and its quality elements;

RESULTS AND DISCUSSIONS

On planting, seedling age was 27 to 29 days. Vegetation period was set a total number of days since the date of spring mass at the first harvest.

It is found that this the period of vegetation differ in little limits, being between 61-63 days.

It highlights a great earliness at Sirius F1 cultivars, Mirabelle F1, Pasalimo F1 with 61 vegetation period. The late cultivars are Crispin F1, F1 Vertina with 63 days. As a general note we consider that vegetation periods registered are characteristic to cornichon cucumbers culture in greenhouses in autumn cycle (Table 2).

Average weight of fruits is relatively low, ranging between 45-57 g. The production is valued on the open market during the request by customers with less weight of fruit, canned specific craft production, household, family consumption during winter (Table 3).

Production results ordered by variant and repetitions and expressed in kg/m ^{2} were interpreted statistically by variance analysis method. Production results and the differences between them and the two witnesses of the experience are presented in Table 4.

Compared to witness production (Sirius F1 = 7.240 kg/m^2), it is found that the differences between these variants and those made at 2-9 have different statistical coverage, negative differences are significant presented in table.

Mirabelle F1 is distinguished by a total production of 9.100 kg/m ^{2}, exceeding the very significant, with + 1.860 kg/m^2 witness production (Sirius F1).

The other variants (V4 Crispin F1 and V5 Vertina F1), negative differences are very significant comparison to the witness.

The second set of results synthesis, compared with mt$_2$ (Triumph F1) it is found that at V1, V6, V8 and V9 differences obtained are insignificant.

At V7 (Pasalimo F1 + 1.625 kg/m^2) the difference is distinct significant positive, and at Crispin F1 and Vertina F1, the negative differences are large, very significant ones.

And at that series of results, it is remarkable Mirabelle F1 cultivar, which, with its production of 9.100 kg/m^2 exceeds very significant (2.292 kg/m ^{2}) the mt$_2$ witness production.

CONCLUSIONS

Based on the results presented in previous subsections, the following conclusions can be drawn:

1. Testing assortment to work with in the experience highlights the fact that some cultivars are very advanced, while others showed a level below the typical assortment of domestic production (Sirius F1 and Triumf F1);
2. It noted in particular Mirabelle F1cultivar performance production (9.100 kg/m^2), which exceeding with significant positive differences the high production of the two witnesses of experience. Also among the witnesses and the production made by Pasalimo F1, there are positive differences (1.193 kg/m ^{2} and 1.625 kg/m^2), which are very significant;
3. Cultivars Crispin F1, Vertina F1, F1 Artist, Kybria F1 and Karaoke F1 registered lower productions than of witnesses, the difference are negative (Crispin F1, Vertina F1) or without coverage statistics (Artist F1, Kybria F1 and Karaoke F1) compared to mt$_2$ (Triumph F1);
4. Considered necessary to continue further research and experimental program.

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TABLES

Table 1

Experimental variants
Cornichon cucumber cultivars in solarium, SC Mogos Agro SRL, Buzau – 2009

Var.	Cultivar	Origine	Consume destination	
			In fresh weight	Industrialization and consume in winter
V_1	Sirius F_1 (mt_1)	Romania	Spring, summer, autumn	Autumn
V_2	TriumfF_1(mt_2)	Romania	Spring, summer, autumn	Autumn
V_3	Mirabelle F_1	Holand	Spring, summer, autumn	Autumn
V_4	Crispina F_1	Holand	Spring, summer, autumn	Autumn
V_5	Vertina F_1	Holand	Spring, summer, autumn	Autumn
V_6	Artist F_1	Holand	Spring, summer, autumn	Autumn
V_7	Pasalimo F_1	Holand	Spring, summer, autumn	Autumn
V_8	Kybria F_1	Holand	Spring, summer, autumn	Autumn
V_9	Karaoke F_1	Holand	Spring, summer, autumn	Autumn

Table 2

Characteristic data of the principal phenophases and vegetation periods. Cultivars cucumber cornichon in, SC Mogos Agro SRL, Buzau-2009

Var.	Cultivar	Seeding data	Spring data	Trnsplanting data	Age of transplants (no.days)	The data of the first harvest (no.days)	Vegetation period (no.days)	Harvest period (no.days)	Cancellation of the previous culture
V_1	Sirius F_1(mt1)	18 June	21 June	18 July	27	24 Aug.	61	64	28 Oct.
V_2	Triumf F_1(mt2)	18 June	22 June	18 July	28	24 Aug.	62	64	28 Oct.
V_3	Mirabelle F_1	18 June	21 June	18 July	27	24 Aug.	61	64	28 Oct.
V_4	Crispina F_1	18 June	23 June	18 July	29	24 Aug.	63	64	28 Oct.
V_5	Vertina F_1	18 June	23 June	18 July	29	24 Aug.	63	64	28 Oct.
V_6	Artist F_1	18 June	22 June	18 July	28	24 Aug.	62	64	28 Oct.
V_7	Pasalimo F_1	18 June	21 June	18 July	27	24 Aug.	61	64	28 Oct.
V_8	Kybria F_1	18 June	22 June	18 July	28	24 Aug.	62	64	28 Oct.
V_9	Karaoke F_1	18 June	22 June	18 July	28	24 Aug.	62	64	28 Oct.

Table 3

The number of fruits,medium weight and total production. Cultivars cucumber cornichon in, SC Mogos Agro SRL,Buzau- 2009

Variant	Cultivar	Number fruits/plants	Medium weight (g/fruit)	Crop (kg/plant)	Plant density/m^2	Total crop kg/m^2
V_1	Sirius F_1(mt1)	61	54.06	3.290	2.2	7.240
V_2	Triumf F_1(mt2)	57	54.37	3.094	2.2	6.808
V_3	Mirabelle F_1	72	57.13	4.136	2.2	9.100
V_4	Crispina F_1	53	45.80	2.420	2.2	5.325
V_5	Vertina F_1	53	45.97	2.447	2.2	5.384
V_6	Artist F_1	60	49.63	2.999	2.2	6.598
V_7	Pasalimo F_1	78	48.80	3.833	2.2	8.433
V_8	Kybria F_1	63	48.51	3.044	2.2	6.697
V_9	Karaoke F_1	59	50.52	2.970	2.2	6.535

Table 4

Experimental results synthesis. Cultivars cucumber cornichon in, SC Mogos Agro SRL, Buzau- 2009

Variant	Cultivar	Total crop kg/m^2	Crop differences for mt$_1$		Significant	Crop differences for mt$_2$		Significant
			Kg/m^2	%		Kg/m^2	%	
V$_1$	Sirius F$_1$(mt1)	7.240	0	0	-	+0.432	+5.97	-
V$_2$	Triumf F$_1$(mt2)	6.808	-0.432	-5.97	-	0	0	-
V$_3$	Mirabelle F$_1$	9.100	+1.860	+2.57	xxx	+2.292	+33.66	xxx
V$_4$	Crispina F$_1$	5.325	-1.915	-26.45	ooo	-1.483	-21.78	ooo
V$_5$	Vertina F$_1$	5.384	-1.856	-25.63	ooo	-1.424	-20.92	ooo
V$_6$	Artist F$_1$	6.598	-0.642	-8.87	o	-0.210	-3.08	-
V$_7$	Pasalimo F$_1$	8.433	+1.193	+16.47	xx	+1.625	+23.87	xx
V$_8$	Kybria F$_1$	6.697	-0.543	-7.50	o	-0.111	-1.63	-
V$_9$	Karaoke F$_1$	6.535	-0.705	-9.74	o	-0.273	-4.00	-

DL – 5% - 0.483 kg/m^2
DL – 1% - 0.945 kg/m^2
DL – 0.1% - 1.716 kg/m^2

Setting up the degree of suitability of some types of soil for directly sowed onion crop

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Keywords: physical properties, typical chernozem, calcareous alluvial soil, Diamant, Daytona F1

ABSTRACT

The researches have been done with the scope of establishing the suitability of two types of soil (typical chernozem and calcareous alluvial soil) for the onion crop set up through direct sowing.

The biological material used for performing the experience was Diamant sort and Daytona F1 hybrid, with applying the same crop technology.For Diamant cultivar, the highest level of production was recorded on typical chernozem soil 34.75 t/ha. The cultivation of this sort on the other type of soil has as consequence a decrease of production level, being recorded negative differences as against mt 1 (V1) with statistic cover.

The negative difference of -15.75 t/ha as against the standard sample, recorded at cultivating the some sort on calcareous alluvial soil (V3) is very significant.As compared with the standard sample – Diamant sort cultivated on typical chernozem, it is seen that the production performances of Daytona F 1 cultivar are superior in case of variant 2 (Daytona F1/typical chernozem), a very significant positive difference.

Following to the researches performed, it resulted that the highest production was obtained on typical chernozem soil (42.00 t/ha)) against only 54.67 t/ha on calcareous alluvial soil in case of Daytona hybrid. In case of Diamant sort, the level of the productions obtained was a little bit lower, but it varied in the same way as per the type of soil on which the crop was set up.

INTRODUCTION

The onion occupies forth place among the main vegetable species cultivated at world level and it represents 6% from world vegetables production. In Romania, out of the total area of 278.9 thousands ha cultivated with vegetables in year 2006, 33.6 thousands ha were cultivated with onion, and out of total vegetables production of 4141.4 thousands tons, 10 % was represented by onion. Braila County is found in a very favourable area from point of view of the ecological areas for onion crop (region with long, rainy and adequately warm springs, but in the second part of the summer, the time must be warm and dry) (Voinea, 1977). Out of the total area cultivated with vegetables at county level in year 2007 (3.3 thousands ha), about 20% is cultivated with onion, and from total vegetables production (30.6 thousands tons), onion represents 17% (Soare, 2008).Average production at county level is quite low, about 12.4t/ha, in the case when crop's profitableness by using the direct sowing technology starts from a production of minimum 20 t/ha, even with manual harvesting (Popandron, 2006).

The soil on which the onion crop is set up conditions the size of the production through its physical (texture, structure, porosity, etc.) and chemical properties (pH, humus content, mobile potassium and phosphor content, content of soluble salts etc) (Dumitrescu, 1998). Alluvial soils are often recommended, but they are not always appropriate, due to the fact that in some meadows, alluvial deposits contain much clay that is equally allotted on the profile of the soil (Munteanu, 2001).The low level of hydraulic conductivity and of infiltration rate determines a low water stability of structural aggregates, with effect on the air-water regime of the soil and implicitly, on onion production (Ramirez, 1997). In order to obtain high, stable and qualitatively productions at onion crop, it is recommended to use hybrids homologated in last years by companies which are large producers of seeds mainly from Europe, due to the fact at onion, bulb's development is decisively influenced by the duration of day and by the temperature during vegetation (Popandron, 2005). Actual sort was enriched by some hybrids that are appropriate for crop through direct sowing and is characterized by large productions and by earliness: Daytona, Romito, Milena, Tamara, and Cortland (Luchian, 2007).

MATERIALS AND METHODS

The researches have been made between 2003-2005, on experimental variants mounted on the two types of soil, four repetitions each: typical chernozem that is part of Cernisoils class, class that at the level of Braila county occupies about 50% from the area and calcareous alluvial-soils, soil that is part of Protisoils class, class of soils that occupies about 27 % from the arable area of Brăila county.For each type of soil, the experimental variants have been mounted in multi-staged blocks without randomization, the experimental surface being of 480 m² for each type of soil, the area of a repetition being of 60 m² and total area of the experience for the two types of soil was of 960 m².

The biological material used for performing the experience was Diamant sort and Daytona F1 hybrid, with applying the same crop technology.

Diamant Sort is a typical sort for the crop through direct sowing, semi-late, with a period of vegetation of 145-150 days; the dry bulbs have the shape of a sharp cone form, with a slight tendency of flattening, covered with cataphylls of yellow-coppered colour.
Average weight of the bulbs is of 140-150 g, with a limit of variation between 90-300 g. The production potential in very good technological conditions is of 40-45 t/ha.

Daytona F1 Hybrid is of Dutch origin, it has a period of vegetation of 110-115 days, it presents resistance to Fusarium and tolerance to Botrytis. It has a root system very well developed, the bulbs have the ball shaped – elongated form, and the colour of the cataphylls is beige – brown. The production potential is very good, under conditions of well applied technologies, productions of 50-60 t/ha are easily obtained. The bulbs have the average weight between 90-100 g and are characterized through an increased uniformity.

Establishing the degree of suitability for onion crop directly sowed for each type of soil, was based on establishing on the depth of the arable layer (0-40 cm) of some physical (texture, apparent density, porosity) and chemical properties (pH, humus content, total content of soluble salts, mobile P2O5 and mobile K2O).

The texture of soil was determined based on the proportion of granulometric fractions (sand, dust, clay) that intervene in its set up that was made through treating the soil sample by Kacinski method and separating the granulometric fractions through screening and dropping. The method consists in dissipation of granulometric fractions by treating the soil sample with solution of hydrochloric acid 0,2 n, washing with solution of hydrochloric acid 0.05 n, treating with solution of sodium hydrate 1 n and boiling. Separating the particles is made through screening (for coarse sand, with diameter over 0,02 mm) and dropping (for dust and clay, with diameter equal to or less than 0, 2mm). Apparent density (AD) was determined by reporting the sample of dry soil to the strove at 105°C, to total volume of the soil sample. Total porosity (TP) was determined through calculation by the formula: TP = (1-AD) x 100/D. Aeration porosity (AP) was determined through calculation by the formula: AP=TP-FC x AD. The structure of soil was determined on site based on morphological characterization of the soil profile. The reaction of the soil expressed through pH units was determined through potentiometric method in water slurry in ratio of 1:2.5. Humus content was determined through the method of wet oxidation and titrimetric dosing (Walkley-Black). Total content of soluble salts was determined through conductometric method in soil extract in soil: water ratio of 1:5. Mobile phosphorus (P2O5) was determined through Egner-Riehm-Domingo method, in solution of lactate ammonium actate. Mobile potassium (K2O) was determined through photometric method in Egner-Riehm-Domingo extract (Basaraba, 2000).

RESULTS AND DISCUSSIONS

The significance of noting down the horizons is the following:
Ap Horizon (A processed) that defines the ploughed layer from the surface of the soil and which, due to its being cultivated, it suffers changes that make it different from the balance of the horizon not worked on.
Am Horizon (A molic) is characterized by cumulating best quality humus, that gives it a dark colour and a very good structure, due to which it is aerated.

The results obtained following to establishing the physical properties of typical chernozem are presented in table 1. From table 1 it results that on the depth 0-40 cm, in the granulometric set-up of typical cernozem soil it predominates the soft sand (42.08-44.44%) that determines a loamy texture (medium), with positive properties on soil's suitability for the onion crop directly sowed, due to the fact that the soil does not form crust. The values of apparent density 1.16 -1.18 g/cm³ show an aerated soil that allows a good development of the root system in depth, the sowing being done at a depth of 2.0 cm. The well developed glomerular structure ensures on the depth of 0-40 cm a total porosity comprised between 56.3-55.2 %, out of which aeration porosity is of 23.8 -23.6 %, these values ensuring to the plants an aero-water regime favourable to an optimum breeding and development. Due to the structuring, soil moistures on high depth that leads to forming water reserves in depth, and in the draught periods, no cracks appear in the soil.

Analysing the results obtained at determining the chemical properties presented in table 2**,** it is observed that the reaction of the soil on the depth of 0-40 cm is slightly alkaline with values of pH between 7.81-7.87. The soil's supply with humus is medium, with values comprised between 3.58-2.49 %, these values ensuring a humus reserve on the depth of 0-40 cm of 156 t/ha.

The supply with mobile phosphor is weak, the content of mobile phosphor varying between 46-39 ppm, this making necessary the application of chemical fertilizers with phosphor. The content of mobile potassium is medium (225-160 ppm). The total content of soluble salts is under 100 mg/100 g soil that shows that the soil is not affected by salinization processes. The significance of noting down the horizons is for Ap and AC horizons the same as for typical chernozem, and Ao horizon (A ocric) is characterized through a light colour due to a small content of organic material and it becomes massive and hard or very hard in the dry period of the year.

From table 3 it results that in the granulometric set up of calcareous alluvial-soil it predominates the clay mineral fraction, with values between 42.88-44.01% determining including the soil in soft textural class, clayish loam subclass, with negative properties on soil's suitability for the onion crop directly sowed, due to the fact that soil forms a crust. The soft texture determines: reduced aeration, humidity excess in the rainy periods and water puddles at soil's surface, a short interval of optimum humidity in the soil, a high resistance at ploughing, superficial rooting. The value of apparent density on the depth of 0-10 cm of 1.25 g/cm³, shows a soil with a moderate compactation even from the surface, that makes sowing to be made more superficially at the depth of 1.5 cm and energy consumption for performing the ploughing works and for preparing the germinal bed should be high; also, for obtaining some quality works, there is necessary to perform more crossings, and the interval of time when the soil can be worked on is short. The compacting of the soil has as effect also the fact that the soil is hard to warm. On the depth of 15-40 cm, apparent density has values of 1.37 - 1.42 g/cm³, that leads to a soil compacted in depth. The small grain size structure, poorly developed, ensures values of total porosity of 47.5-44.7 %, out of which 10.3-4.0 % is aeration porosity. These values of aeration porosity are small, that is why the air regime from soil is not satisfactory to the respiration of onion plants' roots. This presupposes applying a higher number of soil's aeration works during vegetation period. Over the depth of 40 cm, the soil is not structured, that is why it cannot form water reserves in depth; consequently, phenomena of puddles appear when abundant precipitations fall or when high norms of irrigations are used.

From table 4 it results that the reaction of the soil is lightly alkaline, with values of pH between 7.82-7.94. It is observed that at the same time with the depth, the value of pH increases also, because it takes place an increase of the quantity of calcium carbonate that is washed from the surface to the base of the soil profile. Soil's supply with humus is poor, the content of organic material varying between 2.94-2.47 % that ensures humus reserve of 113 t/ha on the depth 0-40 cm. The supply with mobile phosphor is poor, its content varying between 47-42 ppm that makes necessary to apply the fertilizers with phosphor. The content of mobile potassium is medium (197-165 ppm). The total content of soluble salts is under 100 mg/100 g soil that shows that the soil is not affected by salinization processes. The results of onion bulbs' production on the two types of soil analysed and on each cultivar are presented in table 5. The results regarding the production recorded during the three years of experiments reported in t/ha, have been arranged per variants and repetitions wise. These data regarding average production of each variant have been statistically interpreted as per the method of the analysis of the variation specific to bi-factorial experiences. From the tables with synthesis results there have been chosen for presentation only those regarding the influence of the type of soil and cultivar on the production at the onion directly sowed.(table 6 and 7)

From table 6 it results that for Diamant cultivar; the highest level of production was recorded on typical chernozem soil 34.75 t/ha. The cultivation of this sort on the other type of soil has as consequence a decrease of production level, being recorded negative differences as against mt 1 (V1) with statistic cover. The negative difference of -15.75 t/ha as against the standard sample, recorded at cultivating the some sort on calcareous alluvial soil (V3) is very significant. At Daytona F1 hybrid, against standard sample (V2), at variant 4 (culture on calcareous alluvial soil), statistic interpretation highlights a negative difference of -19.02 t/ha, difference also very significant. Synthesis data regarding sort's influence on total production at onion directly sowed presented in table 7 highlights following aspects: As compared with the standard sample – Diamant sort cultivated on typical chernozem, it is seen that the production performances of Daytona F 1 cultivar are superior in case of variant 2 (Daytona F1/typical chernozem), a very significant positive difference.In the same conditions, the similar differences of production between the standard sample and the other variant at which it was worked with Diamant sort is negative (-15.75 t/ha), having a very good statistical cover (a very significant negative difference).In a similar case is found also the variant V4 (Daytona F1/calcareous alluvial soil) at which the negative difference (-11.77 t/ha) against the standard sample is very significant.

CONCLUSIONS

For onion crops directly sowed, the typical chernozem type of soil is recommended, on which the production obtained was superior at the two cultivars with which it was worked, as against calcareous alluvial soil.

The production performances of this technology of crop on alluvial soils are not good for the cultivars with which it was worked on. This observation allows formulating the recommendation that on the alluvial soils with clayish loamy texture, directly sowed onion crops should not be set up, no matter if traditional sorts (Diamant) or hybrids of recent generation (Daytona F1) are used.

Out of the two cultivars used, it is recommended using with priority Daytona F1 hybrid, due to the fact it is more productive (42.0 t/ha), as compared with traditional sort Diamant (34.75 t/ha).

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TABLES

Table 1

Physical properties of typical chernozem soil formed on loamy loess in plain conditions

Specification/horizons Depths (cm)	**Ap 0-20**	**Am 30-40**
Coarse sand (2,0-0,2mm)%	0.05	0.05
Soft sand (0,2-0,02mm)%	44.44	42.08
Dust (0,02-0,002mm)%	25.49	31.29
Clay (under 0,002mm)% out of which:	30.02	26.58
Physical clay (under 0.01mm)%	37.93	43.56
Texture	LL	LL
Apparent density (AD g/cm^3)	1.16	1.18
Total porosity (TP%)	56.30	55.20
Aeration porosity (AP%)	23.80	23.60

Table 2

Chemical properties of typical chernozem soil formed on loamy loess in plain conditions

Specification/horizons Depths (cm)	**Ap 0-20**	**Am 30-40**
pH in water	7.81	7.87
Humus (%)	3.58	2.49
P mobile(ppm)	46	39
K mobile(ppm)	225	160
Soluble salts (1:5) mg/100g soil	-	62

Table 3

Physical properties of calcareous alluvial soil formed on river deposits, under conditions of plain meadow

Specification/horizons Depths (cm)	**Ap 0-10**	**`Ao 15-25**	**AC 30-40**
Coarse sand (2,0-0,2mm)%	0.19	0.16	0.06
Soft sand (0,2-0,02mm)%	24.56	21.03	14.83
Dust (0,02-0,002mm)%	32.37	34.80	40.54
Clay (under 0,002mm)% out of which:	42.88	44.01	44.57
Physical clay (under 0.01mm)%	65.54	71.64	73.54
Texture	LA	LA	LA
Apparent density (AD g/cm^3)	1.25	1.37	1.42
Total porosity (TP%)	47.50	45.60	44.70
Aeration porosity (AP%)	10.30	5.70	4.00

Table 4

Chemical properties of calcareous alluvial soil formed on river deposits, in conditions of plain meadow

Specification/horizons Depths (cm)	Ap 0-10	Am 15-25	AC 30-40
pH in water	7.82	7.86	7.94
Humus (%)	2.94	2.77	2.47
P mobile (ppm)	47	45	42
K mobile (ppm)	197	184	165
Soluble salts (1:5) mg/100g soil	-	71	61

Table 5

Average of onion bulbs' production (t/ha) directly sowed, per repetitions and variants wise, in Brăila County, in the period 2003-2005

Variant No.	Specification	Cultivar	Average per repetitions				Average of variant
			R1	R 2	R 3	R 4	
1 (mt)	Typical	Diamant	34.41	36.25	34.84	33.52	**34.75**
2	chernozem	Daytona F1	42.43	42.70	41.96	40.92	**42.00**
3	Calcareous	Diamant	20.26	19.89	18.32	17.54	**19.00**
4	alluvial-soil	Daytona F1	23.41	24.78	21.86	21.87	**22.98**

Table 6

Influence of type of soil on total production at onion directly sowed in Braila County, in the period 2003-2005

Variant No.	Type of soil	Cultivar	Average production		Differences	Significance
			t/ha	%	t/ha	
1 (mt 1)	Typical	Diamant	34.75	100.00	0.00	**-**
2 (mt 2)	chernozem	Daytona F1	42.00	100.00	0.00	**-**
3	Calcareous	Diamant	19.00	54.67	-15.75	**ooo**
4	alluvial-soil	Daytona F1	22.98	54.71	-19.02	**ooo**

DL 5 % = 1.28 t/ha
DL 1 % = 1.84 t/ha
DL 0,1 % = 2.70 t/ha

Table 7

Influence of the cultivar on total production at onion directly sowed in Braila County in the period 2003-2005

Variant No.	Type of soil	Cultivar	Average production		Differences	Significance
			t/ha	%	t/ha	
1 (mt 1)	Typical	Diamant	34.75	100.00	0.00	**-**
2 (mt 2)	chernozem	Daytona F1	42.00	120.86	+7.25	***
3	Calcareous	Diamant	19.00	54.67	-15.75	**ooo**
4	alluvial-soil	Daytona F1	22.98	66.13	-11.77	**ooo**

DL 5 % =0.88 t/ha
DL 1 % =1.24 t/ha
DL 0.1 % =1.75 t/ha

Researches regarding the behavior of autumn cabbage crop set up on different types of soil

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Keywords: Krautkaiser, De Buzau, chernozem, alluvial soil, physical properties

ABSTRACT

The researches performed had as objective determining the types of soil that offer the best conditions for autumn cabbage crop that will be recommended for micro-zoning this crop in Braila County.

Experimental variants mounted on each of the four types of soil, four repetitions each: typical chernozem, saline chernozem, calcareous alluvial-soils and saline alluvial- soils.

For each type of soil, the experimental variants have been mounted in multi-staged blocks without randomization, the experimental surface being of 480 m² for each type of soil, the area of a repetition being of 60 m² and total area of the experience for the four types of soil was of 1920 m².

The biological material used for performing the experience was De Buzău sort and Krautkaiser F1 hybrid, with applying the same crop technology.

Accordingly, for the sort De Buzău, the highest level of production was recorded on calcareous alluvial soil 90.44 t/ha, recording a positive difference distinctly significant against standard sample. Cultivating this sort on other types of soil had as consequence decrease in production level, being recorded negative differences against mt 1 (V1) with statistic cover.

At Krautkaiser F1 cultivar, against the standard sample (V2), at variant V6 (crop on calcareous alluvial soil), the statistic interpretation highlights a positive difference of +4.76 t/ha that is very significant. At the same cultivar, the negative production differences of -3.86 t/ha and -8.18 t/ha are very significant.

Setting up the autumn cabbage crops by using the cultivars De Buzău and Krautkaiser F1 is recommended on calcareous alluvial and typical chernozem soils, because on these types of soil, there have been obtained productions larger by 8.53-14.26 t/ha at De Buzău sort and by 8.62-12.94 t/ha at Krautkaiser F1 hybrid, as against saline chernozem and saline alluvial soil.

INTRODUCTION

White cabbage is considered a medicine vegetable, even though the food value is reduced; cabbage is consumed during entire year in fresh state or sauerkraut, due to its content in mineral salts, carbohydrates and vitamins.The main producer of cabbage in the world is Asia, which produces over 70 % from world production, as against Europe where about 19 % from total production is produced. In our country, the area occupied with cabbage in year 2006 was of about 45 thousand ha, that means about 10% from the area cultivated in Europe, and out of European cabbage production, in our country there is produced about 7%. Annual consumption of cabbage/inhabitant is about 25-35 kg, which means approximately 1/4 from total vegetables consumption (Beceanu, 2006). In Brăila county, cabbage occupies forth place as surface, the percentage being 6 % from total area cultivated with vegetables at county level (4 thousand ha) and 10% out of the total of vegetables production (52.6 thousand tons) (Soare, 2008). The soils recommended for autumn cabbage crop are the medium to compact soils that retain water better during summer and are heating less, with a neutral to slightly alkaline reaction (pH=6.5-7.8) (Apahidean, 2007). On heavy soils, cabbage productions are reduced due to the fact that cabbage develops a weak root system, in this case being diminished the possibilities to supply with water and nutritional substances (Dumitrescu, 1998). Total area of root system is 50 times larger than leaves area. Actual range of white cabbage cultivars comprises foreign sorts and hybrids (Ballet F1, Falvius F1. Musketter F1, Piton F1, Santorino F1) that proved to be adaptable to the climate conditions from our country (Glăman, 2005). Comparing the suitability of different sorts (Field Winner, Varazdinski) and hybrids (Cecile, Krautman, Krautkaiser) of cabbage for pickling, it was noticed that the hybrids have big and globular head and short internal stem as compared with the sorts at which the head is flattened and with internal stem longer with up to 50% as compared to hybrids. These characteristics of hybrids recommend them for being conserved by pickling (Zutic, 2007).

The fertilization of the cabbage crop on the direction of the rows proved to be an efficient method by improving the uniformity of growth, without having any connection to the natural fertility of the soil (Murakami, 2006). The efficiency of weeds' chemical control in cabbage crops is influenced by the moment of crop's set up, so the quantity of bio-mass of the weeds is the largest when the crop is set up earlier and decreases as the cabbage crop is set up later (Caruso, 2000).

MATERIALS AND METHODS

The researches have been made between 2003-2005, in Braila County, on experimental variants mounted on each of the four types of soil, four repetitions each: typical chernozem, saline chernozem, soils that are part of Cernisoils class, class that at the level of Braila county occupies about 50% from the area and calcareous alluvial-soils and saline alluvial soils, soils that are part of Protisoils class, class of soils that occupies about 27 % from the arable area of Brăila county. For each type of soil, the experimental variants have been mounted in multi-staged blocks without randomization, the experimental surface being of 480 m² for each type of soil, the area of a repetition being of 60 m² and total area of the experience for the four types of soil was of 1920 m². The biological material used for performing the experience was De Buzău sort and Krautkaiser F1 hybrid, with applying the same crop technology.

De Buzău Sort is an aboriginal sort created at Vegetable Research and Development Station Buzau, recorded in the Official Catalogue of crop plants' sorts and hybrids since 1962. It is a late sort of autumn cabbage, with a period of vegetation of 135 –145 days from the date of planting, tolerant against diseases, with a very vigorous growth. It forms a large rosette of leaves, the head has the globular - flattened form, very tight, of rimed green- bluish color, soft interior leaves, of white color, juicy, average weight of the head 2 – 3.5 kg.

Krautkaiser F1 is a Dutch hybrid, recorded in Official Catalogue of crop plants' sorts and hybrids since 1998.It is a late hybrid of autumn cabbage, with a vegetation period of 140-145 days after planting.The growth is vigorous; the head has a rounded-flattened form, average weight 2.5-3 kg. It is a very productive hybrid that is kept in the field for a longer period of time without cracking and is recommended for pickling.

These four types of soil have been analyzed from point of view of physical properties (texture, structure, apparent density, porosity, capacity of maximum accumulation of water), determining these physical properties being done through specific methods.

The texture of soil was determined based on the proportion of granulometric fractions (sand, dust, clay) that intervene in its set up that was made through treating the soil sample by Kacinski method and separating the granulometric fractions through screening and dropping. The method consists in dissipation of granulometric fractions by treating the soil sample with solution of hydrochloric acid 0,2 n, washing with solution of hydrochloric acid 0.05 n, treating with solution of sodium hydrate 1 n and boiling. Separating the particles is made through screening (for coarse sand, with diameter over 0.02 mm) and dropping (for dust and clay, with diameter equal to or less than 0.2mm). Apparent density (AD) was determined by reporting the sample of dry soil to the strove at 105°C, to total volume of the soil sample. Total porosity (TP) was determined through calculation by the formula: TP = (1-AD) x 100/D.Aeration porosity (AP) was determined through calculation by the formula: AP=TP-FC x AD. Capacity of maximum giving up of water into the soil (%) was calculated as per the formula: CAC max = TC-FC, where TC = total water capacity of the soil, and FC= soil's field water capacity. The structure of soil was determined on site based on morphological characterization of the soil profile.

RESULTS AND DISCUSSIONS

The behavior of autumn cabbage crop is firstly influenced by the physical and chemical properties of the soil, then by the production's genetic potential of the cultivar and not lastly, by the elements of the technology applied. In this document, there are determined the physical properties of those four types of soil (typical chernozem, saline chernozem, calcareous alluvial soil and saline alluvial soil), these being correlated with the size of the productions obtained at the two cultivars with which is was worked.

The significance of noting down the horizons is the following:

Ap Horizon (A processed) that defines the ploughed layer from the surface of the soil and which, due to its being cultivated, it suffers changes that make it different from the balance of the horizon not worked.

Am Horizon (A molic) is characterized by cumulating best quality humus, that gives it a dark colour and a very good structure, due to which it is aerated.

From table 1 it results that on the depth 0-40 cm, the texture is loamy (medium) because in the granulometric set-up of typical cernozem soil, it predominates the soft sand (42.08-44.44%), texture that favours the root to explore a large volume of soil.

Apparent density between 1.16 -1.18 g/cm³ - values that show an aerated soil that determines performing quality works of the soil. The well developed glomerular structure ensures on the depth of 0-40 cm a total porosity comprised between 56.3- 55.2%, out of which aeration porosity is of 23.8 -23.6%, these values ensuring to the plants an aero-water regime favourable to an optimum breeding and development. The values of the capacity of maximum accumulation of water between 20.5-19.9% show that the soil is permeable, letting the water to flow in depth where water reserves are made.The significance of noting down the horizons is the same as in case of typical chernozem.

From the results presented in table 2 it results that the texture of saline chernozem soil's texture on the depth of 0-40 cm is loamy (medium), predominating in the granulometric set up of the soft sand particles in proportion of 43.68 - 40.0 %, the soil's structure is glomerular and ensures values of total porosity of 53.1-55.4 %, out of which between 28.5-23.7 % is aeration porosity, values that ensure a favorable air-water regime. The values of apparent density 1.16-0-1.20 g/cm³ show an aerated soil that allows an optimum development in depth of the root system; over the depth of 30 cm it takes place an increase in the apparent density values, following to decreasing the content of organic material from the soil.The capacity of maximum giving up of water has values between 23.5-17.7 %, these values showing that the soil is permeable, leaving the water to flow into depth where water reserves are made.At the depth of 40-50 cm, it appears a process of poor salinization of chlorine nature that has a moderate effect on diminishing the production.

The significance of noting down the horizons is for Ap and AC horizons the same as for typical chernozem, and *Ao horizon (A ocric)* is characterized through a light colour due to a small content of organic material and it becomes massive and hard or very hard in the dry period of the year.

From table 3 it results that in the granulometric set up of the calcareous alluvial-soil, it predominates the clay mineral fraction, with values between 42.88 - 44.01% determining the inclusion of the soil in soft textural class, clayish loam subclass. The soft texture determines: reduced aeration, humidity excess in the rainy periods and water puddles at soil's surface, a short interval of optimum humidity in the soil, a high resistance at ploughing, superficial rooting. The value of apparent density on the depth of 0-10 cm is of 1.25 g/cm³, that shows a soil with a moderate compactation even from the surface, that has as effect increasing the energy consumption for performing soil's works; also for obtaining some quality works is necessary to perform more crossings, and the interval of time when the soil can be worked on is short. The compacting of the soil has as effect also the fact that the soil is hard to warm. On the depth of 15-40 cm, apparent density has values of 1.37 -1.42 g/cm³, which show a soil compacted in depth.Values of total porosity of 47.5-44.7 %, out of which 10.3-4.0 % is aeration porosity, are determined by the small grain size structure and poorly developed. These values of aeration porosity are small, that is why the air regime from the soil is satisfactory to the respiration of plants' roots. This presupposes applying a larger number of works of soil's aeration during vegetation period. Over the depth of 40 cm, the soil is not structured and that is why it cannot form water reserves in depth; consequently, phenomena of puddles appear when abundant precipitations fall or when high norms of irrigations are used.The capacity of maximum giving up of water into the soil has small values comprised between 8.7-2.8 % on the depth of 0-40 cm that shows that as the clay content increases, total porosity decreases and the water cannot be drained in depth. The water is lost through evaporation-transpiration at the soil's surface and not long time after humectation, the superficial surface will dry and the plants will suffer due to lack of water. During the periods of drought, cracks appear into the soil that accelerates water loss from soil's depth. But a small soil's capacity of accumulation of water is also benefic to cabbage crop because water retention by soil's particles has as effect prevention of its excessive heating, with high importance because at autumn cabbage, intense vegetable growths appear in very hot periods.

The significance of noting down the horizons is the same as at calcareous alluvial soil. From the results regarding physical properties presented in table 4 it results that the granulometric fraction that predominates in saline alluvial soil composition on the depth of 0-40 cm is clay 42.12-44.78 %, values that determine including the soil in soft textural class, clayish loam subclass, with negative properties on the growth and development of the cabbage plants' root systems.The apparent density on the depth of 0-40 cm has large values between 1.34 -1.44 g/cm³, that shows a compacting process even from the soil's surface with negative effects on the depths of roots penetrations and on the rhythm of soil heating, being necessary to apply works of soil's aeration more often. Also, it is more difficult to prepare the field in order to perform the planting, through more crossings with farming equipments. The small grain size structure poorly developed in the arable layer and the lack of structuring in depth of the soil determines values of total porosity between 49.8-44.8 %, out of which between 14.2 -9.5 % is aeration porosity, ensuring an unsatisfactory air regime. The capacity of maximum giving up of water into the soil has small values comprised between 8.1-2.9 on the depth of 0-40 cm, determining alternation of the periods when the soil is over-saturated with water in periods of excessive drought.

Average cabbage production obtained on each crop variant was statistically interpreted through the analysis of the variation specific to bi-factorial experiences and the results are presented in table 5.

From the results presented in table 5 it results that the type of soil powerfully influences the level of production.Accordingly, for the sort De Buzău, the highest level of production was recorded on calcareous alluvial soil 90.44 t/ha, recording a positive difference distinctly significant against standard sample. Cultivating this sort on other types of soil had as consequence decrease in production level, being recorded negative differences against mt 1 (V1) with statistic cover.On the type of soil: saline chernozem, the production decreases against the standard samples with – 5.26 t/ha, a very significant negative difference.

The negative difference of -10.99 t/ha as against the standard sample, recorded at cultivating the same sort on saline alluvial soil (V7), is very significant. At Krautkaiser F1 cultivar, against the standard sample (V2), at variant V6 (crop on calcareous alluvial soil), the statistic interpretation highlights a positive difference of +4.76 t/ha that is very significant. At the same cultivar, the negative production differences of -3.86 t/ha and -8.18 t/ha are very significant.

CONCLUSIONS

For setting up autumn cabbage crops there are recommended the soils with a medium to heavier texture (loamy-clayish) with a clay content comprised between 33 - 45%, with a good capacity to retain water, well supplied with humus, free of salinization processes (calcareous alluvial soil).

Setting up the autumn cabbage crops by using the cultivars De Buzău and Krautkaiser F1 is recommended on calcareous alluvial and typical chernozem soils, because on these types of soil, there have been obtained productions larger by 8.53-14.26 t/ha at De Buzău sort and by 8.62-12.94 t/ha at Krautkaiser F1 hybrid, as against saline chernozem and saline alluvial soil.

It is not recommended to set up cabbage crops on saline chernozem and saline alluvial soil, but when it is required, it is recommended to use De Buzău sort that is superior to Krautkaiser F1 cultivar.

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Soft sand (0,2-0,02mm)%	44.44	42.08
Dust (0,02-0,002mm)%	25.49	31.29
Clay (under 0,002mm)% out of which:	30.02	26.58
Physical clay (under 0.01mm)%	37.93	43.56
Texture	LL	LL
Apparent density (AD g/cm^3)	1.16	1.18
Total porosity (TP%)	56.30	55.20
Aeration porosity (AP%)	23.80	23.60
Capacity of maximum giving up (%)	20.50	19.90

Table 2

Physical properties of saline chernozem soil formed on loamy loess in plain conditions

Specification/Horizons Depth (cm)	Ap 0-10	Am 30-40
Coarse sand (2,0-0,2mm)%	1.32	1.07
Soft sand (0,2-0,02mm)%	43.68	40.00
Dust (0,02-0,002mm)%	27.18	27.66
Clay (under 0,002mm)% out of which:	27.82	31.27
Physical clay (under 0.01mm)%	40.87	43.04
Texture	LL	LL
Apparent density (AD g/cm^3)	1.16	1.20
Total porosity (TP%)	55.40	53.10
Aeration porosity (AP%)	28.50	23.70
Capacity of maximum giving up (%)	23.50	17.70

Table 3

Physical properties of calcareous alluvial soil formed on river deposits, under conditions of plain meadow

Specification/Horizons Depth (cm)	Ap 0-10	Ao 15-25	AC 30-40
Coarse sand (2,0-0,2mm)%	0.19	0.16	0.06
Soft sand (0,2-0,02mm)%	24.56	21.03	14.83
Dust (0,02-0,002mm)%	32.37	34.80	40.54
Clay (under 0,002mm)% out of which:	42.88	44.01	44.57
Physical clay (under 0.01mm)%	65.54	71.64	73.54
Texture	LA	LA	LA
Apparent density (AD g/cm^3)	1.25	1.37	1.42
Total porosity (TP%)	47.50	45.60	44.70
`Aeration porosity (AP%)	10.30	5.70	4.00
Capacity of maximum giving up (%)	8.70	4.10	2.80

Table 4

Physical properties of saline alluvial soil formed on river deposits, in conditions of plain meadow

Specification/Horizons Depth (cm)	Ap 0-10	Ao 20-30	AC 30-40
Coarse sand (2,0-0,2mm)%	0.04	0.04	0.03
Soft sand (0,2-0,02mm)%	22.69	22.52	22.23
Dust (0,02-0,002mm)%	33.85	35.32	32.96
Clay (under 0,002mm)% out of which:	43.42	42.12	44.78
Physical clay (under 0.01mm)%	75.96	76.07	79.52
Texture	LA	LA	LA
Apparent density (AD g/cm^3)	1.34	1.40	1.44
Total porosity (TP%)	49.80	46.50	44.80
Aeration porosity (AP%)	14.20	11.40	9.50
Capacity of maximum giving up (%)	8.10	4.50	2.90

Table 5

Influence of the type of soil on the autumn cabbage production in Braila County, in the period 2003-2005

Variant No.	Type of soil	Cultivar	Average production		Differences	Significance
			t/ha	%	t/ha	
1 (mt 1)	Typical	de Buzău	87.17	100.00	0.00	-
2 (mt 2)	chernozem	Krautkaiser F1	83.32	100.00	0.00	-
3	Saline	de Buzău	81.19	93.96	-5.26	-
4	chernozem	Krautkaiser F1	79.46	95.36	-3.86	ooo
5	Calcareous	de Buzău	90.44	103.75	+3.27	**
6	alluvial-soil	Krautkaiser F1	88.08	105.71	+4.76	***
7	Saline alluvial	de Buzău	76.18	87.39	-10.99	ooo
8	soil	Krautkaiser F1	75.14	90.18	-8.18	ooo

DL 5 % = 1.32 t/ha
DL 1 % = 2.56 t/ha
DL 0,1 % = 3.45 t/ha

Influence of hybrid on the productive potential of sweet corn

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Keywords: Zea mays, *var. rugosa (Bonaf),* convar. Saccharata Koprn *(Sturt.),* growing, production, precocity

ABSTRACT

The hybrid is one of the most important technological factors that influence the quantity and quality of production. The results presented in this paper demonstrate the influence of hybrid on morphological and production characteristics of sweet corn. Main phenophases of growth and development in sweet corn were appeared differently depending on hybrid. Deliciul verii hybrid was the first at phenophase of anthesis (67 days) as well as silk emergence phenophase (72 days), followed by hybrids Prima and Boston, while the hybrid 702 was later, requiring 81 days for anthesis and 95 days for silk emergence. Therefore, harvesting took place differently, the first three hybrids reaching consumption maturity in 107 days while 702 hybrid reached consumption maturity 10 days later. The highest production level was recorded for 702 hybrid, for which 21.8 tons/ha were harvested. Local hybrids had cobs of a lower size compared to the foreign hybrids, but have formed more cobs per plant, achieving production of 18.6 to 20.7 t/ha, which exceeded the Boston hybrid. Foreign hybrids were superior to the indigenous regarding the higher percent of ears (80%) from the total mass.

INTRODUCTION

Sweet corn is considered to be a real source of food, witch has proved to have a high caloric content and nutritional value compared to the usual corn. Fresh or preserved, provides a real vitamin, mineral and energy intake, and is an important source of micronutrients, especially magnesium (48mg/100g grains), which is usually missing from other vegetable products (Tracy, 1994). The energy value of sweet corn is 370 kJ/100g grains, being higher than green peas. After Bajurian and Ţurcanu, 1980, quoted by Stan, 1992, at technological maturity, seeds contain 25-27% dry matter, 14-15% carbohydrates, 5-5,5% protein, 0,75% fat, amino acids, significant amounts of vitamins: C, B, PP, E and minerals (K, P, Ca, Mg, Fe).

Sweet corn is used in food industry as raw material for canning, but it is also eaten fresh in the milk stage as boiled corn or in the preparation of different corn mashes, garnishes for steakes, stewed fruits, cream-soups of corn and flour from sugar corn is in the composition of various pastries (Vâlceanu, 1982, Ciofu, et.al. 2003).

Sweet corn is one of the most popular vegetables in the U.S. market, ranking second in consumption after tomato and seventh between fresh vegetables (Goldman and Tracy, 1994). Every year, 226.000 hectares in the U.S. are planted with sweet corn and turnover resulting from the marketing of the product is over 180 million dollars. This culture is also very popular in Japan, Taiwan, South Korea, where they occupy 20.000 ha. In Europe, significant areas are grown in France (17.100 ha), Italy (4.800 ha) and Spain (2.100 ha).

The sweet corn culture in our country began to expand much later, one of the reasons being that the population used and is still using in consumption corn cultivars for grain that is consumed in the milk stage as boiled or fried corn.

Since lately, sweet corn began to sell in supermarkets, as fresh or preserved vegetable and the fact that this product is known and appreciated by the buyers, explains the need for further studies on the development of technological measures to allow expansion of the culture in Romania.

The main objective of the undertaken research was to establish a technology framework for sweet corn in order to make possible the achieving of a higher production at a price as low as possible in order to place on the market of a quality product, primarily as fresh vegetables, but also as preserved.

The paper presents partial results regarding the influence of hybrid on plant growth and development, production potential, and some correlations between different morphological characteristics and the level of production for sweet corn.

MATERIALS AND METHODS

Experience was held in 2011 in the town Dâlga, Călăraşi County.

The biological material was represented by two Romanian hybrids: Deliciul verii and Prima and of two hybrids from foreign assortment: Boston hybrid and 702 hybrid.

During the experiment, it was realised many observations, measurements and determinations, which were used specific working methods namely:

- Morphometric determinations (plant height, height of the first ear insertion point), on the variants and repetions. It was maded observations and determinations on 10 plants in 4 repetitions.
- Phenological determinations: sowing date, date of emerging, date of anthesis and date of silk emergence.
- Production potential was determined by recording the number of ears formed per plant, their average mass and calculates the average production per plant and per hectar, for each variant studied. The results were interpreted statistically by analysis of variance.
- Calculation of correlations between some elements of growth and productivity for the four sweet corn hybrids was performed by using statistical methods applied in agricultural and biological experiments (Ceapoiu, 1968).

The technology used in the experiences was selected from the literature for sweet corn (Stan, 1992, Ciofu, et.al., 2003).

Culture was established by sowing, when the soil temperature has reached 8 to 10^0 C, respectively on 07.04.2011. Density used was 60.000 plants/ha. On May the 5^{th}, thinning has been made to nest. Weed control was done by hand hoeing and two applications of herbicide Laudis.

Sweet corn harvesting occurs when they reach the maturity stage of consumption (milk-wax stage) when the cob is hard, well covered by leaves, and silk became brown and dry. The experience data collection was different, as the hybrids studied have reached tehnological maturity, namely: 23^{rd} of July for Deliciul Verii, Prima and Boston, respectively at 3^{rd} of August for 702 hybrid.

RESULTS AND DISCUSSIONS

In specific climatic conditions of Dâlga locality in 2011, for sweet corn emergence it took on average 14 days after sowing. From the results presented in Table 1, we can see that the number of days for the emergence of the seed of the cultivars studied varied between 11 (Deliciul verii) to 17 days (702). Compared to the species average, the seed emergence occurred with 2-3 days earlier for local hybrids, while foreign hybrids seed emergence occurred with 2-3 days later.

The phenophase of anthesis started at 67 days from sowing for Deliciul verii, at 71 days for Prima and Boston and at 81 days for 702, differences for average was between -5,5 and +8,5 days.

The phenophase of silk emergence occurred differently by the hybrid. On first place was Deliciul verii (72 days), followed by Boston (74 days), Prima (75 days) and on the last place was 702 (95 days). It should be noted that to achieve this phenophase, hybrids were characterized by the highest difference with species average namely - 7 to + 16 days.

Harvesting began in the same order; the first three hybrids reached consumption maturity (milk-wax stage) in 107 days, with almost three days earlier than average, and the last one was 702 which came to consumption maturity after 118 days, 8 days later than average.

It can be concluded that the influence of hybrid on the development phenophases is obvious. Unlike other three hybrids, 702 was with 11 days later.

Influence of hybrid on plant growth is clear from the data presented in Table 2 and Figure 2.

From the measurements made on plants followed that in the experimental conditions, plant height varied between 180 and 243 cm, with an average of 200 cm. It is noted that the 702 hybrid exceeded the average with 43 cm, making very significant positive differences (21.5%), while the other hybrids have been much lower, but below the average.

Concerning the first ear insertion height, stands out the 702 hybrid, followed by Boston hybrid, both hybrids above the average with very significant to significant differences (21.5% and 3%). While the Romanian hybrids Deliciul verii and Prima have been very significantly lower differences, with 7-8% below the average.

From Figure 2 we can see that between plant height and ear insertion height there is a strong relation which is confirmed by regression line. Between these two properties exists a very significant correlation ($r^2 = 0.7649$).

Hybrids have been particularly studied in the ear morphometry. From Table 3 we can see that the number of cobs per plant was trained an average of 1.2 with very small differences between hybrids. It can be seen that there is an inverse correlation between the number of cobs per plant and ear size. For example Prima hybrid exceeded control (average) in the number of ears per plant but the size of ears was below average values, while at Boston hybrid, number of ears was below average, but had over-sized values of ears. 702 hybrid was marked by the large size of ears (19.3 cm long and 5.1 cm diameter), the number of rows of grain (20) and grains per row (40), exceeding the average values .

As shown in Table 4, in the climatic conditions of 2011, at Dâlga, Călăraşi County, the average weight of sweet corn cobs it was 290.5 g. Foreign hybrids had a higher average mass of the cob. The first place was at 702 with 314 g/cob, exceeding the average of 8% and the last one it was Prima with 244g/cob, 16% below the average.

Studied hybrids were differentiated by weight of the cob components to its total mass. In this respect all foreign hybrids has shown a high percent of ear mass from 79.4 to 80% of the total mass, with differences of 2 - 2.6% of the average. Accordingly, these hybrids has been the smallest share of leaves (cover of the ear), which accounted 20 to 20.6% by weight, compared with 23.6 to 26.1% on local hybrids and 22.58% on average.

Concerning the mean mass of cobs (ear + cover leaves) per plant, hybrids behaved differently, this fact being explained by the different number of cobs per plant. Thus, the first was 702 hybrid which has 364 g per plant, but the following was Romanian hybrids Deliciul verii and Prima with 346 g and 310 g per plant respectively. At the last place was Boston hybrid with 308 g mass of cobs per plant.

These differences in the productive potential of different hybrids were reflected on the production results achieved.

In the experimental conditions, at the 4 hybrids of sweet corn, cobs production varied from 18,472 to 21,817 kg/ha, with an average of 19,907 kg/ha (Table 5). Were observed with the highest production values 702 (21,817 kg/ha), followed by Deliciul verii (20,755 kg/ha), which exceeded the average with very significant to distinct significant differences (9.6%, respectively 4.3%).

Between some elements of growth and productivity of sweet corn hybrids studied, it was revealed the existence of strong positive correlations (Figure 3 and 4).

Plant size makes strong positive correlation (r^2 = 0.5112) with the production of cobs, which means that production is directly determined by the vigour of the plant (Figure 3) 71.5% of the total variation of the production is determined by the height of the plants.

Correlation between ear insertion height and yield per plant is strong positive (r^2 = 0.5439). From the total variation in production, about 74% can be attributed to variation in height of ear insertion (Figure 4).

CONCLUSIONS

- Romanian hybrids were better adapted to environmental conditions at the beginning of vegetation, occurring earlier emergence of seeds by about 6 days from the foreign hybrids.
- Deliciul verii, Prima and Boston hybrids reach consumption maturity after 107 days from sowing, while the 702 hybrid was late, reaching consumption maturity after 118 days from sowing.
- The later 702 hybrid, presented superior characteristics of vigour and production to other hybrids.
- Although the Romanian hybrids have been overtaken by the foreign hybrids on the average ear size and the percentage of ear, because of the ability to form a larger number of cobs per plant, were remarked by the production achieved.
- Highest production of cobs were obtained from 702 hybrid (21,8 t/ha) and Deliciul verii romanian hybrid (20,7 t/ha), which exceeded the average production (19,9 t/ha) with significant differences.
- It was noted positive correlations between plant height and production of cobs r^2 =0,5112) and between height of ear insertion and production (r^2=0,5439), which shows that the production of sweet corn is directly determined by the vigor of plants.

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TABLES AND FIGURES

Table 1

Results on the influence of hybrid on the development phenophases at sweet corn – 2011

Hybrid	Sowing date	Emerged*		Anthesis		Silk emergence		Harvest	
		Date	No. days	Date	No. days	Date	No. days	Date	No. days
Deliciul verii	7.04.	18.04	11	13.06	67	18.06	72	23.07	107
Prima Boston		19.04	12	17.06	71	21.06	75	23.07	107
702		22.04	15	17.06	71	20.06	74	23.07	107
		24.04	17	27.06	81	11.07	95	3.08	118
Average	-	-	13,75	-	72,5	-	79	-	109,75

*date of mass emergence

Table 2

Results on the influence of hybrid on the growing of the plants - 18 iunie 2011, Dâlga

Hybrid	Average height		Signification	Insertion height		Signification
	cm	% from Control		cm	% from Control	
Average	199,6	100,0		60,1	100	
Deliciul verii	180,0	90,2	ooo	56,0	93,2	ooo
Prima	186,7	93,5	ooo	49,3	82	ooo
Boston	189,1	94,7	ooo	61,9	103	***
702	242,6	121,5	***	73,0	121,5	***
DL 5%	13,7	1,9		5,7	0,09	
DL 1%	21,9	2,3		9,2	1,20	
DL 0,1%	53,7	4,6		13,9	2,85	

Table 3

Morphometric characteristics of ears for different hybrids of sweet corn

Hybrid	No. of ears per plant	Ear length (cm)	Ear diameter (cm)	No. of rows	No. of grains/row
Deliciul verii	1,2	18,7	4,8	14	42
Prima	1,3	17,1	4,2	10	36
Boston	1,0	19,1	5,0	18	34
702	1,2	19,3	5,1	20	40
Average	1,2	18,6	4,8	15,5	38

Table 4

The influence of hybrid on the weight of ears at sweet corn

Hybrid	The average weight of ear (g)					The average weight (kg/pl.)
	Total ear +covering leaves (g)	of which				
		ear		covering leaves		
		g	%	g	%	
Deliciul verii	299	228,4	76,4	70,6	23,6	0,346
Prima	244	180,3	73,9	63,7	26,1	0,310
Boston	305	244,0	80,0	61,0	20,0	0,308
702	314	249,3	79,4	64,7	20,6	0,364
Average	290,5	225,5	77,43	65	22,58	0,332

Table 5

Synthesis of production results in some sweet corn hybrids

Hybrid	**The average production**		**Signification**
	kg/ha	% from Control	
Average	19907	100,0	
Deliciul verii	20755	104,3	**
Prima	18583	93,4	ooo
Boston	18472	92,8	ooo
702	21817	109,6	***
DL 5%	29,45	1,95	
DL 1%	201,96	3,04	
DL 0,1%	2597,4	5,70	

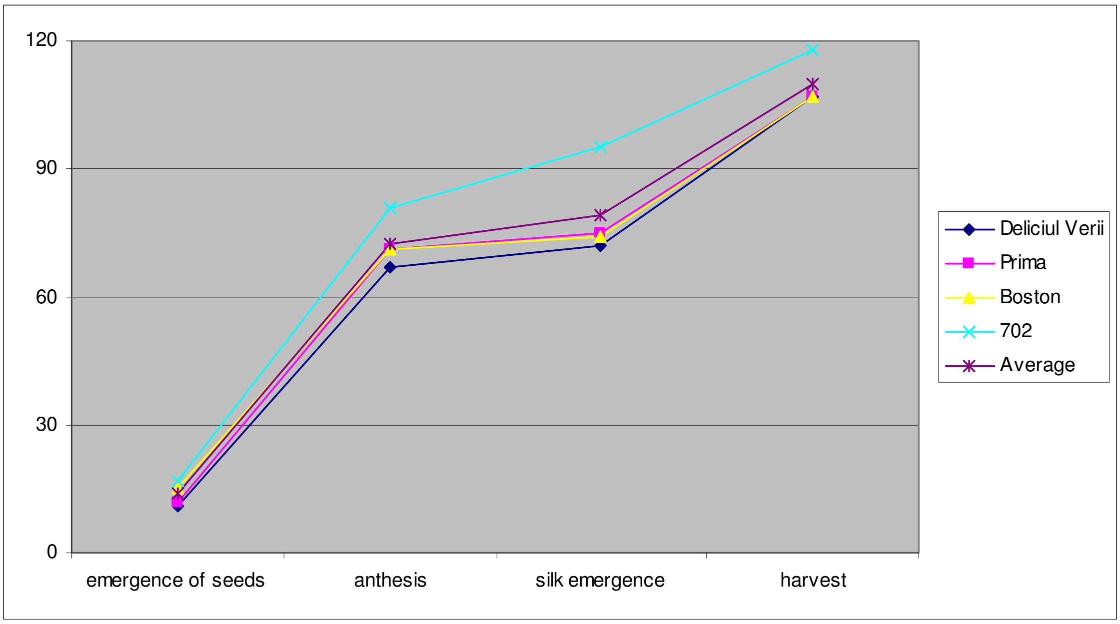
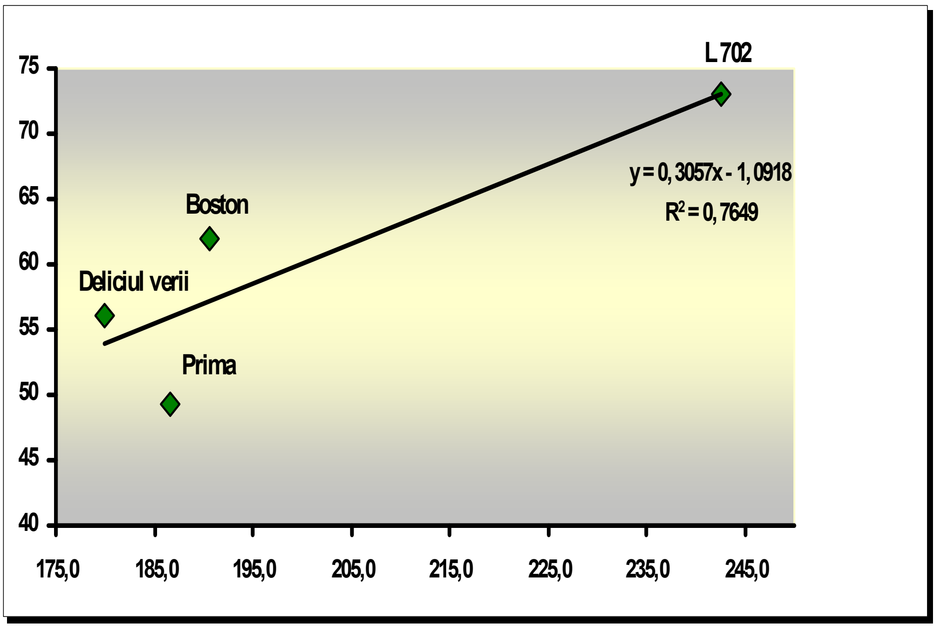


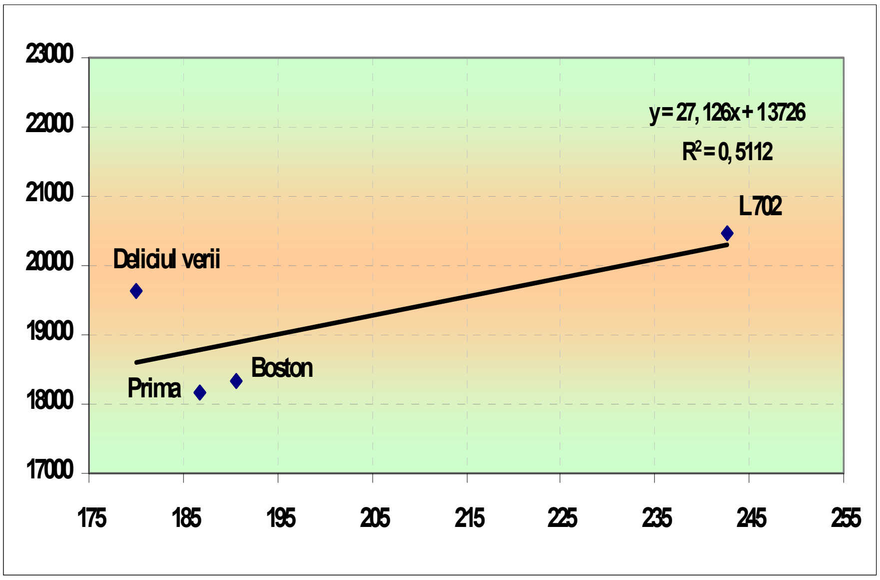
Fig. 1. Results on the influence of hybrid on the development phenophases at sweet corn – 2011, Dâlga



$e_r =$ 0,343

$t =$ 2,551

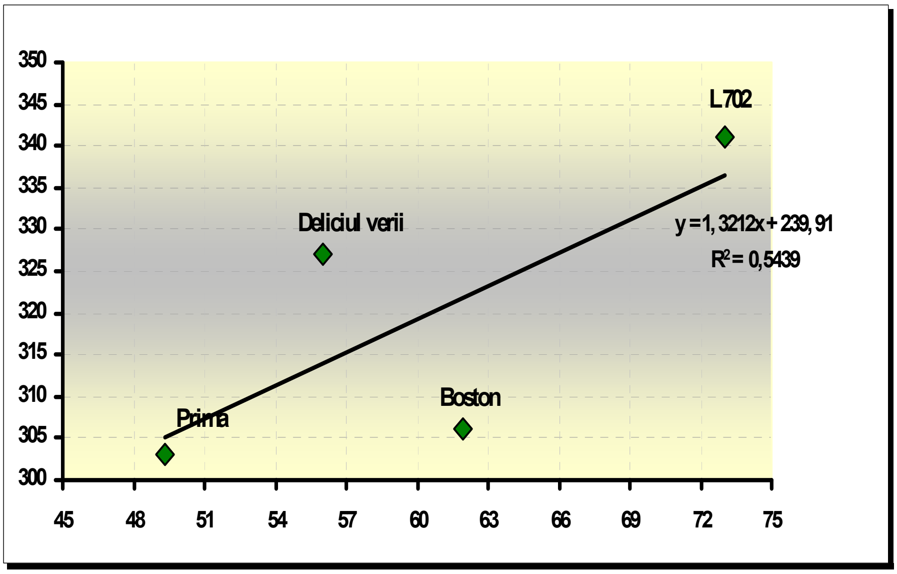
Fig. 2. The correlation between plant height (cm) and ear insertion height in some sweet corn hybrids



$e_r =$ 0,494

$t =$ 1,446

Fig. 3 The correlation between plant height (cm) and production of cobs (kg/ha) in some sweet corn hybrids



$e_r =$ 0,478

$t =$ 1,544

Fig.4. The correlation between ear insertion height (cm) and yield per plant (g) to some sweet corn hybrids

ORNAMENTAL PLANT

Studies concerning the growth and development of *Gloxinia speciosa* cuttings under the influence of rooting substrate

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Keywords: *Gloxinia speciosa* cultivars, leaf cuttings, perlite, peat, sand

ABSTRACT

The species from which Florists Gloxinias were derived came from Brazil in 1785. The name *Gloxinia speciosa* was originally assigned in 1817 by Conrad Loddiges, an English Nurseryman, in honor of P.B. Gloxin of Strasburg, Germany. In 1825, the species was renamed, placing it in the correct genus, *Sinningia*. The modern *Gloxinia* is a hybrid from two Brazilian tropical species; *Sinningia speciosa* and *Sinningia maxima*. It arose as a chance seedling raised by a Scottish gardener, John Fyfiana, in the nineteenth century. *Gloxinia* includes approximately 15 species of herbs from tropical America. Commonly grown as houseplants, they can be grown outdoors in mild weather. Their showy flowers are pollinated by birds and bees. Leaves are succulent and hairy. Generally, these tender rainforest species are intolerant of high night temperatures, low humidity, alkaline pH, and cold. *Gloxinia sylvatica* has a greater tolerance for heat and cold and thrives outdoors year-round in South Florida. It is highly recommended. *Sinningia speciosa,* one of the more commonly cultivated gesneriads, is usually, though incorrectly, referred to as gloxinia because it was once included in this genus. It can be multiplied easy by seeds or by leaf cuttings. In our research, has studied the effect of rooting medium in the case of three gloxinia cultivars: Star of Fire, Emporer Friedrich and Emporer Wilhelm. It was followed the degree of rooting and development of cuttings in to rooting mediums: peat + sand, peat + perlite. Best results were registered at Etoile de Feu in peat+sand.

INTRODUCTION

Gloxinia is a genus of three species of tropical rhizomatous herbs in the flowering plant family *Gesneriaceae*. The species are primarily found in the Andes of South America but *Gloxinia perennis* is also found in Central America and the West Indies, where it has probably escaped from cultivation. *Gloxinia perennis* is the original (type) species of the genus and for much of its history the genus consisted of only *G. perennis* and a very small number of other species. However, most recent references on *Gloxinia* reflect the 1976 classification of Hans Wiehler, who took a broad view of the genus. A recent analysis of *Gloxinia* and related genera based on molecular and morphological work has determined that Wiehler's circumscription of the genus was unnatural, both phylogenetically and morphologically (www.wikipedia.org).

Sinningia speciosa, a popular houseplant, was originally described and introduced to cultivation as *Gloxinia speciosa* and is still commonly known as "gloxinia".

The aim of the researches was to improve the assortment of indoor plants with new species with less maintenance work and beautiful morphological characters. It was studied the multiplication technology, using different rooting substrate with influence on the development of *Gloxinia* cuttings.

Gloxinia speciosa Benth. Et. Hook is a perennial plant which produces in the soil high and thick tuber. Gloxinia flowers may be single or double and come in a variety of colors from pure white to pink, lavender, red, or dark purple. Bicolor and those with petals edged in white are very popular. However, the velvet red and purple outsells all others. Hybridization and selection has resulted in three cultivar size groups; the large-growing, standard types are grown for 12-15 cm pots, the compact types are grown in 10-12 cm pots, and the miniature types (minis) are grown in 10 cm pots. Mini types come in two flower types, tubular shaped flowers which sell the best and slipper shaped flowers.

This species requires for growth and flowering 16 to 21° C day and night 18° C. Supports temperatures up to 30-35° C provided that the relative humidity is high and to beware of sunburn (Şelaru, 2004, 2006, Cantor, 2008). Optimum temperature for rest period of tuber is between 4-6º C (Cervantes, 2010).

Gloxinias are relatively easy to grow from seed, but the plants take seven months from seed to bloom to produce flowers.

This species not support direct action of sunlight (leaves twist), has a relatively high tolerance to shade. Deep shade determine bud fall. Preferred condition of *Gloxinia* is south-western orientation, with the possibility of shading during hours with sunburn.

Mixture of soils for culture must contain peat, perlite and compost in equal ratios (Cervantes, 2010) and must to be slightly acid (pH 6-6, 5). Şelaru (2006) mentions that a mixture of 3 parts leaf compost, 1 part mature manure and 1-2 kg/m³ limestone, determine a better plant growth and development.

Procter (1986) recommends for culture the following substrate: clayey soil, peat, humus-rich soil and sand (the ratio 1:1:1:1), 3 parts of hoof meal, 3 parts of superphosphate and 1 ½ parts of sulphate potassium, 28 g bone meal and 28 g powder chalk. Gloxinia is multiplied by seeds, by division of tubers, but also by leaf cuttings (early summer). To this aim, basal leaves are harvested with thicker stems.

MATERIALS AND METHODS

The biological materials used in experience concerning the growth and development of *Gloxinia speciosa* cuttings under the influence of rooting substrate was consist of three cultivars: Etoile de Feu, Emporer Friedrich and Emporer Wilhelm. Cuttings were made in the greenhouse belonging to the Department of Floriculture, in the frame of University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca.

'Etoile de Feu' it is characterized by a high of 11cm, with large leaves, hairy, oval-oblong. Produce about 10 to 11 leaves in bush and a number of 11 flowers. Flowers are red, with five velvet and thick petals. Leaf rosette diameter reaches 35 cm (Fig. 1).

'Emporer Friedrich' has a size of 8 cm, with large leaves, hairy, oval-oblong. Produce approximately 8-10 leaves in bush and more than 8 flowers. Flowers are red with white edge. Leaves rosette reaches a diameter of 28 cm (Fig. 2).

'Emporer Wilhelm' has a size of 10 cm, with large leaves, hairy, oval-oblong. Produce approximately 6-8 leaves in bush and more than 8-10 flowers. Flowers are violet with white edge. The diameter of lower rosette is about 32 cm (Fig. 3).

As rooting substrate was utilized the next mixtures: peat + sand, peat + perlite.

Cuttings were harvested from healthy mother plants, pest and disease free (on 14.06.2010) resulting from forced tubers. Cuttings were made from whole leaves, the leafstalk was shortened from 1.6 to 2.4 cm, then was powdered with Radistim 1 (rooting regulator). The rooting temperature of cuttings was between 22-25 ºC and relative humidity of was 80-90% (Şelaru, 2004, 2006).

Thought the combination of two factors were obtained six experimental variant which were placed in randomized blocks, in three repetitions (Table 1).

The data were statistically interpreted by LSD test (Least Significant Difference) to illustrate the significance of differences. Control was the average of experience.

RESULTS AND DISCUSSIONS

The specialty literature reports that rooting of *Gloxinia* leaves cuttings is develop in 3-4 weeks, at a temperature of 18 ° C (Toogood, 1999). Researches made by in this study shows that the period of rooting *Gloxinia* leaves cuttings varied depending on the substrate. Cultivar Etoile de Feu rooted earlier in 29 days. This cultivar was followed by 'Emporer Friedrich', which formed the root system in 34 days. Emporer Wilhelm rooted in 38 days. These results were achieved when was used the mix substrate of peat + sand. There was a delay of rooting at all studied cultivars, in the mixture of peat + perlite. In this substrate the earlier rooted the cultivar Etoile de Feu (36 days) and at the latest Emporer Wilhelm (43 days).

Concerning the unilateral influence of cultivar on length of leaves cuttings, the data from table 2 show that Etoile de Feu achieved a significant differences compared with the control.

When it was study the unilateral influence of rooting substrate on the development of *Gloxinia* leaves cuttings can conclude that the mix substrate consist in peat+sand determine a very significant differences (positive), while in the case of the second substrate de differences was very significant negative (Table 3).

Regarding the influence of cultivars on the width of leaves cuttings can see that neither cultivar registered significance, even if Emporer Friedrich show a differences of 0.98 cm, but statistically not assured (Table 4).

Concerning the influence of rooting substrate on the width of *Gloxinia* leaves cuttings can conclude that neither substrate determine significance, even if at the second substrate was register a positive difference of 0.27 cm, but an statistically not assured (Table 5).

Table 6 shows the data concerning the influence of cultivar on leafstalk length of *Gloxinia* cuttings. At this character Etoile de Feu registers distinct significant differences of 0.26 cm comparing with the control. Regarding the influence of rooting substrate on the leafstalk length, in the case of first substrate (peat+sand) the differences was significant (Table 7).

Tuber growing period varied depending on cultivar. The Etoile de Feu’s tuber was formed in 110 days after planting cuttings, at the cultivar Emporer Friedrich, the tuber was growth in105 days, while at the cultivar Emporer Wilhelm this process was develop in 90 days.

CONCLUSIONS

Based on the obtained results devolve the following conclusions

1. Analyzing the number of day of rooting, it is found that Etoile de Feu rooted in 29 days, latest Emporer Wilhelm in 38 days.
2. Concerning the rooting substrate, it is remark the first substrate analyzed (peat+sand).
3. The period of tuber growth varied between 90-110 days, depends on cultivar.

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TABLES AND FIGURES

Table 1

Experimental variants

Symbol	Experimental variants
$V1R_1R_2R_3$	'Etoile de Feu' x peat+sand
$V2\ R_1R_2R_3$	'Etoile de Feu' x peat+perlite
$V3\ R_1R_2R_3$	'Emporer Friedrich' x peat+sand
$V4\ R_1R_2R_3$	'Emporer Friedrich' x peat+perlite
$V5\ R_1R_2R_3$	'Emporer Wilhelm' x peat+sand
$V6\ R_1R_2R_3$	'Emporer Wilhelm' x peat+perlite

Table 2

The unilateral influence of cultivar on length of leaves cuttings

Gloxinia cultivar	Length of cuttings			Signification of differences
	cm	%	± d	
Etoile de Feu	14.33	109.6	1.26	*
Emporer Friedrich	11.80	90.2	-1.27	o
Emporer Wilhelm	13.10	100.2	0.03	-
Average of exp. – Control	13.07	100.00	-	-

DL5%= 1.00 DL1%= 1.83 DL0.1%= 2.10

Table 3

The unilateral influence of rooting substrate on the development of *Gloxinia* leaves cuttings

Rooting substrate	Length of cuttings			Signification of differences
	cm	%	± d	
Peat+sand	14.86	108.2	1.13	***
Peat+perlite	12.61	91.84	-1.12	ooo
Average of exp. – Control	13.73	100.00	-	-

DL5%= 0.44 DL1%= 0.65 DL0.1%= 0.97

Table 4

The unilateral influence of cultivar on width of leaves cuttings

Gloxinia cultivar	Width of leaf cuttings			Signification of differences
	cm	%	± d	
Etoile de Feu	10.24	99.5	-0.05	-
Emporer Friedrich	11.27	109.5	0.98	-
Emporer Wilhelm	9.38	91.1	-0.91	-
Average of exp. – Control	10.29	100.00	-	-

DL5%= 1.04 DL1%= 1.92 DL0.1%= 2.03

Table 5

The unilateral influence of rooting substrate on the width of *Gloxinia* leaves cuttings

Rooting substrate	Width of leaf cuttings			Signification of differences
	cm	%	± d	
Peat+sand	10.14	97.4	-0.54	-
Peat+perlite	10.68	102.5	0.27	-
Average of exp. – Control	10.41	100.00	-	-

DL5%= 0.44 DL1%= 0.65 DL0.1%= 0.97

Table 6

The unilateral influence of cultivar on leafstalk length of *Gloxinia* cuttings

Gloxinia cultivar	Length of leafstalk			Signification of differences
	cm	%	± d	
Etoile de Feu	2.33	112.5	0.26	**
Emporer Friedrich	1.98	95.6	-0.09	-
Emporer Wilhelm	1.90	91.7	-0.17	-
Average of exp. – Control	2.07	100.00	-	-

DL5%= 0.22 DL1%= 0.41 DL0.1%= 0.90

Table 7

The unilateral influence of rooting substrate on leafstalk length of *Gloxinia* cuttings

***Gloxinia* cultivar**	**Length of leafstalk**			**Signification of differences**
	cm	**%**	**± d**	
Peat+sand	2.25	108.1	0.17	*
Peat+perlite	1.65	79.3	-0.43	**ooo**
Average of exp. – Control	2.08	100.00	-	**-**

DL5%= 0.17 DL1%= 0.27 DL0.1%= 0.40


Fig. 1. Etoile de Feu


Fig. 2. Emperor Wilhelm


Fig. 3. Emperor Friedrich

Researches concerning the behavior of *Gerbera hybrida* cultivars in pots

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Keywords: *Gerbera hybrida*, cultivars, pot plant, morphological characters, diversification assortment

ABSTRACT

Gerbera flower is an important species grown worldwide both as cut flowers and garden plants. The importance of culture is reflected in the statistics that describe production and value of culture. Economic statistics show a steady increase year by year of areas planted with gerbera in Germany, Holland, France and Israel. Improvement and diversification of gerbera is a basic concern in Romania both for cut flowers, but especially lately witnessing the introduction of varieties in pots for interior decoration and landscape for summer. The experiments were organized to "SC GEMINI SRL" Aiud at InterFiorella flowershop in the period 2009-2011 and followed the behavior of six new varieties of potted gerbera: ‚Optima', ‚Fiorella', ‚Frenzy', ‚Blondi', ‚Meriva' and ‚Little Ruby'. Varieties were brought from Holland and observations and measurements were made on the main morphological features decorative: flower stem length, flower diameter, flower diameter disc, the number of ligules, colored flowers, storage capacity of flowers, resistance to diseases), which are considered of interest in a breeding program of these species. The statistical analyze of the characters was do using DL test. Our results showed that varieties: 'Optima', 'Frenzy' and 'Little Ruby' present morphological characters and decorative top. These varieties can be used indoors or out in pots outside in the summer in pots.

INTRODUCTION

Gerbera is an attractive cut-flowers crop, and the flowers last for a longer duration in vase. Gerbera next to carnation were considered as one of the most valuable cut-flowers. Most of the first awarded can be seen as recognition for the work involved in the breeding of the flower *Gerbera jamesoni* hybridization has a long history. There are even today still no satisfactory consistent seeds of these plants. This is as a result of the strong heterozygote of this plant.

The gerbera breeding work was done for the beginning by Robert Jameson in South Africa. In the past many breeder produced more varieties in England, Germany, and France. After the Second World War gerbera breeding program had a great development. In the years that are followed many Holland firms (Van Staaveren, Florist, van Wijk, Goosen) had successful in *Gerbera*. In the meantime, other countries including France and Norway as well as some non European centre have emerged with well known *Gerbera* farms (Ludecke 1966).

On the global scale the gerbera cultivars are changed about 4-5 years, give the search and need for new varieties and do to the biological degeneration of cultivars. The improving of assortment of *Gerbera hybrida* with new cultivars and hybrids it is a goal of all researchers from all countries (Cantor and Zaharia, 2000).

The *Gerbera* breeding was first studied in 1737 by the botanist Frederik Gronovius and the name was given to honor the German scientist that lived in the XVIII century, Traugot Gerber. *Gerbera* is part of the *Asteraceae* family and includes over 80 species that came from Africa, Madagascar and even from the East of Asia.

Growing gerbera as a breeding plant started in South Africa, in 1930, where it was collected in a botanical garden for the first time. The origin of the germoplasm (*Gerbera jamesonii* and *Gerbera viridifolia*) is considered to be a research subject in Europa and USA. The contribution of the two species to the germoplasm cultivated stock is unknown (Maynet, 1992).

In the year of 1947, Alkemade and Sohn started a gerbera culture in Holand, Nordwijk. By the year of 1951 the Dutch growers reached to 20000 square meters of greenhouses with gerbera cultures (Ambrosius, 1993). The early American literature focused on writing information about the culture technology and plant diseases.

This species was first brought to America through New Jersey and Rhode Island. An early description is published in American Gardening, 1901, in Herrington. ARTHUR HERRINGTON, an immigrant gardener from England, started growing gerbera in Madison (N.J.) since 1897. He may be the first gerbera grower from America (Roh and Lawson, 1990).

In 1901, Atkins, the scientist harvested 94 seeds from one crossing protogenica inflorescence. Also, Atkins described the culture technology. In USA, the gerbera started being used as a commercial culture species in 1930

Because of the „fading" that produced a lot of damages to the plant, the interest for gerbera decreased between 1914 and 1922, when practically the gerbera cultures disappeared from Europe, surviving only in Bodigera (Italy). In 1922 the selection and improvement process started with *Gerbera jamesonii* and once again, this species spreads in all Europe. Between 1938 and 1947 was registered a low culture of gerbera, but afterwards the species regained interest in Colombia and California (Schiva, 1976).

Lately, in Romania we assist to the pot culture of gerbera used for interior design. In summer time, the pots can also be placed outdoors for decorating balconies or porches.

The present paper recommends introducing in Romania new gerbera varieties which fit to pot culture, based on the observations regarding the species properties and characteristics, gerbera could easily be recommended in our country considering the climate conditions.

MATERIALS AND METHODS

The experiments regarding the pot culture for some *Gerbera hybrida* cultivars took place at greenhouses of University of Agricultural Sciences and Veterinary Medicine, Horticulture Faculty.

The biological material used in the *Gerbera* experiment came from 6 different varieties with Dutch origins, used for pot culture. The studied cultivars are: ‚*Optima'* (orange ligules), ‚*Fiorella'* (light pink ligules), ‚*Frenzy'* (pink ligules), ‚*Meriva'* (yellow ligules), ‚*Little Ruby'* (red ligules), ‚*Blondi'* (white ligules). The study took place between 2009-2011. Figures 1 to7 present the *Gerbera* studied varieties.

The study materials were placed in random blocks, each of three repetitions. Each variety was a version, and for each variety were 5 plants for repetitions, therefore result 15 plants for each variety, with a result of 90 pots of *Gerbera* for the experiment.

During vegetation period, the typical technology was used, with a special care for the pest and disease control.

During the study there were observations made on the following characteristics: flower color, length of the floral stem, diameter of the capitule, diameter of the flower receptacle, number of ligules, flower production and resistance to *Phytophtora cryptogea*.

The obtained data was statistically interpreted, by calculating the average and testing the significance of the variations of results, using the DL test (Ardelean et al., 2002).

RESULTS AND DISCUSSIONS

Analyzing the length of the floral stem (Table 1), it has been revealed that among the studied cultivars, this characteristic varies from 25.73 cm (‚Blondi') to 44.25 cm (‚Frenzy'). Considering the average length of 37.30 cm and comparing it to the length of each cultivar, it has been noticed that some of the cultivars are below average: ‚Blondi' 25.73 cm, ‚Meriva' 34.78 cm, ‚Little Ruby' 34.70 cm.

The following varieties from the experiment are above average: ‚Frenzy' 44.25 cm, ‚Optima' 43.35 cm, ‚Fiorella' 40.98 cm. Those variations show that ‚Blondi' variety deviates considerably negative from the average length of floral stem, meanwhile ‚Frenzy' variety deviates positively.

Statistically speaking very significant positive differences were registered at ‚Frenzy' variety; distinctively significant positive differences at ‚Optima' variety and significant positive differences at ‚Fiorella' variety. ‚Blondy' was registered with very significant negative variations; meanwhile the other two varieties used in the experience were irrelevant.

From the diameter of capitule point of view, it was revealed that it varied from 9.08 cm at ‚Blondi' and 11.60 cm at ‚Optima' (Table 2). Considering 10.45 cm the average value of the capitule and comparing it to the other measurements, we can conclude that there are varieties below the average, such as: ‚Blondi' 9.08 cm and ‚Fiorella' 9.10 cm, meanwhile the next cultivars are above the average: ‚Optima' 11.60 cm, ‚Frenzy' 11.38 cm, ‚Meriva' 11.13 cm.

The data concerning the diameter of the receptacle are presented in Table 3. It is concluded that this element varies from 1.78 cm at ‚Meriva', to 3.43 cm at ‚Optima'. Considering 2.59 cm the average for this element, we can see that there are below average cultivars: ‚Meriva' 1.78 cm, ‚Blondi' 2.18 cm, ‚Little Ruby' 2.18 cm and above average cultivars: ‚Optima' 3.43 cm, ‚Frenzy' 3.28 cm, ‚Fiorella' 2.70 cm. Only for ‚Optima' cultivar is significance positive comparatively with the control variant.

Table 4 reveals data concerning the number of ligules, which varied during the experiment from 55.40 ligules at ‚Blondi', to 71.38 ligules at ‚Optima'. Considering 62.10 the average of ligules, the below average varieties are: ‚Blondi' 55.40 ligules, ‚Frenzy' 56.80 ligules and ‚Fiorella' 58.28 ligules, meanwhile the above average varieties are: ‚Optima' 71.38 ligules, ‚Little Ruby' 65.95 ligules, ‚Meriva' 64.78 ligules.

Considering the number of flowers on each plant, Table 5 reveals that this characteristic varies from 10.03 flowers on plant, at ‚Fiorella' and 16.23 flowers at ‚Frenzy'. With an average of 13.76 flowers on plant, there can be classified the below average varieties: ‚Fiorella' 10.03 flowers on plant, ‚Meriva' 12.65 flowers on plant, ‚Blondi' 13.70 flowers on plant.

The results concerning the vase life and water resistance are presented in Table 6. The storage was made in glass recipients, using water of 18-20^{o}C. During the process, the water was renewed every two days (with tap water) and also the floral stem end was constantly refreshed. As revealed, this character also varied from 11.2 days of vase life at ‚Little Ruby' and 14.6 days at ‚Frenzy'. The other studied varieties had positive results of more than two weeks of vase life.

Resistance to *Phytophtora cryptogea* was evaluated using a ranking system from 1-4: 1-very resistant, 2-resistant, 3-medium resistant, 4-low resistant. Research show that the most resistant varieties to *Phytophtora cryptogea* are ‚Optima' and ‚Frenzy', which were ranked with number 1.

CONCLUSIONS

The results from the two year research made on pot gerbera cultures are distinguished by:

- The length was between 25.73 cm at the 'Blondy' variety and 44.25 cm at 'Frenzy'.
- The diameter of capitule varied from 9.08 cm at ‚Blondi' and 11.60 cm at ‚Optima
- The number of ligules was over 55 pieces at all varieties.
- The diameter of the receptacle is between 1.78 cm and 3.43 cm. The 'Meriva' variety has the lowest value in this category and the 'Optima' variety has the highest one.
- The 'Frenzy' variety has the highest number of flowers on the plant (16.23), and the 'Fiorella' has the lowest (10.03).
- The color of flowers is a very positive characteristic for every studied variety.
- Optima' and ‚Frenzy' varieties have a good resistance to *Phytophtora cryptogea.*

Based on the results, the varieties recommended for the pot cultures are the following: 'Optima', 'Frenzy' and 'Little Ruby'. These varieties present superior morphological and decorative characters. They can also be used in interior pot cultures. In summer time, the pots can also be planted outdoor for decorating balconies or porches.

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TABLES AND FIGURES

Table 1

Length of floral stem at *Gerbera* cultivars studied

No. var.	Cultivar	Length of floral stem			Significance of differences
		cm	%	± d	
1.	Optima	43.35	116.22	6.05	**
2.	Fiorella	40.98	109.86	3.68	*
3.	Frenzy	44.25	118.32	6.95	***
4.	Blondi	25.73	68,98	-11.57	ooo
5.	Meriva	34.78	93.24	-2.52	-
6.	Little Ruby	34.70	93.03	-2.60	-
7.	Control – Mt	37,30	100.00	-	-

DL5%= 3.62 DL1%= 4.96 DL0.1%= 6.75

Table 2

Diameter of capitule at *Gerbera* cultivar studied

No. var.	Cultivar	Diameter of capitule			Significance of differences
		cm	%	± d	
1.	Optima	11.60	110.96	1.15	*
2.	Fiorella	9.10	87.05	-1.35	o
3.	Frenzy	11.38	108.81	0.92	-
4.	Blondi	9.08	86.81	-1.38	o
5.	Meriva	11.13	106.42	0.67	-
6.	Little Ruby	10.45	99.96	-0.004	-
7.	Control – Mt	10.45	100.00	-	-

DL5%= 1.12 DL1%= 1.54 DL0.1%= 2.09

Table 3

Diameter of receptacle at *Gerbera* cultivar studied

No. var.	Cultivar	Diameter of receptacle			Significance of differences
		cm	%	± d	
1.	Optima	3.43	132.37	0.84	*
2.	Fiorella	2.70	104.35	0.11	-
3.	Frenzy	3.28	126.57	0.69	*
4.	Blondi	2.18	84.06	-0.41	-
5.	Meriva	1.78	68.60	-0.81	o
6.	Little Ruby	2.18	84.06	-0.41	-
7.	Control - Mt	2.59	100.00	-	-

DL5%= 0.66 DL1%= 0.91 DL0.1%= 1.24

Table 4

Number of ligules at *Gerbera* cultivar studied

Nr. var.	Cultivar	Number of ligules			Significance of differences
		No.	%	± d	
1.	Optima	71.38	114.94	9.28	***
2.	Fiorella	58.28	93.85	-3.82	o
3.	Frenzy	56.80	91.47	-5.30	oo
4.	Blondi	55.40	89.22	-6.70	ooo
5.	Meriva	64.78	104.31	2.68	-
6.	Little Ruby	65.95	106.21	3.85	*
7.	Control - Mt	62.10	100.00	-	-

DL5%= 2.85 DL1%= 3.91 DL0.1%= 5.33

Table 5

Number of flower/plant at *Gerbera* cultivar studied

No. var.	Cultivar	Number of flower/plant			Significance of differences
		No	%	± d	
1.	Optima	15.28	111.02	1.52	***
2.	Fiorella	10.03	72.86	-3.73	ooo
3.	Frenzy	16.23	117.93	2.47	***
4.	Blondi	13.70	99.58	-0.06	-
5.	Meriva	12.65	91.94	-1.11	oo
6.	Little Ruby	14.68	106.66	0.92	*
7.	Control - Mt	13.76	100.00	-	-

DL5%= 0.69 DL1%= 0.95 DL0.1%= 1.29

Table 6

Vase life in water *and resistance to* Phytophtora cryptogea

No. var.	Cultivar	Colour	Vase life in water (days)	Note to resistance at *Phytophtora cryptogea*
1.	Optima	red – carmine	13.7	1
2.	Fiorella	dark pink	12.9	2
3.	Frenzy	pink – cyclamen	14,6	1
4.	Blondi	white	13.1	3
5.	Meriva	yellow	13.4	4
6.	Little Ruby	red	11.2	3

Fig. 1. Pot *Gerbera* cultivars studied

Fig. 2. Cultivar 'Optima'

Fig. 3. Cultivar 'Fiorella'

Fig. 4. Cultivar 'Frenzy'

Fig. 5. Cultivar 'Meriva'

Fig. 6. Cultivar 'Little Ruby'

Fig. 5. Cultivar 'Blondi'

The influence of the nutrition regime on the quality characteristics of some Pelargonium peltatum varieties multiplied in greenhouse

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Keywords: chemical fertilization, frequency of applications, different concentration

ABSTRACT

This paper presents the influence of the chemical fertilizers, used in different concentrations, on the qualitative characteristics of some weeping geranium varieties with simple flowers, which are cultivated in greenhouse. The experiments were made in propagation glass-house of the Research and Development Institute for Processing and Marketing of the Horticultural Products-Horting, Bucharest, during 2009-2010 periods. The researches had as purpose to underline the qualitative differences (number of inflorescences -flower, inflorescences -bud, leaves) between plants, determined by different conditions of fertilization with NPK ($N_{19}P_{19}K_{19}$+ME and $N_{14}P_{14}14K_{28}$+2%MgO+ME, depending on the growing phase), in some concentrations (no fertilization, 0.1%, 0.2%,) and frequencies of fertilization (one or two applications/week). For the establishment of the fertilization regime it was aimed satisfaction of the demands of the species, in order to obtain plants of superior quality. The studied geranium varieties were: Balcon Red (red flowers), Balcon Lila (lila flowers) and Balcon White (white flowers). These were obtained from cuttings from mother-plants, grown in pots. As a result of the researches it was concluded that the most valuable qualitative characteristics were obtained to the plants with were fertilized which chemical fertilizers in concentration of 0.2% and with a frequency of two applications/week, in comparison to other variants. The results also show that, between the three studied varieties, important differences related to quality were registered, the most valuable variety being Balcon Red, followed by the Balcon Lila variety and then Balcon White variety.

INTRODUCTION

The geranium is a plant very spread in our country, being cultivated for its flowers' beauty, simple or abundant, small or big, of different colours, such as red, pink, violet, white etc., for its rich foliage, and permanent and abundant flowering period, especially the cultivars with simple flowers (Doltu, 2010). This plant is used for the adornment of interior and exterior spaces (windows, balconies, terraces, gardens, parks etc).

The geranium belong to the Pelargonium genus, that contains more species and cultivars. Currently, 250-300 cultivated species of Pelargonium genus are worldwide known (Serbanescu, 1958, Gostin et al., 2000).

Pelargonium peltatum is a geranium that has thin, long and pendent shoots, succulent and glowing leaves, of dark green color, with inflorescence (umbel) with varied number of flowers, supported by long and thin stalks (Selaru, 2000).

The researches demonstrated that this perennial plant needs optimal parameters – light, temperature, humidity and appropriate nutrition - in order to realize the best quality of development and flowering.

The plants of these species, with a long history of cultivation and breeding, need a frequent fertilization in order to maintain an active growing and abundant flowering (Klingaman, 1999).

Fertilizations with water soluble fertilizers applied to acid soil with pH=6,5 are recommended for all types of geranium (Padgalskas, 2009).

MATERIALS AND METHODS

The researches realized within the Laboratory for Protected Cultures of ICDIMPH-Horting Bucharest, during 2009–2010 period, had as biologic material three varieties of the

Pelargonium peltatum species: Balcon Red (simple and red flowers – figure 1), Balcon Lila (simple and lila flowers – figure 2) and Balcon White (simple and white flowers – figure 3) that were obtained from cuttings from mother-plants grown in pots. These were obtained from the flowers market.

The cutting propagation of mother-plants was made in March, in a peat substrate, enrichment with macro and microelements. The plants that were obtained and selected for the experience were irrigated with water and cut to approx. 4-6 leaves (figure 4), at the end of the May.

Subsequent to these maintenance works, the plants had different nutritive regimes.

The works were proceeded in the specialized glass-house for plant propagation, where the propagation by cutting and maintenance of the geranium can be made during all months of the year, thanks to the possibilities to ensure the environmental factors needed by these species.

The fertirigations made with automatic irrigation ramps, by supplying the optimal quantities and a uniform distribution of water and fertilizers (figure 5).

There were used 2 types of complex chemical fertilizers, water soluble:

- $N_{19}P_{19}K_{19}$+ME, for growing and development phase of the plants (4 fertilizations for the variant with one application/week and 8 fertilizations for the variant with two applications/week);
- $N_{14}P_{14}K_{28}$+2%MgO+ME**,** for the flowering period, with the purpose to favor the flower induction (8 fertilizations with one application/week and 16 fertilizations with two applications/week).

It was organized a trifactorial type of experience with the following experimental factors:

- Factor A – the variety: a_1 - Balcon Red, a_2 – Balcon Lila, a_3 - Balcon White;
- Factor B – the level of fertilization: b_0 (control) – irrigation with water, no fertilization, b_1 - fertilization with chemical fertilizers in concentration of 0.1%, b_2 – fertilization with chemical fertilizers in concentration of 0.2%;
- Factor C – the frequency of fertilizations: c_1 – one fertilization/week, c_2 – two fertilizations/week.

The experience was made of 75 plants (25 plants/variety), each variety having 5 plants. For each variety it was worked with the following experimental variants:

- Irrigation with water, no fertilization (control), two applications/week;
- Fertilization with nutritive solution 0.1%, one application/week;
- Fertilization with nutritive solution 0.1%, two applications/week;
- Fertilization with nutritive solution 0.2%, one application/week;
- Fertilization with nutritive solution 0.1%, two applications/week;

RESULTS AND DISCUSSIONS

By analyzing the results of the table 1, it is observed an important numeric increase of the decorative elements (inflorescences and leaves) within each variant of variety (a_1-a_3), in case of fertilizations in concentration of 0.2% and with a frequency of application twice times per week.

In the case of Balcon Red variety, at fertilization in concentration of 0.2% and 2 applications/week, it were obtained the largest mean values, of 58 leaves/plant and a total number of 17 inflorescences (bud and flower phases). The values of the other variants were inferior, decreasing gradually from the fertilization with fertilizers in concentration of 0.2%, one application/week, to fertilization with fertilizers in concentration of 0.1%, two applications/week and fertilization with fertilizers in concentration of 0.1%, one application/week, to control variant, irrigation with water, with no fertilizers, where it were obtained 42 leaves/plant and a total number of 11 inflorescences/plant (bud and flower phases).

Important qualitative differences were also registered for the Balcon Lila and Balcon White varieties, depending on the dose and number of applications. Thus, the largest mean values, of 56 leaves/plant for Balcon Lila variety and 51 leaves/plant for Balcon White variety, respectively, and 15, respectively 14 inflorescences/plant were obtained at variant of the fertilization with fertilizers in concentration of 0.2% and two applications/week. These values decreased more for control variant, the number of leaves/plant being 45 for Balcon Lila variety, 39 for Balcon White variety and number of inflorescences/plant being 9 and 6, respectively. The mean values of these indicators decreased gradually to fertilization with fertilizers in concentration of 0.2%, one application/week, fertilization with fertilizers in concentration of 0.1%, two applications/week and fertilization with fertilizers in concentration of 0.1%, one application/week, on the last place being the variant with no fertilization.

CONCLUSIONS

1. Between all studied peltatum geranium varieties it is remarked the Balcon Red variety, with a superior decorative value, thanks to the larger number of leaves and inflorescences in comparison to the Balcon Lila and Balcon White varieties, obtained in all variants of concentrations and frequencies of fertilization.

2. The researches demonstrate that for the applied nutrition regimes, all three varieties answered the best to the variant in which the fertilizer was applied in concentration of 0.2%.

3. The optimal frequency of fertilization was two application/week, for all varieties that were studied.

4. In order to establish the appropriate nutrition regime for the production of plants in protected space, with the purpose to obtain some exemplars with maximum decorative value, it is recommended to continue the researches regarding the optimal application of the fertilizers to peltatum geranium (cascading geranium)

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TABLES AND FIGURES

Table 1

The qualitative results of the geranium culture (Balcon Red, Balcon Lila, Balcon White varieties) during the maximum period of flowering (June-August), under the influence of different nutrition regimes

Factor			Number of qualitative characteristics/plat (mean values)		
A	B	C	Leaves	Bud inflorescences	Flower inflorescences
a_1	b_0	-	42	5	6
	b_1	c_1	47	7	7
		c_2	52	7	7
	b_2	c_1	55	6	8
		c_2	58	8	9
a_2	b_0	-	45	5	4
	b_1	c_1	50	6	7
		c_2	51	7	6
	b_2	c_1	55	7	7
		c_2	56	7	8
a_3	b_0	-	39	4	2
	b_1	c_1	45	5	5
		c_2	48	5	5
	b_2	c_1	50	6	6
		c_2	51	7	7

Fig. 1. Balcon Red geranium variety

Fig. 2. Balcon Lila geranium variety

Fig. 3 Balcon White geranium variety

Fig. 4. Geranium cut to 4 leaves

Fig. 5. Fertirigation ramp

Climatic effects on the phenology of some geophytes rustic species

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Keywords: geophyte rustic plants, phenology, climatic conditions

ABSTRACT

Most rustic geophyte species have similar requirements concerning the ecological factors, requiring light, permeable, well drained, and humus-rich soils, in a sunny or semi-sunny location. The requirements regarding the temperature of the flowering plants from this group varies along the vegetation period, the temperature being a key factor that correlates with the phases of vegetation; the temperature level determines the starting of the main phenophases and also the duration of the decor period. The insufficient water determines a reduced growth of floral stems, and in terms of light, the most studied bulbous plants prefer sunny places, shady places causing the damage of the decorative aspect of the flowers (Anton D., 2003, 2004, Toma F., 2009). This paper aims to study the behaviour of some rustic geophyte plants from the phenological point of view, of which some less used in the city of Craiova, and the determination of the decor period according to different climatic conditions in the five experimental years. From the analysis of the average values, it results that *Hyacinthus orientalis* and *Tulipa fosteriana* had the shortest decor duration (10.2, 10.4 days respectively), and the highest values correspond to *Muscari armeniacum* (30.2 days) and *Allium hollandicum* (25.7 days) genera, less used in our area.

INTRODUCTION

Geophytes have a distinct position within the ornamental plants with their underground stems, their durability against unfavorable environmental conditions, their structure as a medical and aromatic plant, their ability to blossom in winter and early spring, their aesthetic and decorative appearance, and the appeal that they give to the parks and gardens in landscape design. Geophytes have a wide area of use, including but not limited to settlement areas, parks and gardens, arboretums, building entries, garden walls, roadsides and rock gardens (Seyidoglu and all, 2009).

They present a great diversity in terms of morphology, biology, genetic control and response to environmental conditions (Hertogh AA DE and Le Nard, 1993, Flaishman and Kamenetsky, 2006).

Thus, the geophyte flowering plants with spring flowering in the field, call in their biological cycle the seasonal thermoperiodism according to the succession of temperatures as hot-cold-hot. These species require the following temperatures scheme during the annual biological cycle: during rest, in the summer, high temperatures of 20-23°C; for rooting of the bulbs (fall) cold temperatures, 4-8°C; for intense vegetative growth and flowering, in winter or spring, moderate temperatures, 10-18°C, depending on phenophase (Stursa J., 1997, Anton D., Nicu C., 2006, Şelaru E., 2007, Toma F., 2009).

In our area the rustic geophyte flowering species are not sufficiently used in the decoration of green areas, although they may be used in making spring-summer flower compositions, together with biennial species and some perennial hemicryptophytes. Choosing plants for flower compositions is done according to several criteria: type of landscape, size of plants, flower type and colour, but especially depending on the period and duration of flowering.

MATERIALS AND METHODS

The analyzed biological material was represented by nine species of rustic geophyte perennial flowering plants: *Allium hollandicum, Crocus chrysanthus, Hyacinthus orientalis, Iris pumila, Muscari armeniacum, Narcissus pseudonarcissus, Ornithogalum umbellatum, Puschkinia scilloides, Tulipa fosteriana.*

Analysis of the phenology. During the vegetation period there were performed observations on the vegetation phases of rustic bulbous flowering species, based on which there was determined the average number of days from the bud detachment to the beginning of flowering, and the average number of days from the beginning until the end of flowering (decor duration).

The perennial bulbous flowering plants behaviour was observed in the didactic study field of the Floriculture discipline located in Craiova. The sector is located on a plane ground with sandy-loam texture, away from air currents.

Analysis of climatic conditions. From the main meteorological elements there were observed particularly the monthly and annual average temperature, total precipitations on months and years, atmospheric humidity and the sunshine duration.

In terms of *annual average temperature*, which ranged between 10.8ºC in 2003, value similar to the multiannual average level, and 12.4ºC in 2007, value which exceeds with 1.6ºC the annual average temperature (10.8ºC). (fig.1)

In the analyzed period, the annual average temperature was below the multiannual average in a single year (2005) and in three of the five years of experiment the annual average values exceeded this value (2004, 2006, and 2007).

Regarding the amount of precipitation fallen in the five years of study, the obtained values exceed the multiannual average (582 mm), but their distribution during the vegetation period was uneven. (fig. 2)

In many critical moments, the plants have suffered because of hydric stress (the summer of 2003, the spring of 2004), with an absolute need for irrigation, or because of abundant precipitations (2005, 2007), with negative effects especially during the flowering period.

RESULTS AND DISCUSSIONS

The number of days from the bud detachment to the beginning of flowering varied widely depending on the species and the very different climatic conditions in the period 2003-2007, the values ranging between 4 days (*Ornithogalum*, *Crocus*) and 49 days (*Hyacinthus*) (fig.3).

Making a comparison between the nine species belonging to different genera, *Iris pumila* (after 5-12 days) and *Allium hollandicum* (after 6-12 days) have flourished most quickly, both are very resistant species and less demanding in the flowering – climatic conditions relationship.

The highest number of days until flowering corresponds to *Hyacinthus orientalis* species (18-49 days). For Craiova climate zone there are great differences between the flowering periods of the analyzed genera and species, emphasized by the climatic conditions specific for each year.

The influence of the climatic conditions on the decor duration within the same genus is obvious and may vary between 5-25 days for *Iris pumila*, 11-44 days for *Allium hollandicum* or 20-54 days for *Muscari armeniacum* (fig. 4).

Making a comparison between the years in terms of flowering duration for the nine analyzed species, it is observed that the best year in this regard was 2006 (9-54 days) followed by 2007 (7-44 days); the shortest decor duration for the studied rustic bulbous species corresponds to the year 2003 (5-20 days) characterized by low temperatures in January-March (fig. 5).

In 2007, characterized as a warm year (12.4°C), but not a dry one (752.5 mm), at most studied bulbous plants there were found: an advancement of starting of phenophases in comparison to 2003, the differences being significant (with 50 days earlier at *Crocus*) and the extension of the decor duration for some species (*Muscari, Allium*).

Analyzing the average duration of flowering for the period 2003-2007, it appears that *Hyacinthus* and *Tulipa* genera had the shortest decor period (10.2, 10.4 days respectively) and the highest values correspond to *Muscari* (30.2 days) and *Allium* (25.7 days) genera, less used in our area (fig. 6).

CONCLUSIONS

Depending on the species and on the very different climatic conditions for the period 2003-2007, the number of days from the bud detachment to the beginning of flowering varied widely, between 4 days (*Ornithogalum, Crocus)* and 49 days (*Hyacinthus*).

Making a comparison between the nine species belonging to different genera, *Iris pumila* (after 5-12 days) and *Allium hollandicum* (after 6-12 days) have flourished most quickly; both species are very resistant and less demanding in the flowering-climatic conditions relationship.

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In terms of flowering duration for the nine analyzed genera, it appears that the best year in this regard was 2006 (9-54 days) followed by 2007 (7-44 days), the shortest decor period for the studied rustic bulbous species corresponds to the year 2003 (5-20 days) characterized by low temperatures in January-March.

The average duration of flowering for the studied bulbous flowering plants ranged between 10-15 days (*Hyacinthus orientalis, Tulipa fosteriana*) and 25-30 days (*Allium hollandicum*, *Muscari armeniacum*).

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FIGURES

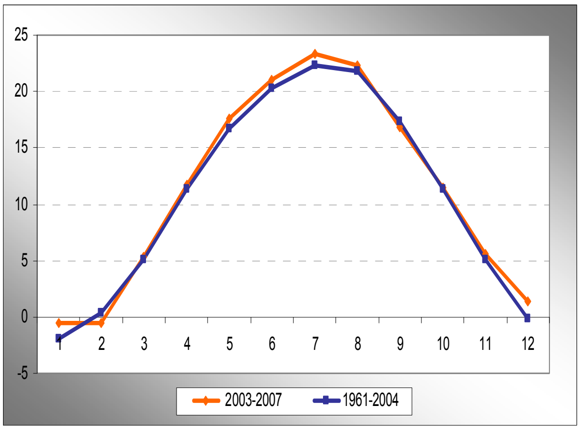

Fig. 1. The monthly average temperature (Craiova-Airport Weather Station)

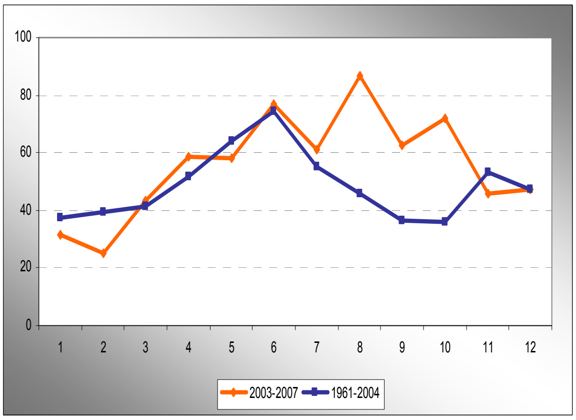

Fig. 2. The monthly average precipitations (Craiova-Airport Weather Station)

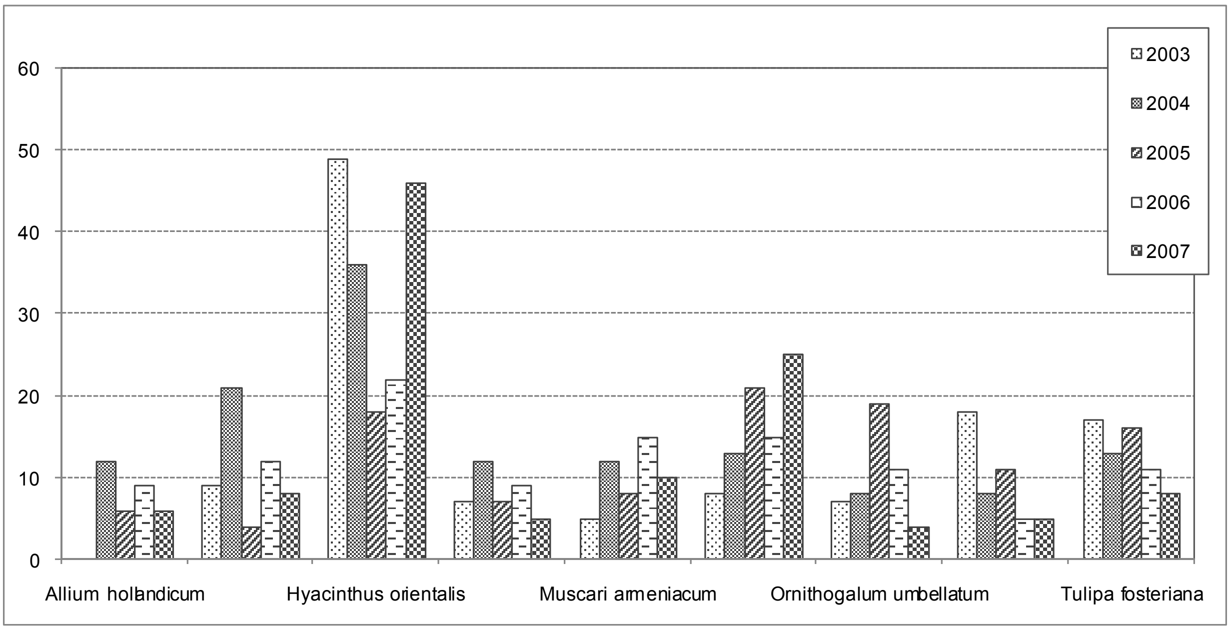

Fig. 3. The number of days from the bud detachment to the beginning of flowering of bulbous species in the period 2003-2007

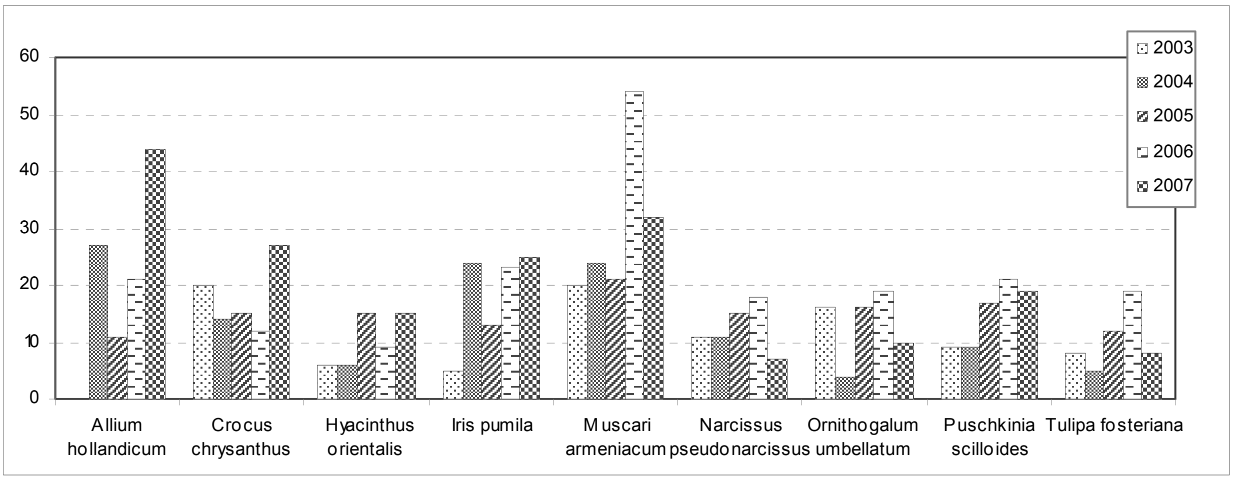

Fig. 4. The flowering duration of rustic geophytes species studied

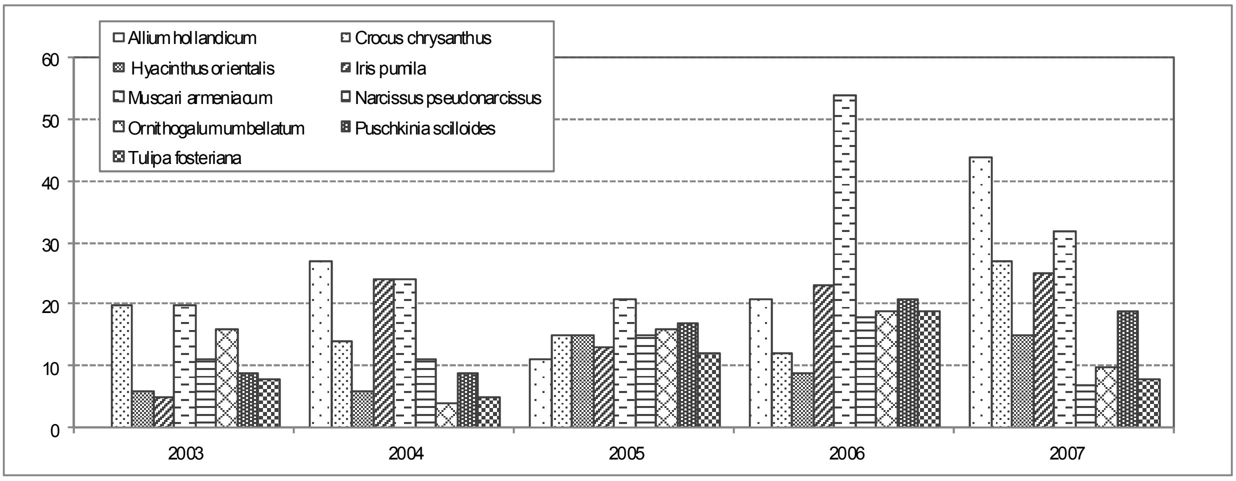

Fig. 5. The flowering duration of perennial bulbous flowering plants studied

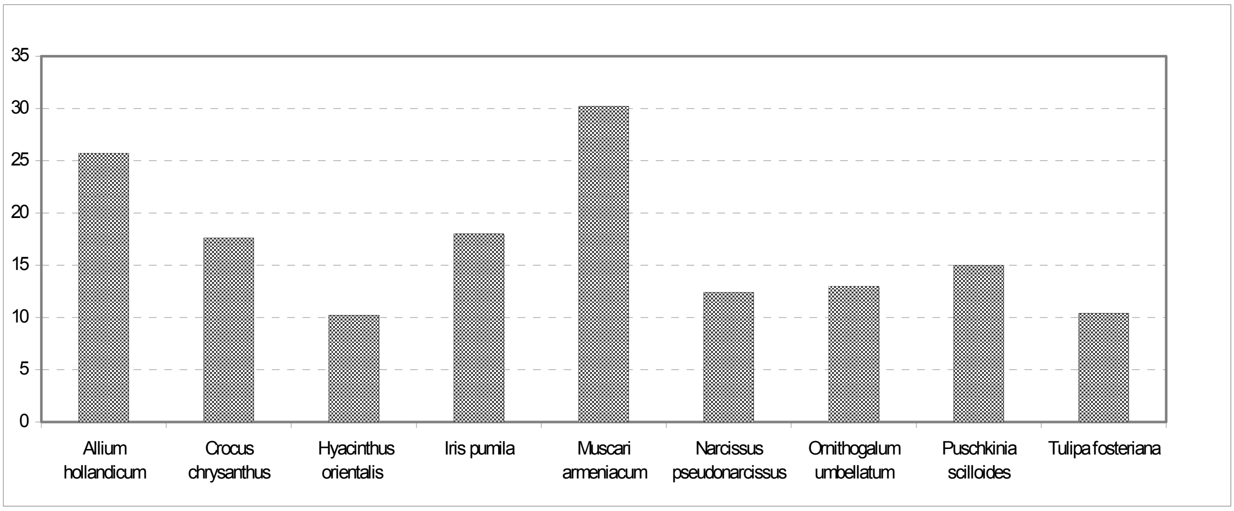

Fig. 6. The average flowering duration for the studied rustic geophytes species in the period 2003-2007

Research on technology of obtaining *Delphinium cultorum* by sowing

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Keywords: covering materials, viability, humidity

ABSTRACT

Obtaining good seedlings is of crucial importance for commercial producers and one of the perennials flowers what is known to be difficult is *Delphinium cultorum*. Therefore is recommended to find the best method for production of seedlings as in this moment the percentage of plants obtained from the seed in hybrids is less than 60% and the propagation from cuttings is not capable of generating enough plants for commercial purposes. The impact of coverage of the potting mixture is a major one in the process as much as the quality of the seeds (source and the type of storage applied), both being able to increase/decrease the percentages shown in germination, and by that having an essential role. Different sources of seeds (Franchi Sementi, Magic Fountain, Pacific Giant, New Millennium Delphinium) and materials for covering the seeds (sand, perlite, potting mix, potting mix with wet paper tissue) were used to determine the technology best to be applied. The results obtained after conducted trials revealed that the importance of keeping the soil moist is having implications in obtaining a high germination rate (can be achieved more than 80% using perlite or potting mixture with wet paper towel) and a good quality of obtained plants as indicated by surviving seedlings in one month after germination (around 70%) and also a sustained conclusion that the source and quality of seed is a crucial factor.

INTRODUCTION

Delphinium cultorum represents a perennial with germination problems, which factor is making this type of culture less attractive for the commercial sector. The experiment was conducted in order to establish what is the importance of using different materials for covering seeds of *Delphinium cultorum* in the process of sowing and what is the percentage of germination that can be obtained in different cases.

MATERIALS AND METHODS

In order to establish the percentage of germination on four sources of seeds - Franchi Sementi, Magic Fountain, Pacific Giant, New Millennium Delphinium – before using on them different types of coverage that can be used in real practice, trials have been conducted in 2 situations, using 50 seeds each time: in the first case seeds have been put on wet paper towel inside a plastic bag in a bright place but not in direct sunlight, in the second case the seeds have been seeded in the same potting mix that will be used in experiment further away, in the same place as the ones in plastic bags, at 21 degrees Celsius temperature. The seeds have been pre-chilled at 6 degrees Celsius for a week before sowing. To achieve a level of equality have been used mixes of seeds (probably obtained by free pollination) that would generate a mix of colors in the plants produced, eliminating the probability of variation due to a specific hybrid.

After determining the real germination percentage, have been used for each variety one potting tray with 98 cells for every type of covering used: sand (measuring 1-2mm height), perlite (1-2mm height in dry state), potting mixture (commercial prepared for seedlings, 1-2mm height), the same potting mixture (1-2mm height) covered with wet paper towel for the first 4 days from sowing to maintain humidity at high levels. After the sowing trays were watered by submersion at ½ of their height in solution of Previcur N with 0,1% concentration and also have been sprayed on the top layer with the same product. The temperature was 24 degrees Celsius during day time and 15 degrees Celsius during night time all period of the experiment.

Viability of seedlings has been established by counting at one week and one month (30 days) from the day when majority of the seeds sprouted.

RESULTS AND DISCUSSIONS

There were notable differences in the number of sprouted seeds (between 46% and 79% in potting mix and 58% and 82% in damp paper towel in a plastic bag) during the trials for germinations (as can be seen in tables 1a, 1b, 1c and 1d) that can be put on behalf of quality combined with temperature and period of storage of the produced seeds that influenced their viability according with other authors (Corbineau and Come, 1991; Alderson, 1987).

The results of the trials are indicating that the best methods of sowing for *Delphinium cultorum* are using a light potting mixture and as a cover perlite (having a percentage of 75%-82% in the sector of seeds from reliable sources) or potting mix with damp paper towel for a period of 4 days (having a percentage of 76%-81% in the same sector of seeds) combined with chemical control of the pathogens as reported in tables 2b, 2c, 2d .

This results are in fact proved to be correct even in the case of the unproven quality of the seeds or the seed storage until sowing (as can be seen in table 2a), because the percentage of seeds germinated is higher in the two sectors that have been nominated above (51% using potting mix with damp paper towel and 56% using perlite cover) but the fact that low levels of sprouting are obtained from low quality seeds is emphasizing once again the need of using reliable sources for initial material in commercial sector production as can be sustained by previous scientific works (Mikkelsen James, 1987).

As the production has to have a simple technology to be economically efficient probably the best recommendation for the technique is to use the perlite covering for production of *Delphinium cultorum* seedlings.

CONCLUSIONS

The most important aspects for obtaining good *Delphinium cultorum* seedlings by the commercial producers are the quality of the seeds (including also the conditions of storage from source to the moment of sowing) and the maintaining of a good ratio between aeration and humidity in their sowing trays in the light of avoiding the possible diseases encouraged by high humidity needed, with maximal efficiency obtained when perlite cover is used.

AKNOWLEDGEMENT

The author is grateful to Terry Dowdeswell for providing seeds from his collection for this experiment.

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TABLES

Table 1a

Standard germination of the seeds from series Franchi Sementi

In damp paper towel in plastic bag	In potting mix
58%	46%

Table 2a

Results in germination and viability on Franchi Sementi seeds

	Seeds covered with sand	Seeds covered with perlite	Seeds covered with potting mixture	Seeds covered with potting mixture and wet paper towel
Germination percentage	49%	56%	46%	51%
Viable seedlings at one week from germination	43%	52%	42%	48%
Viable seedlings at one month from germination	36%	42%	34%	39%

Table 1b

Standard germination of the seeds from Magic Fountain series

In damp paper towel in plastic bag	In potting mix
80%	76%

Table 2b

Results in germination and viability on Magic Fountain seeds

	Seeds covered with sand	Seeds covered with perlite	Seeds covered with potting mixture	Seeds covered with potting mixture and wet paper towel
Germination percentage	74%	80%	76%	78%
Viable seedlings at one week from germination	66%	76%	69%	74%
Viable seedlings at one month from germination	59%	67%	63%	66%

Table 1c

Standard germination of the seeds from Pacific Giant Hybrids series

In damp paper towel in plastic bag	In potting mix
76%	72%

Table 2c

Results in germination and viability on Pacific Giants Hybrids seeds

	Seeds covered with sand	Seeds covered with perlite	Seeds covered with potting mixture	Seeds covered with potting mixture and wet paper towel
Germination percentage	71%	75%	72%	76%
Viable seedlings at one week from germination	61%	72%	63%	70%
Viable seedlings at one month from germination	53%	64%	59%	62%

Table 1d

Standard germination of the seeds from New Millennium Delphinium series

In damp paper towel in plastic bag	In potting mix
82%	79%

Table 2d

Results in germination and viability on New Millennium seeds

	Seeds covered with sand	Seeds covered with perlite	Seeds covered with potting mixture	Seeds covered with potting mixture and wet paper towel
Germination percentage	76%	82%	79%	81%
Viable seedlings at one week from germination	69%	79%	73%	77%
Viable seedlings at one month from germination	62%	71%	67%	69%

Study on medium-term behavior of *Delphinium cultorum* in Bucharest, Bacau and Caransebes

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Keywords: temperatures, location, viability

ABSTRACT

***Delphinium cultorum* has high demands for the growing conditions and its development and viability are related to the range of weather conditions that occur in different stages of the culture. The influence of those was broken down because in all three locations of the trials the cultures were started in the same conditions, were applied all the fertilizers and pesticides needed and all types of soil in which plants have been grown have similar qualities, the exposure to the sun was the same. Trials have been conducted having as subject the implications of weather coordinates on the medium term behaviour of *Delphinium cultorum* in cultivation, depending of region, taking into account as the most important coordinate being the temperature who is involved in all stages of cultivation and is limiting the evolution of plants. The results showed a high dependence of the culture technology and site selection for cultivation vs. temperature range and variation, leading to the drastic reduction of the number of surviving plants in the Bucuresti location, in fact due to high temperatures during late Spring to Autumn, and the diminished number in Bacau after three years of trials. The best results for viability and number of inflorescences on every blooming period have been obtained in Caransebes directly related to lower temperatures during summer.**

INTRODUCTION

Perennial culture is an important source of income for the producers of planting material and for that is important to have a rigorous technology that can be applied to their cultures. The right technology is subordinated to those factors that cannot be changed and uses them in its own advantage. In horticulture the main factors that cannot be changed when the culture takes place outdoors are the weather coordinates. As long as the amount of rainwater fallen on the soil, the position vs. sun and exposition to the winds can be managed by improvement measures, the temperature is one of the factors that cannot be managed by normal human intervention.

As mentioned by other authors the weather is very important to this culture (Pfister, and Cook, 2011.) and if the difference in temperature between night and day has not enough consistency the plants are decreasing in height and present fewer inflorescences (Sasaki et al., 2008).

The importance of the temperatures in Delphinium cultorum cultivation technology is the object of the present work and there is to be established if this is a limiting factor for the Romanian zones proper for successful growing of this type of plants.

MATERIALS AND METHODS

For the trials have been used plants obtained by sowing from two reliable sources: Sahin Delphinium seeds collection for the plants cultivated in Bacau and New Millennium Delphiniums for those cultivated in Bucuresti and Caransebes. Have been used plants resulted from seeds obtained by free pollination. The plants have been planted in spring because they have been obtained by sowing in January, so in May-June 2006 they have bloomed for the first time. This bloom was taken into account as the first year of blooming and the 2007 and 2008 were counted as the second and third year. The cultivation technology was the same for all three places including the amount of irrigation necessary to obtain and maintain the same humidity in soil and the treatments applied to the plants. Trying to obtain the same conditions the soil for the three locations has been improved with both mineral and organic materials. Although the plants population in Bucuresti and Caransebes were the smaller ones (48 plants in year 2006 in Bucuresti and 35 in Caransebes) the population in Bacau had a more larger panel – 92 plants and the study included all of them.

Was recorded and studied the temperature in the three location on three years (2006, 2007 and 2008) (tables 1-3), and the temperature variation was graphically interpreted so the difference between minimal and maximal temperature can be easily shown (fig. 1-3).

First were recorded the dates about the number and height of the inflorescences on each plant in all the three places of culture. Those dates were interpreted in two categories – the average number and the average height of inflorescences on plant in every location, on each year.

After the weather conditions started to leave their mark on plants, were counted the number of plants survived in years 2007 and 2008.

RESULTS AND DISCUSSION

The monthly average temperatures calculated for the period 2006-2008 in Bucuresti, Bacau and Caransebes are presented in tables 1-3 and the temperature variation calculated is represented in table 4.

As can be seen in table 4 the major difference between Bucuresti and Caransebes is the maximum and minimum temperature during summer and this is having a great influence in biology of the plants as they continue to diminishes their flowering annually and reduce their life span.

Figures 1-3 reveal that the variation of minimal/maximal temperatures is more constant in Caransebes, medium to high in Bacau and high in Bucuresti. The fact that spikes of high temperature are noticeable in Bucuresti correlated with diminishing quality of inflorescence can conduce to the theory that plants that are flowering in lower and more proportional temperature between day and night will produce better inflorescences (as Ogasawara et al., H. 1996 have written).

In table 4 is noticeable that the minimum variation of temperature from May to October was in Bucharest (9.97 to 12,59 degrees Celsius) comparing to the Caransebes where the maximum was (11.84 to 13.78 degrees Celsius). This fact correlated to the maximum temperature that occurred in Bucuresti has the same results as a previous trial (Noritoshi and Yoshinobu, 1997) claimed – the quality and quantity of flowers is decreasing with the rising of the temperatures above average (table 5 and 6).

As can be seen in figures 4-12 the quality of the inflorescences is diminishing rapidly in Bucuresti and at a slower rate in Bacau but it's maintained in Caransebes, indicating that plants cannot adapt to a more xeric sites (in accordance with Eplig and Lewis, 1952.).

The Bucuresti location could not produce inflorescences with high quality and this can indicate that it's not advisable to conduct commercial plantation in this conditions.

Bacau location triggered a medium response of the plants, but can be presumed that other measures (as cultivating on raised beds and providing shadow in the middle of the day) can be taken to manage correctly a commercial plantation of *Delphinium*.

The best location of the three investigated is Caransebes, which has a good quality of inflorescences.

The number of plants viable in year 2007 and 2008 depends on the locations of the culture (fig.7). This conduces to a small viability percentage of 56.25 (in 2007) and 27.08 (in 2008) for plants cultivated in Bucuresti, a medium viability percentage of 70.65 (in 2007) and 44.56 (in 2008) for plants cultivated in Bacau and a high viability percentage occurred in Caransebes – 91.43 (in 2007) and 85.71 (in 2008).

CONCLUSIONS

The high temperatures occurred are lowering the height of the inflorescence and the number of stalks by plant, reducing also the viability of the plant on medium term. A more balanced temperature situation, with the highest monthly average temperature less than 27.5 degrees Celsius can provide good conditions for commercial cultivation of Delphinium in Romania.

AKNOWLEDGEMENT

The author is grateful to Mr. Terry Dowdeswell for providing seeds from his collection, to Statiunea de Cercetari Legumicole Bacau for allowing to use their field cultivated with *Delphinium* for trials and to Mr. George Pop for providing access to his cultivation field of *Delphinium*.

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TABLES AND FIGURES

Table 1

Monthly average temperature values calculated for the period 2006-2008 [Bucuresti]

Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MAXIMUM	4.05	5.92	12.10	18.07	23.90	27.89	30.13	29.85	23.15	17.92	9.76	4.47
MINIMUM	-3.00	-2.40	1.69	6.95	12.04	17.75	17.54	17.50	12.51	7.95	2.27	-1.13

Table 2

Monthly average temperature values calculated for the period 2006-2008 [Bacau]

Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MAXIMUM	2.38	2.50	9.68	15.73	22.35	25.82	28.77	28.45	21.84	16.43	8.30	3.86
MINIMUM	-4.13	-4.58	-0.30	5.04	10.18	13.92	15.83	15.95	10.37	5.60	0.85	-1.45

Table 3

Monthly average temperature values calculated for the period 2006-2008 [Caransebes]

Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MAXIMUM	1.69	4.06	10.28	16.65	22.09	25.24	27.47	26.31	21.19	16.67	7.84	2.30
MINIMUM	-6.12	-5.17	-0.89	4.45	9.11	12.30	13.69	13.81	9.35	3.86	-1.28	-3.44

Table 4

Temperature variation in Bucuresti, Bacau, Caransebes for the period 2006-2008

Temperature variation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bucuresti	7.05	8.32	10.41	11.12	11.86	10.14	12.59	12.35	10.64	9.97	7.49	5.60
Bacau	6.51	7.08	9.98	10.69	12.17	11.90	12.94	12.50	11.47	11.43	7.45	5.31
Caransebes	7.81	9.23	11.17	12.20	12.98	12.94	13.78	12.50	11.84	12.81	9.12	5.74

Table 5

The average number of inflorescences on plant in spring/summer flowering in Bucuresti, Bacau, Caransebes for the period 2006-2008

Year	Place of cultivation		
	Bucuresti	Bacau	Caransebes
2006	1.73	1.92	1.57
2007	4,22	4.96	5.27
2008	2.58	4.31	6.83

Table 6

The average height of inflorescences on plant in spring/summer flowering in Bucuresti, Bacau, Caransebes for the period 2006-2008

Year	Place of cultivation		
	Bucuresti	Bacau	Caransebes
2006	63 cm	68 cm	56 cm
2007	123 cm	138 cm	142 cm
2008	136 cm	154 cm	161 cm

Table 7

The viability of plants in Bucuresti, Bacau, Caransebes for the period 2007-2008

Year	Place of cultivation		
	Bucuresti	Bacau	Caransebes
Initially planted -2006	48	92	35
2007	27	65	32
2008	13	41	30

Table 8

The percentage of surviving plants in Bucuresti, Bacau, Caransebes for the period 2007-2008

Year	Place of cultivation		
	Bucuresti	Bacau	Caransebes
2007	56.25	70.65	91.43
2008	27.08	44.56	85.71

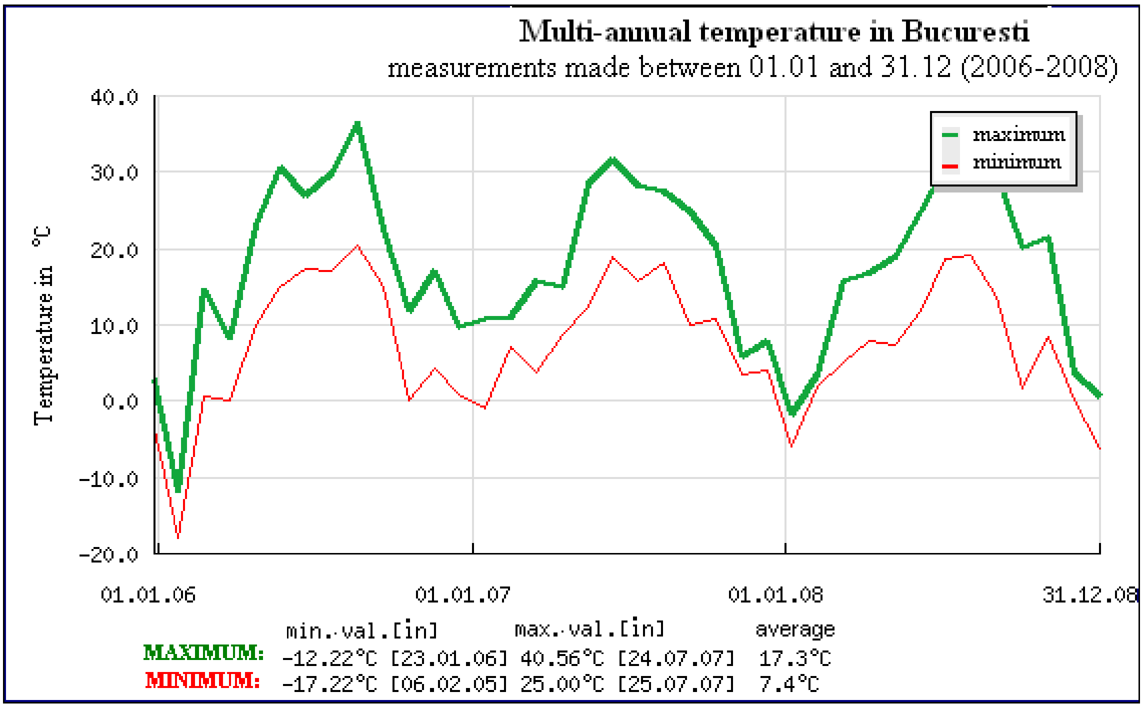

Fig.1. Temperature in Bucuresti 2006-2008

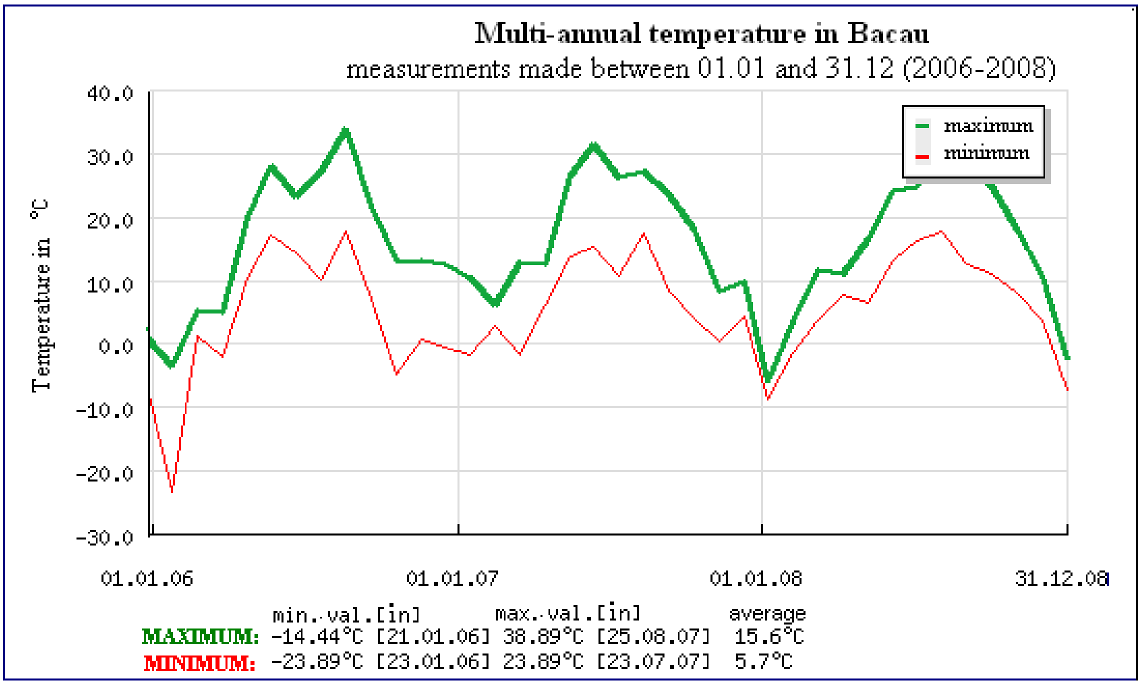

Fig.2. Temperature in Bacau 2006-2008

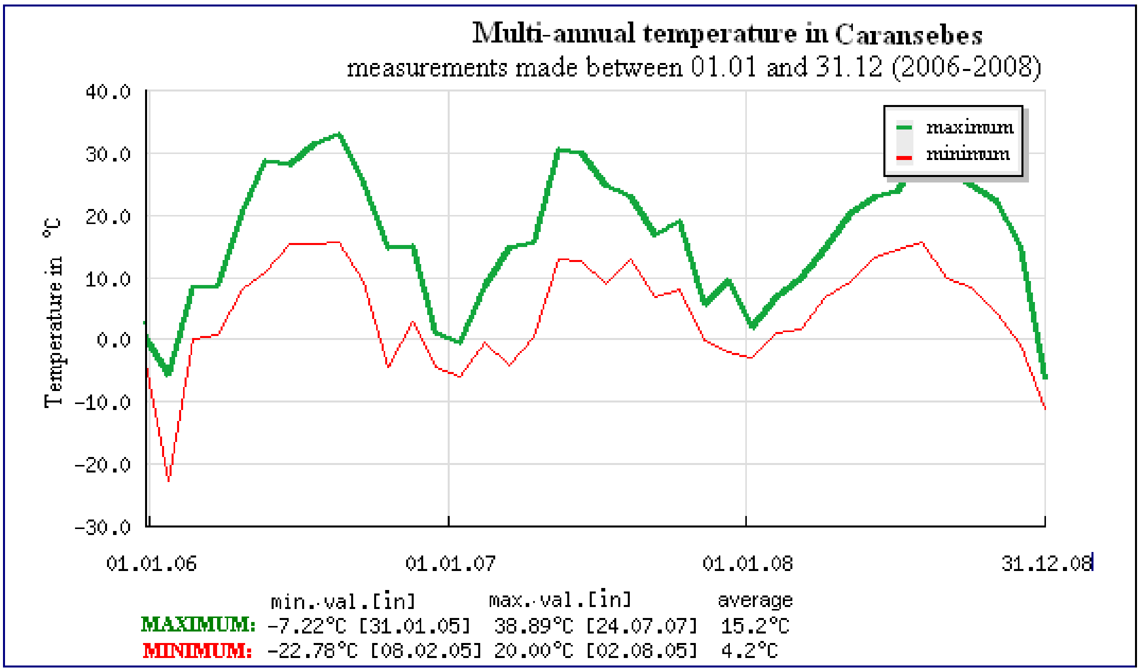

Fig.3. Temperature in Caransebes 2006-2008

Fig.4. Inflorescence first year Bucuresti

Fig.5. Inflorescence second year Bucuresti

Fig.6. Inflorescence third year Bucuresti

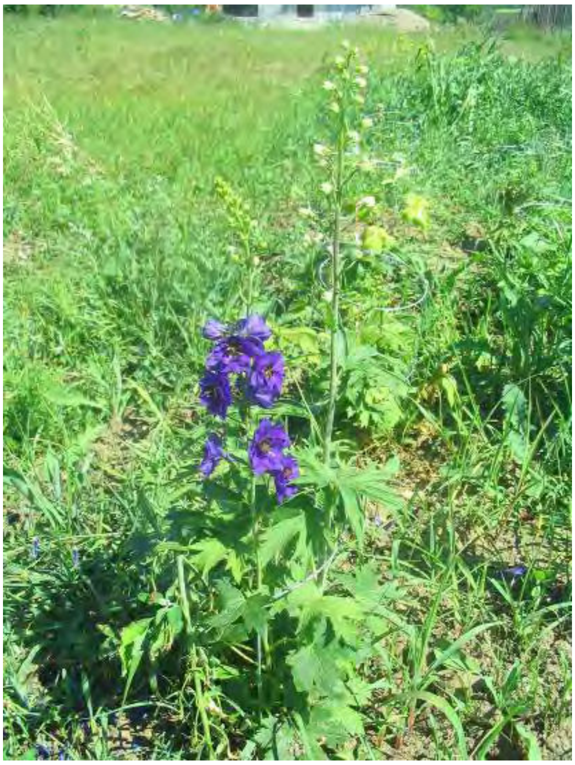

Fig.7. Inflorescence first year Bacau

Fig.8. Inflorescence second year Bacau

Fig.9. Inflorescence third year Bacau

Fig.10. Inflorescence first year Caransebes

Fig.11. Inflorescence second year Caransebes

Fig.12. Inflorescence third year Caransebes

Micropropagation of *Phalaenopsis* Orchid by natural substances for unique-formed "Orchid Key-Holder" on small bottle in order to agritourism development

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Keywords: Micropropagation, Phalaenopsis, Natural Subtances, Orchid-key holder

ABSTRACT

***Phalaenopsis* is one of the unique plants groups, highly aesthetics, it has become one of important export commodities, like; plant-potted, cut flower, etc. Another unique-formed is "key-holder" to growth and development by tissue culture technology (on small bottle 1.3x0.6 inch) for Agritourism Development in Indonesia. The aim of research was to know and obtain the best interaction between chitosan and potato extract (natural substances) on the growth and development of Phalaenopsis hybrid protocorm *in vitro*. The explants protocorm of Phalaenopsis Join Angel X Phalaenopsis Sogo Musadian were grown in MS medium. The design of experiment was Completely Randomized Factorial with sixteen treatments and three replications. The first factor was chitosan concentration (without, 10 , 20 and 30 mg/L), and the second was potato extract concentration (without, 100, 200, and 300 ml/L). The results of experiment showed that there was interaction effect between chitosan and potato extract on number of PLBs (protocorm like bodies) number of shoots, number and width of leaves.. The best result showed at 10 mg/L chitosan and 100 ml/L potato extract, especially for "*orchid key- holder* "development.**

INTRODUCTION

Orchids are plants that have a high aesthetic value as a beautiful flower with attractive colors. Aside from being beautiful flowering potted plants, orchids are also known as a cut flower crop which has important meaning in the world flower trade is a potential source of foreign exchange for the country and source of income for people who cultivated. Also the orchid can be used as a product of art "orchid key-holder" through tissue culture. "Orchid Key-holder" of a key chain containing the plantlets in small bottles with a height of 1.3 inch and 0.6 inch in diameter. This product has been developed since 2004 by the authors in laboratory tissue culture of seed technology. This innovation can be used as touristic products for the development of tourism in Indonesia. In addition, the product "orchid key-holder" can also be developed into an industry supplying quality seeds. This situation is a challenge for the orchid farmers, academics and research institutions to improve the quantity and quality of the orchids for domestic and foreign.

Therefore we need a mass propagation of orchids and rapidly through tissue culture. . Application of tissue culture, it is possible to perform a variety of matters related to the development of orchids that cannot be done conventionally.

To enhance orchid seed qualitatively and quantitatively can be done by modifying the media through the addition of complex organic material in order to optimize the growth of orchids. The organic matter used is chitosan and extracts of potatoes. Culture media are often used for tissue culture was Murashige and Skoog (Arditti and Ernst, 1992), and the addition of growth regulators (PGR) such as cytokinin and auxin plays an important role in tissue culture. The addition of organic materials such as potato extract has been widely applied in tissue culture because it serves to stimulate callus formation and proliferation of shoots (Rahman et al., 2003), enhance growth and differentiation of cells in certain plants (Widiastoety and Purbadi, 2003). Potato extract can increase the growth of shoots orchid Doritaenopsis (Rahman, et al., 2003). Chitosan is the result of shrimp shell waste, shellfish, insects, and fungi. Chitosan can stimulate plant growth (Griezka, et al., 2008) and increase the absorption of nutrients (Sukwattanasinitt, et al., 2001) and can stimulate plant cells to form secondary metabolites (Putalun, et al., 2007). Chitosan was able to induce the synthesis of plant hormones such as gibberellin and stimulate the biosynthesis of auxin via the tryptophan path so as to enhance plant growth and development. The results showed that chitosan in orchid meristem tissue culture, can enhance the growth of PLB (protocorm like bodies) up to 15 times (Nge, et al., 2006).

Addition of Chitosan with potato extract in vitro culture is expected to solve the above problems so that it can be applied to improve the quantity and quality, especially Phalaenopsis orchid seed and development of "orchid key holders."

This study aims to determine the effect of interaction between chitosan and potato extracts on growth of Phalaenopsis hybrid protocorm in vitro and obtain the best concentration of chitosan and potato extracts on growth of Phalaenopsis, especially in product development "orchid key-holder".

MATERIALS AND METHODS

The study was conducted at Tissue Culture Laboratory, Faculty of Agriculture Seed Technology, Padjadjaran University. Explants used were protocorm Phalaenopsis Phalaenopsis hybrid crosses of "Join Angel" x "Phalaenopsis' Sogo Musadian". Each culture bottle contained one explant. Culture bottles used have 0.6 inch in diameter and 1.3 inch in height. Basic medium used was Murashige and Skoog medium that has been modified by the addition of organic material that is chitosan and extracts of potatoes. Treatment consists of two factors: the first factor was the concentration of chitosan with four levels; without chitosan, 10 ppm, 20 ppm and 30 ppm. The second factor was the concentration of potato extract which consists of four levels; without potato extract, 100 ml/L, 200 ml/L and 300 ml/L. The design used was completely randomized factorial design with three replications. Each unit consists of 10 samples. Observation of experiment performed every 4 weeks until 12 weeks after incubation. The variables measured were the number of PLB (protocorm like bodies), the number of shoots, leaf number, and leaf width.

RESULTS AND DISCUSSIONS

Total PLB

PLB formation is a manifestation of embryogenesis, the process of somatic embryo formation. Pierik (1987) states that the process of somatic embryo induction driven by the increased concentration of the hormone auxin and amino acids, the reduction of nitrogen in ammonium form, the addition pottasium, and reduction in calcium concentration.

Addition of chitosan and extracts of potato on the basis of media Murashige and Skoog (MS) gave a significantly different effect of the interaction of the variable of PLB at 8 WAI(week after incubation) and 12 WAI (Table 1). In each specific treatment media have a positive influence in the initiation and multiplication of PLB at 8 WAI and 12 WAI were to show the occurrence of the number of PLB at each interval of observation. There were because the chitosan and potato extract contained various amounts of carbohydrates was relatively high amino acids, minerals and vitamins that complement each other.

Carbohydrates an important role in tissue culture that was as a source of energy and carbon. Sucrose which was a type of carbohydrate is needed together with IAA in the propagation network. According Heddy (1989) carbohydrates also function as IAA-forming complexes, which can function as a form of savings and in the process of activation of IAA. Sucrose can also increase the rate of photosynthesis at 20-30 g/L (George et al., 2008).

Hormones auxin and cytokinin was required in low concentrations that could cause physiological responses. Hormones auxin and cytokinin derived from endogenous hormone protocom or explant that was used in tissue culture. Cytokines found in the t-RNA from the cytoplasm and chlorophyll (Van Staden and Davey, 1979 quoted by George, et al., 2008).

The hormone auxin in potato is indole acetic acid (IAA) that was synthesized from tryptophan. PLB formation caused by IAA together with cytokines (Chaturvedi et. Al., 1978 quoted by George, et al., 2008).

The interaction between auxin in high concentration with a low cytokinin could form a callus or PLB on orchid (Figure 1a). Vitamins that have been a lot added to the tissue culture medium such as thiamin (vitamin B1), nicotinic acid or niacin and pyridoxine (vitamin B6), and myo-inositol. That vitamin except myo-inositol was contained in potato extract and chitosan. Thiamin (Vitamin B1, aneurina) on thiamine pyrophosphate, is an essential cofactor in the metabolism of carbohydrates and is directly involved in the biosynthesis of several amino acids. Pantothenic acid plays a role in the production of callus (George, et al., 2008).

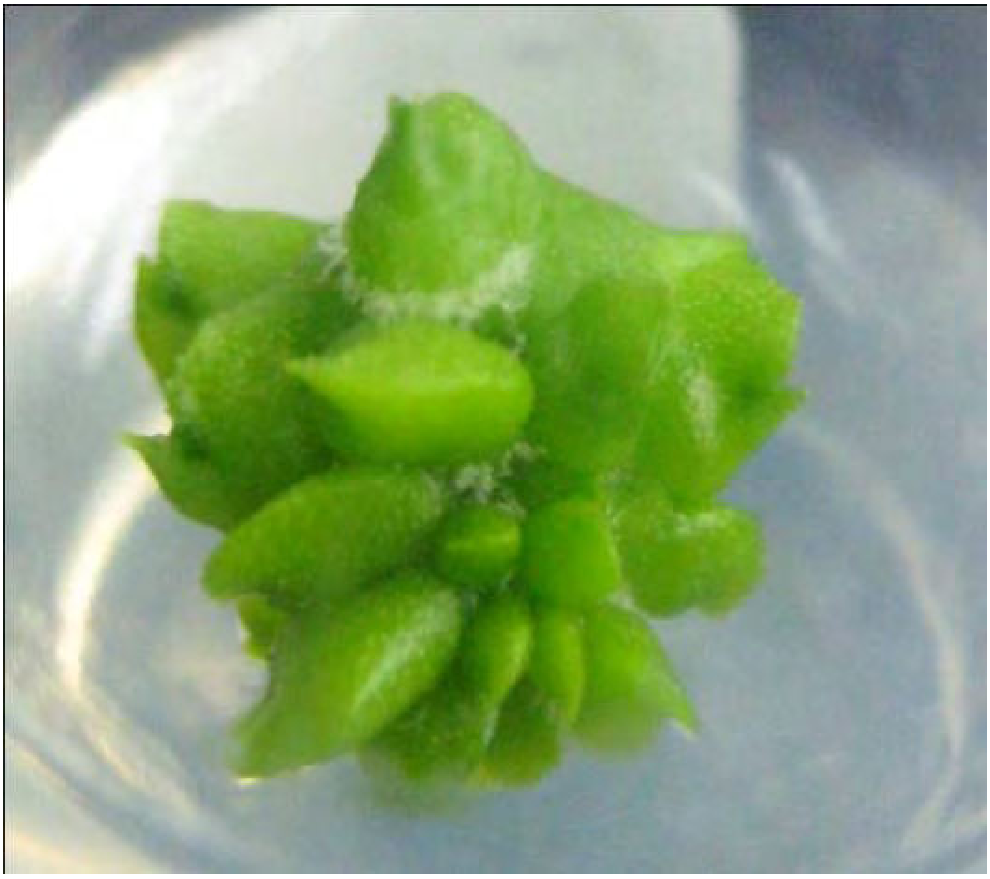

Fig. 1a. PLB multiplication

Table 1

Interaction effect of chitosan with potato extract on the number of PLB per explant at Age 8 WAI and 12 WAI

Treatment	8WAI				12 WAI			
	k_0	k_1	k_2	k_3	k_0	k_1	k_2	k_3
c_0	1,76 a A	5,68 ab B	2,44 a A	8,90 b B	2,06 ab A	10,50 a C	4,59 a B	10,07 a C
c_1	1,13 a A	5,52 ab C	2,63 a B	5.00 a BC	1,90 a A	7,58 a BC	4,68 a B	13.00 a C
c_2	1,63 a A	10,03 b C	4,27 a B	4,93 a BC	2.37 a A	14,67 b C	10,12 a BC	6,10 a B
c_3	3,68 b A	3,66 a A	3,02 a A	5,32 a A	5,01 b A	6,07 a A	4,12 a A	7,58 a A

Note: The average value which the same small letters on the same column and the same capital letters on the same line are not significantly different according to Duncan's Multiple Range Test at 5% level. Chitosan (c), c_0 = 0 ppm, c_1 = 10 ppm, c_2 = 20 ppm, c_3 = 30 ppm; Potato Extract (k), k_0 = 0 ml/L, k_1 = 100 ml/L, k_2 = 200 ml/L, k_3 = 300 ml/L

Number of shoots

The successful growth of shoots mainly depend on tissue source, levels of nutrient medium, the type and levels of hormones (Wetter and Constabel, 1991). Increase of chitosan and extracts of potato on MS basic medium gave a significantly different effect to the number of shoots variable at 8 WAI and 12 WAI . Table 2 shows that the treatment used in this experiment can stimulate regeneration protocorm to be shoots (Fig. 1b). Shoots are not formed in each treatment. Growth of morphological development of a culture heavily influenced by hormones. Growth of shoots and leaves, primarily driven by higher concentration of cytokinin than auxin, but other chemical substances such as vitamins, amino acids, macro and micro also contributed to the formation of shoots. Addition of chitosan and potato extracts contribute to the amino acid, carbohydrate, vitamins, macro and micro nutrients. Based on observations during the experiment, protocorm get a multiplication into PLB from PLB first and then begin to divide in the scutellum and the gap is formed buds. Fundamental factors that cause organogenesis was to be vague because it was influenced by the type of media, endogenous components produced culture, and the substance carried by the original explants (Thomas and Davey, 1975 quoted by Dodds and Roberts, 1985). According to George et al., (2008) seed is a source of natural cytokinins.

Fig. 1b. Bud multiplication

Table 2

Interaction effect of chitosan and potato extract on the number of shoots per explant at Age 8 WAI and 12 WAI

Treatment	8 WAI				12 WAI			
	k_0	k_1	k_2	k_3	k_0	k_1	k_2	k_3
c_0	0,00 a A	0,00 a A	2.92 b B	4.25 c B	0,00 a A	5.53 b B	3.93 a B	4.62 a B
c_1	0,00 a A	3.89 c B	2.72 ab B	0.00 a A	0,00 a A	6.30 b C	2.72 a B	3.25 a B
c_2	0.67 a A	2.72 bc BC	1.78 a B	3.17 c C	0,00 a A	2.72 a BC	2.33 a B	4.50 a C
c_3	0,00 a A	2,33 b B	2,00 ab B	1.43 b B	0,00 a A	3.01 a B	4.33 a B	5.17 a B

Note: The average value which the same small letters on the same column and the same capital letters on the same line are not significantly different according to Duncan's Multiple Range Test at 5% level. Chitosan (c), c_0 = 0 ppm, c_1 = 10 ppm, c_2 = 20 ppm, c_3 = 30 ppm; Potato Extract (k), k_0 = 0 ml/L, k_1 = 100 ml/L, k_2 = 200 ml/L, k_3 = 300 ml/L

The number and width of leaves

Interaction of chitosan and potato extracts gives a significantly different effect to the variable of leaf number and width of leaves per explant at 12 WAI (Table 3). However, not all explants formed leaves.

At 0 ppm chitosan treatment and potato extract 0 ml/L could form a leaf from protocorm. This was due that endogenous cytokinin hormone was higher than the concentration of auxin, then resulting in organogenesis. Organogenesis is the process of organ formation without going through the multiplication of PLB. Some of the other treatments containing chitosan and extracts of potato leaves could not formed, because the direction of progress towards the multiplication protocorm PLB. The balance of auxin and cytokinin hormones influences the development of plant growth.

Leaf growth was affected by proper nutrition in the media. One of the macro nutrients were nitrogen was needed in increasing the number of leaves. Chitosan and potato extract containing various amino acids which are a source of organic nitrogen. Addition of organic nitrogen was more effective than inorganic nitrogen, because it is more easily absorbed by the explants.

Table 3

Interaction effect of chitosan and potato extracts of average number of leaves and leaf width per explant at Age 12 WAI

Treatment	Number of Leaves				Leaf Width			
	k_0	k_1	k_2	k_3	k_0	k_1	k_2	k_3
c_0	2.17 b B	0.67 ab A	0.42 a A	0.33ab A	0,32b A	0,16a A	0,22a A	0,10ab A
c_1	0,00 a A	1.00 b B	2.25 b B	0,00 a A	0,00a A	0,53b B	0,57a B	0,00 a A
c_2	0,00 a A	0.67 ab A	2.00 b B	1.00 b B	0,00a A	0,13a AB	0,54a C	0,30 b BC
c_3	0,67 a A	0,00 a A	0.33 a A	0.33ab A	0,13ab A	0,00a A	0,23a A	0,22ab A

Note: The average value which the same small letters on the same column and the same capital letters on the same line are not significantly different according to Duncan's Multiple Range Test at 5% level. Chitosan (c), c_0 = 0 ppm, c_1 = 10 ppm, c_2 = 20 ppm, c_3 = 30 ppm; Potato Extract (k), k_0 = 0 ml/L, k_1 = 100 ml/L, k_2 = 200 ml/L, k_3 = 300 ml/L

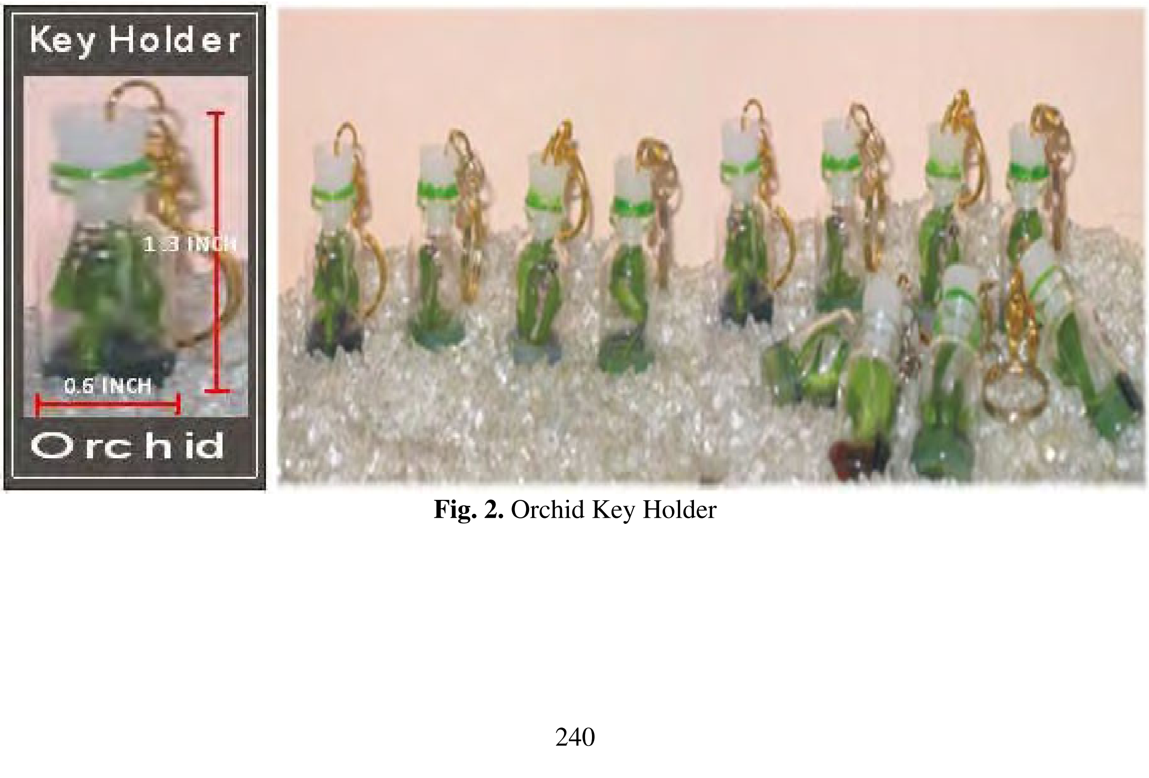

Fig. 2. Orchid Key Holder

CONCLUSION

1. Interaction of chitosan and potato extract affect to the variable that is the number of PLB, the number of shoots, leaves number, and leave width.
2. Chitosan concentration of 10 ppm for the level of concentration of potato extract 100 ml/L is the best result of growth Phalaenopsis protocorm.

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Use of chitosan and potato extract on Hyponex medium for hybrid *Phalaenopsis* Orchid propagation *in vitro*

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Keywords: chitosan, potato extract, *Phalaenopsis*, protocorm.

ABSTRACT

Orchid was known as an ornamental plant with the aesthetic and high commercial value. The high production of orchids caused by the higher market demand. Much research has been done to improve the growth, development, production, and quality orchids. To reproduced *in vitro* orchid, you can use natural materials, such as chitosan and extracts of potatoes. Chitosan was a deacetylation of chitin derived from fungal cell walls, crustacean exoskeleton, the cuticle of insects, and some algae. Chitosan acts as a growth promoter in some species of plants, including orchids.

This study aimed to determine the effect of interaction between the concentration of chitosan with potato extract on the growth of hybrid *Phalaenopsis* Orchid protocorm in Hyponex medium and to get the concentration of chitosan with potato extract which gave the best effect on growth of *Phalaenopsis* hybrid protocorm on Hyponex medium. The experiment was conducted at Tissue Culture Laboratory, Faculty of Agriculture Seed Technology, Padjadjaran University, in December 2009 to February 2010. The method used in this experiment was Completely Randomized Design (CRD) factorial pattern, with three replications. The first factor is the concentration of shrimp chitosan which consists of four levels as without chitosan, 10, 20, and 30 ppm. The second factor is the concentration of potato extract which consists of four levels, as without potato extract, 100, 200, and 300 ml/L. Basic medium used for each treatment were foliar fertilizer Red Hyponex 1 g/L The results showed that the interaction between chitosan with potato extract on the variable in the number of *PLB* (Protocorm Likes Bodies) and number of shoots at 12 weeks after incubation. The best treatment obtained at chitosan concentration of 30 ppm with potato extract 300 ml/L. Addition of chitosan with potato extract independently at different treatment concentrations gave the same effect on the variable of leaves. At the variable of root number, treatment independently without chitosan and 10 ppm and without potato extract and 200 ml/L gave a better effect. In the meantime, the best effect on the character of wet weight was on treatment with potato extract concentration of 200 ml/L.

INTRODUCTION

Orchid is one of the ornamental plants that have the aesthetic and high commercial value. Local species of orchid, *Phalaenopsis,* is one species of orchids are sold in the domestic market. The high market demand for orchids, unfortunately not followed by the level of production. Needed a way to meet high market demand for *Phalaenopsis* in large quantities and in relatively short time. One way that can be used to reproduce *Phalaenopsis* quickly, effectively and efficiently is to use tissue culture techniques.

Plant tissue culture is a technique of isolation of plant parts, such as tissues, organs, or embryos, then cultured on artificial medium are sterile so that plant parts are able to regenerate and differentiate into complete plants. There are some alternative medium that we can choose as tissue culture medium, one of which is Hyponex foliar fertilizer. Hyponex is an economical alternative medium which has been widely used in tissue culture. Hyponex contains macro and micro nutrients that are good for growth and development of the explant. Hyponex medium use can influence almost the same compared to the use of MS medium in *Dendrobium* orchid seed germination, which can reach 78% on MS medium, and 73% in Hyponex medium.

The addition of organic matter in the culture can provide a positive effect on culture growth. Extracts of potato in tissue culture serves to stimulate callus formation and proliferation of shoots (Rahman *et al*., 2003). The addition of organic substances which have a high carbohydrate content such as potato pulp can improve the growth and differentiation of cells in a particular plant. Chitosan is a deacetylation of chitin. Chitosan is able to induce the synthesis of plant hormones such as gibberellins and stimulate the biosynthesis of auxin via the tryptophan, which can enhance plant growth and development (Uthairatanakij *et al.*, 2007).

The purpose of this study was to determine the effect of interaction between chitosan and potato extract and to obtain certain concentration of chitosan and extract potato that can provide the best effect on growth of *Phalaenopsis protocorm* in Hyponex medium.

MATERIALS AND METHODS

The experiment was conducted at Tissue Culture Laboratory Seed Technology Faculty of Agriculture, University of Padjadjaran in Jatinangor, Indonesia. Explants used two months of old *protocom* of *Phal.* "Join Angel" X *Phal.* "Sogo Musadian".

Basic medium used Red Hyponex foliar fertilizer with the addition of organic materials, jelly (purified jelly), sugar, and distilled water. Treatments consisted of two factors, chitosan and extracts of potatoes. The first factor is chitosan which consists of four levels of concentration (0 ppm, 10 ppm, 20 ppm, and 30 ppm). The second factor is the potato extract which consists of four levels of concentration (0 ml/L, 100 ml/L, 200 ml/L, and 300 ml/L).

The design used completely randomized design (CRD) with factorial pattern as many as 16 combinations of treatments with three replications. Observations were carried out for three months. The variables were the number of *Protocorm Like Body* (*PLB*), the number of shoots, leaf, roots, and fresh weight.

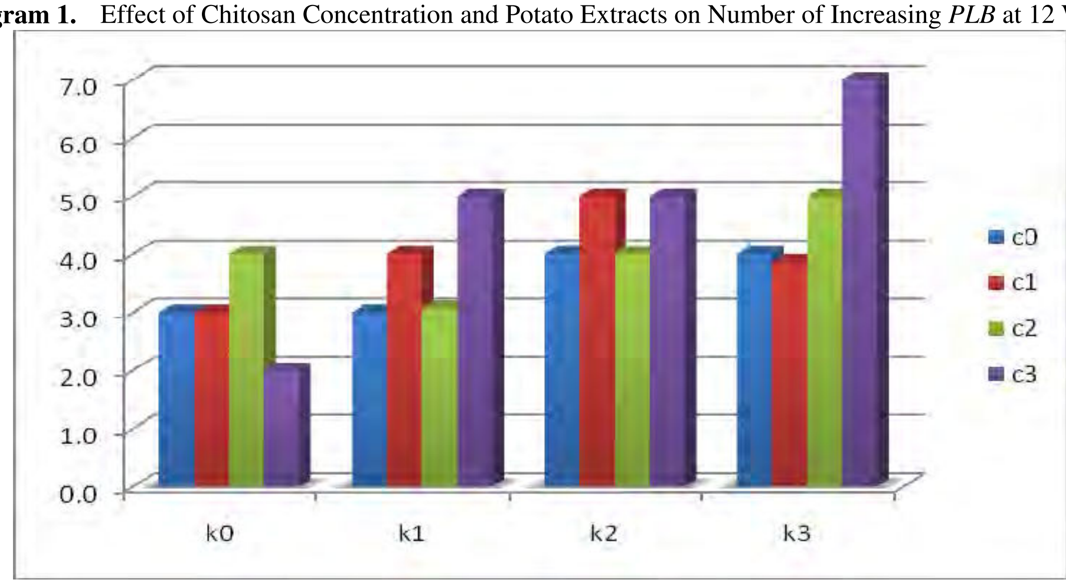
RESULTS AND DISCUSSIONS

Increasing of *Protocorm Like Bodies* (*PLB*)

Protocorm Like Bodies is a vegetative parts of orchid plant which form a structure resembling *protocorm*, round and shiny, which can be propagated indefinitely or can be induced to regenerate plants. The treatment showed that the best results in 12 Weeks After Incubation (WAI) is the treatment of chitosan concentration of 30 ppm with potato extract of 300 ml/L (Table 1). Visually, the best treatment comparisons can be seen in Figure 1.

Potato extract containing carbohydrates, auxin, and amino acids, that is, alanine, aspartic acid, glutamic acid, glicin, proline, and serine, while chitosan is a potential source of polysaccharides with 6.89% of nitrogen content more higher than cellulose (1.25%).. Nitrogen within chitosan is a primary aliphatic amino group and can act as a substitute glucan.

Diagram 1. Effect of Chitosan Concentration and Potato Extracts on Number of Increasing *PLB* at 12 WAI



Note: c_0 = 0 ppm Chitosan; c_1= 10 ppm Chitosan; c_2= 20 ppm Chitosan; c_3= 30 ppm Chitosan; k_0= 0 ml Potato extract; k_1= 100 ml Potato extract; k_2= 200 ml Potato extract; k_3= 300 ml Potato extract

Auxin concentration is higher than the cytokinin can stimulate the initiation of callus in monocot plants. The role of auxin in somatic embryogenesis among others, for initiation of somatic embryogenesis, embryogenic callus induction and somatic embryo induction. The hormone auxin in potato is indole acetic acid (IAA) is synthesized from tryptophan via tryptophan transaminase (trypthopan amino transferase). Indolpiruvat then converted into Indolasetaladehid. IAA can be produced from this aldehyde by dehydrogenase or by oxidation (oxidase Indolasetaldehid). Optimizing the performance of the hormone auxin in potato extract (IAA) can be achieved due to chitosan is able to synthesize the hormone auxin through the tryptophan, to use the explant to multiply (Uthairatanakij et al., 2007).

Fig. 1. Comparative growth of PLB at 30 ppm chitosan cultures with potato extract 300 ml/L (left) and the culture of chitosan 0 ppm with 0 ml/L potato extract (right).

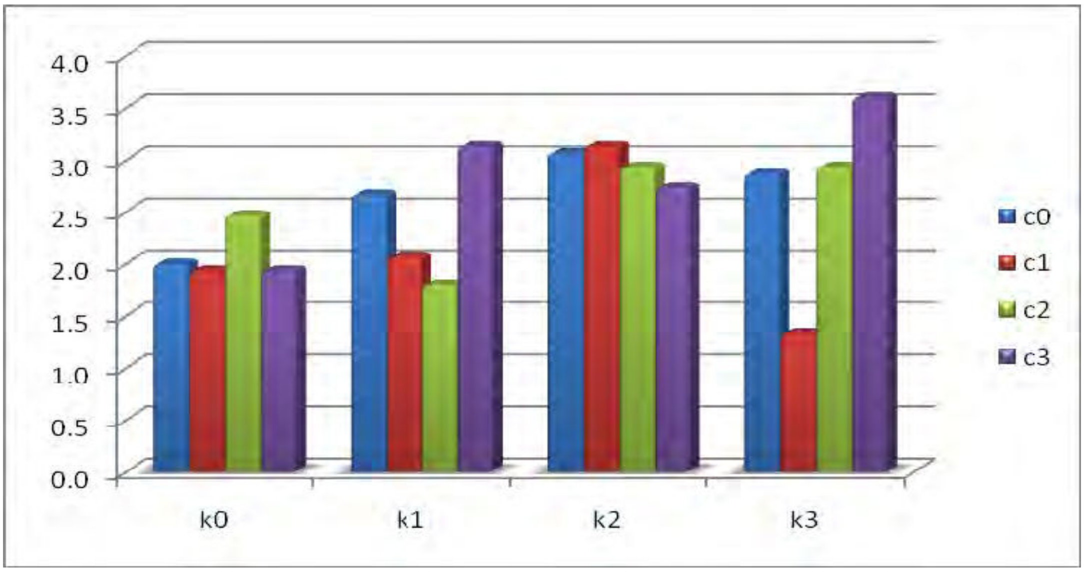
Number of shoots

Concentration of potato extract of 300 ml/L were added at 30 ppm chitosan is the best treatment to stimulate the number of buds in *Phalaenopsis* hybrids (Figure 2). Islam *et al.* (2003) explains that this can happen because of the effect of adding organic materials such as potato extract is not always constant, due to the influence of organic material performance depends on several factors, including plant sources, cultivars (varieties) of plants used, and the formulation and composition of materials used in the medium.

According Uthairatanakij *et al.* (2007), chitosan can stimulate vegetative growth of plants, including stimulating the formation of buds. Judging from its structure, chitosan has amine group in which this cluster also plays a role in the synthesis of amino acids. One of the known amino acid is adenine. Zeatin (natural cytokinin) can be produced from amino acids. Adenine is one of the exogenous cytokinin can be given to stimulate plant growth.

Relative concentration of cytokinin higher than the auxin will stimulate the formation of adventitious buds. If the ratio is higher concentration of cytokinin to auxin, the meristem cells in the callus will divide and affect other cells to develop into buds, stems, and leaves. The presence of cytokinin in in vitro culture have a role as a stimulant shoots. At high concentrations, cytokinin can promote proliferation of shoots, on the contrary inhibited root formation. The addition of auxin (IAA) actually slowing down as the emergence of shoots, because the function of auxin is likely to trigger the formation and growth of the roots presumably ,so that the resulting effect will inhibit the formation of buds.

Diagram 2. Effect of Chitosan Concentration and Potato Extracts Against The average number of shoots on 12 WAI



Note: c_0 = 0 ppm Chitosan; c_1= 10 ppm Chitosan; c_2= 20 ppm Chitosan; c_3= 30 ppm Chitosan; k_0= 0 ml Potato extract; k_1= 100 ml Potato extract; k_2= 200 ml Potato extract; k_3= 300 ml Potato extract

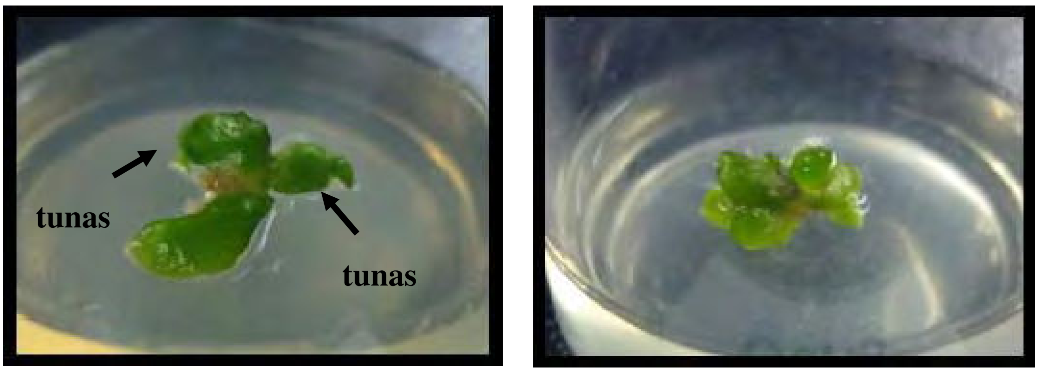


Fig. 2. Comparison of shoots at 30 ppm chitosan treatment with potato extract 300 ml/L (c3k3) on the left, with no treatment (c0k0) on the image to the right.

Average Number of Leaves

Leaf is a continuation of the morphological form buds, but the number of shoots do not always reflect the variable number of leaves. This is because the formation of leaf buds varies. Data analysis of variance showed that there was no interaction between the chitosan with potato extract against the average number of leaves in *Phalaenopsis* hybrids Hyponex medium within 12 Weeks After Incubation (WAI).

The content of endogenous hormones in explants *Phalaenopsis* hybrid was l enough to growing the leaf explants, so no use growth regulator derived from potato extract. The possibility of this is due to the presence of cytokinin have been experienced in these orchids. In addition, cytokinin are also present in t-RNAs from the cytoplasm and chloroplast as a free molecule. The cells in the explant tissue is assumed to produce a natural cytokinin for cell division, including the formation of leaves. Interaction of auxin and cytokinin appear to be inhibiting the number of leaves due to the addition of both simultaneously produce fewer number of leaves. Addition of cytokinin to encourage the increased number and size of the leaf. Cytokinin has an important role in tissue explants and stimulates the growth of shoots and leaves.

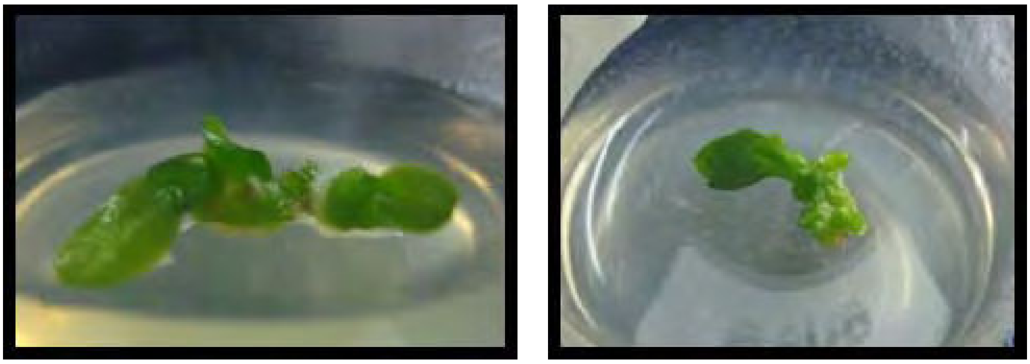


Fig. 3. Comparison of the number of leaves at 30 ppm chitosan treatment with potato extract 300 ml/L (c3k3) on the left, with no treatment in 12 WAI.

Number of roots

Chitosan treatment with potato extract to the variable average number of roots of Phalaenopsis hybrids on 12 WAI, showed no interaction (Table 3). That is because new roots begin to form before the 12 WAI. Independent treatment with chitosan concentration of 0 ppm (without chitosan) and 10 ppm, and potato extract with a concentration of 0 ml/L (without potato extract) and 200 ml/L, giving a significant effect on average variable average number of roots. In Figure 4, we can see examples of cultures that have shaped roots without chitosan treatment and without potato extract (c0k0).

Root formation in this experiment occurs through indirect organogenesis process that begins with the formation of PLB. On medium treatment, generally the root formation occurred after the buds are formed. Initiation of roots often occurs after tissue culture to produce shoots, and bud development in culture alter endogenous hormone, which stimulates the formation of roots. Inisisasi roots occurred under conditions of high auxin and the subsequent development of root primordia require a lower concentration of auxin. Auxin that is involved in the rooting process in plants is IAA herbaseous

Auxin wide influence on growth, stimulate, and accelerate the growth of roots, and to improve the quality and quantity of roots. Root growth requires auxin or cytokinin only in low concentrations. At high concentrations, cytokinin can promote proliferation of shoots, on the contrary inhibited root formation. The ability of root explants to grow without the addition of IAA presumably because of endogenous auxin in the explant. Concentrations of growth regulator are too high will encourage the synthesis of ethylene which can inhibit root elongation.

Table 3.
Effect of chitosan concentration and potato extracts against average number of roots on 12 WAI

Treatment	Average number of roots
Chitosan (c)	
c0 = 0 ppm	0.033 b
c1 = 10 ppm	0.033 b
c2 = 20 ppm	0.000 a
c3 = 30 ppm	0.000 a
Potato extract (k)	
k0 = 0 ml/L	0.033 b
k1 = 100 ml/L	0.000 a
k2 = 200 ml/L	0.033 b
k3 = 300 ml/L	0.000 a

Note: Figures marked by the same letter in same column indicates no significant difference according to Duncan's Multiple Range Test at 5% level.

Chitosan is a derivative N-deacetylation of chitin, which is an abundant source of polysaccharides such as cellulose and has a function as a polysaccharide. With the abundant content of polysaccharides, it is believed the addition of chitosan independently capable of inducing the formation of roots. Induction of root and leaf growth by chitosan treatment depends on the composition of culture medium used (Limpanavech, 2003 cited Uthairatanakij et al., 2007). In the treatment without the addition of chitosan, mayybe the explants capable of biosynthesis of auxin only without the help of chitosan. It takes a longer time trials to find out more about the effect of chitosan on root growth, given on 12 WAI new roots begin to form and the medium treatment has not fully give effect to the formation of roots. Moreover, the mechanism of chitosan in plant-growth behavior is not fully known (Uthairatanakij *et al.,* 2007).

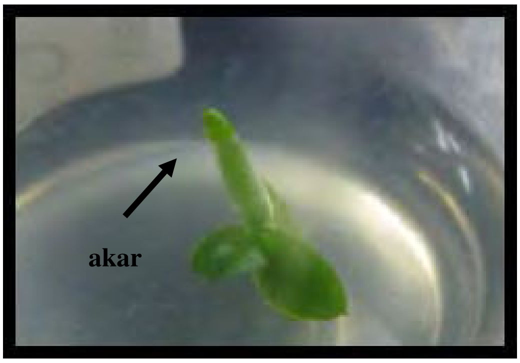


Fig. 4. Cultures that formed roots in the treatment without chitosan without potato extract (c0k0) on 12 WAI

Wet weight Explants

There was no interaction between the chitosan with potato extract at 12 Week After Incubation (WAI).

Tabel 4.

Effect of Chitosan Concentration and Potato Extracts Against Average Weight Wet on 12 WAI

Treatment	Average Weight Wet (g)
Chitosan (c)	
c0 = 0 ppm	0.071 a
c1 = 10 ppm	0.051 a
c2 = 20 ppm	0.060 a
c3 = 30 ppm	0.071 a
Potato extract (k)	
k0 = 0 ml/L	0.043 a
k1 = 100 ml/L	0.057 a
k2 = 200 ml/L	0.083 b
k3 = 300 ml/L	0.069 ab

Note: Figures marked by the same letter in same column indicates no significant difference according to Duncan's Multiple Range Test at 5% level.

In the experiment, the treatment that is able to provide the best effect in the variable weight of wet potato extract is treated with a concentration of 200 ml/L. It is clear that auxin has a contribution in influencing the wet weight of explant. Effect of auxin on the development of explant cells showed that there are indications that auxin can increase the osmotic pressure, increased protein synthesis, increase cell permeability to water, and soften the cell wall followed by decreasing pressure of the cell wall so that water can enter the cell, accompanied by increase in cell volume. With the increase in protein synthesis, then the material can be used to power the growth of explants. The hormone auxin and the amino acid tryptophan is the raw material forming the presence of IAA effect on protein synthesis. The function of auxin in the synthesis is the release of DNA from histones to RNA synthesis that will help the formation of new enzymes. These enzymes will increase the plasticity and dilation of the cell wall. Enzyme that formed some of the enzyme invertase, hemiselulose and ascorbic acid oxidase. These enzymes are important enzymes in the formation of proteins in the cell wall.

The addition of chitosan at each concentration of treatment has not been able to have a significant influence on the variables of wet weight. This can occur because of several factors, including explant capable to synthesis the endogenous hormone independently without the assistance of chitosan. However, the mechanism of chitosan in plant growth is still unclear (Uthairatanakij *et al.,* 2007). Moreover, chitosan itself that the performance depends on the culture medium used.

CONCLUSIONS

There is interaction between chitosan with potato extract only occur on variable of number of shoots of *Phalaenopsis* hybrid chitosan in the treatment of 30 ppm with potato extract 300 ml/L. While the variable number of leaves, the average number of roots, and wet weight, no interaction. An independent effect, as follows:

a) The addition of chitosan as well as extracts of potato in each gave the same effect on the variable number of leaves.
b) Treatment without chitosan and 10 ppm, and treatment without potato extract and 200 ml/L have more better than the other concentrations on number of roots.
c) The best of wet weight culture was given on 200 ml/L concentrations of potato extract .

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Research on the influence of fertilization regime on growth and flowering of *Alstroemeria hybrida* Hort. plants

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Keywords: *Alstroemeria*, fertilization regime, growth, flowering

ABSTRACT

Our research aimed at assessing the influence of fertilization regime on growth and flowering of *Alstroemeria hybrida* plants. Experiments were conducted during the vegetation period 2010-2011 and included four experimental versions, each version being applied fertilizers with different chemical composition. To study the stages of growth and flowering of *Alstroemeria hybrida* plants were made the following observations: number of shoots per plant, height of shoots, when the appearance of flower buds, flower buds during the appearance of the bloom, the number of days from flowering to wilting flowers, flowers in inflorescence number, inflorescence diameter and total number of stems per plant flowers. The results demonstrate that fertilization had a positive effect on growth and flowering but differentiated *Alstroemeria hybrida* plants, depending on the type of fertilizer applied.

INTRODUCTION

Alstroemeria hybrida is one of the most popular species grown for producing cut flowers, lies in the top ten species planted for this purpose (Toma, 2009). It is a specie geophyta with rhizomes, they enter the rest in high temperatures and drought conditions (Le Nard et al., 1993). It is a demanding species to light but moderate claims against temperature (Selaru, 2002). Requirements in relation to water plants and culture substrate are high, frequent watering and fertilization are necessary to support a more adequate nutrition of plants (Toma, 2009). *Alstroemeria* is appreciated not only for outstanding ornamental qualities but also for resistance to diseases and pests (Bellardi et al., 1994).

MATERIALS AND METHODS

Research has been realized in greenhouses at the Department of Floriculture Department of Horticulture at the University of Agricultural Sciences and Veterinary Medicine Bucharest, in the vegetation period comprised between October 2010 to July 2011.

The biological material used for the experiments initiation was rhizomes in vegetation with 3-4 shoots of 5-10 cm (figure 1), their planting being done on 20 October 2010.

Starting one month after planting rhizomes were applied periodical fertilizations every 3 weeks using 250 ml nutrients for each plant. At the same time thinning was carried out and shoots, keeping only the vigorous shoots, without defects, shoots evolved in floral stems.

Experiences were included four experimental variants, each variant being applied fertilizers with different chemical composition (Table 1).

Observations to study the processes of growth and flowering of plants have considered the following elements: number of shoots per plant, height of shoots, the moment of appearance of flower buds, the duration between the opened of flower buds to fading of flowers, the number of flowers in inflorescence, the flower diameter and the total number of flowers stems per plant.

The onset of flowering (March 29, 2011) were initiated and observations and measurements on the number of flowers in inflorescence and flower diameter.

RESULTS AND DISCUSSIONS

Observations on growth and flowering of *Alstroemeria* plants show that these processes are strongly influenced by applied fertilizer regime. Table 2 indicates that the first part of the vegetation period the number of shoots formed per plant has the highest values in variant V 3, where the plants were fertilized with MaxiFeed (NPK 20: 20: 20 + trace elements) and V 2 at which plants were fertilized with VitaFlora (NPK 6.5: 3: 5.5 + microelements).

In the second part of the vegetation period, however, the best results in the number of shoots were obtained in variant V 1, in which plants were fertilized with Agro product (NPK 3.6: 2.3: 2.7).

The lowest increases were registered in version V4 which were applied in the ratio 20:20 NP complex fertilizers.

In terms of height shoots best results were obtained in variants V 1 and V 2, the ratio between macro and nitrogen was in favor of the weakest results were recorded at V versions 3 and 4, which macro ratio was equal (Table 3).

On March 18, 2011 flower buds are appearing first in the variant V 1 (figure 2).

The duration of the moment of appearance of flower buds to flowers blooming (figure 3) was influenced also by the type of fertilizer applied, varying from 9.8 days to 11.4 days variant V 3 and variant V 4 (Figure 4).

These results demonstrate that trace elements are crucial in bringing forward the period from flowering by reducing the appearance of flower buds to bloom.

From Figure 5, that trace elements and has a favorable effect on the duration of the flowers blooming to flowers wilting (figure 6), the best results being obtained in variant V 2 (16.1 days) and V 3 (15.8 days), the micronutrients fertilizers applied were included.

Number of inflorescence flowers and inflorescence diameter are also influenced by the composition of the fertilizers used to periodical fertilizations. From table 4 it is found that the highest values of these items were recorded in variants that included micronutrients fertilizer composition or a larger amount of phosphorus and potassium.

CONCLUSIONS

Fertilization regime applied differently influence both quantitative and qualitative elements of growth and flowering of *Alstroemeria hybrida* plants.

The number and length of shoots, number and size of flowers and inflorescences recorded the highest values at the fertilized variants was done with fertilizer that had relations in balance and that included macroelements and microelements.

The appearance of flower buds time to flowering (important indicator of early flowering) had the lowest values in variants in which fertilization was done with fertilizer and micronutrients which included the macro ratio was in favor of potassium.

Flowering period was longer than all the variants that were used included fertilizers and micronutrients that macro ratio was in favor of potassium.

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TABLES AND FIGURES

Table 1

Experimental variants

Variants	Type of fertilizer	Chemical composition
V 1	Agro	Nitrogen total –N 3.6 % Phosphorus – P_2O_5 2.3 % Potassium – K_2O 2.7 %
V 2	VitaFlora	NPK 6.5 : 3 : 5.5 + trace elements: B 0.014%, Cu 0.007%, Fe 0.02%, Mn 0.01%, Mo 0.001%, Zn 0.007%, Mg 0.01%
V 3	Maxi – Feed	NPK 20 : 20 > 20 + trace elements: B 0.01%, Cu 0.002%, Fe 0.02%, Mn 0.01%, Mo 0.001%, Zn 0.002%
V 4	Complex	NP 20 : 20

Table 2

The variation and the dynamical of number of shoots per plant

Variants	No. of shoots/plant at date:							
	12.11.2010	17.12.2010	12.01.2011	25.02.2011	18.03.2011	29.04.2011	20.05.2011	10.06.2011
V 1	3.4	6.8	12.4	15.8	8.6	21.4	14.8	12.4
V 2	3.8	8.4	15.4	18	9.6	20.6	14.8	12.4
V 3	5.4	10.6	18.4	16	9.4	17.8	13	11.4
V 4	3.4	6.8	12.4	13.2	10.6	19.2	13.6	12.6

Table 3

The variation and the dynamical of length of shoots

Variants	The length of shoots (cm) at date:							
	12.11.2010	17.12.2010	12.01.2011	25.02.2011	18.03.2011	29.04.2011	20.05.2011	10.06.2011
V 1	9.17	12.99	14.76	14.73	30.59	37.16	48.01	55.68
V 2	5.09	12.02	13.04	17.05	28.60	40.73	52.51	54.88
V 3	2.77	9.04	10.35	15.86	26.16	33.36	52.97	55.19
V 4	5.72	10.30	11.02	15.22	25.11	34.65	40.78	42.19

Table 4

The variation of number flowers in inflorescence and diameter of inflorescence

Variants	Number flowers in inflorescence	Diameter of inflorescence (cm)
V 1	16.3	16.4
V 2	13.2	13.9
V 3	15.9	14.3
V 4	10.9	13.4

Fig. 1. The rhizome used for the experiments initiation

Fig. 2. The moment of appearance of buds flowers

Fig. 3. The moment of flowers blossoming

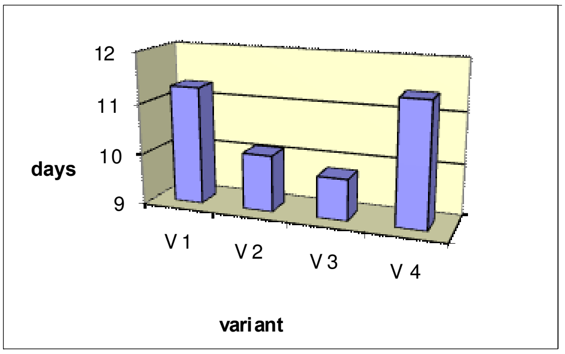

Fig. 4. The variation of number of days from buds flowers appearance to flowers blooming

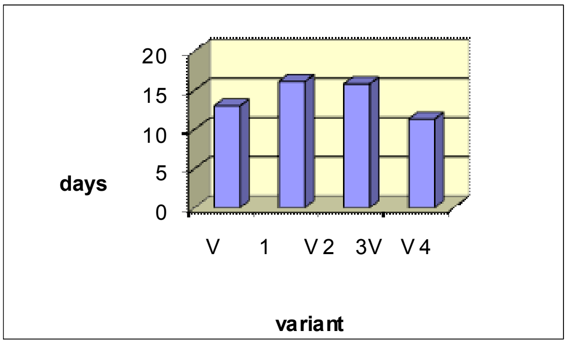

Fig. 5. The variation of number of days from flowers blooming to flowers wilting

Fig. 6. The moment of flowers wilting

Research concerning the propagation by cutting of some new cultivars of petunia

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Keywords: petunia, propagation, cutting, substrate, rooting

ABSTRACT

This research has aimed at testing the potential for breeding by cuttings of four new varieties of Petunia: *'Veranda Scarlet', 'Picotte Purple', 'Surfinia Blue'* and *'Shihi Purple'*. Seedlings were used for cuttings with 3-4 nodes peak, collected in three stages, every month, in January and February. All varieties have demonstrated a good capacity of cuttings, the highest number of seedlings collected in the period under review (16) being recorded in the variety *'Surfinia Blue'* the lowest (13) the variety *'Veranda Scarlet'*. Rooting cuttings was done in alveolar plate diameter of 3 cm, the substrate of peat (90%) + perlite (10%), under artificial fog (90% RH) and an average temperature of 18-24 ° C. Rooting duration was 18 days in the varieties *'Veranda Scarlet', 'Surfinia Blue', ' Shihi Purple'* variety and 21 days *'Picotte Purple'* and the percentage of rooting of cuttings ranged from 97.43% to the variety *'Purple Picotte'* and 88.25% for the variety *'Blue Surfinia'*. These results demonstrate a good propagation through cuttings capacity of the four varieties studied, potting-up is thus a practical alternative planting material production in Petunia.

INTRODUCTION

Petunia deal in recent years, the most important place for setting flowers summer range of parks, gardens, balconies and terraces, impressing the extraordinary variety of shapes, sizes and colors of flowers, long blooming, good resistance to stress factors (Selaru, 2007, Toma 2009). Production of planting material of Petunia is made most often from seeds (Graper et al., 1990, Jauron, 1999, Toma, 2003).

Given the relatively long period from sowing to obtain mature plants, able to flourish, some scientists and manufacturers recommend that the alternative of producing planting material for propagation by cuttings Petunia (Jauron, 1999).

Major advantages of this method of propagation characteristics consist of faithful transmission of mother plant and shorter duration of flowering plants produce, sell (Toma, 2009). In addition, plant shoots good capacity allows to obtain a satisfactory number of seedlings in a short period of time and the mother plants from which cuttings were collected can be used for decoration, after the cutting (Lopez and Runkle, 2006).

MATERIALS AND METHODS

The biological material used was the initiation experiences rooted cuttings of Petunia varieties belonging *'Veranda Scarlet', 'Picotte Purple', 'Surfinia Blue'* and *'Shihi Purple'* (Figures 1-4).

These seedlings were planted in pots with a diameter of 10 cm in peat substrate (90%) + perlite (10%), on 7/12/2009, they are practically the mother plants.

The first seedlings (Figure 5) were collected on 01.04.2010 by pinching mother plants to 4 knots at the base (Figure 6). Following harvesting of cuttings was made on 02.02.2010 and 03.03.2010 data.

At each stage of cuttings for each variety was recorded number of cuttings harvested from each plant and observations were made on the length of cuttings and number of leaves per cuttings.

Rooting cuttings was done in alveolar plates of 3 cm in diameter (Figure 7), the substrate of peat (90%) + perlite (10%), under artificial fog (90% RH) and an average temperature of 18-24 ° C.

At 10 days after planting the cuttings are rooting substrate pinch, eliminating the gain peak strict ramification. At the end of rooting observations were made regarding the duration of rooting, number and length of roots and root diameter bale.

RESULTS AND DISCUSSIONS

Research conducted on the four varieties of petunia taken in the study shows a good capacity of their breeding by cuttings.

From Table 1 it is found that the total number of cuttings taken from a mother plant in a period of 58 days varies from 13 seedlings per plant the variety *'Veranda Scarlet'* to 16 cuttings per plant the variety *'Blue Surfinia'*.

One can easily see that the number of seedlings increases with each stage of harvest, indicating a good capacity of shoots after harvesting plant cuttings and obtain a high multiplication factor in a short period of time (Figure 8).

Analyzing data from Table 2 it is found that cuttings of petunia are smaller and have shorter lengths due internodes ranging between 3 and 5 cm, depending on variety and harvest time, number of leaves vary also depending on variety and time to harvest cuttings from 3,5 to cuttings of varieties *'Veranda Scarlet'* and *'Picotte Purple'*, collected in January from 6 to cuttings of the variety *'Purple Vein'*, harvested in March.

The percentage of rooting of cuttings ranged from 88.25% to the variety *'Blue Surfinia'* and 97.43% for the variety *'Picotte Purple'* (Table 3).

The variety *'Purple Picotte'* was noticed by a high quality of rooting: 25.23 roots per cutting, root length 11.45 cm, 3.34 bale diameter of roots (Figure 9).

At the opposite end stood variety *'Blue Surfinia'*: 18.35 roots per cutting, 8.34 cm long roots, root bale diameter is 3.25 cm (Figure 10).

Rooting cuttings duration was 18 days between the varieties *'Veranda Scarlet'*, *'Surfinia Blue'*, *'Shih Purple'* variety and 21 days *'Picotte Purple'*, which is a period more than satisfactory for obtaining planting material of petunia, able to be planted in pots.

CONCLUSIONS

The four varieties of Petunia taken in the study demonstrated a good capacity of cuttings, allowing a period of only 58 days a total harvest of cuttings per plant ranges from 13 seedlings of the variety *'Veranda Scarlet'* and 16 seedlings per plant at variety *'Blue Surfinia'*.

Petunia cuttings rooted in a relatively short time (18-21 days), the percentage of rooting was higher in all varieties. Best at rooting cuttings behaved variety *'Picotte Purple'* with a rate of 97.43% rooting percentage, 25.23 roots per cutting, 11.45 cm long of roots and a diameter of 3.34 cm root bale.

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TABLES AND FIGURES

Table 1

The variation of number of cuttings taken from a mother plant

Cultivar	Number of cuttings taken from a mother plant in a date:			Total number of cuttings taken from a mother plant
	4.01	2.02	3.03	
'Veranda Scarlet'	1	4.5	7.5	13
'Picotte Purple'	1	5.5	7.5	14
'Surfinia Blue'	1	6.3	8.7	16
'Shihi Puple'	1	4.5	8.5	14

Table 2

The variation of length and leaves number from cuttings

Cultivar	Length of cuttings (cm)			Leaves number per cutting		
	4.01	2.02	3.03	4.01	2.02	3.03
'Veranda Scarlet'	3	3.5	3.5	3.5	5.0	5.0
'Picotte Purple'	3	3.9	3.4	3.5	4.0	4.5
'Surfinia Blue'	3	3.3	3.5	4.5	4.5	6.0
'Shihi Puple'	3	3.4	5.0	5.0	5.0	6.0

Table 3

The variation of percentage of cuttings rooting and the quality of rooting

Cultivar	Rooted cuttings (%)	Rooting duration (days)	No. of roots per cutting	Length of roots (cm)	Roots bale diameter (cm)
'Veranda Scarlet'	91.67	18	20.14	9.33	3.12
'Picotte Purple'	97.43	21	25.23	11.45	3.34
'Surfinia Blue'	88.25	20	18.35	8.34	3.25
'Shihi Puple'	94.32	18	18.47	9.65	3.56

Fig. 1. Cultivar *'Veranda Scarlet'*

Fig. 2. Cultivar *'Picotte Purple'*

Fig. 3. Cultivar *'Surfinia Blue'*

Fig. 4. Cultivar *'Shihi Purple'*

Fig. 5. Cuttings of petunia

Fig. 6. Mother plants after the first cuttings taken

Fig. 7. The cuttings planted in alveolar plates

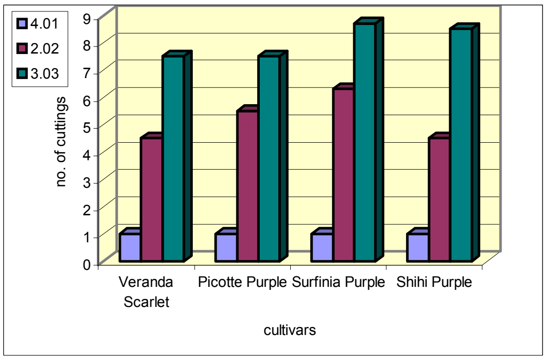

Fig. 8. The variation and the dynamical of number of cuttings taken from mother plants

Fig. 9. Rooted cuttings of cultivar *'Purple Picotte'*

Fig. 10. Rooted cuttings of cultivar *'Blue Surfinia'*

Research on the influence of the cold period and the type of substrate on growth and flowering plants *Hyacinhus orientalis* L, the variety *'Ostara'*

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Keywords: cold period, substrate, *Hyacinthus*, growth, flowering

ABSTRACT

Our research aimed at testing the influence of the cold period and the type of substrate on growth and flowering hyacinth plants of the variety *'Ostara'*. Bulbs were planted in mid-November 2009, two types of substrates: a mixture of peat and soil made of equal parts ground celery, sand and peat. After planting the bulbs were maintained in cold (5-7 ° C) for 9 and 12 weeks, then were brought into the greenhouse to begin the process of forcing itself. The results of observations on growth and flowering plant elements hyacinth substrate showed that culture does not significantly influence any of these items. Instead, during the cold, even at a difference of 3 weeks, determine significant differences between versions, the best results being obtained for maintenance in cold weather bulbs for 12 weeks.

INTRODUCTION

Hyacinth is one of the most popular species grown in both field and in protected areas, to obtain flowers in season (Selaru, 2005). Forcing can be done through various methods and ongoing interest to both the growers and researchers (Toma, 2009).

Besides the variety and quality of bulbs, factors influencing flowering plants in most crops during the cold strength is needed rooting bulbs (Pemberton and De Hertogh, 1999).

This time varies depending on a lot of variety and want to realize when they bloom (Miller, 2008). Other authors (Gude et al., 1992) consider that flowering hyacinths in forced culture is influenced, besides during the cold and the quality of light and culture substrate.

MATERIALS AND METHODS

The biological material used for the experiments was the establishment of hyacinth bulbs from the best quality (90 g weight, 5.5 cm diameter, 5 cm height, 17 cm circumference) of the variety *'Ostara'*.

Planting bulbs was done in mid-November 2009, two types of substrate (Figure 1), after planting, bulbs were kept in cold (5-7 ° C) for rooting for 9 or 12 weeks, resulting in four variants experimental (Table 1).

At the end of the cold was examined by survey, rooting quality, by removing the bulbs and make observations on the roots (Figure 2).

After completing the period of cold bulbs were brought to the greenhouse, where temperature was gradually increased from 8 to 17 to 18 ° C.

Observations on plants were observed: height at the time the leaf cone rooted bulbs in the greenhouse, the number and length of leaves, flower stem length, flower length, number of flowers in inflorescence, number of flowers open inflorescence, number of flowers inflorescence wilted.

RESULTS AND DISCUSSION

The research results have demonstrated the importance of treatment duration of cold, this influence, with few exceptions, all the growth and flowering plants.

Thus, when placed in the greenhouse bulbs cone rooted leaves relatively close in size, ranging from 1.20 cm to version 1.35 to version V 2 and V 3 (Figure 3).

Although differences between the versions in terms of these items are not significant it is interesting to note that variants V 3 and V 4, the duration of the cold they were exposed bulbs was higher, have higher values.

As for the other elements of vegetative growth - the number and length of leaves, it is found that differences between the versions are higher.

Thus, in Table 2 we see that the influence of cold duration is determined in that a longer period of cold applied after planting bulbs lead to higher values of number and length of leaves (Figure 4).

Influence of culture substrate is insignificant but the differences between variants in terms of this indicator are very small.

On March 23, 2010 was recorded when blossoming of flowers peak for each of the four variants (Figure 5).

Analyzing the data in Table 3 found that when full flowering, the values are almost double in the number of open flowers in blossom in variants V 3 and V 4, in which bulbs were maintained 12 weeks after planting in cold conditions (Figure 6). We see therefore that a longer duration of flowering significantly ahead of cold.

A longer period of cold and has favorable effects on the quality of flowers, expressed by higher values of stem length floral inflorescence length and circumference (Figure 7).

CONCLUSIONS

Forcing hyacinth bulbs of the variety *'Ostara'* in the flowering season is strongly influenced by the duration of cold and slightly influenced by the culture substrate composition.

Keeping the bulbs after planting in cold (5-7 ° C) for 12 weeks resulted in obtaining higher values of most elements of growth and flowering plants compared with alternatives that were maintained by planting bulbs in cold only 9 weeks.

Even if they were introduced in the greenhouse for itself forcing a 3 weeks later, the bulbs maintained in cold (5-7 ° C) for 12 weeks had a more intense pace of vegetation, which led to the flowering in same time as the bulbs which were in cold 9 weeks.

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TABLES AND FIGURES

Table 1

Experimental variants

Variant	During the cold (weeks)	Substrate of culture
V 1	9	ground celery + sand + peat (1:1:1)
V 2	9	peat
V 3	12	peat
V 4	12	ground celery + sand + peat (1:1:1)

Table 2

The variation of leaves number and length at 10 Mars 2010 (after 7 weeks after seven weeks of the introduction of rooted bulbs in the greenhouse for variants V 1-V 2 and 5 weeks after seven weeks of the introduction of rooted bulbs in the greenhouse)

Variant	Leaves number	Length of leaves
V 1	7.2	6.17
V 2	6.9	5.70
V 3	8.5	7.20
V 4	8.3	7.10

Table 3

The variation of flowers quality in the moment of maximum blossoming (23 Mars 2010)

Variant	No. of flowers in inflorescence	No. of blossomed flowers	Length of inflorescence (cm)	Circumference of inflorescence (cm)	Length of inflorescence stem (cm)
V 1	38.35	17.4	12.45	25.40	6.70
V 2	38.22	16.0	12.20	24,00	7.25
V 3	38.37	33.5	14.80	25.83	9.30
V 4	38.32	32.6	13.50	24.70	8.86

Fig. 1. The bulbs after the planting in culture substrate

Fig. 2. The rooted bulb

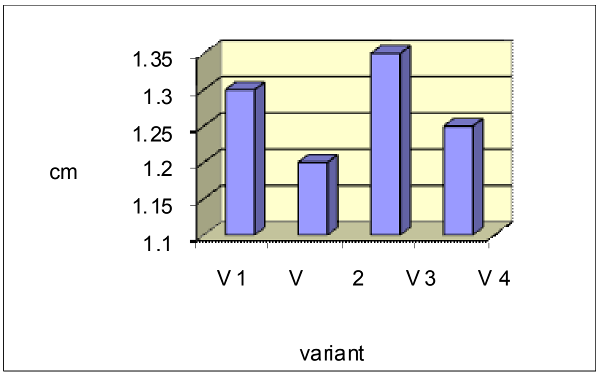

Fig. 3. The variation of leaves cone length

V 1

V2

V 3

V4

Fig. 4. The aspect of plants at 10 Mars 2010

Fig. 5. The plants in the moment of maximum blossoming

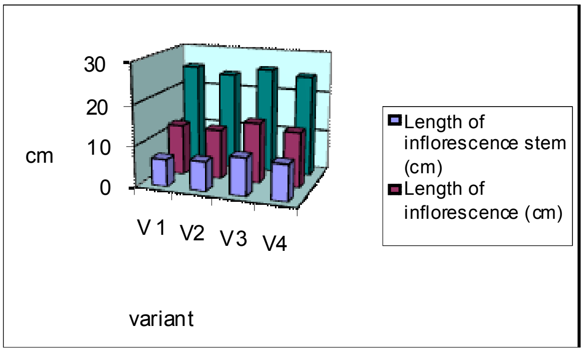

Fig. 6. The variation of number of flowers in inflorescence and number of blossomed flowers

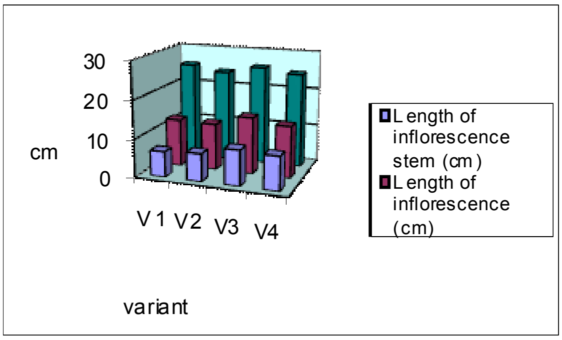

Fig. 7. The variation of flowers quality

LANDSCAPE ARCHITECTURE

An investigation into the increased use of Desso Grassmaster in modern sport

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Keywords: Artificial grass, sports surfaces, turf technology, stadium innovation's, pitch construction.

ABSTRACT

An investigation into the Desso Grassmaster system and its increased use on various types of sport pitches around the world. Grassmaster is one of a few systems that has enabled increased hours of play compared to more conventional surfaces. "The health and safety and social benefits from sports participation are more easily achieved if the sports surface provisions are safe, affordable and of a high quality. Investment, construction and research into artificial sports surfaces have increased to meet this provision" (Kolitzus, 1984; Nigg & Yeadon, 1987)[(1)]. However, Full provision cannot be met without natural turf surfaces. Modern sport demands that the sports surface is in pristine condition all year round, however with increased hours of play and a longer playing season, the pitch, the focal point of the stadium can become subject to criticism. It is also common to find two separate clubs sharing the same stadium such as at Adams Park, Wycombe which is home to Wycombe Wanderers Football team as well as London Wasps rugby union team. This can demand that the pitch needs to be switched from one sport to the other over night or in some cases the same day this puts immense stress on the playing surface.

INTRODUCTION

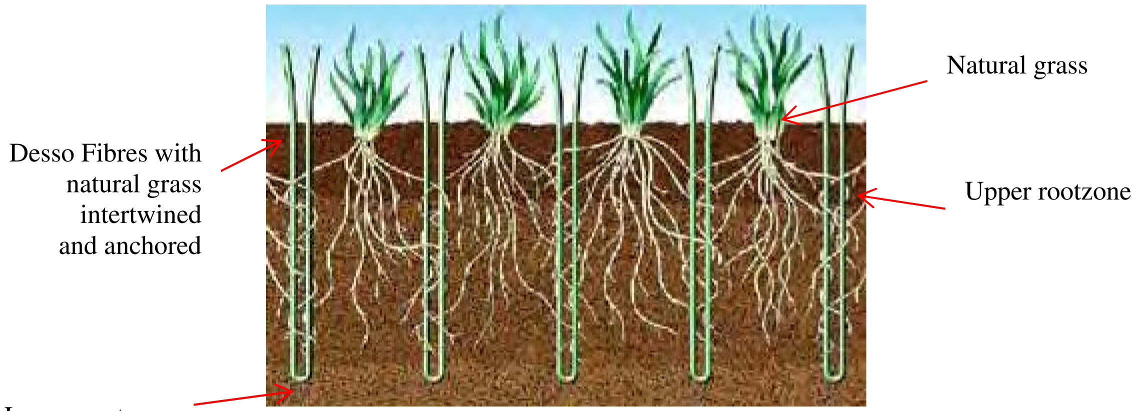
Desso Grassmaster over the past 20 years in the sports turf and stadium management industry has become a major player in the production of a consistent playing surface of high quality throughout the season. This new surface developed in the Netherlands can cope with increased hours of play with less maintenance. The Desso system is now intensively used both in the premier league and the championship league clubs, as well as stadiums which accommodate both football and rugby on the same surface.

The Desso system is popular not only in the United Kingdom but across the world, being installed In the USA, Green Bay Packers and Greece, 2004 Olympic games to name but a few. Desso is now accredited by UEFA and FIFA after its involvement in the World Cup in South Africa in 2010.

The Desso Grassmaster system uses internationally patented technology. This technical system uses the combination of a natural turf system, the traditional system with the characteristics and durability of a synthetic pitch. This is done by Injecting Synthetic grass fibres 20cm into the natural grass surface at 2cm centres across the pitch, when the pitch is finished there will be on average 20 million synthetic Desso grass fibres on the pitch, which amounts to 3% of the pitch being synthetic.

There are five main benefits of the Desso Grassmaster system, which are **durability**, no large divots created due to the grass plant being anchored to the plastic fibres, which leads to better drainage and level surface retention this means an increased quality of play is achieved. It **plays** the same as a normal turf pitch, rather than a fully synthetic pitch (3G). It allows **more** hours of play, up to 3 times as much as a normal pitch (up to 900 hours per season). It doesn't need any **extra** maintenance than a normal pitch even with increased hours of play. The system when installed becomes a **smart investment** that enables the pitch to be used as a multi-use venue for sport, concerts and events. These benefits mean that **Desso =**

Return on investment.



The Grassmaster system

A stadium that has really put the Grassmaster system to the test and gained full return on investment is the Danish Parken Stadium, the home base for FC Copenhagen and the Danish national team. At this Stadium "more goes on there than just football, business seminars, pop concerts and other sports events, such as speedway, take place regularly. And they don't leave a damaged-grass hangover in the morning" (Desso Sports Systems, 2009) [(2)]. This was also commented on by the grounds manager of the stadium "The stadium hosts several of the largest concerts, events and tennis tournaments. Thanks to the Desso Grassmaster, the field doesn't get damaged. And the grass recovers faster. That's necessary, too, because the next game is not far off!" (Hague, 2009, grounds manager Parken Stadium)[(3)].

These tables show the schedule from the Parken Stadium:

Date	Event
June	
5	Football match: National team Denmark v Russia
10	Business event
11-14	Removal of old natural grass layer (Renovation)
16-17	Installation of cover protection system
19	Rock Concert
20-26	Speedway event
27-28	Uncovering of Desso pitch

Date	Event
July	
1	Seeding for new season
3	Germination cover to accelerate grass growth
14	First time cutting grass
20	Super Cup football match
23	Morning: covering pitch for event
23	Evening: Pop concert Simon & Garfunkel
24	Removal of cover system

Date	Event
August	
1	Football match FC Copenhagen
3	Training session
4	Champions league qualifying round
15	Football match
29	Match
30	Training national team Denmark

Date	Event
September	
3	Training visiting team World Cup
4	World Cup qualifying match Denmark
7-8	Installation of cover protection system
10	Dinner party with 8,000 seated guests

One of Desso's biggest triumphs was the contract to relay the Wembley stadium pitch in June 2010. Arsenal Manager Aresen Wenger famously commented on the pitch after England played a match on Wembley, "It's handicapping the national team because do you think Steven Gerrard, Frank Lampard and Wayne Rooney don't want to play on a good pitch?" (The Guardian, 2009) [(4)]. The pitch, being a natural turf pitch had been relayed 11 times at a cost in the region of £100,000 each time. In June 2010 the pitch was ripped up and replaced with the Desso Grassmaster system at a cost in the region of £750,000 by J Mallinson (Ormskirk) Ltd and Desso. The pitch is now transformed giving Wembley National Stadium the full credit for being the most famous stadium in the world due to the use of the Desso Grassmaster system earning its return on investment.

Desso pitches in the United Kingdom

This table shows the stadium pitches in the UK that have Desso Grassmaster installed

Stadium	Club/association	Sport	Installed	Contractor
Wembley National Stadium	English FA	Multi-use	June 2010	J Mallinson
Galpharm Stadium	Huddersfield Town	Football	July 1996	J Hewitt
Emirates Stadium	Arsenal FC	Football	April 2006	J Hewitt
Turf Moor	Burnley FC	Football	July 2010	J Mallinson
Anfield	Liverpool FC	Football	August 2001	J Hewitt
Villa Park	Aston Villa FC	Football	July 1997	J Mallinson
Keep Moat Stadium	Doncaster Rovers	Football	September 2006	J Mallinson
City of Manchester Stadium	Manchester City FC	Football	July 2003	J Mallinson
Oldham	Oldham Athletic	Football	August 2001	J Mallinson
Upton Park	West Ham United	Football	August 1998	J Hewitt
Carrow Road	Norwich City	Football	June 2004	J Hewitt
Stadium:MK	Milton Keyes Dons	Football	September 2006	J Hewitt
Madejski Stadium	Reading, London Irish	Football, Rugby union	July 2001	J Hewitt
Adams Park	Wycombe Wanderers, Wasps	Football, Rugby union	July 2002	J Mallinson
Loftus Road	Queens Park Rangers	Football	July 1997	J Mallinson
Vicarage Road	Watford, Saracens	Football, Rugby union	August 1998	J Mallinson
Reebok Stadium	BWFC	Football	July 2007	J Mallinson
Leigh Sports Village	Leigh Centurions	Football, Rugby League	June 2010	J Mallinson
White Hart Lane	Tottenham Hotspur	Football	June 2002	J Hewitt
Hawthorns	West Bromwich	Football	June 2011	J Mallinson

Testing

Testing to prove effectiveness of the process is essential in order to achieve approval from the relevant sporting bodies. Desso, because they hold the patents for the machines to inject the plastic fibres have carried out most of the research and testing.

Standard pitch with no Desso Fibres

Part of the pitch installed with Desso Fibres

Construction of a Grassmaster pitch

The construction of the pitch is unique to each of the Desso partners in the United Kingdom. The specification varies from pitch to pitch with costs ranging from £400,000 to excess of £1,000,000, the higher end would include under soil heating and irrigation.

Stage 1 - Remove the existing surface and reduce the base to formation level

Excavation of old pitch

Install drains to the formation layer

Drainage system

Install gravel carpet, followed by a blinding layer
Install the sand layer also known as the lower rootzone
Install the under soil heating system

Heating system

Install upper rootzone layer (70/30 engineered mix)

Stage 2 - Ameliorants are then spread on the pitch, they typically include the following

- Terra cottem (200kg)
- Lime (2-4 tonnes)
- Base fertiliser (500kg)
- Vaminoc (160kg)
- Fertiliser 12:6:6 (200kg)
- Zeolite fossils (2 tonnes)
- Ryesport grass seed (500kg) (40g of seed per metre),(Lamoury, 2011) [(5)]

Stage 3 – The Desso Process

This process is carried out by Desso using their internationally patented machines. These machines are computer controlled, so don't need an operator. The machines due to the nature of the process are slow however a faster process would affect the quality of the finished product. It takes on average 10 hours to carry out one pass lengthways down the pitch.

Desso machine

Stitching plant
on the back
with 88 spools

Stitching plant
on the front
with 88 spools

Tracked digger base, power unit

The computerised system works in a cycle operated by hydraulics and pneumatics. In each cycle a thread of fibres is fed through, cut to the correct length and injected into the pitch, then the machine moves forward and the process continues.

End of season renovation process

This specialist process is usually carried out by a Desso partner. The aim of the process is to remove as much of the natural grass as possible, leaving the Desso fibres with a clean and a level surface retained. The pitch is then top-dressed and seeded.

The traditional system to renovate these pitches was carried out using a standard Koro Field Top Maker to fraize mow the surface, however this system, if conditions did not suit could it cause considerable damage to the pitch with the extraction of Desso fibres.

The Pitch at Queens Park Rangers was fraize mowed in 2010 and suffered a patch a Desso ripped out as seen below.

Due to the risks involved in this process specialist precision machines were developed. These machines known as spiral rakes us a rotating drum with a series of either spring or solid tines mounted in a spiral that comb the natural grass out leaving the Desso fibres.

The process

The pitch is spiral raked with between 7 to 10 passes to remove the natural grass and debris. After each pass the debris is collected in order retain surface levels.

Picture to show the spiral rake


The spiral rake and custom sweeper

When this process is complete, with just the Desso fibres exposed on the surface, the pitch is then top-dressed with 60 tonnes of sand to replace the material that has been removed.


Top- dressing

Verti-draining is then carried out to relieve surface compaction.

Verti-draining

The pitch is Wiedemenn raked and fertilised. The last process is to seed the pitch, this is carried out using a Blec star wheel seeder at a rate of 23g/m².

Blec seeder

Maintenance

The maintenance of a Desso pitch is very similar to a natural turf pitch. The maintenance measures in a typical season are as follows.

- Wiedemenn rake and sweep/vacuum at regular intervals throughout the season, to remove thatch, this also helps the Desso fibres to keep standing up.
- Verticutting
- Mowing
- Aeration, Verti- Draining
- Fertilising, Liquid and granular
- Fungal and weed treatment

Analysis

The Desso Grassmaster system despite its scepticism is proving itself to be a viable option to be used on modern sports surfaces. The cost of installing the Grassmaster pitch would not be worth it for many clubs that only accommodate an average number of games amounting to less than 250 hours on a traditional surface such as fibre sand per season. However for those stadiums that accommodate more than one team or sport the installation of Desso would be beneficial.

Stadiums that earn their full return on investment from the system use the stadium for both sport and events such as concerts. The use of the system as found at the Parken stadium and Wembley can allow the pitch to be transformed from concert venue to Sports field overnight and at a reduced cost compared to traditional turf surfaces.

CONCLUSIONS

This Investigation into Desso Grassmaster has focused on the reasons why in recent years there has been an increased use of the system and how this has had an impact across the world. It has outlined the stages of construction and renovation involved with the unique process.

The Grassmaster system is going to be more intensively used as modern sport continues to put increased demands on playing surfaces. However, if these semi artificial surfaces and fully synthetic surfaces (3G) become the norm, the need for machinery to carry out maintenance will become more specialised and will outdate the current machinery.

Further research is required in order to find the impact on the machinery industry if the increase use of these semi and fully artificial surfaces continues.

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Landscaping solutions for redecorating part of the USAMV Cluj-Napoca campus, using the Japanese Garden techniques

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Keywords: green spaces, Japanese garden, design, didactic role, ornamental plants

ABSTRACT

The landscaping in Agriculture and Horticulture University institutes has different connotations then regular green spaces. They enable scientific research, host practical lessons and expose to students or visitors rare, exotic species. The USAMV University Campus owns round 46.900 square meters of terrain, which includes orchards, vineyards, experimental plantations, greenhouses, but also leisure spots. One key area of the Campus is the one located next to three important buildings: West from the Horticulture Faculty building, south from the Agriculture Faculty building and East from the Veterinary Medicine Faculty (Fig. 1), therefore is highly circulated. The original vegetation consists on several tree and shrub species, part of which would be kept in the redesigning project, but also a few solitary roses. Considering the key location of this area, it is recommended a more specific, clear type of landscape, part of a complex project, which targets the whole University Campus. Therefore, based on the nature of the interest area, and the resources it offers, a modern and exotic type of landscape, such as the Japanese garden, would fit perfectly. The main reason is the educative one, as it offers a live example of an oriental garden, for the students, not to mention the aesthetic valences, and the utility of the spot, which would be designed to host outdoor classes, workshops or just a nice, quiet place to study.

INTRODUCTION

The key spot is part of the USAMV Campus from Cluj-Napoca, Romania, and it is the subject of a redesigning project, based on multiple landscaping styles, such as a modern, vertically shaped lawn, French and Japanese gardens, modern urban techniques, green Parking and a few others. All this garden sectors of the Campus are meant to be a live demonstration of the different garden design styles around the world and in history, especially for the landscaping students, and why not for the many visitors of the University.

The terrain is located on the Southern part of the University Campus and is rectangle shaped, with sides of 65 and 25 meters, the whole area measures round 1.625 square meters.

The whole space is green, except for a pedestrian alley, which crosses the entire parcel.

The plantations consist on trees and shrubs mainly, accompanied by several isolated roses. The nearby areas are represented by one of the two main pedestrian alleys of the Campus, followed by vehicle destined alleys and parking areas, belonging to the three important buildings from around: the Horticulture, Agriculture and Veterinary Medicine Faculties (Fig. 1).

The objectives of the project focused on obtaining a clear image of the actual status, regarding the terrain and the location, surroundings, soil and climate conditions, the vegetation, circulation system, and outdoor furniture. Based on this analysis, the malfunctioning was found, and therefore, the landscape redesigning project was elaborated, in order to satisfy the necessities of a university campus.

One of the main purposes of landscaping is to improve the aspect and the quality of the environment, therefore to assure the quality of life, and most importantly to correlate the constructions with the environment, by using the right type and amount of decorating vegetations, in order to facilitate various social activities. In this particular case, the terrain is not just a green space, but a garden affiliated to a University, therefore it has specific connotations.

Normally, a garden has social-economic functions (it hosts various permanent or seasonal social activities), ecological functions (improving the air and soil qualities), sanitary roles (source of oxygen, space for sports and playgrounds), recreational functions, and nevertheless the aesthetic role, by making our everyday places more attractive for the human eye (Dumitras, 2006; Iliescu, 2006; Negrutiu, 1980). Not to mention the great impact nature has on the mental state, the colour "green" has proven to be very relaxing, not to mention the nice colors and shapes of flowers, shrubs or trees, which are a delight for the human eye.

That said, it is very important to realise that a university garden has also other connotations. These types of gardens are set nearby specific schools, colleges and institutes of higher education and have the following purposes: hosting practical lessons on natural science sessions, creating opportunities for work study circles, sports and playgrounds, in a pleasant leisure (Bertanski, 2005).

Also, these areas provide learning materials through the exotic ornamental trees and shrubs plantations in greenhouses, experimental fields or vegetable gardens and seedbeds.

Generally, schools should own green spaces according to the number of students and the characteristics of the education institution (a high school in the agriculture field will have considerably more green space than a school with general profile). Thus, for educational institutions it is recommended a norm of 10 square meters per student. For plantations are provided about half of the total area, of which 22-26% for grass, shrubs 40-50%, 25-28% trees. The remaining area is divided into alleys, athletic fields, playgrounds (about 35-40%) and buildings (10-15%) of the total area of the school (Preda and Palade, 1973).

The trees species should be chosen in order to provide beautiful, fragrant bloom, without staining the alleys with their fruits, or having any harmful, effects on students.

Nearby higher education institutes of agricultural and horticultural sciences, in addition to classical landscaping facilities, there should be also areas destined to didactical and experimental gardens. They are designed to enable scientific research according to themes, to serve educational purposes, for harvesting seeds from selected indigenous and exotic plants and also to expose to visitors a series of known rare species (Petrescu, 1983).

In this particular case, the landscape is designed to host outdoor classes and workshops, by providing the proper urban furniture.

MATERIALS AND METHODS

The composition centre of the new design will consist on a Japanese pavilion, shaped like a pagoda and made of wood. The pavilion will incorporate several wooden benches, in order to provide the space for the outdoor classes (Fig. 2). The access to this point of interest will be possible through a new alley, which will consist on stairs, on the slope area, and on the plane zone would be conceived as an alley paved with black granite slabs of rectangular shape, accompanied by gravel on both sides. 40-60 diameter decorative rocks, along with the crawling shrub Juniperus *horizontalis*, will edge the alley.

In the Western part of the alley, another key point of the zone will be designed as an arid spot, made of small gravel boarded with massive rock on the sides, accompanied by the conifer shrubs: *Ilex aquifolium* var. *alaska*, *Chamaecyparis lawsoniana* var. *minima aurea, Juniperus sabina* var. *tamariscifolia* and the flower decorative specie: *Rhododendron concinum* (the centre of the composition).

As urban furniture, a circular wooden bridge (Fig 2) will cross the arid spot.

The area of interest will own a few others Japanese garden plants, such as *Acer palmatum var. disectum, Prunus serrulata* and *Pinus excelsa*, distributed as alignments or solitary in order for the decoration to be complete and on different stages

The new landscaping will also benefit of an informative panel, which will detail the Japanese gardens characteristics, for all the students and the guests to know about Japanese garden design.

The lighting system will be placed at the ground level and will project the light from the base of the plants in different angles, creating special artistic effects, in order for the decorative species to be appreciated also in the absence of natural light.

RESULTS AND DISCUSSIONS

All the new plants are typical for the Japanese gardens, some of them decorate through their leaves, flowers or figure, and most importantly, they are fully highlighted by the urban furniture specific to the oriental gardens. Another important aspect is the material of the used furniture: wood and rock, with a very natural looks, just as the Japanese gardens dictate.

The decorative plants will be distributed as follows: the leaf decorative tree *Acer palmatum* var. *disectum* will be placed on both sides of the alley, one on the West side and three more on the Eastern side, next to the arid spot. The 2-3 meters high specie has a thick crown with five-lob leaves, which are of an intense red during spring, and changing to shiny carmine (Zaharia *et al.*, 2008).

The next highly decorative tree is *Prunus serrulata*, or the Japanese cherry tree, a powerful symbol for the Japanese gardens. It is quite short, with straight stem, and white to pink flowers which bloom before the leaves appear, producing an impressive effect.

Pinus excelsa will be distributes along with the other pine trees from the original design, none of them would be removed, as the pine is typical for oriental gardens, and they will serve as green background for the flower decorative plants. They also have the advantage of decorating all year round

The crawling shrub *Juniperus orizontalis* will also be kept from the original project, even multiplied and distributed along the alley or in the company of the boulders, creating a very natural, wild effect.

Chamaecyparis lawsoniana var. *minima* will decorate the arid zone along with the gravel and the boulders and *Juniperus*. Those two conifer species will create nice green effects, with their yellow or dark green shades. Those two will be accompanied, again in the arid zone, by *Ilex aquifolia* var. alaska (in containers) and *Juniperus tamariscifolia,* also leaves decorating plants, the last one produces very nice decorating red fruits.

Also in the arid zone, the flower decorating shrub *Rhododendron concinum* will have the leading role in the design, as a centre piece, a flower decorating plant with persistent leaves (Cantor and Pop, 2008), among many other leaf decorating plants (of different shades of green).

Table 1 reveals the decorative and biology of the recommended decorative plants.

The design will incorporate also different urban furniture elements, specific to the oriental gardens, which are presented in the Table 2. As Table 2 reveals, all the used materials are very close to the original materials that we can find in nature, which is a very important aspect of the Japanese gardens, whose role is to bring people closer to the nature.

The original landscape design was based mainly on leaf decorating plants, without any piece of urban furniture, or any other designing concept, three of the original species, which fit into the Japanese landscape, were kept, such as: *Juniperus horizontalis, Pinus nigra,* and *Prunus cerassifera*.

The new designed Japanese garden would bring a fresh oriental perfume to the plant collection of the University, in a very elegant manner, but most importantly with great use for the studying process.

CONCLUSIONS

The area of interest, a 1.625 square meters of green space, is located on a intersection of pedestrian and vehicle alleys, which assure the access to the three important neighbor buildings: the Horticulture, Agriculture and Veterinary Medicine Faculties.

Therefore, considering the high traffic and the degree of exposal, this area as part of a bigger redesigning project of the entire University Campus, will be one of the most important in the designing concept. It is highly populated with decorative plants which assure a very nice landscape all year round (Table 1), and most importantly, the new vegetation would be accompanied by various pieces of furniture, in different colors, shape, material and utility (Table 2).

This whole new concept will bring personality to the Campus, increasing the plant variety, and most importantly the decorative plants will not be just associated, without any territorial planning, moreover, they will be part of e very well defined landscaping concept. Nevertheless, this garden is even more valuable, as the examples of Japanese gardens in Cluj-Napoca are very limited, mostly private properties, without any public exposal. Therefore, the Japanese garden in the U.S.A.M.V. University Campus will be very practical for both students and teachers, by making the learning process easier and more pleasant, but also for the visitor, who will be charmed by the exotic Japanese air.

All in all, for the educative role to be completed the students should be regularly involved in the maintenance process and the spot should be accompanied by a panel explaining all the characteristics and the symbols of the beautiful Japanese gardens.

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TABLES AND FIGURES

Table 1

Ornamental species and the type of decoration they provide

Species	Decorative element	Colors	Life cycle
Acer palmatum var. disectum	Leaves, figure	Red	Perennial
Prunus serrulata	Flowers	White to pink	Perennial
Juniperus horizontalis	Leaves, figure	Green	Perennial
Pinus excelsa	Leaves, figure	Green	Perennial
Chamaecyparis lawsoniana var. *minima*	Leaves, figure	Green	Perennial
Juniperus tamariscifolia	Leaves, figure	Green	Perennial
Rhododendron concinum.	Flowers, figure	White to pink	Perennial
Ilex aquifolia var. *alaska*	Flowers, figure, fruits	Green/red	Perennial

Table 2

Presentation of urban furniture and the recommended constructions

Type of furniture	Quantity	Material
Illuminating spots	10	Plastic/steel
Wooden bridge	1	Wood
Plant containers	5	Dark wood
Gravel	40 kg.	Gravel
Pagoda pavilion	1	Wood
Boulders	80	Boulders
Granite slabs	20	Granite
Wooden benches	8	Wood

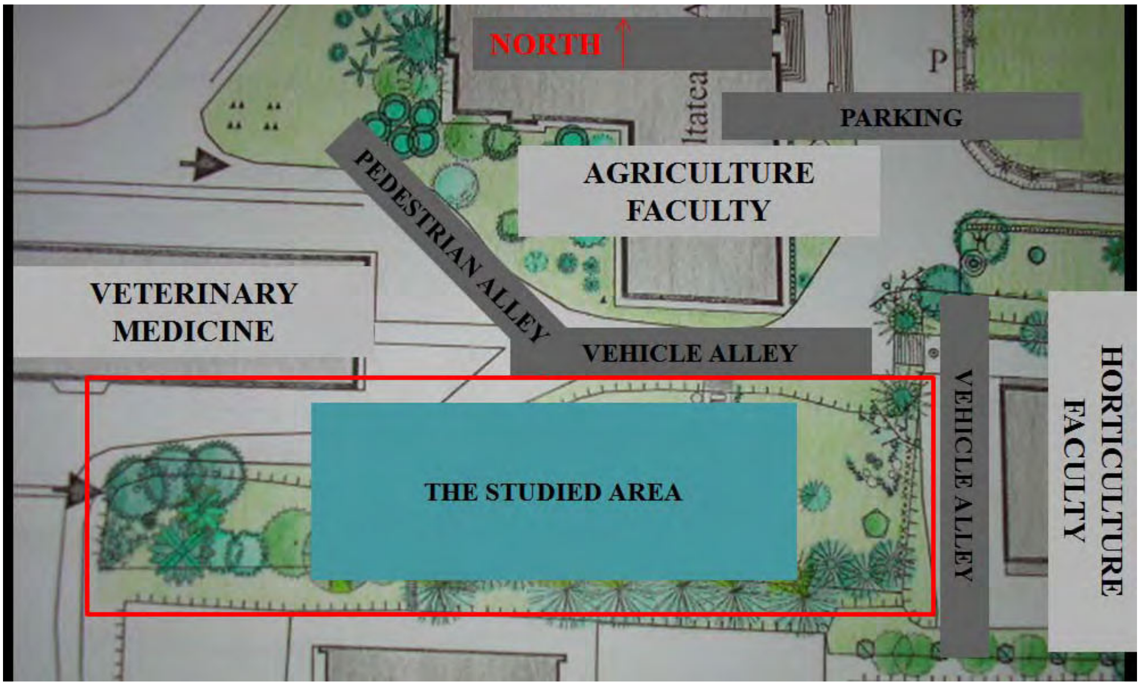

Fig. 1. Location of the area of interest, in relation with the neighborhood

Fig. 2. Presentation of the recommended plants, materials and the territorial organization

Why we [don't] love palm-trees? Landscape design between local identity and exoticism.[1]

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Keywords: soil respiration, carbon pools, management

ABSTRACT

Our article aims to analyse the relation between the people and the public space design in Bucharest. It also tackles the role played by landscape architects in a society bent on applauding the overwhelming kitsch around the city. One acknowledges that kitsch calls for a certain dubious, at times aggressive, aesthetic sensibility, which would be ready to visually pamper rows of palm-trees and clusters of rustic design in the middle of a 19th-century plaza or along modernist boulevards. The aesthetic conflict is exacerbated by the highly suspicious manners in which public money is spent, by the endangering of urban ecosystems, the crumbling of school buildings behind the tapestries of flowers and topiaries, the lack of improvement in the public services sector, along with the steadily missing urban politics. The most sensitive issue at hand, we claim, is the public aesthetic education. Should the landscape architects, as professional elite, impose their taste standards upon the almost general preference of the population for topiaries, palms and rustic add-ons? Should we attempt to impose a visual coherence of the city? If kitsch is a way to escape a dull and gray daily reality to an exotic and idyllic imaginary world, why should landscape architects force a poor and stressed population to face their "misery". Yet, what about our cultural heritage? Do we have the duty to preserve it? What about our existing cultural values, which are largely ignored nowadays? Trough interviews, inquiries and blog analyses we will try to understand the conflicts generated by the aesthetic globalisation in a specific cultural context. Otherwise put, what aesthetic carnival ensues when the palm-tree mediates in such a way that Nice becomes the landscaping model of Bucharest?

INTRODUCTION

In the frame of our study about the overwhelming kitsch that invades Bucharest the main focus will be on the southern part of the city, where Piedone acts like the owner of public space, expressing his personal taste all around.

Piedone is not just a fat, yet agile film character, but also the slimy mayor of one of Bucharest's districts, one of Romania's many mayors that are used to spending their holydays in touristic paradises, wherefrom they come back home filled with ideas, such as planting palm-trees and colourful flowers. Even if our winters feature -20° temperatures and plenty of snow, somehow palm-trees make most of the locals happy!

And Piedone is not just an inflicted nickname but the very name used by this politician in his campaign, already a kitsch attitude announcing his entire vision sprawling over the city. As an anecdotic fact Bud Spencer (Carlo Pedersoli), the actor playing Piedone character in spaghetti westerns entered politics in 2005 and unsuccessfully stand as regional counsellor in Lazio for the Forza Italia party.

On the other hand, Piedone is not out of tune with Bucharest's landscape. He is only a record-holder for the kitsch that has overrun the city in the last 20 years. If kitsch can be defined as man's way of relating to the real world, driven by an object or a situation that induces a positive emotional state, resulting in a fundamentally positive and reassuring (yet realistic) view of things, Piedone's palm trees (and many others) are capable of creating a universe parallel to the harsh reality of life in Bucharest (fig.1). But, as suggested by the definition offered by the 2004 Larousse, kitsch refers to an object, a decor, a work of art whose tastelessness, or vulgarity, whether intentional or not, appeals to some, and repels others. This different public reaction turns Bucharest's public spaces into a bone of contention. While a high percentage of the population sees the new developments as beautiful

[1] A first version of this article is already in print EFLA Online Journal, 1st Edition, Topic: *Political implications of urban landscap*e.

and welcome into the city's landscape, another part (in minority) as well as professionals (architects, landscapers, designers) are horrified by the city's new look.

Analyse of the public perception of Kitsch

In order to understand the public perception of the conflict between the administration's and the professionals' view regarding public space, as well as to clarify the way new developments are received by the public, we have carried out a series of interviews and analyzed comments featured in various blogs (professional or not).

Interviews taken on the street, usually in places made in a manner that verges on visual aggression, show that almost 80% of Bucharester praise the new developments. In their opinion, the miner, bear or simply spiral-shaped topiaries individualize the space, even if, in reality, given the extensive use of these items, it is more a case of creating a uniform image of Bucharest's public spaces, in contradiction with the architectural diversity (fig.2).

Most supporters of these new developments don't understand why professionals label them as kitsch, seeing as they find them simply beautiful. It is difficult to explain to them basic landscape architecture or plastic language principles. For the vast majority, they are dry, incomprehensible, restraining and especially... ugly and boring! In their view, new and clean equals beautiful. As a matter of fact, this taxonomical confusion of new – clean – beautiful versus old – dirty – ugly defines the entire Romanian culture post 1990 (Tudora, 2009; Mihailescu, 2011)

If we are to refer to the definition of kitsch as pseudo-object, namely a simulation, a copy, an artificial object, a stereotype, the lack of real meaning and the overabundance of signs, of allegorical references, of disparate connotations, like the exaltation of detail and a saturation with details (Baudrillard, 1970), the call to the past, to urban coherence is challenged based on the same arguments: the use of pastiches, of stylistic references can sometimes be as easily viewed as kitsch.

But we cannot transform a discussion on kitsch into one regarding the relation between beautiful and ugly. Ultimately, the essence of kitsch lies in the exchange of the ethic for the aesthetic, it compels the artist not to create something "good", but to create something "beautiful", the focus being on the beauty of the result (Broch,1966). Hence, the kitsch is fundamentally beautiful, it moves, it is immediately liked and it stakes on the acceptance and approval of the vast majority (fig.3). This "popularity" of kitsch is extremely important from an elected politician's stand point. So the leaders' use of kitsch seems only natural. However, in most cases, this isn't a public manipulation for campaign reasons, but "honest" choices, based on the personal taste of city officials.

The few public opinions voiced against these developments aren't based on aesthetic reasons, but on financial ones. Palm-trees and topiary art is considered a luxury that the Romanian society, plagued by poverty, cannot afford:

- *Must we, the tax-payers, really pay for these palm-trees, for this stupidity of planting and removing them during winter? Or is there someone that must benefit from planting and replacing them with something else during winter? It's embarrassing and frustrating!"*(http://www.reporterdeocazie.ro/)
- *„An ass is but an ass, though laden with gold. Why in God's name didn't they plant a tree adapted to this climate, Lord, the stupidity and pretentiousness of some people. What? Do they think that Bucharest is the new Dubai?"*

(http://www.ziua.ro/f.php?f=news&data=2008-08-30&thread=11954&id=31188)

- *I wonder how he got the idea to plant these palm-trees, and why here. It won't be long. December is just around the corner and we won't see them again. Other money down the drain."* (http://www.andreearaicu.ro/, 4 September)

Consequently, the aesthetic discussion is one for the elite, a controversial subject limited to a handful of professionals isolated within a society that seems to have lost any sensibility regarding the urban landscape surrounding it.

The kitsch between aesthetics and ethics

The most sensitive issue at hand, we claim, is the public aesthetic education. Should landscape architects, as professional elite, impose their taste standards upon the population's almost general preference for topiaries, palm-trees and rustic add-ons? Should we attempt to impose a visual coherence of the city, despite the almost general acceptance of this new (un)aesthetic image of the public space?

If kitsch is a way to escape a dull and gray daily reality to an exotic and idyllic imaginary world, why should landscape architects force a poor and stressed population to face their daily misery? It is largely considered that heritage is a "luxury" problem that our society cannot afford to approach. Even Constantin Enache, professor of urbanism, member of the technical council of Bucharest's town hall and one of the main professionals working in Bucharest, declared - in a televised interview - that the heritage problem is to be postponed until better times and that Romania is too poor to afford to keep (if not even restore) it's heritage buildings or urban landscapes.

If even some professionals are not only neglecting, but clearly dismissing the capitalization of cultural heritage as an important issue of urban politics it is difficult to imagine that Bucharest's unique landscape faces a better faith in the coming years.

The few NGOs fighting for the right to cultural urban landscapes are often considered as "reactionary elements" trying to block urban development. The latest scandal related to extended demolitions in one of the most important historical areas of the city showed, with an unprecedented clarity, that our society has no sensibility concerning its heritage or its landscapes. The urban development is generally reduced to a race for easy and quick profit, a fact that provoked an extremely deep economical crisis.

In this gloomy context we wonder about the possibility of educating public perception, in order to generate a larger understanding of cultural landscape issues. The idea of educating an apathetic population seems utopian, elitist and unrealistic, all the more so because the vast majority feels that foreign cultural patterns are always suitable.

Therefore, if there are palm-trees on the street of Nice, they can fit just as well on Bucharest's boulevards and historical garden topiaries can also embellish the grey sidewalks from neighbourhoods of communist apartment buildings. The trend of copying aesthetic patterns seen on exotic holidays is not necessarily limited to Romanian society, but the intensity of these acts seems much greater and the professional non-involvement in urban politics much more severe. Returning to Piedone case, the argument he brought for the palm-trees and other exotic designs was the impossibility of poor Romanians to go in remote places to admire this kind of features. So he brings them here, for everybody to enjoy their beauty! Thus, if the patrimony is a luxury that we cannot afford the palm-trees is a luxury that we strongly need to solve our common and general travelling frustrations.

Are we faced with a profound conflict between ethics, aesthetics and democracy? If the vast majority ignores the issue of cultural heritage or if it feels represented by copies of exotic elements, mixed together without any coherence, should this "public taste" take the role of "aesthetic principle"? The issue of the "democracy of aesthetics" or the "democracy of art" is not a new one and it isn't part of the scope of this article. But the issue regarding the cultural heritage is mainly an ethical and not an aesthetic one. If ethic is a set or a system of moral principles, leading individuals or groups, sustainable development became, during the last decades, the most important principle governing social and economical development. Sustainable development, even if not usually applied to artistic or aesthetic issues, is considered to be a pattern of resource usage that aims to meet human needs while preserving the environment, and also ensuring access to those resources for future generations and the possibility to fulfil their needs. We can approach the subject of sustainable development from a heritage point of view, seen as a resource for cultural, social and economical development. To that effect, heritage preservation becomes an ethical issue of general interest, and not only an aesthetic and elitist one. The destruction of cultural landscapes means not only the destruction of a life setting, but also of irretrievable values, of social and economical resources (especially in the context of tourism development, viewed as one of the Romanian Government's main goal).

Landscape design between local identity and exoticism

Thus, from a sustainable cultural development stand point, the large scale kitsch practiced by Bucharest's officials is both an aesthetic and an ethical issue. The purpose of professionals is not only to protect a series of values that may seem, on a superficial level, elitist and "trivial", but also to create new values that can generate a balanced development, focused on the issue of identity. The "democratic" argument is a false one, seeing as the population has to choose between the abandonment of public spaces and their transformation into an exotic carnival. In order to have an "aesthetic plebiscite", there should be real options, for a starter. The simple acceptance by Bucharest's population of the kitsch, or even its enthusiastic embrace, is mainly due to an aesthetic monologue, where the palm-tree seems to be the only symbol of urban transformation and modernization. But the transformation and modernization, so ardently desired by Bucharesters, can also be generated using other tools, besides palm-trees and rustic pergolas. Following and even consolidating the local identity doesn't necessarily equal "traditionalism", "retrogressive" views or pastiches.

Unfortunately, aesthetic alternatives are yet to appear. But the few sporadic examples have managed to convince a large part of the population that the city can look different from what is generally proposed by officials. Thus, the Square in front of the Anglican Church, or Gradina Icoanei, tries to restore the city's traditional atmosphere, without turning into simple "reconstruction" projects (fig. 4). Gradina Icoanei is already seen as an alternative to parks laden with petunias and flower beds, pink concrete slabs and statues scattered all over the place. But even if we can find some positive comments on blogs, these are not necessarily shared by readers:

- *If you are sick of Cismigiu and Herastrau, you can relax in a small but gorgeous park in the heart of the city: Gradina Icoanei. After enjoying a morning tea or coffee on Verona Street, the tranquillity from Gradina Icoanei rounds up a perfect half-day. Try it!* (http://traveloman.wordpress.com/2010/04/23/gradina-icoanei-bucuresti/)
- *Gradina Icoanei is a small and stylish park, extremely close to Romana Square and Magheru Bd. Coming from Romana Square and going towards University Square, on Magheru, take a left on Arthur Verona Street, near Carturesti. (…) The rehabilitation project for the Gradina Icoanei Park was undertaken in collaboration with the Ministry of Culture and the aim was to bring the new park closer its original feel from the 19th century. The straight walkways became once again winding trails, the fountain and small stream are reminiscent of Bucurestioara, and the benches and lights set for night walks give a modern feel.*
- *if you are in the area, don't miss the Ioanid Park, across the street:) I find it more stylish than Gradina Icoanei*
- *The walkways aren't pitched, so when I went with my baby (in the evening, around 6 PM) there was a layer of dust of around 0.5 m. I don't know if you can rollerblade on this type of ground, I didn't see anyone while I was in the park. About 50 m away is the Ioanid (Ion Voicu?!) Park, which is just as beautiful, though crowded. But the walk is worth every*

penny. The houses from the neighbourhood have a wonderful architecture and the streets are quiet (http://www.viajoa.ro/recomandari/parcul-gradina-icoanei-liniste-in-mijloc-de-bucuresti).

But maybe it isn't a coincidence that both parks can be found on Street Delivery's itinerary, an urban culture festival that takes place during three days on Arthur Verona Street, a street that crosses the two above mentioned sites. "Street Delivery's mission is to reinvent and to strengthen the structural role of public space in the lives of the citadel's inhabitants, by converting the urban landscape into a live landscape" (http://streetdelivery.ro/street-delivery/). Street Delivery has succeeded in becoming the most important alternative event, managing to bring together a large number of NGOs, artists, or other groups that try to submit projects for Bucharest.

Another attempt to create a specific landscape was done in the frame of *Zilele Bucurestiului* (the Bucharest's days) when the French Embassy and the French Institute together with Cultures France, ArCuB and the City of Bucharest organised a project dedicated to the urban landscape: *Artă şi Peisaj: Grădini Nomade* (Art and Landscape: Nomadic Gardens). Thus, in six points of the city (French Institute yard, Arthur Verona place, Ateneu place, University place, Romana place and the North railway station, two landscape architects – Raluca Ungureanu and Nicolas Triboi, proposed a series of ephemeral landscapes / installations (fig. 5).

CONCLUSIONS

One of the installations presented during the Street delivery by students and alumni of the Landscape Department of USAMV Bucharest brought a little hope for the city. They presented a model of the Magheru Boulevard along with some boxes with different trees models. Each "tree" was presented by its qualities: image, shading capacity, ecological adaptation to the urban environment, oxygen production, foliation period, colours... Passing people were asked to propose their own design by "planting" trees on the boulevard. To our surprise they were completely forgotten, along with the buxus and other regular plants of the contemporary "design". Instead shading trees were preferred as Quercus sp., or pollution resisting ones like Fraxinus. So, informed people are able to choose otherwise! Is not all about aesthetics and personal taste but also about understanding the role of urban vegetation (fig. 6).

Maybe the timid temporary attempts to create a quality urban landscape cannot change overnight the image of Bucharest but they might be able to generate a new perspective on the public space quality and maybe also new demands. The generalized kitsch is not the result of a "democratic" design, as the democracy supposes education and information, a conscious and rational choice among multiple possibilities. Thus, the alternative landscapes are the only way for a real democratic image of Bucharest to replace the political kitsch.

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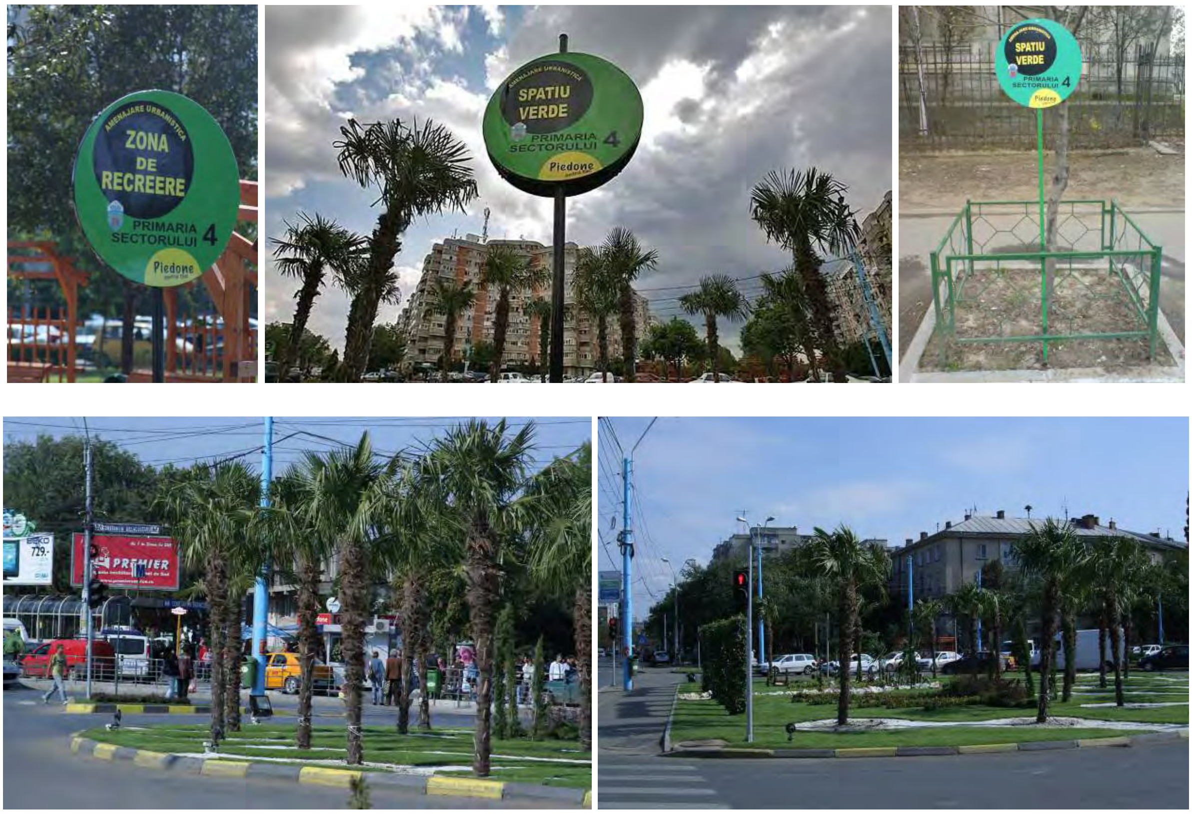
FIGURES



Photos: Mihai Culescu

Fig.1. The reassuring view of things: Piedone's signature on all the more or less designed green spaces in the 4th district

photos: Ioana Tudora

Fig. 2. The "green" spaces" are completely ignoring the architectural context

Photos: Mihai Culescu

Fig. 3. Ars topiaria – luxury and emotional landscapes

Photo: Fratziorul - http://www.panoramio.com/photo/45199625

Fig.4. Icoanei garden

Photos: Raluca Ungureanu

Fig. 5. Alternative landscapes: Raluca Ungureanu's and Nicolas Triboi's *Nomadic gardens*

Photos: Ioana Tudora

Fig. 6. People creating their own landscapes

The new landscapes of old infrastructures

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Keywords: infrastructure recovery, urban ecology, urban landscape, public space

ABSTRACT

The old transportation infrastructures built in the 19th and beginning of 20th century are abandoned, thus creating gaps in the urban tissue but also new resources for the contemporary urban development. The article is analysing, though three case-studies, the possibility of ecological development by landscape urbanism means. Two of the most important and well-know projects – *Promenade plantée* from Paris and the High Line from New York are presented in order to better understand the trends in both urban development and landscape architecture. The third project – Bucharest-West Green Line – has a utopian character in the local context of Bucharest urban development but demonstrate the possibility of an alternative approach of urban landscape and urban policies. A central point of our research will be put on the wild vegetation integration into the urban landscape projects, aiming to highline the new trends around the world that are still absent in our country. The new aesthetic developed in the 20th century ecological paradigm is largely ignored at the local level and has to be integrated in landscape education but also in the landscape architecture and urban development practice.

INTRODUCTION

The urban development of the late 19th century and the beginning of the 20th was marked by the creation of extended rail infrastructures both for industrial and civil services. Thus, both Paris and Bucharest evolved during this period around the new focal points of the cities: the railways stations and the new, modern industrial infrastructures. It is notorious Napoleon III’s vision for the new Paris, centred on boulevards infrastructure that connects the railway stations. What is less known is the development of Bucharest along similar principles: rails ring, and radial rail entrances in the city connected by large boulevards (fig.1). It is of no wander that Bucharest development principles in 19th century are long-time forgotten: those projects were never finished. But still, the most part of the rails infrastructure was realised and still splits the city into unconnected slices. The old infrastructure, for its most part out of use today, represents the main territorial and ecological resource for the future development of the city.

Starting by studying international practices the article aims to present a possible approach of the old infrastructures of Bucharest in order to better integrate ecological areas into the city.

INTERNATIONAL PRACTICES: SINGLE AIM, DIFFERENT APPROACHES

The first one: la *Promenade plantée*

One of the first projects that reclaimed old rail infrastructures in order to create new public spaces and green areas both with social and ecological role is the *Promenade plantée* in Paris. Built on the former Vincennes railway line that connected, back in 1859, Place de la Bastille with Verneuil-l’Etang, the *Promenade plantée* is part of a larger renovation project of the entire Bastille area. The old rail was abandoned in 1969 as the new RER A connected the centre of the city with Vincennes area, thus integrating a part of the old infrastructure. In the ‘80s the entire area was renovated. In 1984 the Bastille station was demolished to make room for the new Opera. In 1986 a second important project transformed the Reuilly area, near Lyon railway station. As a consequence, the old viaduct going from Bastille to Reully was integrated into the renovation project. It became, in 1989, the Viaduct des Arts connecting Bastille with Reully park. But the *Promenade plantée* is continuing at sunken level up to the old Montempoivre gate, on the *Périphérique,* thus covering a 4,5 km length.

The parkway was designed by the landscape architect Jacques Vergely together with Phillippe Mathieux while the rehabilitation of the viaduct (1,5 km) was designed by Patrick Berger and Jamine Galiano.

The planting design alternates forest-like segments with opened areas, using classic design features as pergolas, basins and fountains or cut hedges (fig.2). Also modern design and contemporary materials are largely used thus creating a variety of landscapes (fig.3). The plants are also contributing to this diversity: *Poaceae* plants from *Bambustoideae* subfamily, *Forsythia sp.*, *Kerria japonica*, *Buxus sp.*, *Prunus sp.*, *Tilia sp.*, *Magnolia sp.* and ornamental grass (fig.4). But there was no research for keeping the spontaneous ecosystem that formed along the rails during one century. The project, beside its modernity al the architectural level, stays as a classical approach to gardening and planting design. The only area that keeps part of the wild vegetation is the sunken part between Daumesnil and Bel-air (fig.5).

The famous one: High Line NY

The suspended line – the High Line – was built in 1930 based on West Side Improvement project that aimed to reduce the traffic jams and accidents on the 10th Avenue, also know at the time as the Death Avenue. The traffic was unbearable as such a point that, in 1908, 500 persons protested against the dangerous conditions on the Death Avenue (fig.6). But it was only in 1930 that the High Line project tried to solve the situation that was going from 1851 (cf. www.thehighline.org).

As a result of years of public debate (the project was disputed for 22 years, between 1911 and 1933) the City of New York decided to include the High Line in a larger project of urban renewal for the western part of the city. The line is developed on almost 21 km, eliminating 105 rail-road intersections. (Hoch, 2002)

In 1933 the first train passed on the High Line, event followed by the speech of New York Central Railroad president, F.E. Williamson: This simple event today may well mark a transformation of the West Side that will affect its development for the better for decades to come. (Hoch, 2002, p. 50). It was true in many ways unthinkable than.

Starting with the ’60 the rail transport diminished, in 1961 the first demolitions plans for the High Line being debated. In 1980 the last train passed on the elevated rail. Abandoned by people and trains the High Line was adopted by nature and transformed in an unusual freedom oasis for the city (fig.7). The first to see this new reality of the old infrastructure were Joshua David and Robert Hammond, who created in 1999 the Friends of The High Line non-for-profit group. The central aim of the group was preserving the High Line as a public space.

The Major office of the City of New York, despite the position of its counsellors, had the initiative of demolition in 1992. But the City Council offered a 125.000$ budget to FHL in order to realise an opportunity study for the High Line reuse. In 2000 the FHL submitted a proposal for a planning study to the Design Trust for Public Space. Two architects – Casey Jones and Keller Easterling – to undertake separate investigations concerning the possible reuse of the High Line. (Hoch, 2002, p. 55)

Practically the entire city, starting with the population, was split in two camps: the Friends of High Line and the City Council were confronting the Major Office and the Chelsea Property Owners, while CSX – the company owning the High Line – was willing to give it to those who present the best strategy for the future development of the city.

As a result, on 11 of June 2001 a Public Space Makers forum – *The Future of the High Line* – took place at the Port Authority of New York and New Jersey, World Trade Center. Strategies for the reuse of the High Line were presented by John N. Lieber (Senior Vice President, Lawrence Ruben Co., Former Assistant Secretary of Transportation), Charles Shorter (Principal, Real Estate Advisory Services Group, Ernst & Young) and Marilyn Jordan Taylor (Partner and Chair-elect, Skidmore, Owings & Merrill).

Along the different studies and strategies complex aspect were took into account:
- The community need for public open spaces for urban comfort and security, affordable housing and urban mixity
- The business men need for development opportunities, traffic efficiency, security and accessibility
- The city and state need for future flexibility, income from taxes, parking spaces and public and private sectors contribution to the budget

As a result of the long debates the High Line project was decided. The entire infrastructure will be kept and transformed in an ecological public space – and one of the main arguments for this was the *Promenade plantée* in Paris. The budget was estimated for a minimum of 30m $ - 45m$, apparently a small one considering the dimension of the new public space.

But the project is finally anything but the *Promenade plantée*. The approach was a very different one. Starting with the birth of the project as a bottom-up participatory one and ending with the ecological approach High Line is proposing a very different vision. From the 720 projects proposed by architects from 36 countries the jury formed by represents of FHL and the NY City selected as a winner the James Corner's (Field Operations) and Ricardo Scofidio's (Diller Scofidio + Renfro) proposal (fig.8).

One of the main aims of the design was to integrate and protect the existing wild life as the Phase 1 of the project stated it: "Keep it Wild, Keep it on the Path". But the High Line is far of being wild. The apparent wild vegetation is not the same with the spontaneous one that was already there, it is a new highly managed one as the plants are irrigated, pruned lit and maintained at considerable cost. (Cantor, 2011)

But the High Line however proposes a new aesthetic, based on prairie landscape, with flourishing or dormant plants, thus enlarging the sense of beauty in the public eye (fig.9).

Other projects are proposing the infrastructure recovery. The High Line generated not just a new park for New York but also a new awareness about the development opportunities and ecological resources that old infrastructures are offering. Reading Viaduct Project in Philadelphia, Pennsylvania or the Bloomingdale Trail in Chicago, Illinois are just two other community leaded projects on the way. In Europe also new projects concerning the Hofpeinlijn in Rotterdam, the Duddeston Viaduct in Birmingham or the Guertel-West in Vienna are foreseen.

The dreamed one: Bucharest-West Green Line

The rails existing in the western part of Bucharest are separating today two of the biggest neighbourhoods of the city: Militari and Drumul Taberei, each of them reaching the dimensions of a big city, around 300.000 inhabitants.

The rails are built at the end of the 19th century in order to deserve the military site of the city. During the communist period an important industrial site was developed along the rails, at the western outskirts of the city. Also during the same period the two huge residential areas were built. But after 1990 the industrial activities diminished all over the city (Chelcea, 2008) and the rails remained almost abandoned together with the Cotroceni station.

But this abandonment is a partial one. As the industry and transportation disappeared the nature and the local communities installed themselves. The new vegetation formed during the time a sustainable ecosystem, including pioneer species as well as other plants brought from the vicinities (fig. 10). Thus the dominating species are invasive ones: *Ailantus altissima, Acer negundo, Populus nigra* but other tress can be found also like *Tilia sp., Acer sp., Fraxinus sp., Cerasus sp. or Aesculus sp.* Beside trees other numerous species of plants can be found there: *Polygonum aviculare, Convolvulus arvensis, Setaria viridis, Ambrosia elatior, Onopordum acanthium, Clematis vitalba, Parthenocissus quinquefolia, Cirsium* *arvense*. Most of them are regularly considered weeds, but in the public eye they are just plants, nature and vegetation.

In what concerns the social use the most part of the people are not conscious about the present uses nor imagine future ones even if they are entering the area almost on daily basis. The most often they are crossing the site to access neighbour areas. But they are also use the space to organise barbecues, for playgrounds or for other domestic activities like washing their cars or carpets (fig. 11). Paradoxically the very same persons are describing the area as unused.

Further research showed that the lack of proper design forbid the most part of the people to integrate the rails area as a "real" public space even if they use it as a space resource for their daily needs. The social gatherings are informal and interest-group oriented: children, young people or adults. No formal association seem to be able to generate a social movement or attitude able to lead to a more formal and clear use of the space. The only use that inhabitants are imagining it rapid transportation towards the centre, as both neighbourhoods are poorly connected. So, just a direct reuse of the ancient rails for public transportation makes sense for the local population.

In the frame of a diploma project and further on in some research concerning the possibilities to develop a green infrastructure for Bucharest we proposed a series of minimal interventions that will encourage the use of the open space and will help the development of an ecological corridor connecting the outskirts with the central area of the city (fig. 12).

The project integrates the present use of the space and further develops and eases the daily practices: bridges are assuring a safe crossing of the rails, playgrounds are proposed in the vicinity of the blocs of flats, parking plots are organised more efficiently, lightning is proposed in main areas, green protection corridors and alignments are foreseen, Also neighbourhood centres are created along the rails, thus assuring a better connectivity and accessibility (fig.13).

Meanwhile the project proposes to reinforce the existing ecosystem without redesigning the planting. We aim by this approach to propose a new urban aesthetic, able to create new attitudes towards the natural areas of the city, largely considered as wastelands (fig. 14).

But the entire project rests as a "classic" drawer-project without any chance to see the day in a form of another (fig.15).

COMPARISON AND SOLUTIONS DISCUSSIONS

If we try to adapt to the Bucharest situation elements of other similar projects some difficulties appears immediately. In the case of the *Promenade plantée* the project was determined by political will being the perfect illustration of a top-down design. But the officials of Bucharest prove no intention to recover the rails areas nowhere in the city. More than this, some urban regulations and plans are foreseeing real-estate development despite the lack of public space or accessibility of the area. The simple idea of implementing ecological public transportations on the existing rails is almost repelling the City officials. So the possibility that the old infrastructure will gain a new life by an official project seems bleak.

Taking as an example the High Line project that was imposed by the inhabitants despite the Major office will of demolishing the rails. The associative life in Bucharest is week, just some NGO trying to oppose the abusive and private-interest oriented projects. But the most part of the population regard these oppositions with reluctance and mistrust. So a social movement to generate such a project, as in the case of the High Line, is equally difficult to imagine.

A possible solution is to wait for one of the involved forces: the politics and the society to change. As the High Line experience showed it is a long time effort to debate and to develop a project: it took 20 years to build the High Line and another decade to rehabilitate it. it is also to discuss that the initial 20 years spent to discuss about the opportunity of an elevated rail generated a "too late" project as the High Line functioned just for 30 years at a efficient capacity. More than this, our study was developed somehow under the emergency sign as the present development of the city is already destroying the most part of ecological resources. Our entire research on the Bucharest green infrastructure development is an attempt to create an alternative perspective on the city until is not too late. So time is not a feasible way of attending the results.

CONCLUSIONS

So how we can implement what is already a classic project in other counties in our local political and social context? A third way would involve the landscape architects not as desk-professionals, able to draw smart projects but as social activists and social assistants able to generate communities and communication within. The idea of the landscape architect as social activist is not new nor strange, Peter Latz described once its work as a social work. The dialog with the local communities is already part of the regular work of the landscape architect. A next step should be made in order to create communication between local communities and city represents in order to generate a common vision of professionals, people and politicians in a country where landscape architecture isn't still recognise as a profession and where landscape is still reduced at a sort of ornamental greenery useful in elections campaigns.

As a last conclusion we can affirm that transport infrastructures never been conceived for showing the city but they built and determined the structure of the city. Now, once they have been abandoned to the general social and natural diversity the old infrastructures can be transformed in new lenses to show a new vegetal and human democracy.

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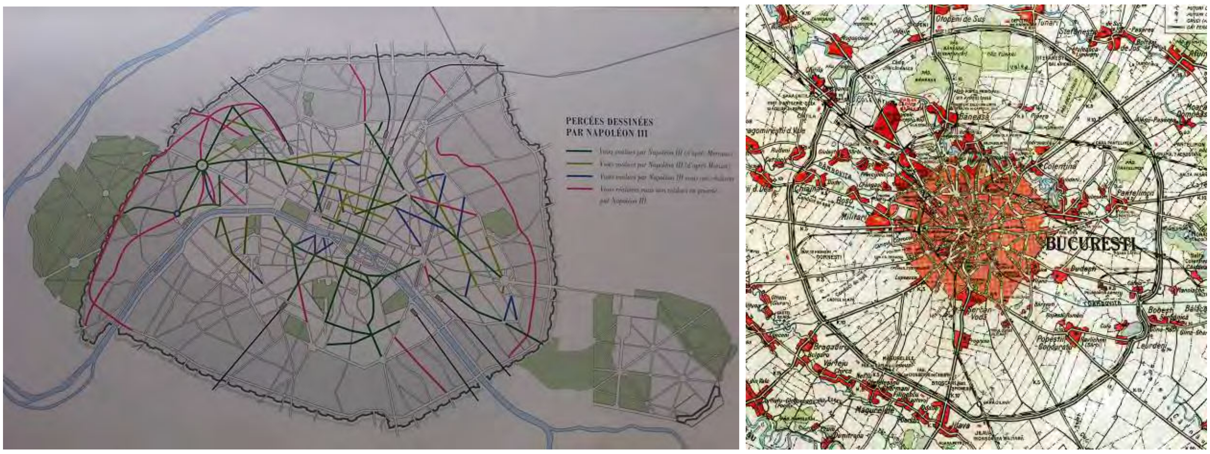
FIGURES



Photos: Jaques Boulet conference Paris La Villette, Pantea Guide of Bucharest, 1923

Fig. 1. Paris's boulevards connecting the rail stations and Bucharest's railways structure

Photos: Ioana Tudora

Fig. 2. Classic features on the Promenade plantée in Paris

Photos: Ioana Tudora

Fig.3. Modern design elements on the Promenade plantée in Paris

Photos: Ioana Tudora

Fig.4. Planting design on the Promenade plantée in Paris including bamboos and hedges

Photos: Google earth

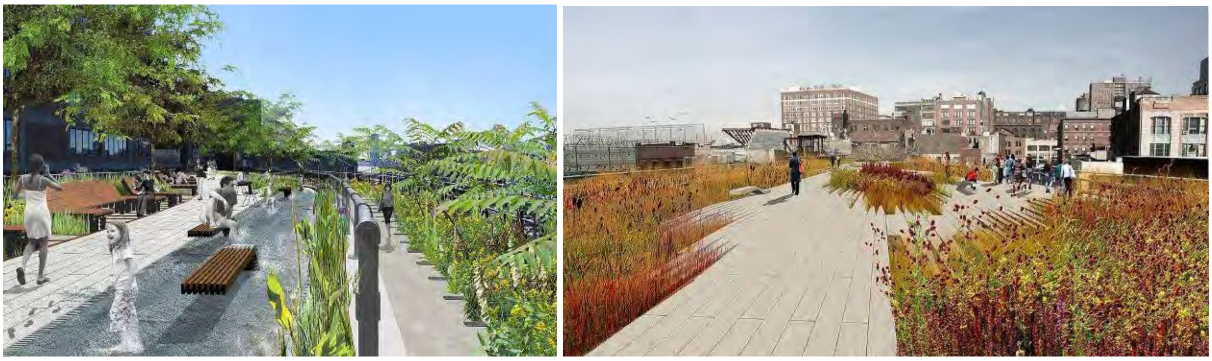
Fig.5. Planting design or left wild nature on the Promenade plantée in Paris

Photos: www.thehighline.org

Fig.6. The Death Avenue before the High Line and the High Line in operation

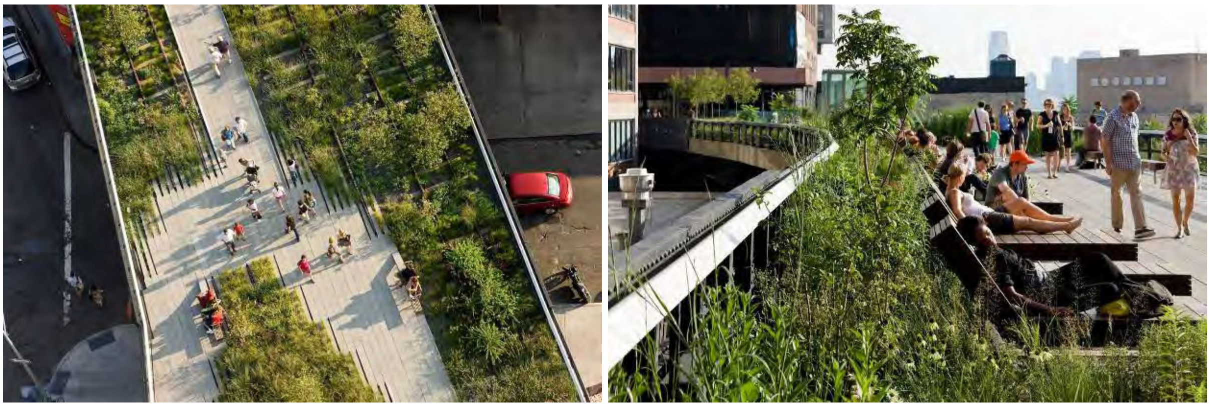
Photos: www.thehighline.org

Fig.7. The High Line during the '90: freedom of plants and freedom of people



Photos: www.thehighline.org

Fig.8. Images from James Cornerand Ricardo Scofidio proposal: keeping the nature



Photos: www.thehighline.org

Fig.9. The present image and use of the High Line: new aesthetics and old management

Photos: Ioana Tudora

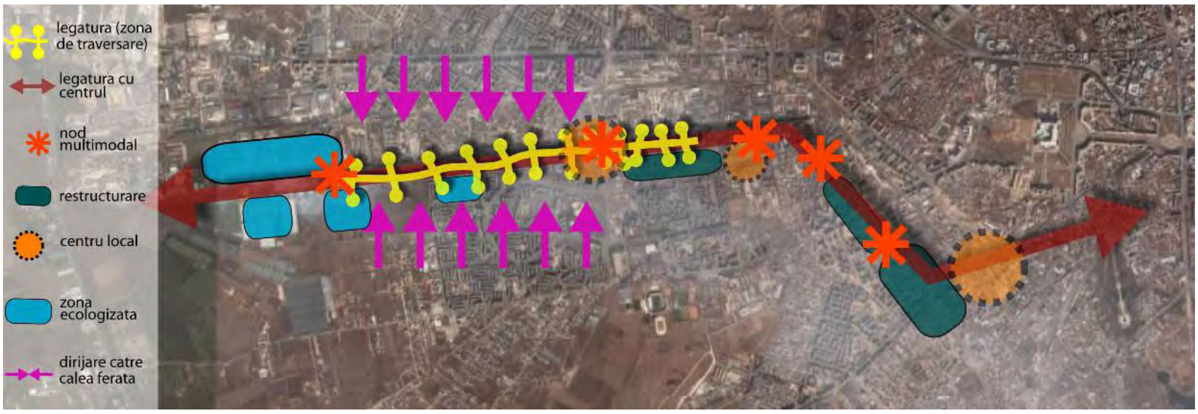
Fig.10. The nature invading the ancient railway Bucharest-west: a new sustainable ecosystem

Photos: Ioana Tudora

Fig.11. Vernacular uses of the rails area from playing to inhabiting

Photos: Mihai Culescu

Fig.12. Possible uses of the rails: alternative transport, playgrounds, open public spaces

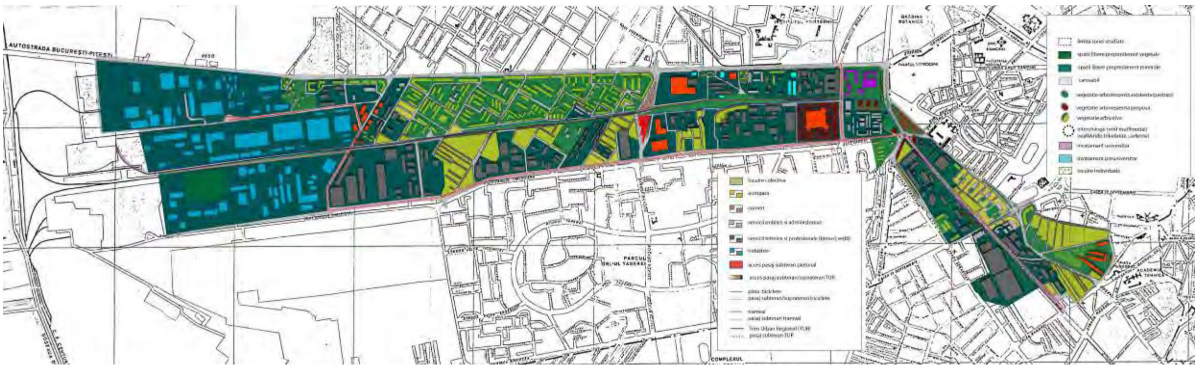


Photos: Mihai Culescu

Fig.13. Development strategy of the Bucharest-west green line including centres and connections for the adjacent neighbourhoods

Photos: Mihai Culescu

Fig.14. Integrated present uses in an ecological perspective: new aesthetic for the public space



Photos: Mihai Culescu

Fig.15. Interventions and design plan for Bucharest-west green line

"Green Roofs" - a viable alternative for increasing the comfort in urban environment

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ABSTRACT

Under current conditions of progressively diminishing of surfaces used for traditional landscape arrangement (on the ground), the roofs of (civil or industrial) buildings represent a resource of extending the green space and implicitly an improvement of parameters envisaging the psychological, thermal, ecological and social comfort of inhabitants living especially in urban environment. According to Government's Emergency Ordinance no. 114/2007, referring to Bucharest, until 31st of December 2013, the authorities of local public administration must provide from intra-urban land, a green surface of minimum 26 square meters / inhabitant. Therefore, there has been identified an area from Bucharest located near the "thermal island" of the city, an area generating of thermal and hydric discomfort but also of excessive pollution and inadequate quality of air, representing our object of study. This area is located on the quay of Dambovita River, in Regie Building Complex of Student Halls. There was studied a number of 12 buildings, evaluated from the point of view of resistance of built structures as being capable of additional loadings, on whose roofs there have been proposed two strategies of landscape arrangement. The obtained results have finally lead to choosing an arrangement strategy proving both a higher degree of adaptability of vegetal composition to the extreme conditions existing on the roofs of the buildings as well as an equilibrium between the resistance of the building's structure and the ecological and esthetical role of the vegetal component.

INTRODUCTION

It is well known that currently, Bucharest and especially its central area, represent the so-called "thermal island". This phenomenon has unfavorable consequences on the life environment of population, because of higher thermal values, low degree of humidity and inadequate quality of air. The phenomenon is generated by multiple factors (traffic, large concreted/asphalted surfaces etc). For diminishing the phenomenon of Thermal Island, the green spaces play an important role. In Bucharest, the number of sunny hours exceeds 5100 per year and the thermal and hydric deviations of the heat island reach 3.1 … 3.3 Celsius degree and 21 … 22% relative humidity. Taking into consideration the proven noxious effects of diminishing the green space surfaces upon urban level and the existing situation characterized by crowding and vertical development, making inadequate the arrangement of green spaces on the ground because of lack of space and natural light, in the central areas, there is agreed upon international level, than one of solutions which does not have any secondary effects is the green roofs solution.

A green roof is a roof planted with vegetation just like a garden. The idea is not new, as it appears in Antiquity, although the purposes from Antiquity are just a part from the currently intended purposes for execution of these green roofs.

The green roofs have become usual in case of European urban civilization at the beginning of XX century (1914 – Zürich, Swiss, Wallishofen), have extended in the 1960 in Germany (having already 10% planted roofs and the surface is yearly extended by 1300 ha), France (L'Historial de la Vendee), Great Britain (University of Nottingham Library, Hornyman Museum). On the American continent, U.S.A. and Canada have special policies of promoting of installing green roofs, providing support of up to 20 $ / square meters to developers implementing such projects; the green roof surfaces are extended on a yearly basis by approximately 30 ha (California Academy of Sciences from San Francisco, for example, owns a 1 ha roof of vegetation constituting of herbal species of spontaneous flora of

Chicago and Chicago already holds a record having over 200 green roofs of remarkable surfaces). In Japan, from year 2001, at least 1/5 of roofs of tall buildings must be covered with plants and Australia, having often downpours and storms, has a national plan of water falling management having the green spaces as an essential component.

We may assume that the green roofs represent a successful symbiosis between architecture and natural elements; as they are similar to ordinary gardens, they create attractive landscapes which may be seen from neighbouring buildings, improving therefore the image of the construction they are built on, creating places for leisure and developing opportunities of spending the free time in unconventional spaces strictly used.

The green roofs are also a new way of acting for environment's protection, trying to reinstall the vegetation in places wherein it has been destroyed by constructions / buildings, being an answer to people's pressing need of clean air and more efficient use of (solar, electrical) energy. The "green roofs" will certainly become a more significant part of the public policies as a solution against global warming.

Currently, this solution is used on a larger scale, upon the level of big cities (and not only in cities). Germany uses this solution on a very large scale, as according to statistics, approximately 5.000.000 square meters of roofs are already installed.

The goal consists in improving the microclimate around the building on which the project is made, regarding the decrease of temperature, change of humidity during the summer and diminishing of the degree pollution of vehicles in the neighbouring areas. The project answers also the challenge of identifying urban solutions for fighting the effects of climatic changes (amplified by urban changes) which already causes in the capital increases of average temperatures by 2-4°C during the summer months.

The location proposed for implementing the project consists in 12 buildings belonging to Regie Building Complex of Student Halls (figure 1).

The research refers to a pilot study based on analysis and selecting of the most adapted strategy for planting a set of 12 roofs of some building located within an intense polluted area. The goal of research consists both in promoting an adequate scenario (the two proposed ones) based on a scale of species adapted to climate and soil conditions specific to overheated roofs as well as in promoting solutions contributing to increase of green surface reported to the number of inhabitants from the urban environment.

MATERIALS AND METHODS

Location's neighbouring: North – Regiei Boulevard and Politehnica Sports Center, South – Splaiul Independentei, East – Orhideelor Street, West – Petre Popovat Street.

The judicial status of the land – the buildings are located inside Bucharest and under the patrimony of Bucharest City Hall.

Economical status – Currently, the terraces are not used.

According to Feasibility Study for "Green Roofs' objective (Project no. 1187 / 2011), there are proposed the following alternative scenarios:

I scenario – represents the solution based on an average investment, having significant benefic effects on the analyzed area, from the point of view of diminishing the costs of operating the buildings, of extending their life duration by additional protection, having a significant contribution to diminishing of pollution, CO_2 consumption and improving of the comfort index of the population from the analyzed area.

The scenario implies the installation of an extensive type "green roof", requiring a landscape arrangement installed on a soil layer having a thickness of 20-30 cm. and a weight of approximately 200 – 250 kg / square meter (figure 2). Studying the requirements of various species (Iliescu, 1998) there has been formed a vegetal composition of aromatic herbs (*Thymus, Salvia, Lavandula*) combined with *Sedum species*, small graminaceae (*Festuca*) and species of crawling bush (*Cotoneaster, Euonymus*) according to a project of landscape arrangement adapted to each type of roof (figures 3, 4, 5).

II scenario – represent the solution based on a maximum investment and obtaining of maximum benefit results both regarding the protection and insulation of buildings and diminishing of zonal pollution as well as regarding the microclimate around the building for which the investment is made.

The scenario implies the installation of an intensive type "green roof" requiring the existence of a thicker layer of soil, of minimum 30-40 cm, whose weight upon saturation exceeds 350-400 kg/square meter. The soil is used for growing herbal perennial plants combinations (*Thymus, Carex, Sedum*), species of bush (*Cotoneaster, Euonymus*) and even small trees (Iliescu A.F., 1985. Guidelines for practical works in landscape architecture; Mailliet and Bourgery, 1993).

This roof requires the same care as an ordinary garden and may be made only in case of solid roofs bearing this load.

In comparison to extensive type roof, the intensive one requires a higher investment value and significant increased exploitation costs. The loading brought to the structure are significant and therefore this type of roof may be used in case of new buildings having the different structural elements adequately dimensioned by taking into consideration also these additional loading. The installation of an irrigation system is absolutely necessary for this type of roof.

The selection of plants used in case of both scenarios is an important decision which might influence the long-term viability of the green roof. That is why there must be taken into consideration: the draught resistance, the capacity of bearing high temperatures (summer) and powerful winds (winter), (moderate/low) increasing rate, type of root (non-aggressive), viability (long life duration), care requirements (modest, requiring rare interventions, small quantities of fertilizer and water/irrigation). This makes that the scale of species used for making the selection is limited to some categories simultaneously fulfilling all enumerated requirements: succulent plants and herbs normally belonging to spontaneous flora as well as covering tree species.

In this sense, the *Crassulaceae* family as the most species (*Sedum*) and species (over 20) fulfilling the requirements, being capable to resists and even develop themselves under extreme conditions (draught and high temperatures), having accumulation capacities (in form of reserves) of water in leaves and "fat" stalks and fine superficial roots. Manu special grow slowly but resist without any problems to sun and draught for a long period of time (3-4 weeks), bearing also the shadow and extreme temperatures, both in the summer as well as in the winter. The have long life and easily propagate by means of striking roots, cover pretty quick the soil surface and prefer rocks by perfectly adapting to mineral sub-layers which are typical for green roofs (Iliescu, 1987).

The graminaceae of spontaneous flora are apparently less pretentious as regards the quality of soil, fertilization, irrigation and shaping (reduction of vegetative mass by means of periodical cuts). They help the ecologization of the green roof, attract the specific fauna and theoretically may remake the destroyed biodiversity as the building is erected (Borza and Boscaiu, 1965).

The medicinal and aromatic plants are species loving the heat and light by efficiently valuating the climatic conditions with hot summer of the last years. The difficult conditions from the roofs, having the air temperature of 42°C during the summer (upon the soil surface it may reach values above 65°C) and low air humidity (up to 25%) act as dehydrating forces on grown plants. Our researches have proven that this category of species is more resistant to draught by easily adapting by means of physiological and biochemical changes upon foliar level. Therefore, there have been analyzed a few parameters of interests (table 2), whose values may give us a first idea regarding the capacity of adapting to stress, helping us to performing the selection of plants. These measurements were made in the vegetation period through the following methods:

- free water and water tied up in leaves – gravimetric method
- dry substance found in leaves – through drying at 105°C
- concentration of the cellular juices – through the refracometric method
- photosynthèses – with the L.C. PRO+ gas analyser (micromols CO_2/m²/sec)
- leaf transpiration - with the L.C. PRO+ (milimol H_2O/m²/sec)

RESULTS AND DISCUSSIONS

The obtained results indicate that all studies species have their metabolism to a low degree of foliar hydration, having values of 65-75% free water, in comparison to other species requiring 85% foliar hydration (leguminous plants). The dry substance was 22 – 30%.

The water quantity corresponding to foliar level increases the plants resistance to frost during water. In case of studies aromatic species, it was 3-5% in comparison to other plants having 1-2%.

The concentration of cell juice increases with the action of thermal-hydric stress factors to 5-8%, as an adapting reaction to draught, strongly connecting the water upon cell level, as they plants oppose themselves to losing water by foliar transpiration.

During summer, the plants had diminished values of foliar transpiration, of 2-4 milimoles H_2O/m^2/sec, meaning a diminished consumption of irrigation water.

The values of photosynthesis of analyzed aromatic species are 9-26 micromoles CO_2/m^2/sec. Depending on plant's habitus (foliar surface 1-2 m^2/plant), for a density of 4500 plants/planted roof surface, there may be converted by photosynthesis around 135 micromoles CO_2/m^2/sec. Therefore, by growing plants with high photosynthetic potential on large surfaces, by covering the blocks with vegetation resistant to draught and frost, there may be significantly improved the microclimate in urban areas, being justified for this level the arrangement of some spaces of rest and leisure.

The scientific researchers have confirmed the conclusion regarding the fact that the *Sedum* species are best adapted to growing on roofs, proving that they may grow also in extremely thin soil layers (6 cm.), being resistant to wind erosion and long draught periods (28 days between watering), keeping intact the photosynthesis capacity.

CONCLUSIONS

From the technical point of view, both strategies may be implements, as the difference consists only in the investment value, difficulty of implementing and the associated risks of each variant (table 1). We estimate that the total value of investment for making the green roofs in case of applying the II scenario is 3,5 – 4 times higher as in case of the extensive type roof.

There is proposed the implementation of I scenario, requiring the installation of an extensive type "green roof", with a thin soil layer on which grow tolerant plants which do not require any special and expensive care. The main advantages of the recommended scenario are: minimal additional loads brought to the existence structural frame; minimal quantities of material for installation; average duration of making the objective – 12 months, low execution price; low maintenance with low prices.

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TABLES

Table 1

Comparative analysis of the two possible scenarios

Nr. crt.	CRITERIA	Share	Scenario I		Scenario II	
			Absolute	Share value	Absolute	Share value
1	Investment costs	0,25	10	2,50	3	0,75
2	Operational costs	0,15	10	1,50	6	0,90
3	Time length of achieving the investment	0,10	10	1,00	5	0,50
4	Isolation and protection	0,05	8	0,40	10	0,50
5	Additional loadings for the resistance structure	0,15	10	1,50	5	0,75
6	Species biodiversity	0,05	6	0,30	10	0,50
7	Risk regarding the necessity of replacing the plantations (inverse proportion with the biodiversity of the species)	0,15	10	1,50	6	0,90
8	Quantity of necessary materials for the instalment	0,10	1	0,10	6	0,60
	TOTAL	**1**		**8,80**		**5,40**

Table 2

Variation of physiological values to some aromatic species

Nr. crt	Species	Free water %	Tide water %	Dry substance %	Conc. celular juices %	Photosinthesis micromols $co_2/m^2/sec$	Transpiration micromols $H_2O/m^2/sec$
1	*Thymus*	75	3	22	5	12-15	2-4
2	*Lavandula*	65	5	30	7	9-22	3-5
3	*Salvia*	71	3	26	8	13-26	3-4
4	*Saponaria*	68	4	28	7	11-16	2-3
5	*Nepeta*	73	3	24	8	14-21	2-3

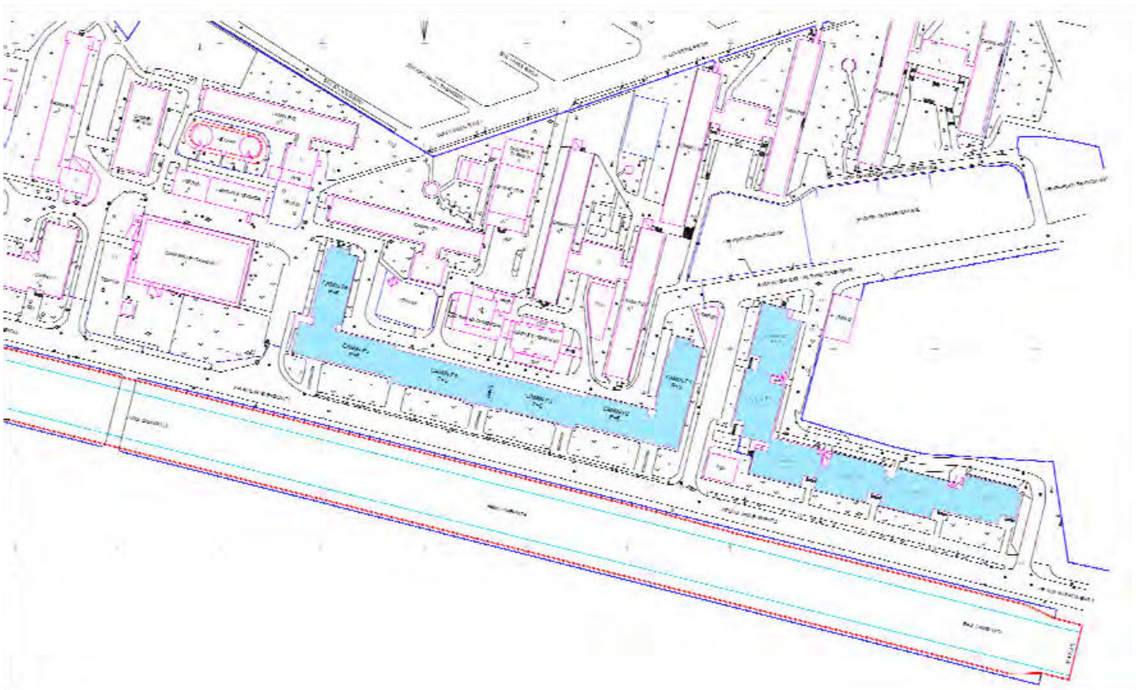

Fig. 1. General location plan

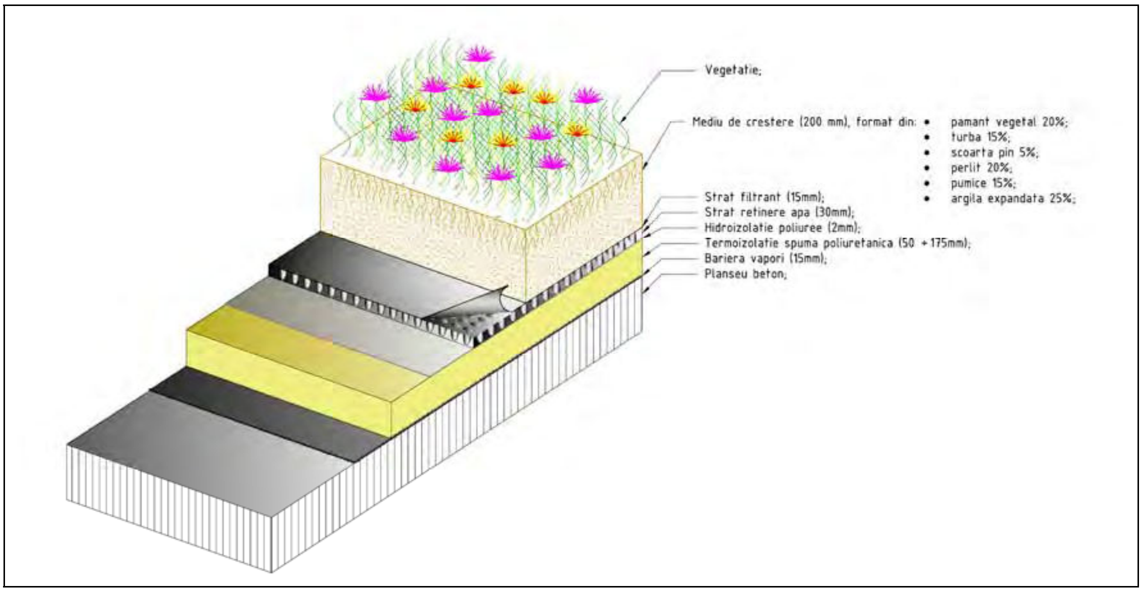

Fig. 2. General structure to implement the layers of a green roof

Fig. 3. Landscape design – general project adapted for the roof of the hostels type 1 (Regie)

Fig. 4. Landscape design – general project adapted for the roof of the hostels type 2 (Regie)

Fig. 5. Landscape design – general project adapted for the roof of the hostels type 1 (Regie)

The landscape as a complex notion - integration in the internal legislation through the adoption of the European Landscape Convention

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Keywords: public policy, territorial model, administrative level

ABSTRACT

The mechanisms put into practice by the European Landscape Convention (Florence, 2000) are meant to develop in a balanced way the European territories. The landscape thus becomes a new element that creates territorial coherence, protecting, at the same time, the local diversity. In view of the European Convention the landscape becomes a territorial development engine which guarantees to each individual an active participation in shaping and developing the territory which he owns. At the same time, the landscape is also viewed as a tool for awareness and education of the European society, designed to protect and valorise territorial identity. The adoption of the Convention has legislative implications at national, regional and local level because the landscape must be introduced in all public policies of a ratifying country. There are differences in interpretation and adoption, and there are also different levels of integration of the Convention, which are determined by legislative differences and by degrees of regional autonomy. Putting the principles of landscape into the practice of each country becomes a complicated mechanism that collides with specific legal interpretations. Thus, at the European level, we come across different models of integrating the landscape in the public policies, but also legislative difficulties that hinder the embracement of the principles of the Convention. This article tries to briefly illustrate the French model of insertion of landscape into the territorial policies. In parallel with the French model it is exemplified the situation in Romania, still in the early adoption phase of the European Landscape Convention.

INTRODUCTION

The European Landscape Convention is the European act which regulates the landscape by trying to find, at the continental level, a uniform definition of the European territorial diversity. Wanting to stop the degradation of the landscapes and the loosing of the territorial and cultural identity of the European territory, the Convention has as main purpose the harmonization of social, ecological and economic values. With the adoption of this Convention, the landscape becomes "a cause of public interest" (Donadieu, 2005) and imposes the implementation of landscape policies that would guarantee the quality of the landscape, be it extraordinary or quotidian.

The Convention sets out an innovative idea regarding the landscape by bringing the landscape into discussion in relation to public policies (Bédard, 2009). These will provide comprehension of the landscape dimension, along with the legal recognition of the landscape. The concept of landscape becomes close to the one of life framework and there is hope to improve it, because "the landscape is everywhere"(Bédard, 2009*)*.The Convention is based on the diversity of national policies and on the mosaic of decisions applied at the local level, and it does not try to standardize nor to impose a certain method of protection and development of landscape. Through this it is considered that each territory is unique in its kind and thus it perpetuates the territorial identity (European Council Convention, 2006). Each ratifying country of the Convention has the obligation to translate the principles of the landscape in its national policies. This guarantees the applicability of the Convention.

MATERIALS AND METHODS

This article discusses two types of landscape integration into national legislation and the obstacles they encounter in adopting its principles. The European territory as a whole is based on "*sustainable and balanced*" development of this territory (European Council Convention, 2006).

It is therefore important in the achievement of this goal of encouragement landscape policies. Materials used in this article are legal documentation which addresses the problem of landscape and the role landscape plays in each of the systems presented. In the French system the landscape is defined at each administrative level, where it will be specified the documents containing it and the role that it plays. In the Romanian system the landscape is summarized because for the time being it remains an element that does not really matter, and it is used too little in documentation.

That is why the role which the landscape plays here cannot be discussed. Through this parallel presentation of two administrative models, I wanted to highlight weaknesses and to present a possible example of action in implementing the notion of landscape at the legislative level.

France ratified the Convention on an existing support, *the law of landscape protection and exploitation* from the 8th of January 1993, which existed in the environmental code. This created a favourable basis, both legislative and at the administrative level, and there was already a regulatory framework that included the landscape into public policy. The landscape is integrated in both environmental policies, and in urban and regional planning regulations. An important role in taking the landscape into account as an active element was played by the state through its centralized organization (European Council Convention, 2006).

To facilitate the adoption of the landscape principles laid down at European level, the French government implements a program to identify and categorize the landscape in France by creating *the Landscape Atlases*. The Landscape Atlas, a guided program under the tutelage of the Ministry of Ecology and Sustainable Development, has as the main aim landscape inventory and presentation of a real image of the landscape at different administrative levels in all the 100 French departments. The implementation of this instrument resulted in the harmonization and easy integration of landscape policies at the local communities' level.

Thus it is established that all administrative levels, starting from the central power represented by the state, and passing through regions, departments and communes, gain competences in the landscape, which are given by the current French legislation (Bédard, 2009).

It is noticed that at the departments level the landscape it is embed through a regulatory mechanism: estate planning directives (EPD) that can be activated by the central power or by a region. EPDs provide the preservation of natural areas, their exploitation and the landscape development. The information and the strategies included in EDP must be respected and translated into local urban planning documentation (European Council Convention, 2006).

Since the year 2000, the urban planning code mentions the landscape as a basic element that enters into Territorial Coherence Schemes. Through this tool of intercommunal design, plans will be imposed to identify protected landscape areas and to design city enters.

At the community level, Local Urban Planning (LUP) will include a Sustainable Development Planning Project (SDPP) where the landscape is taken into consideration through projects of development, protection and conversion of urban spaces. Regarding environmental code, the landscape is approached from the angle of policies for environmental protection and conservation, and it is included into management and development projects of the protected natural areas.

In the Romanian system, the ratification of the Convention took place in 2002, when the Law 451 was enacted, which published the full text of the Florence Convention. The landscape still does not have a clearly defined role; it can be found in legislation of urban planning, in environmental legislation or legislation which treats the heritage issue

(Methodology of Ministry of Regional Development and Tourism, 2008). Thus the landscape does not have a clearly defined legislative justification and in documentation it is an auxiliary part of other public policies.

Environment legislation is the one that presents the most references to landscape[2] and even tries to give a definition of the landscape. But the definition of landscape is expressed only in ecological terms and enters in the structure of the protected areas, which include the obligation to protect and preserve landscape ensembles (Methodology of Ministry of Regional development and tourism, 2008).

RESULTS AND DISCUSSIONS

From those presented so far, can be easily noticed the difference between the two systems, that ratified at a four year difference the European Landscape Convention. Although Romania was one of the first countries to ratify, in 2002, and France ratified in 2006, there is a large delay in including the landscape into national legislation.

Therefore, Romania has ratified and put into effect the European Landscape Convention before France. But the acceptance of European principles regarding the landscape is not enough to implement the notion of landscape at national, legal and administrative level. The natural question that arises from this presentation refers to the accumulated delay in the development and enactment of the landscape law in Romanian system.

According to a report carried out in 2007 by French experts (Peylet, 2007) the Romanian legal system for urban and spatial planning needs some improvements. Recommendations of the report state that the creation of a new urban planning code would allow: "clarification of the division of competences between public collectivises within the state" (Peylet, 2007). This study finds some ambiguities in the hierarchical structure and the opposability of plans for spatial planning and urbanism. A new code of urban and spatial planning would allow the integration of a landscape law in accordance with European legislation.

Another issue would be a better classification of competences at each level of the central administrative from the central level to the local collectivities, the making of clear and logic rules, and the possibility to verify their correct implementation. The issue of legislation development regarding the landscape takes a lot of time in Romania, because we face a documentation structure too rigid to coordinate with the European rules.

In fact it is a basic problem, of legislative structure, which at the national level must be clear, simplified and must have a *better global coherence between the state documentation and urban planning* (Jégouzo, 2009) to integrate the principles of landscape.

The approval of the Convention by Romania was made before synchronizing the environmental, urban and spatial planning legislation. This is demonstrated by the slow steps that our country makes regarding the landscape policies. A solid research of the legislative base and of the administrative system modernization would have facilitated the integration of the notion of landscape and would have opened new perspectives towards effective landscape policies.

The effects of ratifying the Convention will be seen within each state through the transcription of the landscape principles into national legislation (Donadieu, 2005). This issue, at a national level in Romania, did not appear because of internal legislative inconsistency.

Signing this document did not actually guarantee a legislative clarification in Romania. The ratification of the Convention by Romania should have been made when our country could ensure internal public policies to easily integrate landscape. So an improvement

[2] The law n° 345/2006 amending and supplementing Government Emergency Ordinance (G.E.O.) no.236/2000 for the status of Natural protected areas, natural habitats, flora and fauna and the law n° 265/2006 to approve G.E.O. 195/2005 on Environmental protection

in the Romanian legal system would facilitate the enactment of legislation regarding the landscape and would eliminate the legislative ambiguity that still exists.

From this point of view we have the example of France which ratified in 2006 when it managed to synchronize its internal legislation regarding the landscape with the European legislation. Although it has all the instruments put into practice in terms of landscape, there is still a careful bending towards natural and/or outstanding landscapes in protected areas. The ratification of the Convention encourages putting into practice the mechanisms for integrating other types of landscapes (Bédard, 2009).

Being considered "state business" by "many local collectivities", the landscape still fits rigid rules that favor extraordinary landscapes, contrary to the idea of the Convention which guides local authorities to play a key role in the identification and development of all landscape types (Bédard, 2009).

CONCLUSIONS

Due to the innovative ideas of the European Landscape Convention, the political projects are moving towards a valorization of landscapes diversity and towards a democratization of society[3] by introducing the concept of landscape.

A new relationship between nature and society is defined through expression of the concept of landscape (Bédard, 2009). The awareness of each actor regarding the landscape opened up new ways towards a society that wants to maintain local identity, the perpetuation of resources and territorial diversity.

The concept of landscape laid out at the European level creates new links between nature and society. The landscape takes on a new and unprecedented dimension in the European area, trying to include all its *facets*. All types of landscape are taken into account and thus the *protectionist conception* of outstanding landscapes disappears (Luginbühl, 2007).

From now on common landscapes will play an important role in community life by valuing identity image. The implementation of the Convention is still in an experimental phase and the results have not yet occurred (Luginbühl, 2007). Although the signatory countries commit to apply on the field the landscape principles, it is difficult to synchronize the European and the local level, the latter requiring some time to adapt.

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Conceptual approaches on landscaping study

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Keywords: symbolism, cultural value, entropy

ABSTRACT

Sustainable landscaping requires the integration of natural, social, economic and cultural sciences, to deal with their systemic diversity (Bimberg et al, 2009). Ranging from matter to idea, the landscape is staged on three abstraction levels: the object-landscape, the visible-landscape and finally, the perceived landscape (Boureau et al). On the highest abstraction level, the cultural value relies on the whole architecture of the landscape, bearing the influence of material environment and social perception. Furthermore, cultural attributes of landscapes target the widest time spans, just the same way that biodiversity is integrated within sustainability efforts. Unfortunately, cultural attributes often make the non-market value of landscapes (Wrbka et al, 2004), which is a growing risk considering globalisation issues. Variety, significance, views obstruction, fame, sky quality (Casatella et al, 2011) – as cultural attributes, are all emulations of one fundamental issue: the landscape concept. The paper is focused on its impact within landscape sustainability, concept integration in landscape design and finally, the concept-use benefits for society and for the landscape architect. Concept use obstacles are identified and conclusions show possible ways of improving landscape design conceptualisation.

INTRODUCTION

The primary goal of landscape architecture is the harmonisation (as *union of cooperating elements* – Dewitt H. Parker, 2004) of the relationship between society and environment (*integration of nature and culture components* as seen by Fry, 2004). Narrowing the target within the architecture's field – regarded as site, event and sign (Rossi, 1982) – the material subject of landscape architecture is set outdoors (*if there's sky, it's mine* - Kathryn Gustafson by Waterman, 2009), even if landscape itself is still a notion disputed between various disciplines (Tudora, 2009; Huang, 2010).

Civilisation is built on the nature – society interface and its sustainability (diversity, resilience, service …) is proportional with its culture, since the first is the external manifestation of the last, which, as Felipe Fernandez Arnesto states, is the character of a society (Arnesto, F.F, 2001, cited by New World Encyclopaedia).

Landscape and architecture are the most democratic culture propagation mediums: they can show their meanings to anyone, no matter how much time, money or knowledge people need to experience them, unlike the traditional seven arts require it. Museums, galleries, theatres, concerts, movies, lectures etc. – they all require exclusive spectator's attention, previous planning and the conscience of approaching culture. Perception of these two mediums can be considered on a scale ranging between a rather formal, stimulus based approach, to a fancier contact with the architectural language, leading to a cognitive faculty superior to perception (Asso, 2010).

STATE OF THE ARTS

The landscape enrichment with a cultural load in completion to its physical features contributes to long-term landscape planning, since sustainability requires integrated approaches on every stage of development. No landscape development can be therefore sustainable without cultural involvement.

To secure a cultural attitude in landscaping the common sense way should be conceptualisation. Of course, there is also the 'angel-touch' way – in which landscaping approaches come by revelation; but even in this case, concept decrypting is needed to assess proposed development quality.

Landscape democracy involves wide accessibility of its benefits. Since landscaping social targets, seen on the long term, are heterogeneous and cultural services (as in ecology) should be available for as many as possible, concepts should provide messages for the initiated as well as for the superficial readers of a landscape. The message doesn't have to be the same for all target categories, since each social actor can play different parts in the grand play of sustainability.

The diversity of the conceptualization methods is very wide – virtually every concept designer has a personal approach on this matter. Yet, a few categories are more frequent:

- Deductive reasoning or the way from general to specific, *is used to construct a logical and rigorous proof* (Shuttleworth, 2008); in this case, the initial premise should be based on accurate system comprehension, as in the case of history rich sites, where the concept designer should aim to *make peace with the past in order to move into the future* (Waterman, 2009).
- Inductive reasoning, or the specific to general modelling is in the case of designing concepts the 'easy way', since it is based on a great extent of designer's prejudice regarding the site; in this case, a specific historic, cultural or perceptual aspect of the site is assigned dominance over all the other issues on site; this preference is usually a cultural statement, since designer's preferences for the initial premises are based mostly on cultural prejudice. In landscape works, the territorial use of these approaches can be hazardous, but on smaller scales the artistic intentions can be quite spectacular.
- Scientific reasoning (Shuttleworth, 2008) is a general comprehension instrument: real world observation followed by comprehension based on testing questions and hypotheses; the concepts derived out of this should be shaped into predictable theories; their testing on impact assessment studies is recommended.

Landscape potential good standing could be compared to human vocational profile. Just as moral and religion are the social catalysts that decrease entropy and boost up personal potential opening the way to civilisation progress, concepts are the landscape sustainability framework.

In a society increasingly overwhelmed by formalism, where the 'mass culture' is essentially a commercial short-sighted production, the democratic attribute of landscape imposes a great responsibility on landscape architects. Their role in these days of formidable advance of consumerism is to recover the traditional – more sustainable – cultural values and to put them on public debate.

The world economic recession could be an opportunity for all the cultural factors involved in social rehabilitation to enforce their message. The risks are high on the long run and their existence must be spread in order to make people responsible, starting with the professional categories that have a deeper influence in mass culture.

As it was shown before, a concept-less landscape will sooner or later prove to be worthless, or even worst, it will become a medium to support formal culture. Unless landscape architecture will be granted a distinct disciplinary statue, regarding law, administration and social recognition, the landscape architects will be unable to participate in the mass-culture rehabilitation process, thus wasting a strong cultural formation tool (Banksy, 2005).

The landscape architects should contribute to national cultural strategies, along architects, planners, sociologies, theologians, philosophers, artists and designers. They should 'perform' sustainable, meaningful landscapes on any level of activity – from the territorial scale to the smallest private landscaping interventions.

CONCLUSIONS

Conceptualisation benefits:

- Framework to integrate all the features of the landscape, on every stage of development (planning – design – setup);
- Increases flexibility on any development stage regarding the changing premises;
- The democratic attribute of the landscape makes of it a good medium for positive value transmission toward social targets.

Without the conceptual load, no landscape intervention can be considered sustainable, yet conceptualisation involves specific risks:

- The poor site analysis, resulting in poor site cognition, makes concept design hazardous; the implementation of a concept in these terms can lead to site entropy increase (Bogaert et al, 2005).
- The short-term social and political impact of a 'sane' concept can be vague, thus jeopardizing the landscape development authorisation and financing. Concept publicity should be used to mitigate this issue.
- The landscape architect's vision coherence is hard to impose on beneficiary in the absence of a comprehendible concept; in this case, project fundamental alterations inherently occur.

Professional impact of concept-use:

- The indispensable use of concepts in landscaping appoints disciplines that target directly the landscape to the artistic area of interest;
- The inherent reference of landscaping works to sustainable development legitimate it as being part of the applied arts domain.

Concept-use obstacles in landscape architecture:

- The abusive limitation of landscape architecture preoccupations to natural and economical sciences field (a common practice in Romania is to skip social and cultural aspects of landscapes – Lazar-Bara 2011)
- The professional quality of the designers is a potential hazard, since in immature landscape cultures the professional specialisation is precarious.
- The poor cultural background of the landscape architect's customers.

Pop-art emerged in the 50's as a reaction to consumerism, emphasizing its negative impact on traditional, sustainable values. 60 years later, Romanian landscaping, a shallow tradition field of national culture, should follow.

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Carol I Park in Bucharest in the ’30s – *Celebrate Bucharest Month*.

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Keywords: public park, landscape architecture, modern style, fountain

ABSTRACT

Inaugurated in 1906, Carol I Park underwent a second and significant phase of development in 1936. This is when it hosted the first edition of the *Celebrate Bucharest Month* exhibition, which henceforth would become an annual event and an urbanism show of great significance for the capital. This event engendered major transformations in the park. First, the old pavilions from 1906 were restored or entirely rebuilt. Second, an entire neighbourhood, named the “Old Quarter”, was reconstructed. Third, a copy of Colţea Tower – for long the tallest building in Bucharest- and a restaurant were constructed on the lakeshore. The circular plaza that led to the main access point to the park also received major improvements. It became the site for a monumental artesian fountain designed in modernist style. Its characterizing feature constituted a mosaic representing the signs of the Zodiac. The old main gate built in the form of a triumphal arch was demolished and changed with a provisional one for the duration of the exhibit. Following the conclusion of the event, the park would henceforth be accessed through a smaller, permanent metallic gate. This gate endures to the present day.

INTRODUCTION

Carol Park (formerly named *Libertăţii* Park – Liberty Park) is located in the southern part of Bucharest. It is set amongst the hills on the way from the Cotroceni to the Văcăreşti districts of the city. It was conceived in 1906, as a “national park” designed to host the “General Romanian Exhibition”. This was a jubilee celebrating 40 years since Carol I became king of Romania, 25 years since the proclamation of an independent Romanian Kingdom, as well as and 1,800 years since Trajan’s conquest of Dacia (Parusi, 2007 and Potra, 1990). The park was designed and builds after the plans of French landscape architect Édouard Redont. He planned the park in a mixed style that incorporated significant Romantic motifs, elements of French landscape design, as well as a geometrical component at the entrance zone. All these constituent elements coalesced into a Belle Époque park with many imposing pavilions. These pavilions either decayed over time or disappeared altogether. Yet in 1935, after almost 30 years, the park underwent a renaissance concomitant with the *Celebrate Bucharest* festival.

STATE OF THE ARTS

Between May 9th and June 9th 1935, the park played host to a vast urbanism exhibition. This was occasioned by the first edition of the annual *Bucharest Month* pageant, the first in a series of six exhibits conceived at the suggestion of Mayor Alexandru C. Donescu (Drăgan, 2006). The next five exhibits took place in present-day Herăstrău Park. New Pavilions were once more constructed and some of the old ones repaired

The first exhibition even featured an entire reconstructed neighbourhood, which was intended as a reproduction of that particular precinct during the period of the Organic Regulation. The Organic Regulations, which came into effect in 1834-5, mark the first stage in Romania’s constitutional development towards a parliamentary system. It may thus not be coincidental that the organizers chose to reproduce a quarter from the very same time period. The reconstituted precinct featured narrow and meandering streets, small bridges with oak beams, modest cottages, wooden houses, as well as houses made of oak and stone. It was called the “Old Quarter, where one could encounter actors dressed in period costumes trying to revive an atmosphere long faded (Hrib, 2005 and Olteanu, 2002).

The opening of the exhibit on May 9th 1935, also witnessed the inauguration of a striking and monumental water fountain designed in modernist style. The fountain was located at the main entryway to the park in the July 11 Plaza, formerly known as Marshall Joffre Plaza. There, following World War I, there was a 20 meter-high iron model of the Eiffel Tower. The fountain that replaced the scale model of the Eiffel Tower was called the "Zodiac Fountain". It was completed in 1934 by August Schmiedigen and Dorin Pavel, who followed the designs of the famous architect Octav Doicescu. The fountain was decorated by the 12 signs of the Zodiac in a black-white mosaic (Colfescu, 2009; Drăgan, 2006; Potra, 1990 and Olteanu, 2002). This theme might have been inspired by the Metropolitan Dositei Filliti who, in 1863, refurbished an old gazebo, adding another storey to it and building a new fountain (Drăgan, 2006). The ceiling of this construction was adorned with twelve stone slabs, which were carved in the shape of astrological signs (Majuru, 2007). The [new] Zodiac Fountain was fashioned from marble and copper and the water spout reached 25 meters in height

Bucharest Month also prompted the replacement of the old, arch-like gate, situated at the front entrance and ahead of the new fountain (Olteanu, 2002 and Potra, 1990). A new massive gate permitted access to the multitudes of visitors, although only for the duration of the event. At the conclusion of the event, it was replaced by a smaller gate and the old wooden fence that surrounded the entire park was substituted by a metal lattice.

There were several buildings erected in the park, among them a replica of the Colţea Tower. After the closing of the exhibition, the Technical Museum "Prof. Ing. Dimitrie Leonida" was moved to the left of the entrance, in a building designed as an annex for the urbanism exhibit (Drăgan, 2006).

The end *of Bucharest Month* also marks the cessation of the marketing-commercial function of Carol Park. This function was preponderant from its very inception, as substantiated by the jubilee exhibit of 1906. This was followed by the 1921 Industrial Exhibit which attracted both domestic and foreign firms. This particular event prompted the construction of 14 new pavilions and those built in 1906 were either repaired or rebuilt. A year later, the Palace of the Arts – which constituted the principal pavilion of the 1906 exhibition – becomes host to the newly established National Military Museum. The Monument of the Unknown Hero, built by the sculptor Emil Willy Becker was placed in the foreground of the museum (Parusi, 2007). Consequently, the 1935 *Celebrate Bucharest Month* had great significance for the industry and commerce of the capital city. It was rich in economic, social, and cultural activities.

CONCLUSIONS

Remarkable as an example of *Belle Époque* landscape architecture and modernist interventions, Carol Park was damaged by the wrenching transformations wrought the history of the 20th century. It thereby lost its distinctive features. During the second half of the past century, this landscape jewel was given a new name, Liberty Park. This was a cynical move. It marked an attempt to turn it into a platform for Communist propaganda - a move akin to making wallpaper out of public spaces and national symbols.

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FIGURES

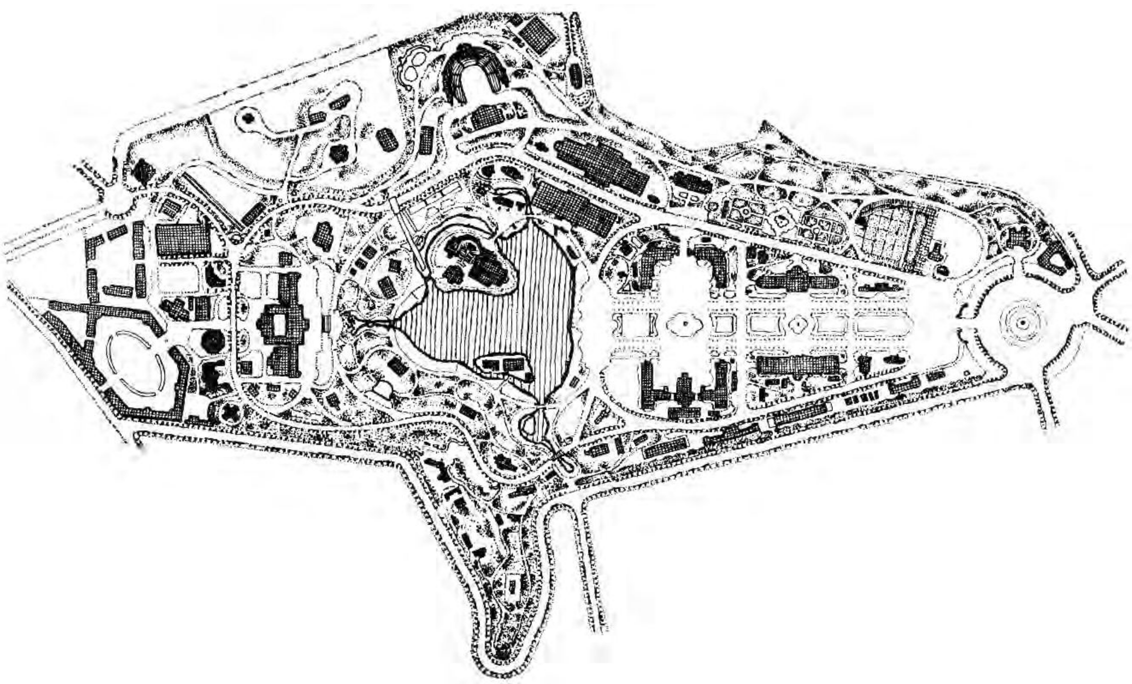

Fig. 1. Carol Park plan in 1906 after Marcus, 1958

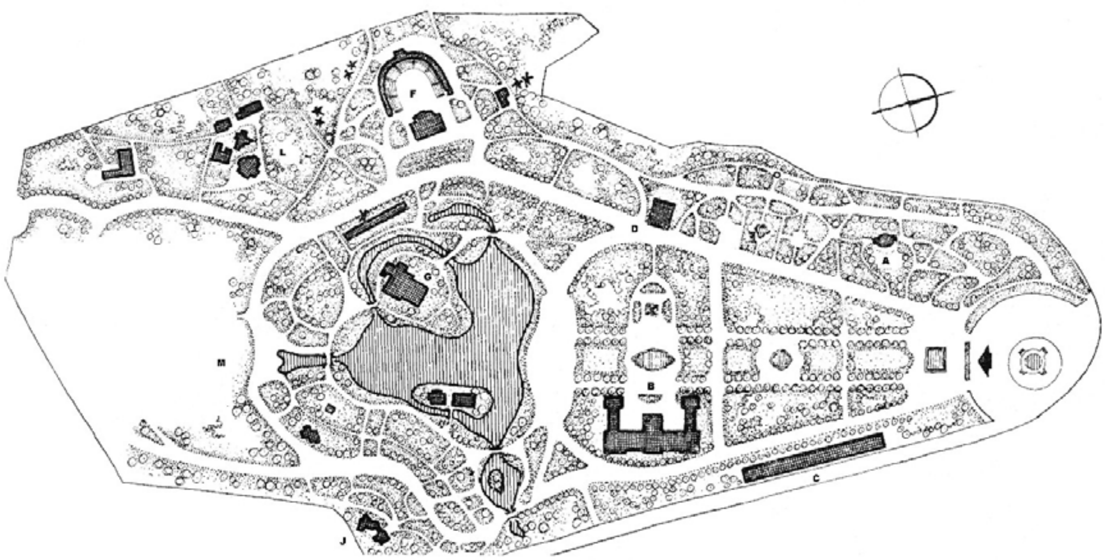

Fig. 2. Carol Park plan in 1958 after Marcus,1958

Fig. 3. Carol I park plan in 1934, after Wahni, 1934

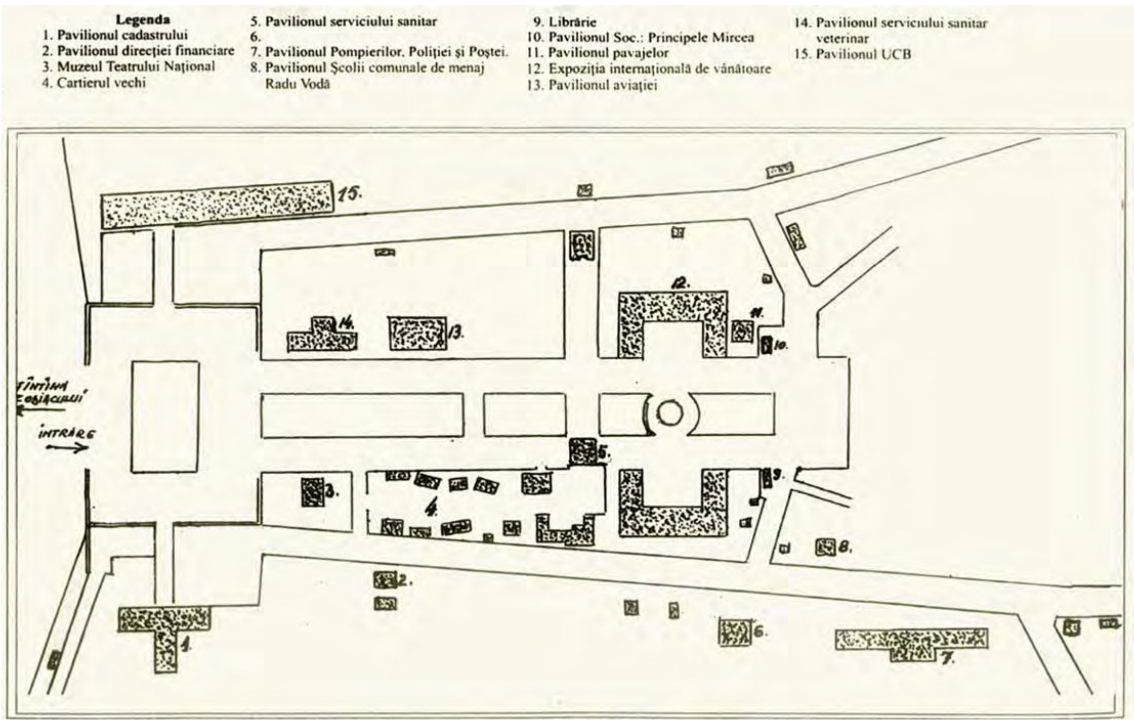

Fig. 4. The *Bucharest Month* exhibition plan – Carol park main entry zone, after Ioniţă,1998


Fig. 5, 6. Old neighborhood from *Bucharest Month* exhibit: house reconstituted from an old Bucharest street, after the Archive of the Museum of Bucharest History


Fig. 7, 8. Copy of Colţei Tower and building Zodiac fountain in 1935, after the Archive of the Museum of Bucharest History

Fig. 9. Zodiac fountain nowadays, September 2004

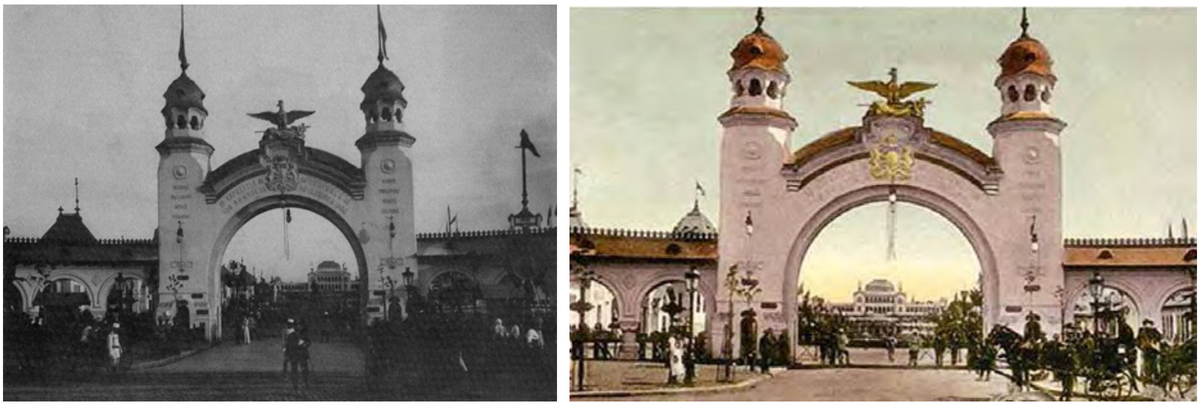

Fig. 10, 11. Carol Park's former main access after Noica, 2007 and Ştefănescu, 1999

Fig. 11. Carol Park's axis with the main access and Zodiac fountain nowadays, July 2011

Trends in 20th Century Landscape Architecture – Garden City

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Keywords: garden city, garden district, landscape architecture, ecology

ABSTRACT
The Garden City is a concept founded in Great Britain by Sir Ebenezer Howard in 1898 based on the principle of creating new suburban towns composed like a radius around the already existing cities, which would then be surrounded by farming land. He proposed that these garden cities should blend all the benefits of urban life with those of country living so that people gain the best of both worlds. The first garden cities were built in Great Britain, but after that, they spread all over the world. In France they became known as *Cité-jardin*. Here, they blend the original concept with typical French rationalism and progressivism. France has garden cities located within the boundaries of palace or castle parks built in the previous centuries.

INTRODUCTION

The Garden City is a urban planning concept founded in Great Britain by Sir Ebenezer Howard in 1898. It is affiliated with the culturalist urban model. The principle consists of creating new suburban towns composed like a radius around the already existing cities, which would then be surrounded by farming land (fig. 1). He proposed that these garden cities should blend all the benefits of urban life (such as job opportunities and social affirmation in general) with those of country living (a healthy environment, contact with nature). Thus, people could gain the best of both worlds.

STATE OF THE ARTS

These new garden cities (or *garden districts* when more limited in size) would have well-defined separate functions and would present a considerable green expanse. For instance, Howard's conceptual blueprints include such features as a vast central park, central and off-central public gardens, private and semi-private gardens (the latter embodied by inner squares centrally positioned within each residential island), as well as the agricultural belt (fig. 2, 3). These parks and gardens were supposed to have moralizing and culturalizing roles in society.

The garden city is meant to represent „native" architecture. Therefore, in the UK, the garden city is built around traditional cottages and would later include Impressionist gardens in the Monet style - designed by Gertrude Jekyll or her supporters -, whereas the US, they turn towards farms as a central element, and so forth.

The first and foremost garden cities were realized in Great Britain. Thanks to the book written by Howard in 1902, *Garden Cities of To-Morrow*, which was a great public success, they also crossed the Channel over to France, where they became known as *Cité-jardin.* Here, they blend the original concept with typical French rationalism and progressivism. France has garden cities located within the boundaries of palace or castle parks built in the previous centuries. Therefore one cannot really speak about the creation of new public parks, but only of reassigning portions of older private parks as public domain. By way of an example, the Cooperative-City *Paris-Jardin* in Draveil, one of the first city gardens, was created in 1911 using the park of the old castle Draveil. It is also the last French city garden still in operation (http://fr.wikipedia.org/wiki/Cité-jardin). Famous garden cities in Paris region are Stains (built between 1921 and 1933) (fig. 4), Suresne (built between 1921 and 1939) (fig. 5), Drancy (built between 1921 and 1929) and Les Lillas (built between 1927 and 1933) (Ward, 1992).

CONCLUSIONS

The gardens and the parks that belong to this prodigious concept have a certain aesthetic role and an unexpectedly strong cultural and civic importance, gathering people from all generations and social levels, putting them together in a green friendly public space, no matter the differences between them.

The concept of Garden City is a legacy of the 19th century for the 20th and especially for the 21st century, because of its profound humanist and ecologist spirit.

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***www.crdp-reims.fr

***http://ocw.mit.edu

***www.ville-stains.fr

***http://fr.wikipedia.org/wiki/Cité-jardin

FIGURES

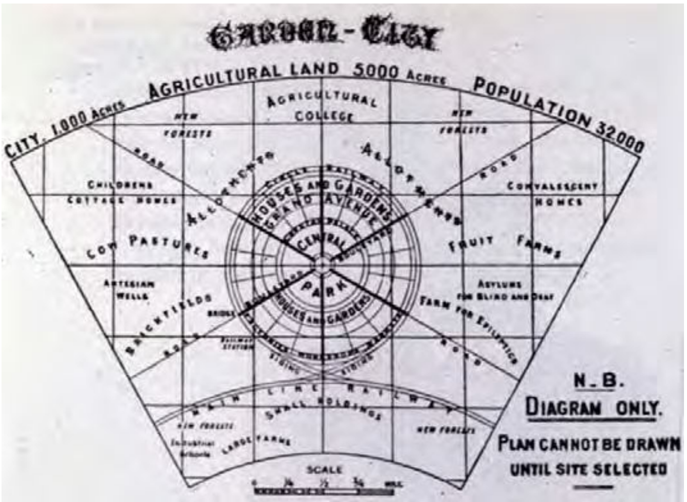


Fig. 1. Garden city scheme with the public park in the center after Howard, 1902

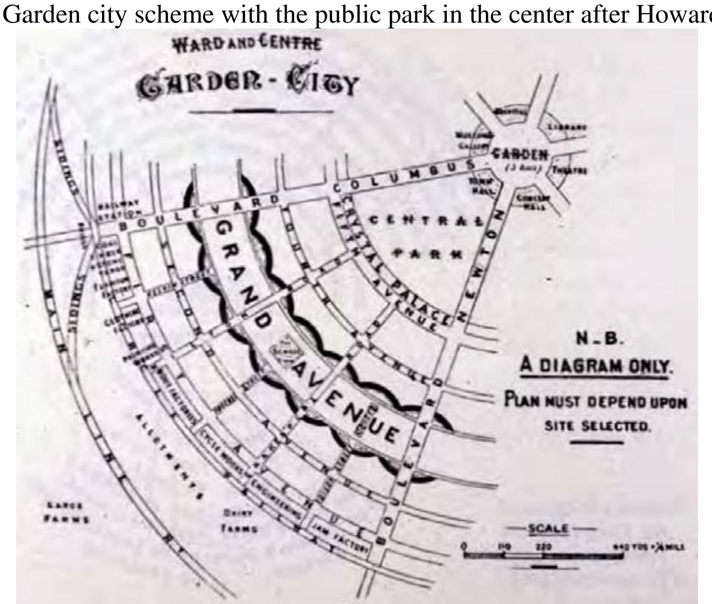
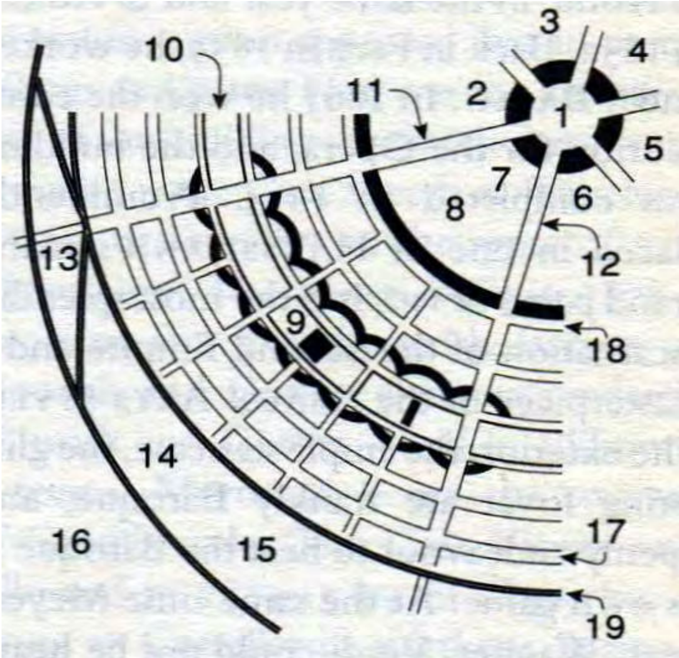


Fig. 2. The diagram of a garden city sector – district and center, after http://ocw.mit.edu



1. public garden; 2-7. public equipment (museum, hospital, library, theatre, concert hall, city hall); 8. central park; 9. school;
10. Main Avenue; 11-12. boulevards; 13. railway station; 14. allotments; 15-16. farms; 17. First Avenue; 18. Fifth Avenue; 19. railway.

Fig. 3. The diagram of a garden city sector – district and centre, after Fleming et al., 1999

Fig. 4. Aerial view of Stains city garden – private gardens and semi-private garden in the centre of the residential island, after www.ville-stains.fr

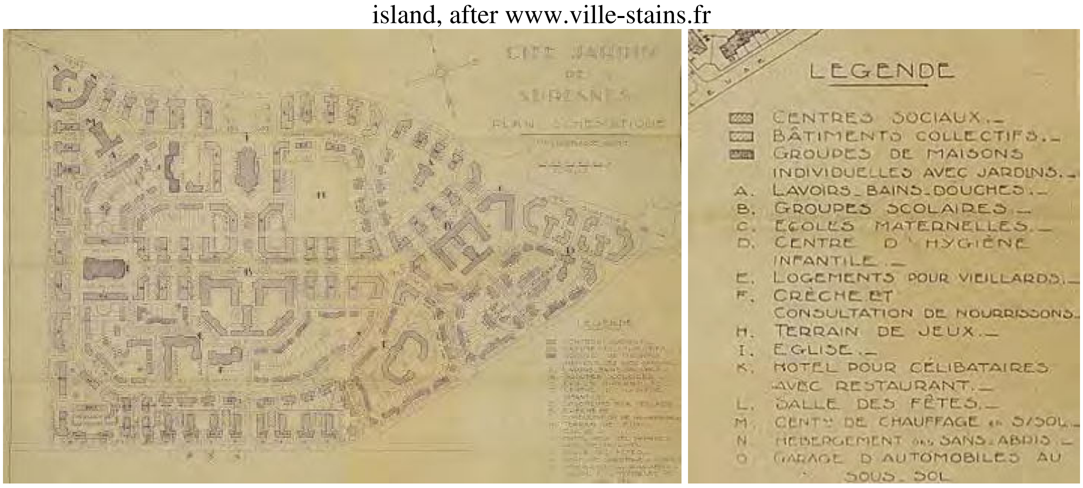


Fig. 5. Sureness city garden plan in Paris region after www.crdp-reims.fr

Common sense and other senses regarding the historical monuments. Case study: Carol Park and Zodiac Fountain in Bucharest

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Keywords: preservation of historical parks and gardens, professional ethics, authority ethics

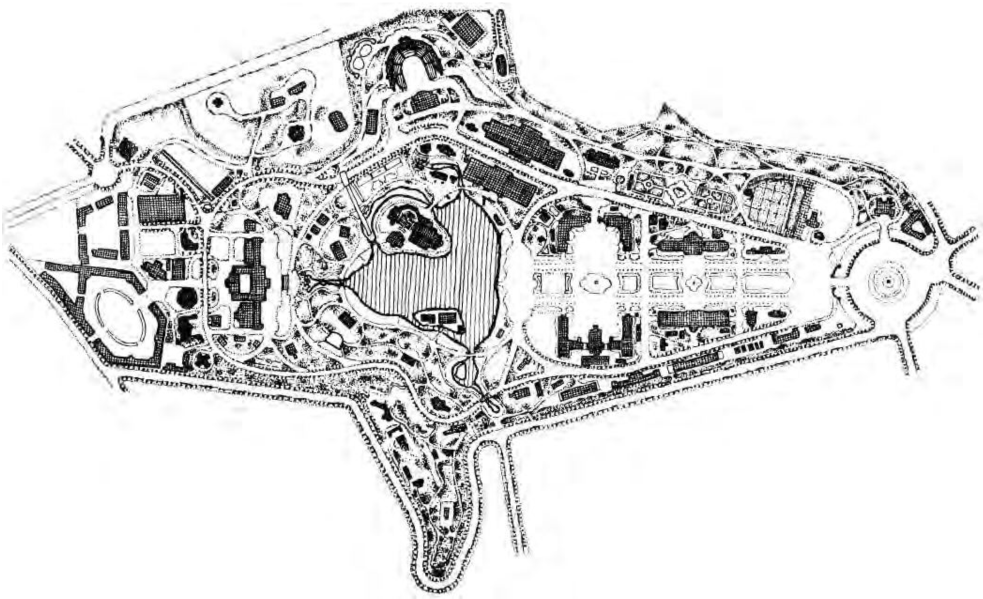
ABSTRACT

All over the world, historical monuments are aggressed in a plant of ways. The preservation of historical monuments has to be part of a large frame of laws, each of them accompanied by specific duties and a frame of coercion means. In Romania, the frame of coercion is very poor and the result is the continuous alteration of the historical character of the monuments. We are in a great danger: to loose a very important part of the national patrimony. The incompetence and the ignorance are other dangers in this field. Ethics has no significance for the authorities and, sometimes, for the professionals too. Carol Park and Zodiac Fountain are the perfect example of destroying the historical character of the monuments. Both of them are part of the List of Historical Monuments. They are monuments of national and international importance ("A" category monuments). The protection area of these monuments is ignored completely and also the vegetal composition. The green cadastre and the management of vegetation are goals for professionals but not for the authorities. The case study presents some aspects, relevant in this context.

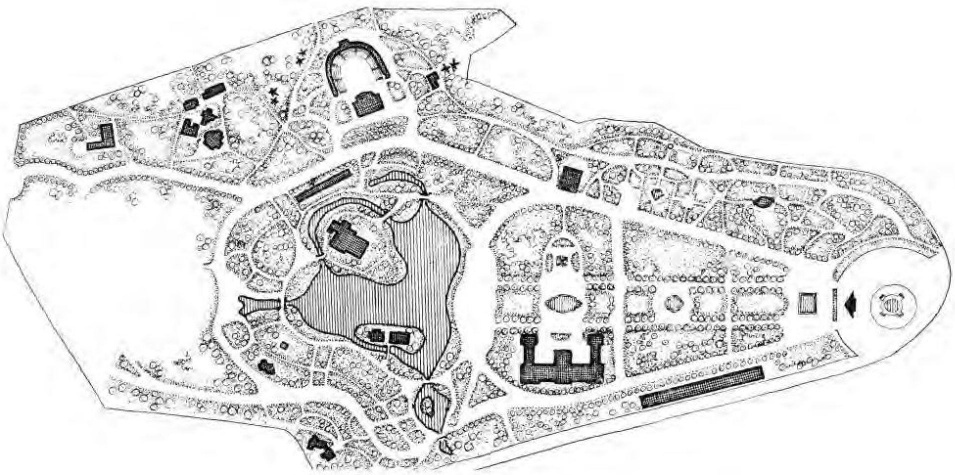
INTRODUCTION

All over the world, historical monuments are aggressed in a multitude of ways. The preservation of historical monuments has to be part of a large frame of laws, each of them accompanied by specific duties and a frame of coercion means. In Romania, the frame of coercion is very poor and the result is the continuous alteration of the historical character of these monuments. The danger is to lose a very important part of the national patrimony. The incompetence and the ignorance are other dangers in this field. Ethics has no significance for the authorities and, sometimes, for the professionals too. The preservation of historical monuments has to be a great responsibility for the authorities, but, even *The Ministry of Culture and National Patrimony* expressed its weakness in this field (Comunicat al Ministerului Culturii și Cultelor - 18.04.2008 posted on its site www.cultura.ro/page/17 on the occasion of *The international day of the monuments and sites,* celebrated on 18th April of each year stating with 1983). Real estate investors create an increasing pressure on monuments and sites, to realize their financial goals. In this context, the local authorities do not respect the legal frame.

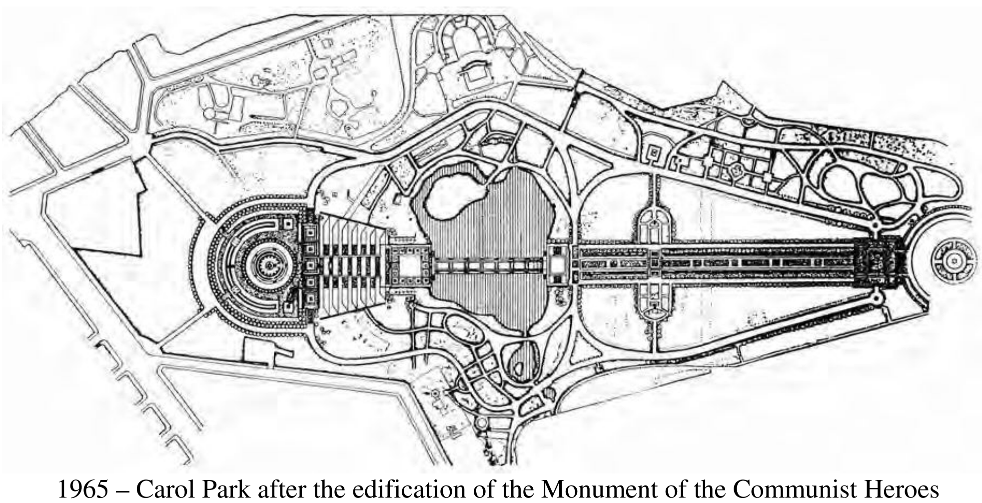
Carol Park and Zodiac Fountain are the perfect example of destroying the historical character of the monuments. Both of them are part of the List of Historical Monuments : Carol Park - 1303 B-II-a-A-19016/2004 and 1289 B-II-a-A-19016/2010 and Zodiac Fountain - 2330 B-III-m-A-20003/2004 and 2319 B-III-m-A-20003/2010. They are monuments of national and international importance ("A" category monuments). The protection area of these monuments is completely ignored and also the vegetal composition. The green cadastre and the management of vegetation are goals for professionals but not for the authorities. The case study presents some aspects, relevant in this context. The history of these two monuments reveals a continuous dissolution of their patrimonial substance.



1906 – Carol Park designed by Eduard Redont for “The International Jubilee Exposition” – 6 July 1906 (40 years since Carol II became king of Romania) after Rica Marcus



1956 – Carol Park after the demolition of the Military Museum, the former Palace of Arts and of some other pavilions after Rica Marcus



1965 – Carol Park after the edification of the Monument of the Communist Heroes “Arhitectura” magazine, number 1/1964

STATE OF ARTS

The mixed character of the composition is preserved but, in the communist era, the geometrical composition is strongly stressed, starting with the edification of the Monument of the Communist Heroes (1963) and with the new bridge linking the main alley with the Monument.

The main axis of this park has two important moments, two very well proportionate terminus points: one is the Monument of the Communist Heroes, on the top of the hill, and the other is the Zodiac Fountain, in the Libertăţii Square. Both of them are ends of perspective, designed according with: the proportions, the dimensions and the vegetation of the park and with the architectural frame of Libertăţii Square and … with the whole context (historical, cultural, functional, physical etc.).

We will reveal some of the most significant changes of this Historical Monument, Carol Park.

The Monument of Unknown Soldier and the Monument of the Communist Heroes

In 1906, on the top of the hill was erected The Palace of Arts, en eclectic building. In 1923, The Palace of Arts became Military Museum and The Monument of Unknown Soldier was placed in front of it, on the 17th of May the same year.

The Monument of Unknown Soldier

The Military Museum before 1943

The Statuary group in 1927

bucurestiivechi.blogspot.com
flickr.com/photos39254322@N023684521117

In 1943, The Military Museum was demolished as a result of the effects of the great earthquake (1940). In 1963 was erected the Monument of the Communist Heroes, the creation two important architects, Horia Maicu and Nicolae Cucu and the Grotto with its statuary group was demolished. Now, the two “Giants” flank the main alley in Carol Park and the “Nymph” was placed in Herăstrău Park.

The main axis before 1991
The vegetation is harmoniously integrated in the geometrical composition of the axis

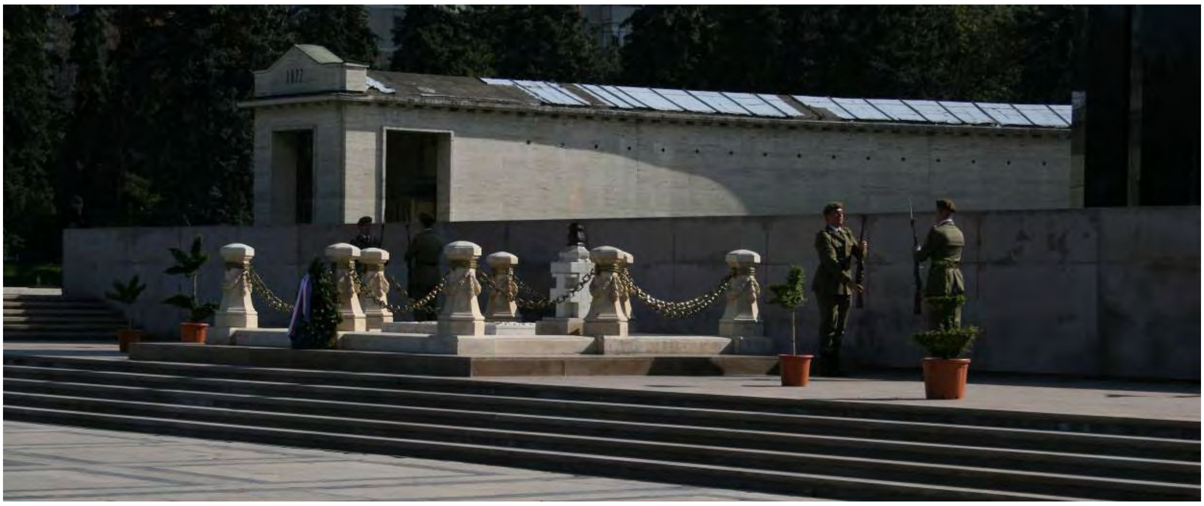
In 1991, the Monument of Unknown Soldier was placed on the lower terrace of the main axis.

The lower terrace before 2004
photo: Violeta Răducan

The upper terrace before 2004
photo: Violeta Răducan

In 2003, the Ministry of Culture and Religious Affaires, without the approval of the Committee of Historical Monuments, decided the declassification of the Monument of the Communist Heroes (Decree no. 468/18.04.2003). As a consequence, the List (rider of the Decree no. 646/16.07.2004) contents the park but not this Monument. In 2004, The Romanian Patriarchy proposed to build the Nation Cathedral in Carol Park, on the place of this Monument. All the National Unions of the Romanian Creators did not agree with the demolition. Many NGOs and a lot of people manifested the same position and … the monument is still there.


2008
The upper terrace after the new insertion
photo: Violeta Răducan

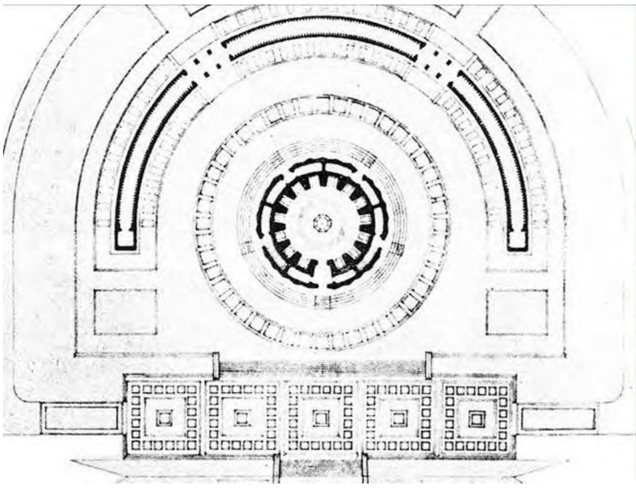


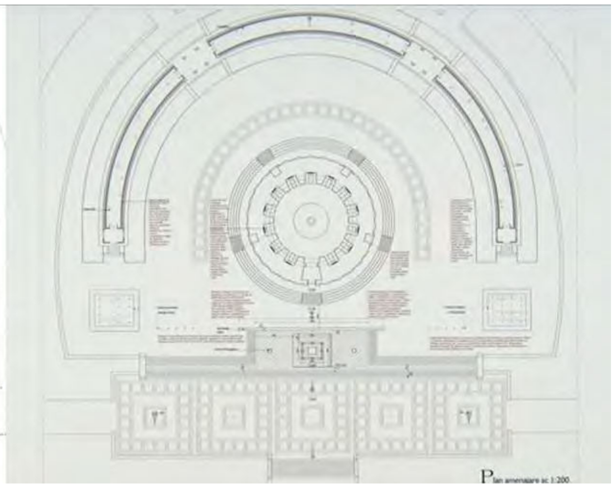
2008
Details of the Monument of Unknown Soldier on the upper terrace
photo: Violeta Răducan

But … in 2008 the Monument of Unknown Soldier was placed on the top of the hill, in front of the Monument of the Communist Heroes, which is still out of the new List of Monuments, 2010 edition. This action has a lot of consequences, altering the artistic value of the former communist monument. Beyond its symbolic/ideological/political significance, this monument is a work of art and it can become the National Pantheon.

As a conclusion, crowding the two monuments on the top of the hill destroyed the coherence of the composition. Each of the monuments has lost its own significance and importance. It was a very unfortunate and destroying decision because the Patrimony is more than a sum of elements.

1963
The Monument of the Communist Heroes
Arch. Horia Maicu and Nicolae Cucu





2008
The insertion of the Monument of Unknown Soldier
with serious compositional implications

<u>Libertăţii Square and Zodiac Fountain</u>

Zodiac Fountain was erected in 1935. The authors of the Fountain are academician architect Octav Doicescu and sculptor Mac Constantinescu. On one side, it was suppose to concentrate the attention on the centre of the Marshal Joffre Scuare (actual Libertăţii Square). On the other side, the goal of this new ensemble was to create an end of the perspective, visible from the top of the hill and from the main alley. The appearance of the built fronts has no coherence, volumetric and stylistic but the landscape design around Zodiac Fountain has to be coherent and compositionally correct.

It was a minimal composition with simple and harmonious details. The fountain was decorated with mosaics representing the zodiacal signs. That is why it was named Zodiac Fountain. The vegetation around the Fountain consists in turf and nothing else. The simplicity of the composition is intended to emphasise the Fountain, the only decorated element of this ensemble. So, all the features of this composition are subordinate to the central water feature.

In the communist era, this central composition seemed to be too simple. The green area around the fountain was enriched with *Buxus sempervirens* and *Rosa polyantha* but the character of the composition was not seriously affected. At that time, in Romania, the landscape design was provided by architects. The first landscape architecture schools were created in 1998. It was supposed to follow a blessed period for the public open space and of course for the historical parks and gardens.

After 2000, the mayors make their own electoral campaign by creating new green spaces, or "enriching" the old ones. They mark these works with panels inscribed with their own names. The name of the creator of a building, a bridge, a park is nowhere. In 2004, for many historical parks and gardens it started a difficult period.

2008 was the year when the Zodiac Fountain was suffocated by a multitude of various elements: wooden pergolas and fences, stone benches, a mix of plants in plastic pots etc. These "improvements" had not the accord of the Ministry of Culture. A lot of protests conducted to the demolition of the pergolas, but the other features and the rustic atmosphere were preserved. In 2011, a huge golden watch was implanted on the eastern side of the fountain, affecting the central composition.

1935-Turf around the Fountain 1974-1975

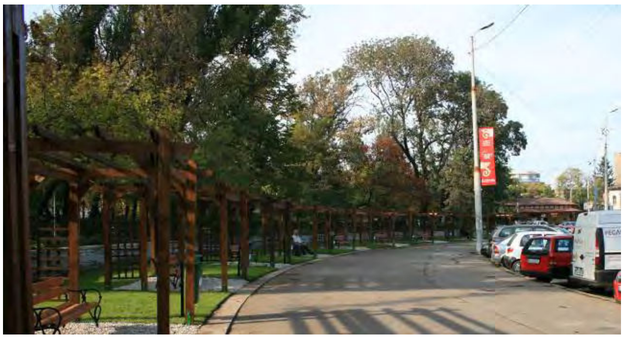
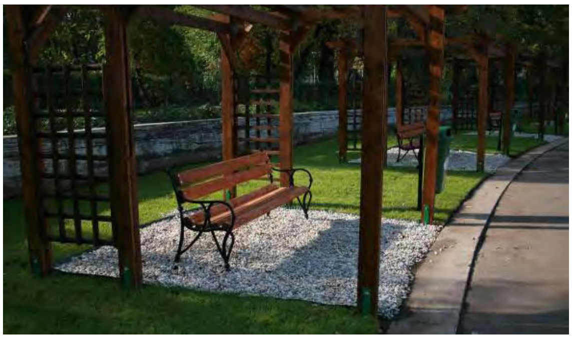
1977 - *Buxus sempervirens* and *Rosa polyantha* in a circular disposition around the Fountain, stressing the central composition (www.flickr.com/photos/35029977@N07/3266314797/)

1980

2004

The metal fence and the pavement around the fountain are poor and do not emphasise the central monument.

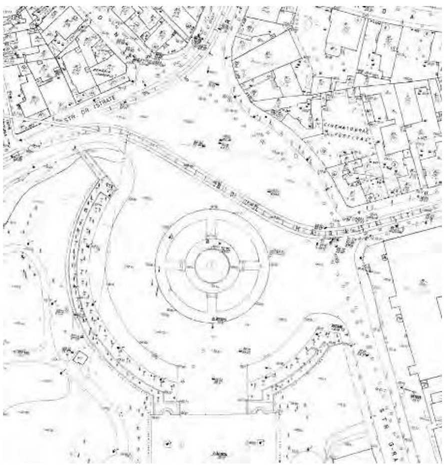
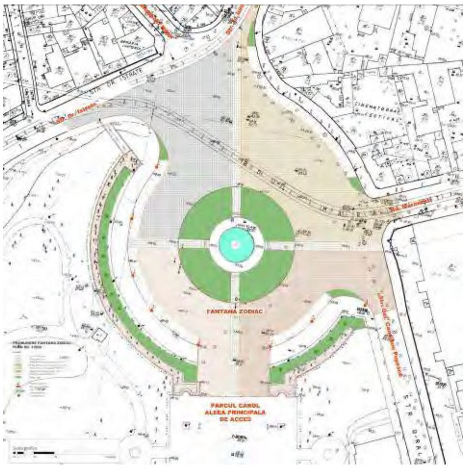
2008, the elections year

2011

The delirious sequence of pergolas is still present in Libertăţii Square, on the park side.

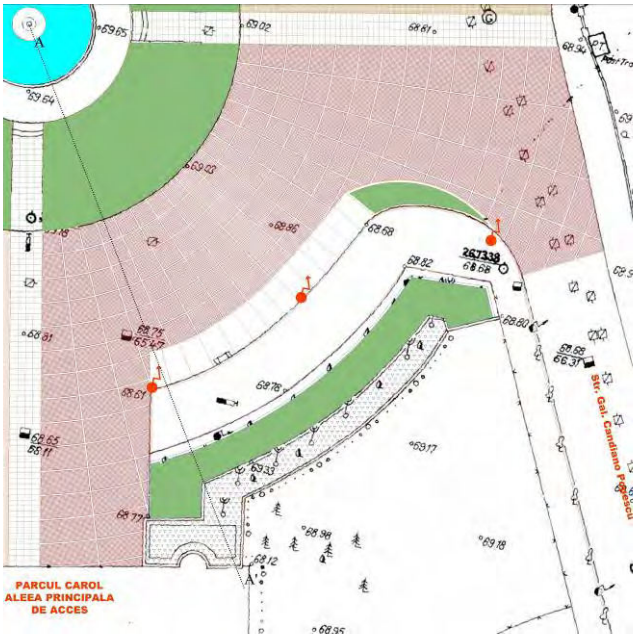
photo: Violeta Răducan

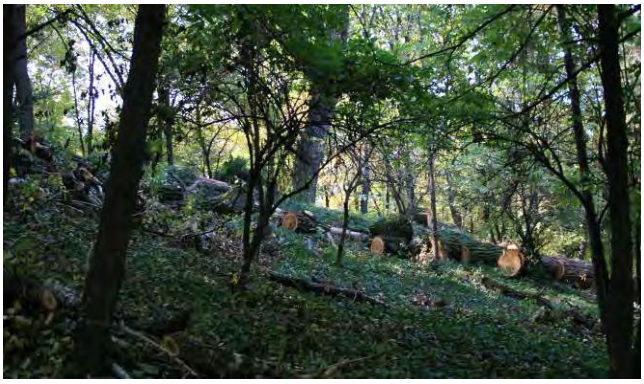
1960 state 2010 proposal

Răzvan Marinescu's proposal for Libertăţii Square and Zodiac Fountain

The extreme simplicity of the composition valorises the Fountain and creates coherence in the whole square



Detail of the proposal
The pavement of the square is made of four different sorts of cubic stone (10x10x10cm) and the alleys are made of stone tiles (100x100cm.)



2008
An area near the Roman Arena
A lot of trees were cut down without planting others.
photo: Violeta Răducan

2008
The romantic borders of the little lake were transformed
They are not anymore romantic at all.
photo: Violeta Răducan

The reinforced bridge in 2011
photo: Violeta Răducan

The names of the engineers were inscripted on the bridge
photo: Violeta Răducan

CONCLUSIONS

The national patrimony is in a great danger. It is not only a matter of money but always is a matter of ethics and professionalism. Landscape designers can solve many problems without a lot of money but with a lot of creativity. The common sense and the determination saved the Monument of the Communist Heroes from the demolition but not yet the Zodiac Fountain from the ridiculous rustic features around it.

The vegetal compositions are not protected and they can be lost for ever. A lot of features are not included in the new List of Monuments, 2010 edition. One of the first reinforced concrete bridges was built in the eastern side of the park. It is not protected by low.

Carol Park, as a historical monument, and all the important features and components, has to be preserved. The green cadastre and the management of vegetation are goals for professionals but not for the authorities.

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Natural stone pavements in landscape arrangements

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Keywords: natural stone, pavement, alley, garden

ABSTRACT
The paper studies the diversity of methods of natural stone usage for different alleys and pavements in public and private green spaces arrangements. The study analyses and points out the multitude of functional, esthetical and ambient aspects generated by the usage of natural stone in alleys and circulation spaces from gardens or public spaces. Because of its multiple qualities it is one of the most used materials for realizing different types of alleys regardless of their size and the character of the space in which the landscape arrangement is used.

INTRODUCTION

Natural stone – as a construction material – has been used from ancient times by the Asiro-chaldeean, Persian, Egyptian, Greek and Roman civilizations until nowadays. Its particular durability and resistance to the atmospheric and mechanic factors, but also the distinct beauty of natural stone, are the qualities which determined its usage from ancient times, anywhere this material could be available to man. Economical reasons like: transportation and processing possibilities, abundance or lack of stone have played an important role in the usage of it in constructions but also in gardens, in different historical times.

In the art of landscape gardening, natural stone has been frequently used both as a construction resistance element and for decorative objects.

The roads and alleys represent infrastructure and compositional elements essential in a landscape arrangement, which is why they must respond to the functional needs as well as to the esthetical sustainable ones. Because of this, using natural stone has always been fully justified when paving alleys (Taschen, 2008).

The goal of the present study is to highlight the qualities of natural stone used for pavements in landscape arrangements, the variety of usage possibilities and of the esthetical effects obtained by using natural stone.

Natural stones can be divided in three distinct categories, according to the manner of forming (the genesis):

- eruptive rocks formed by endogenous processes which consist of the slow cooling of magma which got to the superior parts of the earth crust, without breaking through. Thereby there are formed the magmatic or eruptive rocks: granite, basalt and andesite being the most commonly known
- sedimentary rocks formed through exogenous processes which consist of the effect of physic-chemical and biological agents over some pre-existent minerals. In this manner, there take place alteration processes followed by sedimentary processes which create sedimentary rocks. The most commonly known are freestones, silex (pebble), silicon, river rocklets and limestones.
- metamorphic rocks made as a result of the meta-morphogenous processes: under the activity of tectonic phenomena, large portions from the surface of the earth crust are brought to new conditions of temperature and pressure; the minerals pre-existent here become unstable and profoundly change their chemical composition and structure. In this manner there are formed minerals with a reduced volume and great specific weight. The most well known metamorphic rocks are marble, travertine and porphyry.

All these types of natural stones are used for realising alleys and pavements of any type in landscape arrangements, no matter whether they are public spaces or private gardens, according to the characteristics of the space and the ambiance required. (Figures 1-8)

The method of research applied in the present study is that of documentation regarding the usage of this material – natural stone – and the highlighting of the esthetical qualities offered by this material to the realising of pavements in landscape arrangements.

The study material consists of a selection of representative images for the paper's theme.

Alleys and pavements of natural stone represent elements of landscape composition along with waters, vegetation and decorative objects (Mostaedi, 2004).

Natural stone is characterised by great durability in time and by the expressivity of the most various colours, shades and textures (Kluckert, 2007). That is why it is more preferred than other materials (wood, artificial stone or ceramics). With the help of natural stone – according to the way in which it is processed – there can be conferred a natural, picturesque character or a sober character, representative for a landscape arrangement work (Schleifer, 2010). The processing techniques may offer stone surfaces very diverse textures (from semi-processing to elaborate processing, through which there can be obtained noble stone – the so-called "cut-stone" used for representative works). Natural stone is successfully used both in classical works and in modern and nonconformist works - land-art (Gardner and Molony, 2001). By associating them with vegetal elements or water, pavements and alleys of natural stone earn a plus of compositional-esthetical value anywhere they are used (Mc Grath, 2002).

The contribution of the present study consists of the documentation and selection of representative images of landscape arrangements, most of which contemporary, which demonstrate the importance of natural stone usage in this type of arrangements.

CONCLUSIONS

- Natural stone is frequently used in contemporary landscape arrangements, in any type of spatial-volumetric composition.
- The variety of natural rocks assortment grants the procurement of any desired character in a landscape arrangement, may it be classic or modern.
- The qualities of this pavement material are equally related to its durability in time and to its beauty and expressivity.
- The processing possibilities and techniques of natural stone, but also the association with other construction materials for pavement, are extremely varied and allow the acquirement of any type of expressivity desired in landscape arrangements.

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FIGURES

Fig. 1. Pavement of table slate in Interpolis Garden, Holland
(Gardner and Molony, 2001)

Fig.2. Alleys of stone in the garden of Tlalpan Convent, Mexico City, author Luis Baragan
(Schleifer, 2010)

Fig.3. Pavement of natural stone - Chalice Well Garden, Glastonbury, Somerset, England (Mc Grath, 2002)

Fig.4. Detail of pavement - Pebble Mosaic Garden, Dumbarton Oaks, Washington, DC (Kluckert, 2007)

Fig. 5. Garden of stone - Ryoan-Ji, Kyoto, Japan
(Schleifer, 2010)

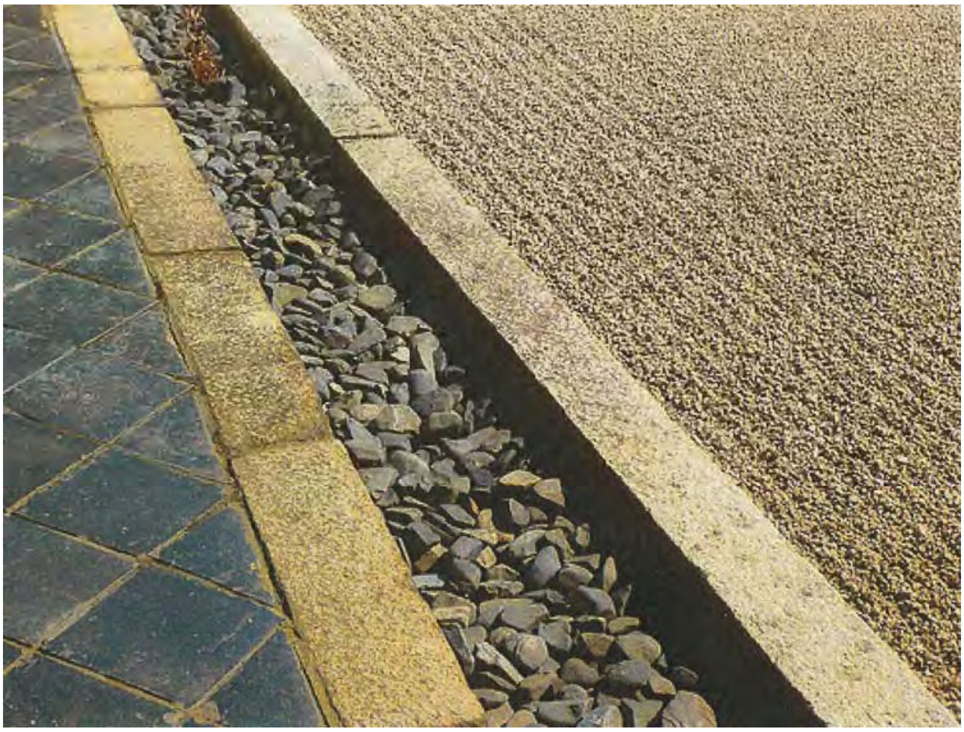

Fig. 6. Detail of natural stone pavement – garden of stone Ryoan-Ji, Kyoto, Japan
(Schleifer, 2010)

Fig. 7. „Spiral Jetty" – combination of natural stone, salt crystals, algae and soil, author Robert Smithson, Great Salt Lake, Utah, USA (Mostaedi, Arian, 2004)

Fig. 8. Alley of river rocklets assembled in concrete – private garden (Taschen, 2008)

Plastics in landscape arrangements

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Keywords: plastics, garden, urban green spaces

ABSTRACT

The study intends to highlight the diversity of usage modalities of plastic materials in contemporary urban landscaping in public and private green spaces. Also, the present paper discusses and analyses the multitude of functional, esthetical and ambient aspects generated by the usage of plastics in the functional and esthetical composition of urban landscape arrangements. Because of their multiple qualities, plastics are used not only in the realising of architectural-functional constructions and utilities, but also that of decorative objects.

INTRODUCTION

Plastics can be found in numerous fields of activity from constructions to common objects in everyday life. Because of their multiple qualities and reduced costs, they are used on a large scale and be often seen in landscape arrangements under the most various forms of usage: for pavements, as objects of outdoor furniture, play objects for children, for utilitarian constructions combined with other materials like glass and metal, elements of separation and enclosure, flower pots and boxes or even decorative objects.

The usage of plastics in garden design is relatively a new trend, but it represents an alternative for classic materials and they often originate from other recycled plastic materials, which represent an advantage from an economic point of view.

The expressivity of shapes, colours and textures is most often orientated towards the modern aspect of volumes and composition in which these materials can be found (Schleifer, 2010).

The goal of the present study is to point out the qualities of these materials used in landscape arrangements, the variety of usage possibilities and the decorative effects that they have, often with a strong visual impact.

Plastics represent a group of materials with different natures, compositions and properties, but which have in common the characteristic of being able to be formed.

The capacity of formation consists in bringing the material in the stage of a finished product through one unique operation, and not through a series of operations like it usually happens in the case of other current materials. The primary component of plastic materials is represented by synthetic pitches which are macromolecular polymer compounds of organic nature. Macromolecular polymers are the result of reactions determined by certain temperature and pressure conditions, reactions which are generically called polymerisations. Polymers are divided into two categories: thermo-rigid polymers (which after the polymerisation reaction become thermal stable) and thermo-plastic polymers (which become sensitive to heat and unbend, being possible to be submitted again to the process of formation). In the composition of polymers can enter a series of auxiliary substances which have the role to modify in a desired manner the properties of the basic materials. Among these auxiliary materials there can be remembered: plasticizers, stabilizers, colorants, release agents, antistatic substances, reinforcement materials etc.

Plastics are characterised by remarkable technical properties between which a very good mechanical resistance (reported to its own weight), a very good response to physic-chemical agents and thermal stability in current exploitation conditions.

There must be mentioned that the manufacturing technology is defined by the simplicity of the process, the precision of the execution, the great productivity and the superior quality of the finish. Because of these qualities, to which there can be also added the relatively low costs of the plastic materials, these products have entered all the fields of everyday life, including of course garden and public green spaces arrangements (Taschen 2008).

The method of research applied in this study is that of documentation regarding the usage of these plastics in landscape arrangements and the highlighting of the functional, esthetical and economical qualities offered by these materials as well as the diversity of practical possibilities of placement.

The study material consists of a selection of representative images for the paper's subject (Fig. 1-8).

In contemporary landscape compositions the usage of plastic materials has numerous advantages in economical, functional, utilitarian and esthetical ways (Kluckert, 2007).

Plastics represent today a viable alternative for gardens or public green spaces arrangements in which the modern character is preponderant (Fine, 2002).

The technology of manufacturing different plastic objects being relatively simple, the costs are reduced and the advantages and economical efficiency are obvious in comparison with classic materials. Furthermore, the possibility of recycling these materials permit a better performance for their usage (Mc Grath, 2002).

The production procedures and the technology of these materials are characterised by the great flexibility of shapes, volumes and colours, both for amply space and for details and finishes desired by the author of the work (Mostaedi, 2004).

The contribution of the present study consists of documentation and selection of representative images from contemporary landscape arrangements in which plastics are successfully used.

CONCLUSIONS

- Plastic materials are frequently used in gardens and public urban spaces arrangements, representing an alternative for classic materials.
- The technology and low costs make plastic materials have a high economic efficiency.
- The extremely varied possibilities permit the obtaining of objects and components of the most diverse functions within the spatial composition.
- The variety and expressivity of volumes, textures and most of all colours lead to remarkable visual effects, that have a strong impact on the viewer.

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FIGURES

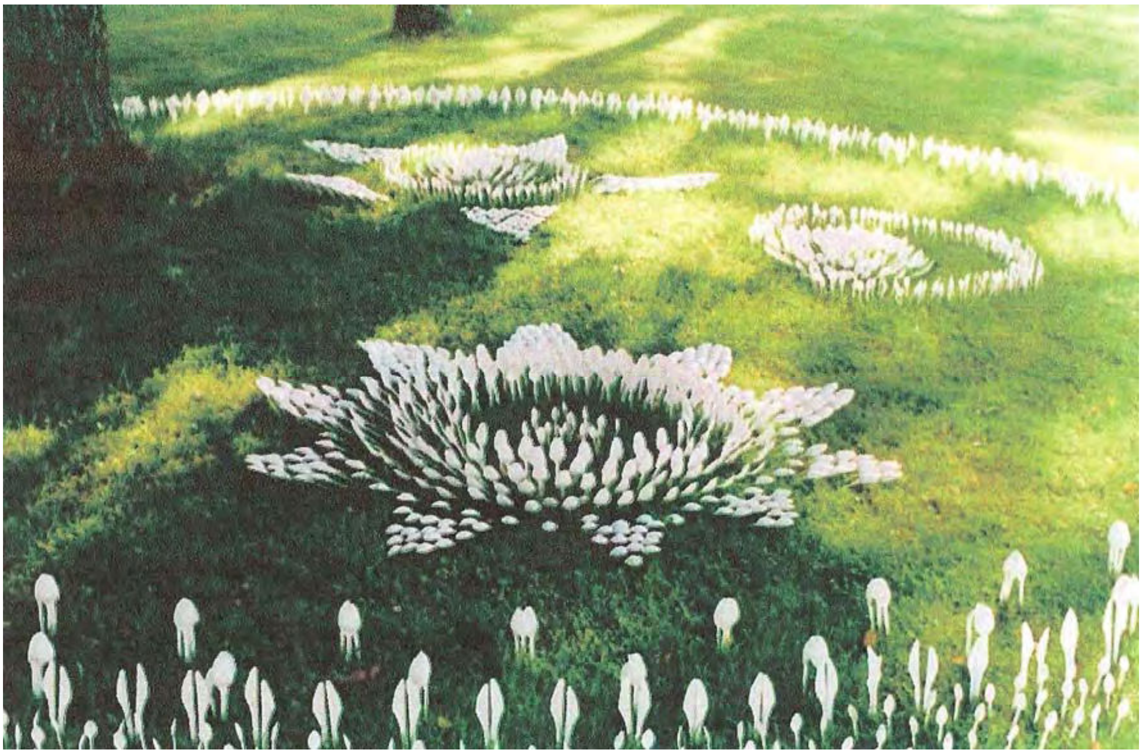

Fig. 1. Plastic ornaments, Park of the Municipal Health Center in Huittinen, Helsinki, author Marja Hakala, 2000 (Fine, 2002)

Fig. 2. Furniture in modern garden – Ellerslie Flower Show 2005, Auckland, New Zeeland (Schleifer, 2010)

Fig. 3. Plastic decorative bench – author Pablo Reinoso
(Fine, 2002)

Fig. 4. Plastic urban furniture – author John Orchard – Singapore
(Kluckert, 2007)

Fig. 5. Plastic benches in public urban space – Zurich
(Mc Grath, 2002)

Fig. 6. Plastic decorative objects symbolizing bushes and trees – authors Peter and Alissa North, The Verdant Walk, USA (Schleifer, 2010)

Fig. 7. Plastic decorative structure in Golden Gate Park, San Francisco (Mostaedi, 2004)

Fig. 8. Plastic play items for children in Golden Gate Park, San Francisco (Mostaedi, 2004)

FRUIT GROWING & TECHNOLOGY

Researches regarding the influence of the fertilization on the firmness of the nectarines

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Keywords: Cora, Delta, chemical, organic, penetrometer

ABSTRACT

This paper presents the influence of the nectarine trees fertilization on the structural-textural firmness of the fruits at harvest and its evolution during nectarines preserving, stored in different technological conditions. There were tested two varieties of nectarine, obtained from SCDP Constanta (Cora and Delta), which were fertilized with organic and chemical fertilizers, applied to soil and foliar. The nectarines were stored at ICDIMPH-Bucharest in three variants: the ambient temperature (26-28^{0}C), in cold conditions (T = 2-4°C) and cold + modified atmosphere conditions. The results show that the different fertilization of the trees is reflected in the firmness degree of the fruits at harvest, but not in its evolution during storage. For the both varieties, the biggest firmness at harvest is represented by the fruits of chemical fertilization – soil and foliar variant (78,33 UP for Cora variety and 68,79 UP for Delta variety). The lowest firmness is represented by the fruits of chemical fertilization to soil (111,75 UP and 93,57 UP, respectively). The evolution of the firmness during the preservation is especially influenced by the storage conditions. Nectarines stored in a warm space lose very easily the firmness, by its rapid ripeness.

In case of cold conditions the intensity of the maturate process is reduced, thus the fruits keep their structural-textural firmness for a longer period (28 days). By supplying atmosphere in the storage space with carbon dioxide, the metabolic processes become slower, and the firmness of the fruits is kept for a long time (35 days).

INTRODUCTION

Thanks to the special taste, aspect and specific aroma, as well as their importance in nutrition, the nectarines, like peaches, have an important place in fresh and processed consumption. The superior dietetic features of those are determined by their content in vitamins (A, B, C, E), mineral substances and oligoelements (calcium, iron, iodine, magnesium, phosphor, potassium, sodium, zinc), celluloses, acids and pectin substances (Lill and King, 1999).

The firmness of the fruits is expressed by the resistance of their tissues to the external pressure and is determined by the content in pectin substances, celluloses, hemicelluloses, pentosans and hexosans, by the turgescent and elasticity of the cells, dimensions of the inter-cellular spaces etc. (Burzo et al., 2005). In the case of nectarines, the value of the structural-textural firmness may represent an important indicator for the determination of the harvest or consumption maturity (Gherghi et. all., 2001, Burzo, 1986).

The structural-textural firmness is modifying during the post-harvest period, as a result of the celluloses biosynthesis, biodegradation of the pectin substances, hemicelluloses etc., and by elimination of the water during the process of perspiration (Gherghi et al., 1977). Willis (1981) stated that the speed of the pectin metabolize in peaches is different, depending on their maturity degree. The storage temperature has a special influence on the enzymatic activity and as a result on the pectin metabolism and decrease of the fruits firmness (Fidler, 1973, Milim, 1981).

The researches made in ICDIMPH- Bucharest, during the period of 2008-2010, had as purpose to underline the firmness value of the peaches immediately after harvest, depending on the variety and fertilization variant, but also its modification during the fruits storage. It is an important indicator related to the quality maintaining capacity of the researched varieties.

MATERIALS AND METHODS

The necessary research fruits were obtained from SCDP Constanta. The tested nectarine varieties are Cora and Delta.

In the speciality literature (Ivascu and Hoza, 2003; The Romanian Official Catalogue of the Varieties of Plant Species, 2011) these varieties were described as follows:

- Cora – early variety, with ripeness period in the second decade of the June. The fruits are round, small, with mass of 90-100g. The colour of the epidermis is yellow, covered by red colour on 65-75% of the surface, and the colour of the flesh is yellow, being adherent to the stone (figure 1).

- Delta – early variety, with ripeness period in the second-third decade of the June, with round, small fruits (90-110g). The colour of the epidermis is yellow, covered by red-garnet colour on 60-70% of the surface, and the colour of the flesh is yellow, being adherent to the stone (figure 2).

Each variety has benefited, in orchard, by four different types of fertilization:

V1 - control -unfertilized

V2 - organic fertilization (fermented manure)

V3- chemical fertilization at soil (NPK complex fertilizers in relation to: 15:15:15.)

V4 - chemical fertilization at soil + foliar feeding (NPK 15:15:15 complex fertilizers in soil and with foliar fertilizer in plant – Murtonik 20:20:20)

In Research and Development Institute for Processing and Marketing of the Horticultural Products, the fruits were stored in three storage variants:

- at ambient temperature (T = 26-28^o C, RH = 65-70%) in 1kg packaging - *keep warm*;

- in refrigeration room (T = 2-4^o C, RH = 83-87%), in packs of 1 kg covered with perforated polyethylene film - *cold storage*;

- in refrigeration room (T = 2-4^o C, RH = 92-96%), in hermetic packs of 1 kg, so that the composition of atmosphere inside them has modified, meaning reduction the O_2 content and increased CO_2 content and the air relative humidity - storage in modified atmosphere - *MA*.

The storage period (days) varied depending on the storage variant, such:

- warm storage: 7
- refrigeration storage: 28
- MA storage: 35

Before the storage, the nectarines were penetrated in order to observe the fruits consistency immediately after the harvest.

During the period of storage, there was made the daily control of the thermohydric factors from the refrigerating room, in order to ensure the fulfilment of the optimal conditions for quality maintaining. It was also made the assessment of the quality maintaining capacity of fruits, including the occurrence and development of different deposit diseases.

After removal the nectarines from storage space we made observations on the general appearance of the fruits and determinations regarding the modifications of the structural-textural firmness during their storage.

These determinations were made with the mass penetrometer OFD with measurement in penetrometric unities (1UP= 0,1mm) of the penetration depth of the conic needle (length=24mm, basis diameter=4mm) in the fruit pulp. The measurements were made for a number of 50 fruits/variant, each fruit being penetrated in 4 points in the equatorial area.

RESULTS AND DISCUSSIONS

The values of the structural-textural firmness, at harvest and after storage in the three tested technological variants, of the Cora variety nectarines are presented in table 1.

It is observed that at harvest, the nectarines of V3 variant (chemical fertilization at soil) appear the lowest value of the firmness (111.75 UP), and the V4 variant (chemical fertilization at soil + foliar) has the highest values (78.33 UP). The average firmness of the nectarines of Cora variety, at harvest, is of 94.48 UP.

During the storage of the nectarines at the environment temperature for 7 days, their firmness decreased to 143.55 UP at the level of variety, with the lesser value at the V3 variant (157.29 UP) and higher value at the V4 variant (129.42 UP)

It was observed that, by refrigerating storage, the structural-cellular degradation process of the nectarines become slow-up, average firmness being, after 28 days, of 126.69 UP for the Cora variety (140.29 UP for V3 variant, 137.07 UP for V1 variant, 122,78 UP for V2 variant and 106.62 UP for V4 variant).

The enrichment of the atmosphere in carbon dioxide allowed the storage of nectarines for 35 days with the maintenance of the firmness at 104.64 UP at variety level, with variations between 115.75 for V3 variant and 95.13 UP for V4 variant.

The values of the structural-textural firmness at harvest and after storage for these three tested technological variants, of the nectarines of the Delta variety are presented in table 2.

The nectarines of Delta variety were harvest at a maturity degree less advanced than those of Cora variety. This is reflected in the average value per variety of their firmness (83.56UP).

The lowest values of firmness were also found to V3 variant (93.57 UP) and the highest value to the V4 variant (68,79 UP).

The evolution of the firmness during the storage in warm conditions had the same direction of the Cora variety, so that at the end of the storage the values were comprised between 175.62 UP of V3 variant and 144.11 UP of V4 variant, with a average value per variety of 155.81 UP.

During the cold storage the mean value of the firmness of the Delta variety nectarines reached 120.75 UP (with values between 129.35 UP for V2 variant and 99.35 UP for V1 variant), while after the storage in the modified atmosphere, the value was 119.92 UP (with values between 125.33 UP for V4 variant and 110.91 UP for V1 variant)

CONCLUSIONS

1. The different fertilization of the nectarine trees is reflected in the firmness degree of fruits at the harvest, but not in their evolution during the storage.

2. For both tested varieties, the highest firmness at harvest is presented by the fruits of chemical fertilization in soil + foliar feeding variant (78.33 UP at Cora variety and 68.79 UP at Delta variety), and the lowest firmness by the chemical fertilization in soil variant (111.75 UP and 93.57 UP respectively).

3. The evolution of the firmness during the storage is especially influenced by the storage conditions. By keeping in warm conditions, the nectarines lose their firmness, by fast ripening of the fruits. In case of cold conditions storage, the intensity of the maturate process is reduced and thus the fruits keep their firmness for a long time (28 days). By enrichment of the atmosphere in the space storage with carbon dioxide, the metabolic processes become more slowly and the firmness is kept more time (35 days).

4. The structural-textural firmness of the nectarines at harvest is also determined by the maturity degree. The fruits of Delta variety were harvested at a less advanced maturity

degree in comparison to the fruits of Cora variety and this is reflected in the average value per variety of their firmness (83,56 UP and 94,48 UP respectively).

5. There are differences concerning the firmness maintaining capacity and their answer to the storage applied technology, between varieties. Analyzing the loses of firmness registered during the period of nectarine storage of these two varieties, it ascertain that the Cora variety has a better capacity of conservation, comparing with Delta variety.

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TABLES AND FIGURES

Table 1

The firmness of the Cora variety nectarines at harvest and after storage

Variant	Penetration value – UP			
	at harvest	after storage		
		warm	cold	AM
V1	**97,97**	**151,89**	**137,07**	**106,17**
V2	**89,88**	**135,58**	**122,78**	**101,51**
V3	**111,75**	**157,29**	**140,29**	**115,75**
V4	**78,33**	**129,42**	**106,62**	**95,13**
Mean per variety	**94,48**	**143,55**	**126,69**	**104,64**

Table 2

The firmness of the Delta variety nectarines at harvest and after storage

Variant	Penetration value– UP			
	at harvest	after storage		
		warm	cold	AM
V1	**91,28**	**153,40**	**99,35**	**110,91**
V2	**80,59**	**150,11**	**129,35**	**119,78**
V3	**93,57**	**175,62**	**126,35**	**123,66**
V4	**68,79**	**144,11**	**127,95**	**125,33**
Mean per variety	**83,56**	**155,81**	**120,75**	**119,92**

Fig. 1. The nectarines of Cora variety

Fig. 2. The nectarines of Delta variety

Evaluation of some sweet cherry cultivars on PHLC and CAB dwarfing rootstock in Istrita-Buzau, Romania

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Keywords: *Prunus avium* L., growth, yield, phenology

ABSTRACT

In the Istria Fruit Nursery Station, a production and experimental area of approximately 8 ha was planted in 2009 with a wide range of modern sweet cherry varieties and rootstocks. Trees are planted in a high density plot (4x2m) trained as central leader with a trellis system and pine poles. Evaluation of the behavior in terms of morpho-productive traits of the trees in the third year after planting have been carried out on the following cultivar/rootstock combinations: Kordia/PHLC, Ferrovia/PHLC, Van/PHLC, GiantRed/CAB6P, FirmRed/CAB6P, FirmRed/CAB11E, EarlyRed/CAB11E. Regarding the growth vigor expressed as TCSA and tree height, the most vigorous combinations were Kordia/PHLC and GiantRed/CAB6P and the weakest Ferrovia/PHLC. In all combinations studied, the percentage of spur branches on the trees crown is over three quarters due to the dwarfing rootstocks effect. Kordia/PHLC recorded the largest number of flowers/tree but the most productive combination was Van/PHLC. FirmRed, EarlyRed and GiantRed had a very poor fruit set percentage but the fruit weight and fruit quality was remarkable.

INTRODUCTION

Cherry is a species of great importance in Romania. Due to the demands of increasingly large part of the market, many growers establish their cherry orchards to meet consumer needs. Unfortunately, in our country, cherry trees are produced mainly on generative rootstocks (*P. avium* L. and *P. mahaleb* L.). To reduce the tree's height and to anticipate yielding, farmers appeal to plant material from abroad, varieties grafted on dwarfing rootstocks which allow establishing intensive cherry orchards. If there are currently a lot of useful information about the behavior of some varieties of sweet cherry on dwarf rootstocks in various areas of culture in the world (Salvador et all, 2005, Paprstein et al, 2008; Balmer, 2008; Kurlus, 2008; Bujdosó and Hrotkó, 2009; Blažkova et al, 2010), in terms of cultural conditions of Romania there are only few published data about the performances of cherry varieties on this dwarfing rootstocks. For this purpose, in this paper we are present the first data about the behavior of modern varieties of cherry rootstocks grafted on dwarf PHLC, CAB11E and CAB6P rootstocks in a young orchard of Istrita, an renowned area for its stone fruits culture in Romania.

MATERIALS AND METHODS

Research has been conducted in Istria Fruit Nursery of UASMV Bucharest. The farm is situated on parallel 45°29 'north latitude and the meridian 26°34' eastern longitude, at an altitude of 134 m, the village Sahateni, Buzau. Semi-humid climate is quite warm. The average annual temperature is around 11.3°C and mean annual precipitation totaling 500 mm. Distances that separate the major urban centers are 105 km from Bucharest and 25 km from the city of Buzau. Nursery area falls in the plains region that begins at the foot of hills (Dealu Mare), just below Hill Istria and connects this area with Baragan Plain.

An intensive modern cherry plantation was established in 2009 on an area of about 8 ha. The trees were planted at distances of 4 x 2 m and are trained as central leader. Plot provides wire support system and treated pine poles. The next combinations were tested: Kordia/PHLC, Ferrovia/PHLC, Van/PHLC, GiantRed/CAB6P, FirmRed/CAB6P, FirmRed/CAB11E and EarlyRed/CAB11E. Variants are simple randomized rank and rehearsals were conducted by three trees/variant.

During the experiment, it were determined: trunk cross-sectional area (TCSA) calculated from the trunk diameter measured at 15 cm height above the graft union at the end of the dormant period; annual number and length of the spur, medium and long branches and the share of the spur and long branches/tree; fruiting elements were also counted: the number of inflorescences and flowers on the fruiting branches and per tree, fruit set percentage depending on the total number of fruits/tree; Yield per tree (kg) was calculated as the average weight of harvested fruit. Yield per hectare (t/ha) was obtained by multiplying the yield per tree and tree density (trees/ha). Fruit weight (g) was obtained as the average of fruit weight of the total of 25 fruits from each tree. The main phenophases were noted according to Fleckinger's method of reference stages (Leckinger, 1960, Chapman et al, 1976). All gathered data were processed by analyze of variance and Duncan's multiple range test at a level of significance of 5% using Cohorte software.

RESULTS AND DISCUSSIONS

Tree height and trunk cross sectional area (TCSA) indicate the vigor of the cultivar/rootstock combination. In the early spring of 2011, the trees were measured and the data collected (table 1), show some differences between the variants. As TCSA, the most vigorous variety was GiantRed/CAB6P (21.77 cm2) followed by Kordia/PHLC (23.06 cm^2) and FirmRed/CAB6P (20.89 cm^2). All of them are higher than the mean of the variants, but the differences are not statistically assured. With negative significance is noted Ferrovia/PHLC which recorded the lowest value of TCSA (11.51 cm^2). Tree height item emphasize the Kordia/PHLC variant as the most vigorous combination (355 cm) with very significant difference comparative to the mean of the experience. All the other variants presented small differences between them and statistically insignificant comparing to the mean. A significant negative difference was observed at Ferrovia/PHLC where the average tree height was only 210 cm.

Branch type distribution (table 2) was studied and the Duncan's test split the variants in the case of medium branches in two groups: one with higher number such as Ferrovia/PHLC, FirmRed/CAB6P, FirmRed/CAB11E and Kordia/PHLC and another group with lower number as EarlyRed/CAB11E, GiantRed/CAB6P and Van/PHLC. Not the same thing we could say for the long branches, where all the variants presented differences statistically uninsured. Concerning the total number of long branches/tree, Kordia/PHLC registered the highest number (21.34) and GiantRed/CAB6P the lowest (8.34). Kordia/PHLC also presented the highest number of spur fruiting branches (52.67) as well as the total number of short branches (80). The share of long branches/tree (fig. 1) highlights Ferrovia/PHLC (28.11%) and FirmRed/CAB11E (27.07%) and regarding the spur branches, GiantRed/CAB6P is the variant with the biggest percentage (87.11%). We must take into consideration that these dates are not defining the fructification type of the varieties which are in the first years after planting and the growth processes are dominant. That's explaining the fact that Ferrovia which has typical spur fructification, in our situation totalized a higher number of long branches type.

With 54.4% more than the next bigger value in term of total annual growth is the combination Kordia/PHLC (1390.97 cm). Ferrovia/PHLC and Van/PHLC have recorded a slower growth rhythm and together with the GiantRed/CAB6P are found at the end of the ranking list.

The distribution analyze of inflorescences appeared on specific type of fruiting branches and the total number of flowers (table 3) indicate Kordia/PHLC and Van/PHLC with the highest number of inflorescences/flowers on spur fruiting branches (104.7/249.37 respectively 96.16/182.13). Excepting Kordia/PHLC, none of the cultivar/rootstock combinations has formed inflorescences on long fruiting branches. Even that

GiantRed/CAB6P has the highest percentage of short branches/tree, the appearance of inflorescence is relatively balanced regarding the types of branches (11.25 on spur fruiting branches and 11.58 on medium branches).

A very small number of flowers was observed at GiantRed/CAB6P (39.01), FirmRed/CAB6P (65.97) and EarlyRed/CAB11E (71.65). The fruit set percentage varied in very large limits, from 51.2% at Van/PHLC to 3.7% at EarlyRed/CAB11E. The bad fruit set recorded at EarlyRed and FirmRed should be followed over time in order to determine if this is a feature or just a cultural conditions influence.

The biggest fruit was noted at GiantRed/CAB6P (9 g) and the lowest for Kordia/PHLC (5.3 g) and Ferrovia/PHLC (5.6 g). The highest yield per tree was recorded by Van/PHLC (793.33 g/pom) due to a great fruit set percentage and large fruits (8.5 g). Although Kordia produced small fruits, the cultivar seems to be one of the most productive varieties (431.07 g/tree).

Some correlations have been made regarding the yield (g/tree) in relation with TCSA (cm^2) and total annual growth (cm). A closer connection between these elements could be observed through the correlation index value such as 0.67 in the case of Yield/Total annual growth (fig. 2) and 0,44 for Yield/TCSA (fig. 3). We also have revealed a correlation between TCSA (cm^2) and total annual growth (cm) with 067 correlation index value (fig. 4).

In the climatic conditions of 2011, the March, 29 was the date of bud burst for the most of the cultivars. Ferrovia/PHLC bursted one day after and Kordia/PHLC with 2 days delay (Table 4). White buds occurred in April, 10 excepting Kordia/PHLC (April, 11) and FirmRed/CAB11E (April, 15). After six or seven days, first flowers appear on the branches and the blossom perioad was 7 days for GiantRed/CAB6P, 8 days for Kordia/PHLC, Ferrovia/PHLC, Van/PHLC and 9 days for FirmRed/CAB6P The end of blossom was framed in the period April 24 to 26. Fruit set took place in the first week of May. Three varieties reached the fruit maturity in June, 8 (GiantRed/CAB6P, Kordia/PHLC and Ferrovia/PHLC), other two varieties on June, 10 (FirmRed/CAB6P and EarlyRed/CAB11E) and one in June, 12 (FirmRed/CAB11E) and the latest one Van/PHLC in June, 16.

CONCLUSIONS

Most vigorous combinations were Kordia/PHLC and GiantRed/CAB6P. In terms of growth vigor expressed as TCSA and tree height, Ferrovia/PHLC was the weakest.

Distribution of fruit branches types in the crown shows a significant proportion of short branches. In all combinations studied, the percentage is over three quarters due to the dwarfing rootstocks effect. GiantRed/CAB6P and Van/PHLC recorded the highest percentage of spur branches.

Although the largest numbers of flowers have been recorded by Kordia/PHLC, the percentage of fruit set and especially the average weight of the fruit, made the yield to be smaller than the Van/PHLC which proved to be the most productive combination.

The varieties grafted on CAB rootstocks (FirmRed, EarlyRed and GiantRed) had a very poor fruit set percentage and also a similar yield but the fruit weight and fruit quality was remarkable.

AKNOWLEDGEMENT

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TABLES AND FIGURES

Table 1

Growth vigor of some sweet cherry cultivars on different rootstocks in the third year at Istrita experimental plot

Cultivar/ rootstock	Trunk Cross Sectional Area (TCSA)				Tree height			
	Absolute value (cm^2)	Relative value (%)	Difference (cm^2) ±	Signification	Absolute value (cm)	Relative value (%)	Difference (cm) ±	Signification
Kordia/PHLC	21.77	119.51	3.55	N	355	129.99	81.90	***
Ferrovia/PHLC	11.51	63.18	-6.71	O	210	76.90	-63.10	OO
Van/PHLC	15.66	85.98	-2.55	N	250	91.54	-23.10	N
GiantRed/CAB6P	23.06	126.63	4.85	N	273	100.09	0.24	N
FirmRed/CAB6P	20.89	114.69	2.68	N	303	111.07	30.24	N
FirmRed/CAB11E	17.25	94.71	-0.96	N	273	100.09	0.24	N
EarlyRed/CAB11E	17.36	95.31	-0.85	N	246	90.32	-26.43	N
Mean	18.21	100	0	Mt	273	100	0	Mt
Statistic Analysis of variance	DL5%=6.02 DL1%=8.45 DL0.1%=11.95				DL5%=37.53 DL1%=52.68 DL0.1%=74.46			

Table 2

Growth characteristics and branch type distribution of some sweet cherry varieties grafted on different rootstocks

* Means followed by the same letter in the same column are not significantly different (Duncan's multiple range test, P ≤ 0.05)

Cultivar/rootstock	No of medium branches	No of long branches	Total no of long branches	No of spur fruiting branches	No of spur vegetative branches	Total no of short branches	Length of medium branches/tree(cm)	Length of long branches/tree (cm)	Total annual growth/tree (cm)
Kordia/ PHLC	10.67a*	10.67a	21.34a	52.67a	27.33e	80.00a	43.19a	87.22a	1390.97a
Ferrovia/ PHLC	14.33a	3.00a	17.33b	14.33e	30.00d	44.33e	29.63d	46.83f	565.15e
Van/ PHLC	3.67b	8.33a	12.00c	44.00b	12.67f	56.67c	32.22c	57.23e	595.07d
GiantRed/CAB6P	5.67b	2.67a	8.34d	6.33f	50.00a	56.33c	34.63b	66.42c	373.37g
FirmRed/ CAB6P	14.00a	2.33a	16.33b	29.33c	35.00b	64.33b	33.44bc	66.11c	622.46c
FirmRed/ CAB11E	12.33a	4.00a	16.33b	12.67e	31.33cd	44.00e	31.33cd	62.00d	634.36b
EarlyRed/ CAB11E	6.67b	4.00a	10.67cd	20.67d	32.67c	53.34d	31.36cd	71.32b	494.32f

Table 3

Fruiting particularities of some sweet cherry varieties grafted on different rootstocks in Istrita experimental orchard (2011)

* Means followed by the same letter in the same column are not significantly different (Duncan's multiple range test, $P \leq 0.05$)

Cultivar/ rootstock	No of inflorescences			Total no of flowers/tree	Total no of fruits/tree	Fruit set (%)	Fruit weight (g)	Yield (g/tree)	Yield (kg/ha)
	Spur fruiting branches	Medium Branches	Long branches						
Kordia/ PHLC	104.7a*	16.19c	19.10	249.37a	81.33b	32.6c	5.3a	431.07b	538.83b
Ferrovia/ PHLC	31.87d	29.13a	-	104.59d	49.67c	47.5b	5.6a	278.13c	347.67c
Van/ PHLC	96.16b	5.04e	-	182.13b	93.33a	51.2a	8.5a	793.33a	991.67a
GiantRed/CAB6P	11.25f	11.58d	-	39.01g	7.00d	17.9d	9a	63.00d	78.75d
FirmRed/ CAB6P	55.44c	18.91b	-	130.79c	6.33d	4.8e	7a	44.33e	55.42e
FirmRed/ CAB11E	21.31e	17.03bc	-	65.97f	3.00d	4.5e	8a	24.00f	30.00f
EarlyRed/ CAB11E	32.20d	8.30e	-	71.65e	2.67d	3.7e	8a	21.33g	26.67g

Table 4

Development of main phenophases of some sweet cherry varieties grafted on different rootstocks during 2011 in Istrita experimental orchard (2011)

Cultivar/rootstock	Bud burst	Early white bud	First blossom	Petal fall	Fruit set	Fruit ripening date
Kordia/PHLC	31.03	11.04	18.04	26.04	5.05	8.06
Ferrovia/PHLC	30.03	10.04	17.04	25.04	4.05	8.06
Van/PHLC	29.03	10.04	17.04	25.04	3.05	16.06
GiantRed/CAB6P	29.03	10.04	17.04	24.04	3.05	8.06
FirmRed/CAB6P	29.03	10.04	17.04	26.04	5.05	10.06
FirmRed/CAB11E	29.03	15.04	21.04	25.04	5.05	12.06
EarlyRed/CAB11E	29.03	10.04	17.04	24.04	3.05	10.06

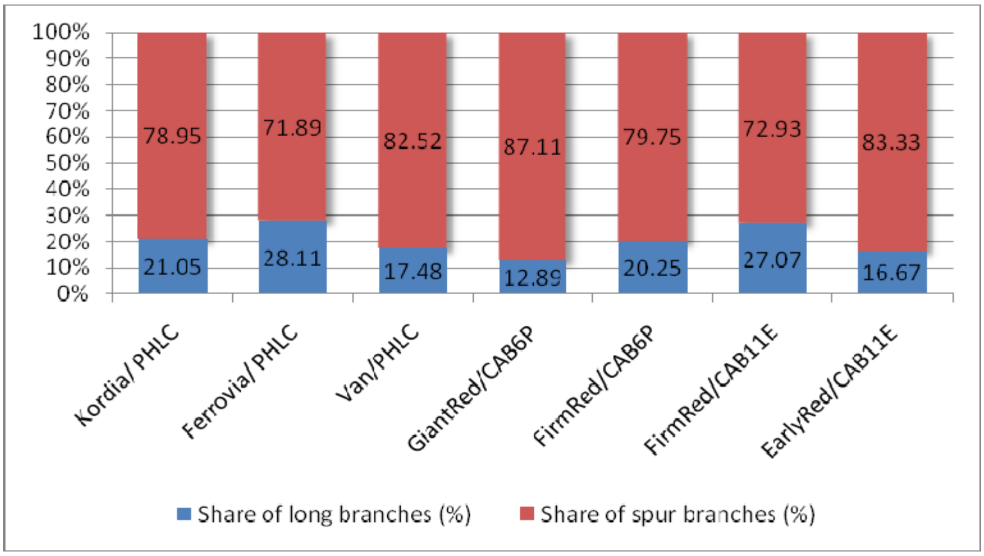

Fig. 1. Distribution of branch types at some sweet cherry cultivars in the third year after planting

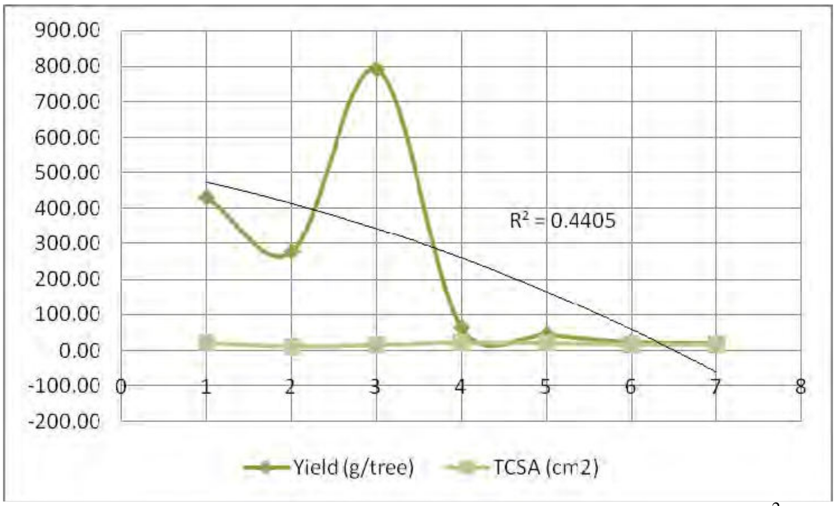

Fig. 2. The correlation between the yield (g/tree) and the TCSA (cm^2) of the sweet cherry cultivars

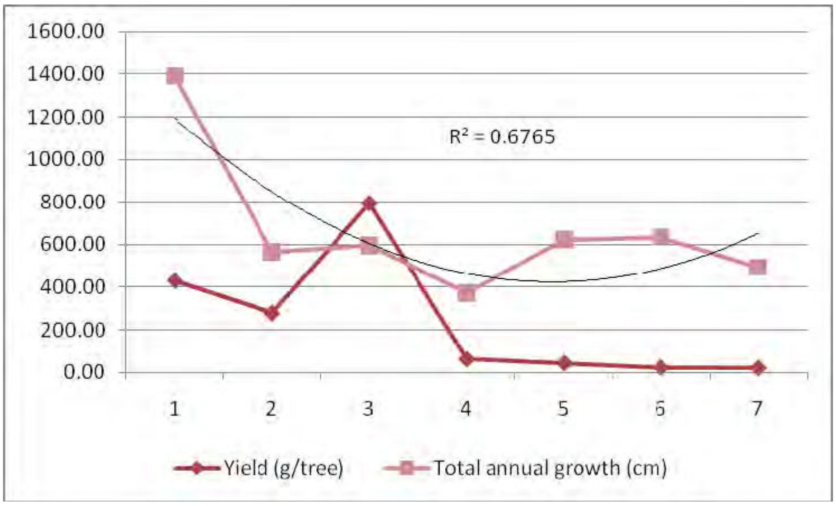

Fig. 3. The correlation between yield (g/tree) and the total annual growth/tree (cm) of the sweet cherry cultivars

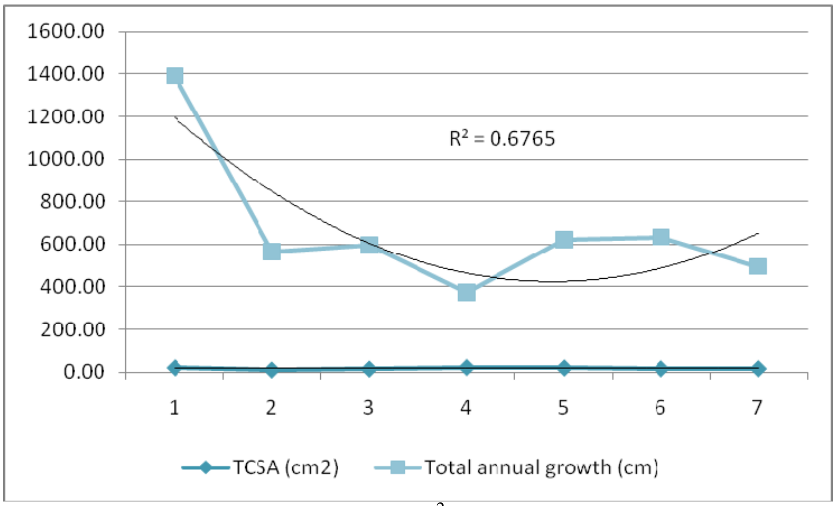

Fig. 4. The correlation between TCSA (cm^2) and the total annual growth/tree (cm) of the sweet cherry cultivars

Increase quantity and quality of apple fruit by normalization of load by different methods of thinning

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Keywords: spindle-shaped, thinning fruit, variety,

ABSTRACT

Investigations were conducted in the years 2009-2010 in apple orchard in SA Zubreşti planted in the spring of 2003, with 4x2 m planting scheme. Trees are driven by thin spindle-shaped crown improved. We studied the apple fruit thinning by chemical thinning, manual and mixed in 3 varieties Golden Delicious, Idared and Florina, grafted on rootstock M26. It was determined blossoms number, fruit number, weight and quality. The number of blossoms Idared variety in control variant is 96 peaces/tree and almost doubled in version 2 reached the threshold of 200 pieces/tree. In the other two variants blossoms number is 50 percent higher in variant 3, respectively, 53.3% in April compared to the control variant.

INTRODUCTION

Fruit thinning in apple is one of the most important techniques to improve fruit quality and prevent the formation of fruiting periodicity. A prerequisite for a harvest of high quality is an adequate number of flowers and fruit trees, so their chemical thinning is a common measure in commercial apple orchards (Wertheim, 2000; Greene 2002).

Hand thinning of fruit, it is often impossible due to labor costs and labor limited. Therefore, chemical thinning be conducted to ensure high fruit production. (Oliena and Bukovac, 1982).

Fruit thinning can increase their size and color and improve their quality. Hand thinning is building on good practice for temperate zone fruits, but is expensive and time consuming (Childers 1995).

MATERIALS AND METHODS

Investigations were conducted during 2009 - 2010 in the orchard of apple company "Zubreşti" SA, planted with trees grafted 2 years old near the village Zubreşti district Straseni. Plantations were conducted in spring 2003 varieties Golden Delicious, Florina, Idared, grafted on rootstock M 26. Distance planting trees 4x2 m.

They studied four variants with fruit thinning:

Variant 1 - control

Variant 2 - Management of chemicals when the central fruit diameter is 10-12 mm blossoms Bioprzerzedzacz 060 SL preparation in a concentration of 0.075%.

Variant 3 - Administration of chemicals when the central fruit diameter of 10-12 mm is blossoms Bioprzerzedzacz 060 SL preparation in a concentration of 0.075% + manual fruit thinning.

Variant 4 - manual thinning is carried out after the fall of physiological fruit when the fruit reaches 16-18 mm in diameter.

Number was determined by counting blossoms button flowers on the same three trees growing force.

Yield was determined for each tree individually, weighing from 24 trees and production by the arithmetic mean. The average fruit weight was determined by weighing and dividing the fruits of 100 to 100. Commercial quality of fruit was determined according to European standard apple No.85/2004.

RESULTS AND DISSCUSIONS

Blossoms number (Fig. 1) the variety Golden Delicious control variant was 130 pieces/tree, with a slow chemical variant of this index value rose by 15%, in variant 3 with 25% more than in control variant and as 15% lower than in version 4.

The number of blossoms Idared variety in control variant is 96 pieces/tree and almost doubled in version 2 reached the threshold of 200 pieces/tree. In the other two variants blossoms number is 50 percent higher in variant 3, respectively, 53.3% in April compared to the control variant.

The variety Florina, which is manifested by a higher growth effect from the other two varieties under study, the value of this index in the control variant was 130 pieces/increasing tree upward until reaching the following 3 options from 32 to percent more than in control variant in the fourth version.

Number of fruit is different about being in the limits of 256-368 pieces/tree of the variety Golden Delicious, 192-380 pieces/tree in Idared and 260-378 pieces/tree in Florina.

Golden Delicious variety in trees most fruits have been linked to variant 4 with manual fruit thinning, representing 368 pieces/tree, and the least in version 3 or 33% compared to variant 4. In version 2 this index value created and 300 pieces/tree or 17% less than the version with manual fruit thinning. In the control variant the number of fruit after binding was 30% less than in version 4 and 27 percent less than in version 32 with combined fruit thinning. After tying the variety Florina fruit number was 260 pieces/tree in control variant, increasing further to 27% in version 2, version 3 and 42% or 45% in version 4.

The largest number of fruit before harvest, the Golden Delicious variety was registered in control variant being 158 pieces/tree and decreasing the chemical fruit thinning version by 13 percent compared to the control, in variant 3 with 15%.

The Idared variety, the highest number of fruit prior to harvest was recorded in control variant created and 134 pieces/tree, and the lowest value of this index was in version 3 with about 50% compared to the control.

As a result of the thinning of fruit number was distributed as follows: the control variant the ratio of fruit after binding and number of fruit prior to harvest fruit is 1 to 0.9, but applied to different types versions where Thinning fruit turnover ratio is higher than the control variant and is 2-1 with a slow version chemical in fruit and grows up to 3-1 mixed fruit thinning and thinning variants manually.

Fruit harvest apple trees per hectare calculated according to the method of thinning fruit showed values within the limits imposed from 20.25 t/ha in the control variant the variety Golden Delicious to 29.75 t/ha in variant 4 Idared variety. Fruit harvest each variety being studied in the framework, we see that the lowest value of this index was obtained in control variant and the highest yield in each variety was shown in the framework variants combined with a slow and manual. Depending on the varieties studied, we see that the variety Golden Delicious harvest was the lowest recorded in the control variant being 21 tons per hectare, and the higher combined with a slow version of defeating fruit harvest fruit chemical thinning version by 17% and 2% with a slow version of the manual harvest of fruits.

The variety also Idared lowest harvest was in control variant, but the biggest harvest in version 4 is recorded about 30 tons per hectare.

Variety Florina had a lower harvest compared with the other two varieties, keeping the same regularity between the variants investigated.

After freight quality fruit noticed that the variety Golden Delicious in control variant over 90 percent of the fruit are part of the third quality, and only 10% of the fruit after diameter corresponding European standard rules. In variants where to apply different methods of thinning the percentage of quality fruit extracts is much greater size than in version control and takes a share of over 80 percent of the fruits examined, but the percentage of poor fruit about 10 percent.

In the control variant Idared variety fruits were mainly classified as category II, by size 30%, while in other variants predominate extra category and the rest are fruit quality after the second diameter.

A slight increase in the percentage of extra quality fruit thinning is observed in the combined variant and 79% fruit. The version with manual fruit thinning fruit percentage is the highest tier of fruit thinning variants and is 20%.

From Figure 7 we see that the variety Florina reacted better to the effect of thinning. In the control variant percentage of fruits diameter of 20 and 24 percent as focused fruit fractions extra category and class I.

The application of chemical thinning of fruit quality extra percentage increase being 85% and in variant 3 extra percentage of quality fruit is over 90 percent.

CONCLUSIONS

In the control variant Idared variety fruits were mainly classified as category II, by size 30%, while in other variants predominate extra category and the rest are fruit quality after the second diameter.

Fruit harvest apple trees per hectare calculated according to the method of thinning fruit showed values within the limits imposed from 20.25 t/ha in the control variant the variety Golden Delicious to 29.75 t/ha in variant 4 Idared variety.

With the application of chemical substances Thinning fruit varieties Golden Delicious, Florina, Idared and increased the percentage of quality fruit and extra tier up to 85-90% of the total fruit.

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FIGURES

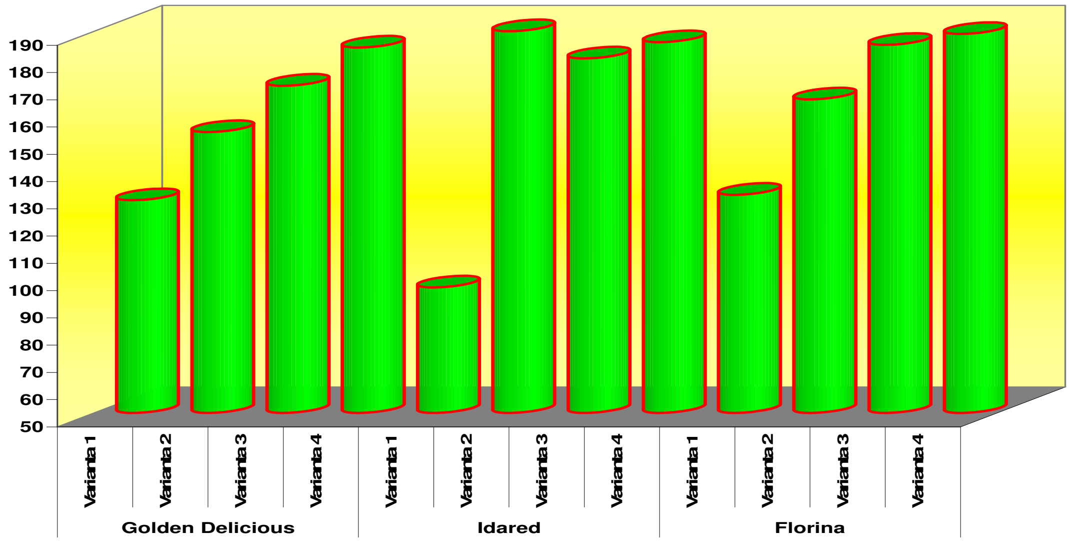

Fig.1. Blossoms number in function of apple variety in the method of thinning, pieces/tree
M 26 rootstock, planting distance 4x2m, SA "Zubreşti", 2010

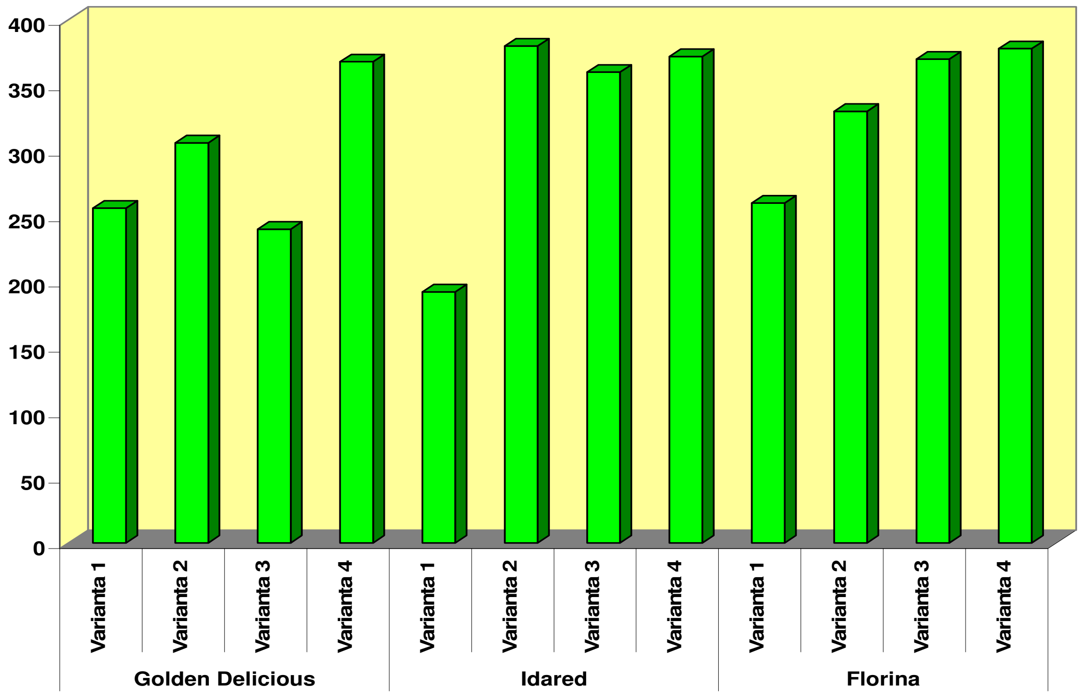

Fig.2. Number of fruit linked by method of thinning, pieces/tree.
M 26 rootstock, planting distance 4x2m, SA "Zubreşti", 2010.

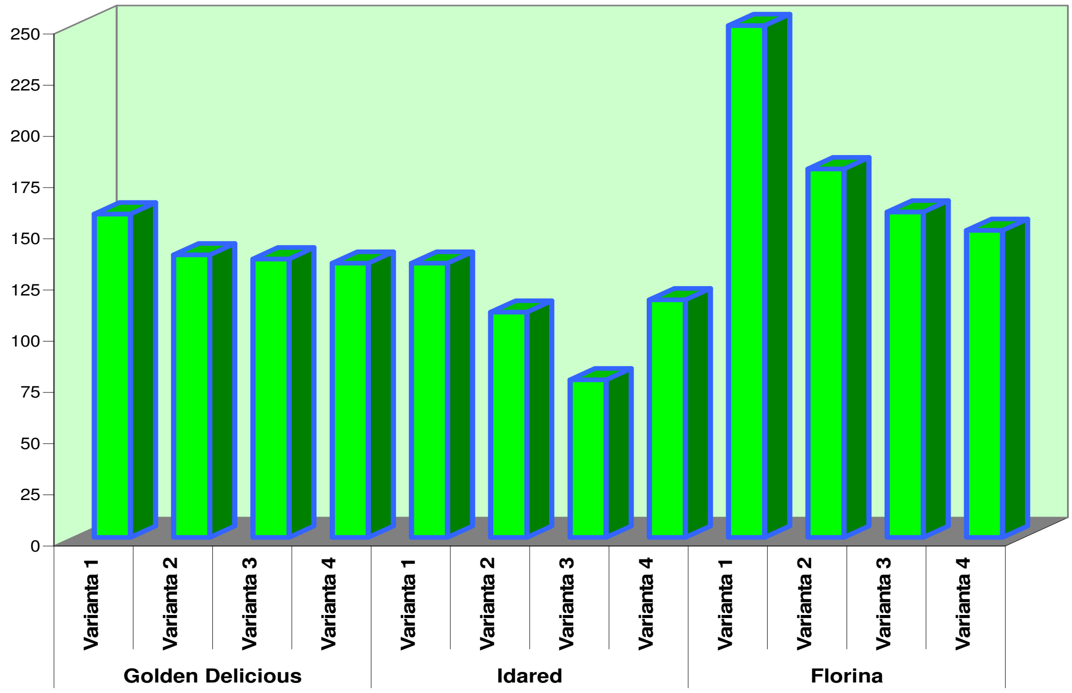

Fig. 3. Number of fruit before harvest depending on the method of thinning fruit, pieces/tree. M 26 rootstock, planting distance 4x2m, SA "Zubreşti", 2010.

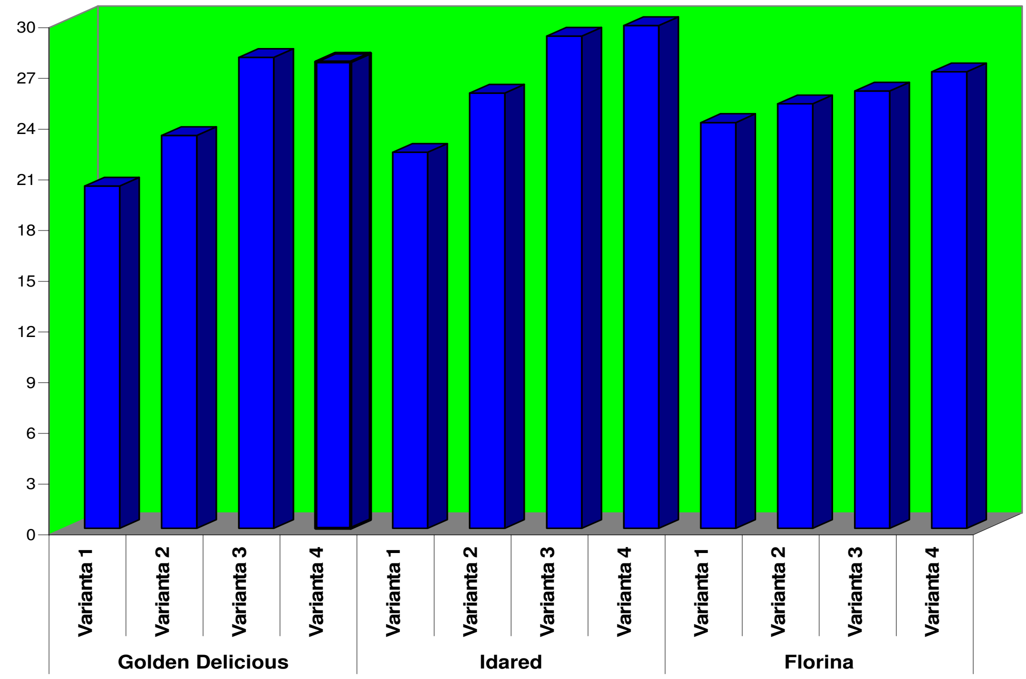

Fig.4. Fruit harvest apple trees obtained from a hectare depending on the applied thinning method, t/ha. M 26 rootstock, planting distance 4x2m, SA "Zubreşti", 2010.

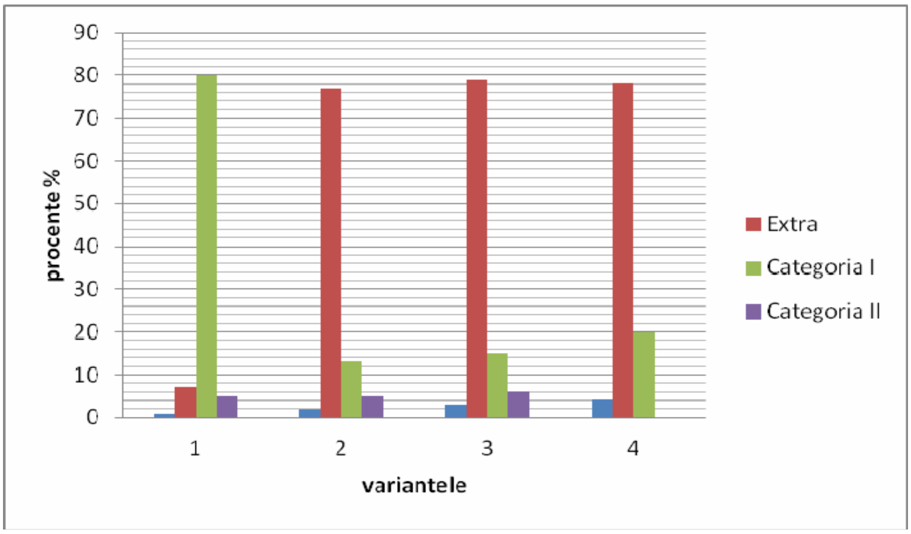

Fig.5. Thinning influence how the freight quality of fruit on their Golden Delicious variety, %. M 26 rootstock, planting distance 4x2m, SA "Zubreşti", 2010.

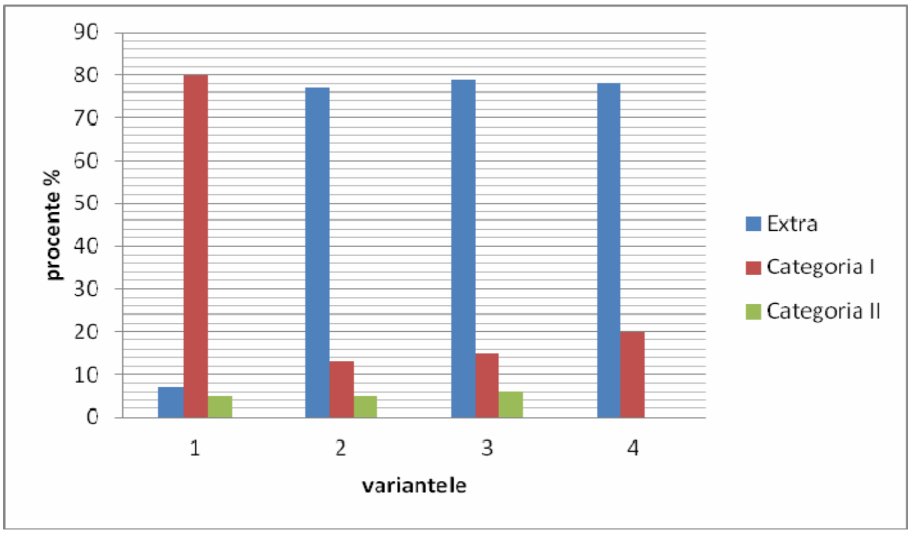

Fig.6. Thinning influence how the freight on the quality of their fruit from the variety Idared, %. M 26 rootstock, planting distance 4x2m, SA "Zubreşti", 2010.

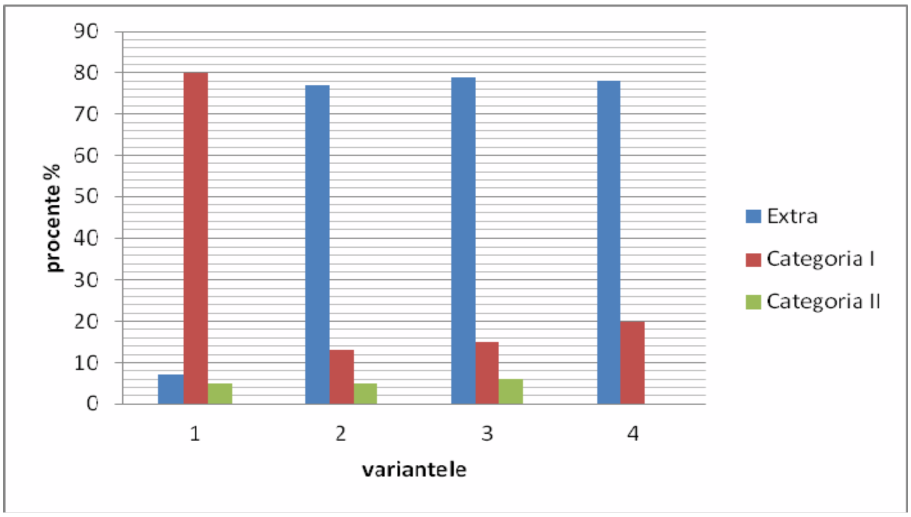

Fig.7. Thinning influence how the freight on the quality of their fruit from the variety Florina, %. M 26 rootstock, planting distance 4x2m, SA "Zubreşti", 2010.

Quantitative formation of apple trees roots in dependence of their nature radial spread limitation

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Keywords: apple tree, variety, root system, cutting, plastic film.

ABSTRACT

The article describes the increasing of the quantity of tree roots of Golden Delicious, Idared, Spartan, 1-11-157, Ianvarscoe, Slava pobediteleam apples (grafted on MM-106 stocks) depending on the variants of the directional formation of the root system of fruit trees. The directional formation of the root is provided by the limitation of their expansion trough their cutting and blocking with a plastic film.

INTRODUCTION

Currently, the fruits growers are forced to choose the land and often resorting to repeated use of the land of former orchards. But in these cases, fruit growing phenomenon-face practice, “fatigue soil "(3). It is also known that soil considerably less tired of it, after clearing of old orchard (exhausted), remain to fewer roots rotting skeleton (thick). A future research direction is considered developing agro-technical procedures to help fruit growers to avoid fatigue on the ground in strips of orchard land in use where the line is expected to place rows of fruit trees orchards next to us (after clearing the old one) (5). As new research approach in the training process claims directed to the trees root system (4). In this context, in 1987, was established in experiment No. 1 farm “Fructovi Donbass” in order to study the impact of apple trees to limit the spread of radial character of horizontal roots (2). With the same purpose and experiment #2 was mounted in the experimental field of the Institute of Horticulture.

This article includes data on the number size of apple trees roots in the 000-100 cm soil layer.

MATERIALS AND METHODS

Experiment no.1 on the training field directed to the root system of varieties of apple trees Golden Delicious, Idared and Spartan was mounted in plantations established in 1985 (agriculture “Fructovi Donbass“), planting distances of trees - 5x3 m. Rootstock MM 106. The soil is alluvial meadow of black clay on hard clay.

They studied the following:

1. Witness. Without limiting the spread of radial horizontal roots;
2. Radial spread of horizontal roots of two trees adjacent rows are moving towards a single interval. Limiting is performed by applying cutting machine, Vibrolaz 80-E ";
3. Radial spread of horizontal roots oriented on strips attached to the stems of trees with a width of 2.5 m. The limitation is done by applying cutting machine, Vibrolaz 80-E ";
4. Radial spread of horizontal roots of two trees adjacent rows are moving towards a single interval. Limitation - by applying polyethylene film;
5. Radial spread of horizontal roots oriented on strip attached to the stems of trees with a width of 2.5 m. The limitation - by applying polyethylene film;
6. Radial spread of horizontal roots of two trees adjacent rows are moving towards a single interval. Limit mixed: in planting - with film application later from the third year after planting - by cutting.

Field Experiment no. 2 included apple varieties Ianvarscoe, Slava pobediteleam, 1-11-157 and was mounted in plantations established in 1996, planting distances of trees - 4,5 x3, 0 m. Rootstock MM 106. The soil is carbonated chernozem, hard clay. The relief is smooth gradient, 4o exhibition southeast.

They studied the following:
1. Witness. Without limiting the spread of radial horizontal roots;
2. Radial spread of horizontal roots of two trees adjacent rows is oriented towards a single interval. The first limitation of the root-cutting in 1998 (autumn), the second-in 2000, the third - in 2002, the fourth - in 2004, the fifth - in 2006;
3. Radial spread of horizontal roots of two trees adjacent rows are moving towards a single interval. The first cutting of limiting roots - in 1998 (autumn), the second - in 2001, the third - in 2004, the fourth - in 2007;
4. Radial spread of horizontal roots of two trees adjacent rows are moving towards a single interval. The first cutting of limiting roots - in 1998 (autumn), the second - in 2002, the third - in 2006;
5. Radial horizontal spread of roots oriented strips attached to the stems of trees with a width of 2.5 m. limit cutting is carried out both sides of the row of trees. First - 1998 (autumn), the second - in 2000, the third - in 2002, the fourth - in 2004, the fifth - in 2006;
6. Radial horizontal spread of roots oriented strips attached to the stems of trees with a width of 2.5 m. limit cutting is carried out both sides of the row of trees. The first limitation of the root-cutting in 1998 (autumn), the second - in 2001, the third - in 2004;
7. Radial horizontal spread of roots oriented on strips attached to the stems of trees with a width of 2.5 m. The first cut to limit the roots - in 1998 (autumn), the second - in 2002, the third - in 2006.

The conditions were kept the same in all versions. Maintenance system was black field. Fertilizers were not applied since the establishment of the orchard.

The total number of apple trees rooted in the soil layer 0-100 cm depending on the options under study was determined in 1997 (exp. nr.1) and 2007 (exp. nr.2), after working method (Kolecnicov 1962) accepted fruit plants (1). For the study of roots in soil trenches were executed (perpendicular rows of trees, the trees right out and away from the tree trunk 100 cm of record) with a depth of 100 cm and 200 cm length.

RESULTS AND DISCUSSIONS

Number of roots on apple trees (000-100 cm soil layer) depending on the character limit radial spread of roots is reflected in Table 1. Data obtained in experiment No. 1 are as follows. Golden Delicious apple variety the highest number of roots in the 13th year after planting, trees has in version five - 1905 piece is by 644 more than in the control variant. Difference limit - 86.79. The root of the trees they have little control variant - 1261 pieces. This difference is significant because the difference exceeds the limit. Variants three, four and six, has this indication, and they go beyond control.

The largest number Idared variety of tree roots have in version five - 1985, with 899 units more than in the control variant. This difference is significant (Dl0, 95 to 19.06). Spartan variety trees in the size of the number of roots, reacted to the variants studied analog varieties Golden Delicious and Idared.

In experiment no. 2, the selection form 1-11-157, the highest number of rooted trees has in version two - 1610 pieces. Thank pobediteleam and Ianvarscoe varieties and, as - in version two. Minimum this indication in all studied varieties is detected in the control variant. In data exposed mention that in experiment No. 2 limit the spread of radial horizontal roots are cut, the interpretation of technological options five six three have significant negative impact on the size of the root number of varieties of apple trees studied.

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In experiment no. 2, 1-11-157 selection form, the highest number of rooted trees has in version two - 1610 pieces, varieties Slava pobediteleam and Ianvarscoe, as - on version two. Minimum this indication in all studied varieties is detected in the control variant. In data exposed mention that in experiment nr.2 limit the spread of radial horizontal roots are cut, the interpretation of technological options five six three have significant negative impact on the size of the root number of varieties of apple trees studied.

According to data presented in Table 2 (experiment no. 1), three five variants, namely those involving the orientation direction of extension of roots in the strip horizontal rows of trees line width of 2.5 m provides a significant increase in root weight (in total) with thickness <1 mm. This percentage is more than 61% in all varieties studied

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The data in Table 3 (experiment # 2) shows that the optimal limit to tree roots provide an interpretation of technological options that involve cutting the horizontal roots over every two or three years (1). In this case it is considering options two, three, five and six. These options increase the weight the thick roots <1 mm, which good reflects on apple trees.

CONCLUSION

Interpreting technological options, involving the spread of radial orientation of the two rows of neighboring tree roots towards a single interval, or orientation of roots in Gaza on line, limiting the application of cutting more than two or three years, provides a positive action on trees apple.

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TABLES

Table 1

Total number of roots in soil layer 0 to 100 cm depending on the limit radial spread of horizontal roots

Variant	Total number of roots in the soil layer 0-100 cm					
	Experiment 1			Experiment 2		
	Golden Delicious	Idared	Spartan	1-11-157	Slava pobediteleam	Ianvarscoe
1(M)	1261	1086	1283	1037	1207	984
2	1497	1463	1408	1610	1763	1286
3	1507	1597	1451	1326	1754	1129
4	1433	1454	1395	1239	1439	1105
5	1905	1985	1468	1252	1691	1198
6	1417	1391	1304	1426	1569	1203
7	-	-	-	1216	1443	1007
DL $_{0,95}$	86,79	19,06	31,68	23,51	33,61	21,66

Table 2

The distribution of the fractions by thick roots - Experiment no. 1

Variant	Golden Delicious			Idared			Spartan		
	The fraction of roots as thickness, mm			The fraction of roots as thickness, mm			The fraction of roots as thickness, mm		
	>3	1-3	<1	>3	1-3	<1	>3	1-3	<1
1(M)	125	313	873	162	267	657	187	323	773
2	162	373	962	180	364	919	180	258	970
3	158	377	972	196	402	999	167	374	910
4	125	358	950	164	368	922	159	357	879
5	200	472	1233	228	490	1267	166	379	923
6	157	357	903	170	353	868	158	332	814

Table 3

The distribution of the fractions by thick roots - Experiment no.2

Variant	1-11-157			Slava pobediteleam			Ianvarscoe		
	The fraction of roots as thickness, mm			The fraction of roots as thickness, mm			The fraction of roots as thickness, mm		
	>3	1-3	<1	>3	1-3	<1	>3	1-3	<1
1(M)	198	251	588	240	286	681	197	239	548
2	212	401	997	213	446	1104	161	325	800
3	166	333	827	270	426	1058	167	280	682
4	177	302	760	229	341	869	169	268	668
5	141	323	788	193	426	1072	151	301	746
6	172	349	905	193	397	579	166	298	739
7	154	302	760	183	358	902	142	247	618

Study regarding the tendencies of the international organic product market

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Keywords: certified, requirements, consumers, quality, fruit and vegetables, yields, conversion period

ABSTRACT

In the last two decades, a strong steady growth in the sales of organic foods has provided these products with a viable and sometimes value added market nice. Changes in dietary habits among many segments of the population of developed countries- resulting from increased health awareness and the increasing demand for a wider variety of products, including convenience food- have contributed to this growth. Due to major food scares, which hit many countries in Western Europe in the late 1990s and early years of this century, consumers in general have become more critical when purchasing food. Moreover, they have become more demanding regarding information on production and processing aspects (including traceability of the product). The sales organic horticultural product has been expanding rapidly in many of the major organic markets (ex. The United States, countries in the Union Europe and Japan). However, the market share of organic products in total food sales is still small. Diversification towards high-value crops can help to reduce the vulnerability of many agricultural producers in some countries, especially for resource poor and small-scale farmers. This study focuses on fresh certified organic fruit and vegetables.

INTRODUCTION

Products labeled as "organic" are those certified as having been produced through clearly defined organic production methods. In other words, "organic" is a claim on the production process rather than a claim on the product itself.

Organic agriculture is best known as a farming method where no synthetic fertilizers and pesticides are used (Dejeu et al., 2007). However, this description does not mention the essence of this form of agriculture, which is the holistic management of farming system. According to the definition of the Codex Alimentarius, "organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity (GlobalGap Control Points and Compliance Criteria –Integrated Farm Assurance). It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted system. This is accomplished by using, where possible, agronomic, biological and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system". Several national governments and a multitude of private farmer organizations have defined organic agriculture. In the past, differences in these definitions were significant, but the demand for consistency by the trade has led to greater uniformity (Dejeu et al., 2007).

Basic criteria for the production, storage and transport of organic fruit and vegetables

One of the essential elements distinguishing organic farming from other forms of sustainable agriculture is the existence of production standards and certification procedures (Dankers, 2003). There are no universal standards for production and handling of organic fruit and vegetables. Initially, private associations, entitling members to use the respective associations organic brands and labels when marketing their products, developed organic standards. The International Federation of Organic Agriculture Movements (IFOAM), a non-governmental organization promoting organic agriculture internationally, has established guidelines that have been widely adopted for organic production and processing (Lenuta Chira, 2005). These guidelines are commonly considered as "minimum standards", leaving room for more detailed requirements, depending on regional or local situations. As organic agriculture has became more widespread, many developed countries have defined their own organic standards. Since early 1990s, EC countries have endorsed a common organic standard, which is spelled out in Regulation EEC 2092/91. CE Regulation 834/2007 replaced this regulation. Canada, the United States and Japan have adopted organic standards and regulations, too (Jurnalalul Oficial al Uniunii Europene). The Committee on Food Labelling of the FAO/WHO Codex Alimentarius Commission adopted "Guidelines for the Production, processing, Labelling and Marketing of Organically Produced Foods" in 1999. Organic standards are usually similar as they derive from IFOAM"s guidelines for organic production.

In general, the use of methods that contribute to maintaining or enhancing soil fertility is mandatory (Lenuta Chira, 2005). Another common feature is that generally natural inputs are approved and synthetic inputs are prohibited.

Nevertheless, there are exceptions in both cases. Certain natural inputs which various certification programmes determine to be harmful to human health or the environment are prohibited. In addition, certain synthetic inputs are allowed. For example, Regulation 834/2007 allows, when required, the use specific fertilizers and plant preservatives. All certification programmes maintain lists of specific approved synthetic inputs and prohibited natural inputs. Many certification programmes require additional environmental protection measures beyond the above prerequisites. For example, specific measures are generally applied in the areas of soil and water conservation, pollution control or the use of biological control agents (www.M.A.D.R. Aricultura ecologica. Acte legislative)

While many farmers in the developing world do not use synthetic inputs, this alone is not sufficient to classify their products as organic. Farmers who produce organic crops for export and the some time grow basic foodstuffs on other areas of the farm using conventional methods with fertilizers and pesticides, inadmissible to the organic system, are at high risk of violating the standards, unless effective measures are taken to prevent prohibited substances from passing to the organic plots.

Consumers prefer organic products from their country or region

The surveys have shown that in virtually all markets, organic consumers have a clear distrust of the authenticity of certified organic imports. The case of Switzerland is most striking where the main domestic organic label (Bio Suisse) prohibits organic products to be transported by plane (Switzerland is a land-locked country). Consumers in Austria are said to strongly prefer domestic organic products (preferably bought directly at the farm) and only appreciate imports during off-season periods or for products, which cannot been grown domestically. If imports are needed, produce originating from nearby countries is favored. The Danish market survey mentions that consumers' confidence in foreign organic products declines with geographical distance. Also, consumers in Japan and the United States have a strong preference for locally grown organic produce (www.fao.org.). In order to successfully introduce imported organic produce into these markets, specific marketing efforts might be needed to gain buyers confidence. These efforts would clearly be linked to the organic importer, wholesaler and retailer. Use of the same domestic organic label in the country of consumption would help to make consumers familiar with imported organic produce, as they are more likely to recognize the equivalency of the product based on domestic standards.

There are a few exceptions. The United Kingdom and Belgium are two examples where the difference in trust between domestically grown and imported organic products in found to be relatively minor. This is probably explained by the fact that domestic organic production in these countries is not able to catch with growing demand, and imports are therefore common practice (www.fao.org.).

Price vary strongly among place, time and product group

Although there is a general lack of publicity available data on prices (at the producer, fob and retail levels), some of the market surveys give some insight into this issue. For most countries, sample of prices is given (mostly at real level), but no price series or complete set of price data could be obtained. Since the organic sector in many countries is still dominated by a few traders, willingness to provide data has often been found to be limited, and market transparency is far from optimal. With the continuing growth of organic sales volumes in developed markets and progression to mare transparent and competitive markets, most surveys indicate that this trend will probably result in a decrease in the price difference between organic and conventional products. The extent, to which price differences will decrease, however, is not known and will depend largely on the respective growth rates of demand and supply (/www.organic-world.net/statistics\world.html).

As expected, prices vary widely over time, due to seasonal trends in production (and consumption), but also from one market place to another within a country (Dejeu et al., 1997). Some non-representative samples of retail prices obtained by various authors suggest that price premia generally range between 20 and 40 percent above conventional prices, with price differences in production and distribution costs (Alexandrescu and Chira, 2010).

Organic price premia and consumer behavior

Groups of consumers are said to be willing to pay a certain price premium for organic foods (Chira, et al., 2008). In many countries, most consumers are willing to pay 20 percent more than for conventional products, but no precise figures could be obtained. Organic sales through supermarkets are the fastest growing distribution channel in most markets. Some market sources stated that consumers buying organic produce in the conventional retail channels (e.g. supermarket) differ somewhat from other organic consumers, in the sense that environmental considerations are less environmentally conscious consumers lend some support to the expectation of decreasing price premia in the next few years.

Some organic marketing trends

During the market surveys various market trends have been observed, including:

- **Organic supermarkets**. Many surveys report the introduction of small supermarkets which only sell fully organic products;
- **Biodegradable packaging**, in order to provide consumers with organic products which are packed in an environmentally-friendly manner;
- **Convenience organic foods.** Convenience foods have been among the fastest growing food items in conventional markets, and over the last years more and more organic convenience products, such as fresh pre-packed salads are to be found;
- **Sales through the Internet, often combined with box schemes, are growing in importance.** Many of the country reports provide detailed information on companies which trade organic produce through the Internet;
- **Organic food sales through public canteens and catering**. The food service sector and other sectors are becoming more and more involved in organics.

Some opportunities for developing countries and basics requirements for success

Internal production of organic products in developed countries is expected to rise within the next few years (there is usually a time-lag of three years between conversion and production of certified organic produce), but it is unlikely to meet demand for most products. Consumers' preference for locally or regionally produced organic fruit and vegetables indicates that the best opportunities are in counter-seasonal fresh organic temperate zone produce and non-temperate zone products. For products that cannot be produced in the colder climates in northern developed countries (e.g. oranges, kiwi, etc.) most organic supply comes from producing countries close to these markets, such as countries in the Mediterranean area for the UE (e.g. Italy, Spain, Israel, Morocco and Egypt). It is important to note that UE member countries or third countries have a clear advantage. For other countries, the highest potential is seen when internal supply from these countries is absent or insufficient. There may also be some opportunities in seasonal produce, which is short in supply and in processed fruit and vegetables. Basic requirements for success include a more competitive producer and fob price while meeting at least the organic and phytosanitary standards and providing the same quality as conventional products. Moreover, strong marketing efforts may be required to educate the organic consumer to mitigate the current distrust towards imported organic products. Some countries have already established a "green" or "fresh produce" export image (e.g. Costa Rica, Chile), which will help them enjoy marketing advantages in organics.

Required planning

When deciding on whether to convert to organic production, one should bear in mind the different (and many times difficult) production and management methods needed in order to succeed. The generally needed conversion period of three year makes long-term planning indispensable. For such planning, a careful cost-benefits analysis should be carried out. The size of the expected decrease in organic price premia, if any, is not well known; neither is the amplitude of the possible drop in yields during conversion and possibly after. Therefore, producers and exporters are advised to carefully assess the potential of their product in the targeted market, as well as to identify competing suppliers of that market. With the recent introduction of organic rules in two of the major organic markets, the USA and Japan, the legislative framework is in place to provide better information and guidance on import rules and, consequently, in theory, to reduce unpleasant surprises for potential organic exporters to those markets.

Some possible strategies to follow

Before certified organic fresh fruit and vegetables can be successfully exported to developed countries, many steps have to be undertaken. The list below - although not exhaustive - gives some of the main conclusions and information

- An important step is **to establish national or regional organic standards and regulations** and a **reliable independent accreditation and control system** to enforce those rules. When the domestic organic rules are recognized as equivalent to the organic rules of the country to which exports are sent, unnecessary additional certification costs are avoided. Although most developing countries do not yet have their own organic standards, they are often capable of exporting certified organic products through close cooperation with an accredited certification body and a specialized importer.
- Another fundamental requirement is the **availability of know-how on organic farming** and **organic inputs**. Organic farming is generally more labor intensive and requires a high level of management attention in order to avoid contamination and pests. Some of the interviewed organic producers stated that the highest initial costs of converting towards organic farming were not so much the costs of certification and control, but the huge losses during the first harvests, resulting from insufficient knowledge and capability to protect the crops from pests and plagues. Organic farming was said to be carried out on a trial-and-error basis until the appropriate techniques were developed through continuous adjustments. Moreover, during conversion towards organic agriculture, yields might drop significantly (and may remain lower even after the transition period), and there are higher risks of severe pest and disease attacks.

- **Good post-harvest handling** (e.g. cold storage), **good infrastructure** and **logistics** (including harbor or airports) will enable the fresh produce to arrive in good condition in the country of destination. Quality problems finally led to discontinuing organic exports.
- In order to export successfully, **good and reliable relations with an importer, trader or wholesaler in the target market** are important. The importer has up to date information on the latest market developments.
- Supermarkets, the fastest growing sales outlet for organic produce, prefer to sell organic fresh produce year-round, with a constant quality and regular supply. International trade in conventional fresh fruit and vegetables shows increasingly characteristics of **buyer-driven global commodity chains**. In such commodity chains, the larger supermarkets in developed countries specify the requirements for price, quality, delivery and food safety for the fresh food produced in developing countries (without owning farms or processing facilities in those countries), in order to guarantee year-round supply. With the increasing importance of supermarkets as a sales outlet for organic fruit and vegetables in developed countries, supermarkets will increasingly establish such commodity chains in international organic trade, as well. The generally high requirements for produce to be purchased by foreign supermarket chains can act as a barrier for some organic producers who are not able to meet such levels. However, this situation can provide considerable rewards and income guarantees for those organic producers who do meet the standards and can operate at the supply side of such chains.

CONCLUSIONS

1. One of the essential elements distinguishing organic farming from other forms of sustainable agriculture is the existence of production standards and certification procedures.
2. In the EU countries the production of organic products are developed according EC Regulation 834/2007.
3. In virtually all markets, organic consumers have a clear distrust of the authenticity of certified organic imports.
4. Organic sales through supermarkets are the fastest growing distribution channel in most markets.
5. In order to export successfully, good and reliable relations with an importer, trader or wholesaler in the target market are important

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*** http:/epp.eurostat.ec.europa.eu/portal/page/portal/agriculture/data/database

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*** www. Fao.org.

*** www.M.A.D.R. -agricultura ecologica. Acte legislative.

Consumer preferences on import and local fruit in Indonesia*

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ABSTRACT

Research Center for Agricultural Policy and Agribusiness (2009) revealed that the contribution of the total fruit of Brotu Domestic Product (GDP) of about 35449.46 billion (48.36%), only the last ten years decreased. On the other hand the demand of fruits in Indonesia has increased the increase over the last five years 10%. This is because the majority of Indonesia began promoting a healthy lifestyle by eating healthy foods like vegetables and fruits. Beside that, since the government policy on FDI *(Free Domestic Trade)* in 1998, then semakim many supermarkets in Indonesia and the more fruit imported into the Indonesian market.

The purpose of this study to know the description of the characteristics of respondents who consume imported and local fruits, how consumer preferences and attributes which are the most dominant of these local and imported fruit. The research was conducted in Bandung West Java Indonesia on the grounds that supermarket growth increased more than other cities in West Java and other provinces in Indonesia, excluding Jakarta (World Bank, 2007). Determination of the respondents conducted in this study is to use *sampling judgment. Judgement sampling* as many as 100 people. Data was analysis by Fishbein Model.

Result of this research revealed that the reasons to consume imported fruit because seeing other people buy (59%), looking for variations in fruit (24%), as a source of vitamins (14%), and favorite families (3%). Apples, oranges and mangoes locally preferred by consumers because of the habit of eating a local family (38%), a source of vitamins (17%), and are the fruit favorite family (45%). In looking at the attributes of apples, oranges and mangoes, oranges and mangoes have higher level of interest on the attributes than the apples. This is interpreted that in buying oranges and mangoes, many things are being consider by the consumers than buying apple. Consumer prefer buy import fruits than local fruits, because cheap price and attractive colour. For consumers not an issue of varieties of fruit, the more important factor is the price, color, usability and freshness. The suggestions are it is necessary to educate to the consumers that buying import fruits does not mean more prestigious, and it is necessary to adjust the quality and other things contained in fruit attributes which are tailored to the needs of consumers for increasing value added.

INTRODUCTION

Potential Indonesia horticulture vegetables and fruits have not been cultivated to the fullest. Actually fruit export from Indonesia had triumphed, the Research Center for Agricultural Policy and Agribusiness (2009) revealed that the contribution of the total fruit of Brotu Domestic Product (GDP) of about 35449.46 billion (48.36%), only the last ten years decreased. Decline in exports of these fruits of which caused rumors of excessive use of pesticides, poor service and lack of commitment to an importer in conducting payment transactions, so that farmers harmed exporters. In a national scale, the volume of horticultural exports of Indonesia in 2005 - 2010 gradually decreased, especially in 2007, with export value of 993.909 million pounds with a value of 153,176,000 U.S. dollars

On the other hand the demand of fruits in Indonesia has increased the increase over the last five years 10%. This is because the majority of Indonesia began promoting a healthy lifestyle by eating healthy foods like vegetables and fruits. Request fruits that increase show that fruits Indonesia prolefektif to be developed, but since the government policy on FDI *(Free Domestic Trade)* in 1998, then many supermarkets in Indonesia and the more fruit imported into the Indonesian market. In traditional and modern markets, often found also imported and local fruits such as apples, oranges and mangoes. Although the price of imported fruit is more expensive, but there is a tendency of consumers prefer local rather than imported fruit. The purpose of this study to know the description of the characteristics of

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respondents who consume imported and local fruits, how consumer preferences and attributes which are the most dominant of these local and imported fruit

MATERIALS AND METHODS

Materials

Consumer preference is defined as a choice like it or not by one's products or (goods and services) are consumed. Consumer preferences show preferences of consumers from a wide selection of existing products (Kohl, 2000). According to Tirmizi (2009), the product is a set of attributes that are real *(tangible)*and intangible *(intangible).* Meanwhile, according to Engel., *Et al* (2004), states that the product attributes include physical attributes and abtibut abstract. Physical attributes describe the characteristics of the product such as size, type, brand, color, packaging, price, taste, and others. While the abstract attributes describe the subjective characteristics of a product based on consumer perception, it agrees with Stores (Young, et all, 2004).

Based on the criteria of atrubute product, preferences of consumer can be seen in Figure 1.

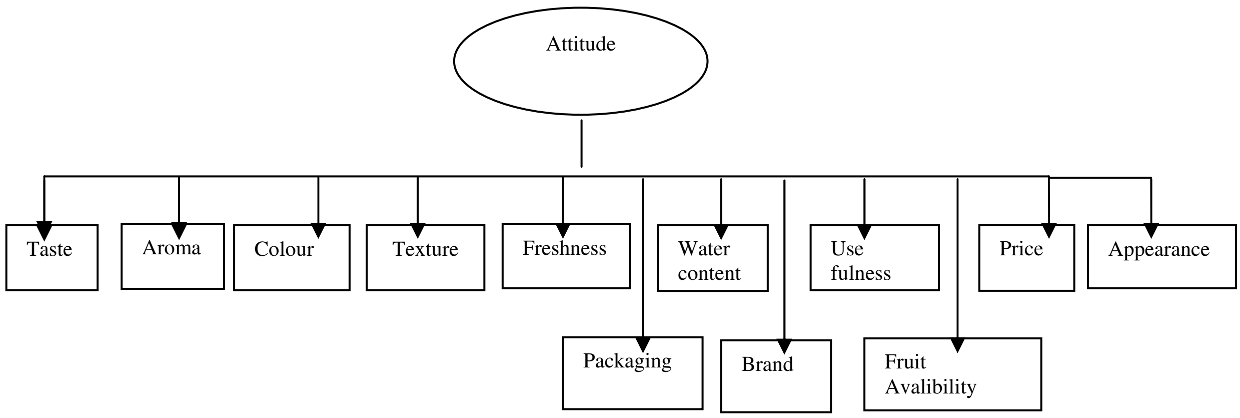

Fig. 1. Variable Indicator of Consumer Atttitude to Fruit Atribute

Methods

The research was conducted in Bandung West Java Indonesia on the grounds that supermaketnya growth increased more than other cities in West Java and other provinces in Indonesia (excluding Jakarta). Determination of the respondents conducted in this study is to use *sampling judgment. Judgement sampling* as many as 100 people. Data was analysis by Fishbein Model:

$$Ao = \sum_{i=1}^{n} biei$$

Where:

Ao = behavior toward the object

bi = level of confidence that the attribute of the object has attributes I

ei = evaluation to attribute I

n = number of attributes that the object owned

After local and imported fruit attributes are identified and then measurements were taken of ei and bi. Components ei and bi are measured using a Likert scale with a score of -2 to 2. Subsequently sought an average value of each attribute. The greater the average value obtained ei attribute indicates that the attribute is more important for respondents, as well as for bi greater average value obtained attribute indicates that attributes the better according to the respondents

$$Skala\ Interval = \frac{m - n}{b}$$

Where:
m = the highest value
n = the lowest value
b = group that will be formed

RESULTS AND DISCUSSIONS

Number of purchasing imported fruit in a month less than the local fruits, as well as apples, oranges and mangoes. The average within one month of purchase of imported fruit is less than 1 kilogram. It depends on your needs and if there are discounted rates, while for local fruit between 2-3 kilograms. Consumers who buy imported fruit generally has a characteristic number of family members between 1-2 people with incomes more than four million per month. While consumers of local fruit is not clearly segmented. Reasons to consume imported fruit because seeing other people buy (59%), looking for variations in fruit (24%), as a source of vitamins (14%), and favorite families (3%). Apples, oranges and mangoes locally preferred by consumers because of the habit of eating a local family (38%), a source of vitamins (17%), and are the fruit favorite family (45%).

The data needed to analyze consumer attitudes is the degree of importance of attributes (ei) and the level of trust attributes (bi). Attributes that will be assessed in this study is, taste, aroma, color, texture of the fruit (fiber), freshness, moisture content, usability, price, how the arrangement of fruit, packaging, brand and availability of fruit. The way the arrangement of fruit in this easy or absence of fruit arranged into a series of interesting pieces on the dining table or used as a parcel of fruit. Packaging in this regard is a view seen from the fruit rind, is the fruit may protect the fruit to stay fresh condition. Brands in this behalf and imported varieties of local apples, oranges imported and local, imported and local mangoes. The availability of the fruit is easily obtained when the fruit any time needed

Table 1

Interest Value (ei) of Attributes on Apples, Oranges and Mango

Atribute		Apple Orange Mango					
		ei	criteria	ei	criteria	ei	criteria
1	Taste	0,95	imp	1,43	Vimp	1,34	Vimp
2	Aroma	0,87	imp	1,23	Vimp	0,86	imp
3	Colour	0,50	imp	0,74	imp	0,22	netral
4	Texture	0,97	imp	1,08	imp	0,86	imp
5	Freshness	1,30	Vimp	1,37	imp	1,11	imp
6	Water content	0,83	imp	1,17	imp	0,76	imp
7	Usefulness	0,91	imp	0,63	imp	1,23	Vimp
8	Price	1,45	Vimp	1,35	imp	1,36	Vimp
9	Appearance	1,94	Vimp	1,21	imp	1,33	Vimp
10	Packaging	0,48	imp	0,15	netral	0,29	netral
11	Brand	0,17	netral	-0,43	n.imp	-0,82	n.imp
12	Fruit avaibility	0,75	imp	-0,69	n.imp	-0,77	n.imp

Note: imp = important; Vimp = very important; n.imp = not important

Consumers in choosing apple and mango fruits consider product attributes as shown in Table 1. There are three attributes that consumers considered important in buying apples: freshness, price and appearance (Kacen, 2002, Babin, 2001). This is because apples available in supermarket are often prepared for the parcel of fruits added with other fruits. Attribute of brand in apples is not so important; because there are many varieties apples provided in supermarket, from Malang, Fuji to Washington apples.

For consumers of orange fruit, the attributes of taste, scent, and color become important since it is usually different among the attributes of appearance and taste. Often consumers are disappointed in one that has attractive color and appearance, but it's not fress anymore. Orange fruits in Bandung supplied from Medan, North Sumatra (40%) and also from Pontianak, West Kalimantan (35%) and other provinces (25%). Distribution of oranges that took too long causes the fruits no longer fresh. The scent becomes important because orange flavor can eliminate fishy smell. The attribute of packaging for oranges is not important because generally it doesn't need package, except mandarin oranges packed in transparent plastic. Besides that, orange fruits are always available in modern and traditional market, makes it easy to get.

The most important attributes for consumers of mango are the taste, use, price and appearance. The taste of mango is a main attribute because each variety has its own typical taste. Mango is a seasonal fruit, unlike apples and oranges which are available all time, so it can be found in their season only. Usefulness of mango is also considered important because it can be used for various purposes such as juice, candied mango, and for garnish. Attribute of packaging is not so important since consumers are indifferent to the interests of this attribute, packaged or not packaged does not change the consumer preferences (Dittmar, 2000). The attribute of packaging is also considered to be insignificant to consumers of oranges. Brand become not important because they are familiar already with its varieties and understand about its characteristics. Similarly, the availability of mangoes become not important because their prices are more expensive than other fruits and its needs can also be replaced by other fruits.

To observe consumer behaviors on fruit purchasing, we need to look at the level of interests and also level of confidence (Erickson, 1994, Frykblom, 2000). Confidence level will be observed for both import and local fruits. The results revealed as in Table 2.

From observations of consumer confidence, the attribute of fruit texture on import apple is more reliable than local one, while import orange has color attribute more reliable. Field observations indicate that the color of import orange is more bright and attractive that local one. Attribute of import mango does not have special attributes of all as import mango is rarely with higher price around Rp. 65.000,- per kg (four times of the local mango).

The prices are more expensive because they are imported from Africa when Indonesia is not in their season. Indonesian Cengkir mango has a hard texture with sweet taste and color like Gedong Gincu mango. Import mangoes are only available in the fruit shop and in some supermarkets. These mangoes cannot compete with off-season mangoes that produced from Pemalang, Central Java. Although their production cannot fulfill the market demand, but they can substitute import mangoes with cheaper price around Rp. 30.000,- (double the price of season mango)

Table 2

Convidence Level of Attributes (bi) on Imports and Local Fruits

Attribute		Apple				Orange				Mango			
		Import		Local		Import		Local		Import		Local	
		bi		bi		bi		bi		bi		bi	
1	Taste	0,74	2	0,55	2	0,52	2	0,04	3	-0,18	3	0,43	2
2	Aroma	0,94	2	0,58	2	1,09	2	0,67	2	0.44	2	1,14	2
3	Colour	1,25	1	0,47	2	1,33	1	0,58	2	0,45	2	1,00	2
4	Texture	0,63	2	0,61	2	0,95	2	0,64	2	0,46	2	0,84	2
5	Freshness	0,94	2	0,71	2	0,98	2	0,72	2	0,56	2	0,58	2
6	Water content	0,87	2	0,54	2	1,00	2	0,81	2	0,47	2	0,84	2
7	Usefulness	0,78	2	0,76	2	0,82	2	0,73	2	0,50	2	0,89	2
8	Price	-0,02	3	0,52	2	0,28	3	0,54	2	0,07	3	0,51	2
9	Appearance	0,98	2	0,33	3	0,93	2	0,41	2	0,40	3	0,45	2
10	Packaging	1,08	2	0,27	3	1,09	2	0,24	3	0,69	2	0,35	3
11	Brand	1,02	2	0,17	3	1,14	2	0,28	3	0,66	2	0,39	3
12	Fruit avaibility	0,99	2	0,43	2	1,08	2	0,55	2	0,65	2	0,54	2

Note: 1 = very good; 2 = good; 3 = good enough

Consumer confidence to the attribute of local apples, oranges, and mangoes in average is good. The attributes of appearance, packaging, and brand for local apple is less reliable. It is based on the consumer experience that the color of import apple is more attractive than local one to arrange parcel of fruits. Packaging and brand for local apple is not so important because consumers are more concerned with the appearance and taste. Similarly for local oranges, where consumer do not rely in the appearance attribute of oranges. Often it looks nice but it has bad taste. Appearance, packaging and brand attributes of local mangoes can be perceived equally by consumers,. Overall, it can be concluded that consumers prefer import mango than local one because it looks more attractive locally and their brand is more prestige.

The results showed that import fruits for apples, oranges, and mangoes are superior to local fruits. If all three fruits are available in the supermarket, then consumers will prefer import apples than import oranges and mangoes, since the price is affordable. As for local fruits, there is no specificity of attributes, so they have the same opportunity to be chosen from. Local fruits purchased based on need, not because he want to try or prestige. Based on the level of interest and level of confidence on attributes of import fruits on apples, oranges and mangoes, we can obtain the value of attitude (Ao) of the fruits. The results of the calculation of the respondent behavior toward fruit attributed can be mapped into the interval line of category as shown in the following. Then obtained the value of attitude (Ao) of the fruit. Here are presented the results of the calculation of the respondents attitudes towards fruit attributes that are mapped into the interval line category

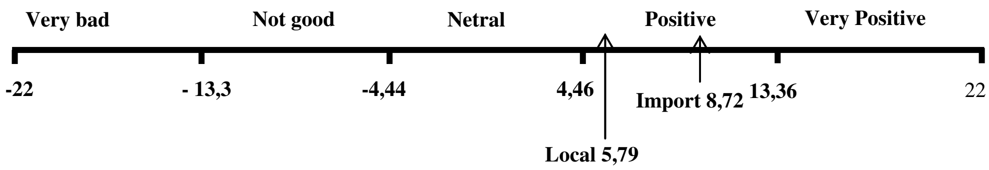

Fig. 2. Interval Line of Category on consumer behavior to import and local Apple

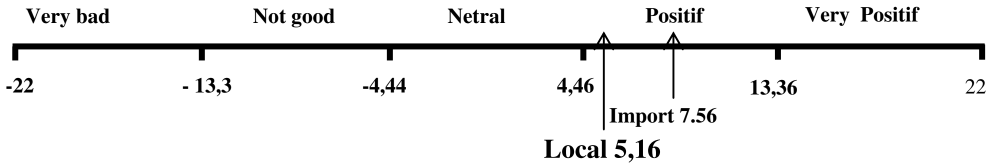

Fig. 3. Interval Line of Category on consumer behavior to import and local Oranges

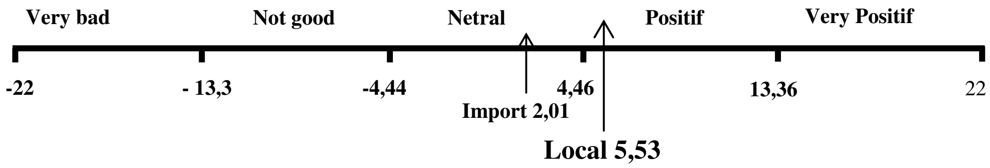

Fig. 4. Interval Line of Category on consumer behavior to import and local mangoes

CONCLUSIONS

1. In looking at the attributes of apples, oranges and mangoes, oranges and mangoes have higher level of interest on the attributes than the apples. This is interpreted that in buying oranges and mangoes, many things are being consider by the consumers than buying apple.
2. Field revealed that if all three pieces are available, consumers prefer oranges and mangoes rather than apples, because apples are perceived consumer has a sour taste.
3. Perceived price of imported apples are more expensive than local apples, but apple imports have uniqueness in terms of color so it is more interesting if it was created passel fruit or interest to set the dinner table.
4. For consumers not an issue of varieties of fruit, the more important factor is the price, color, usability and freshness.
5. Oranges and citrus imports locally perceived consumer does not show it differently, because consumer goods imports and orange citrus attributes locally are relatively similar, although generally when both pieces are available, consumers prefer imported oranges. According to consumer imports oranges have a sweet taste, freshness preserved but the price is cheaper than the local citrus.
6. Consumers see the attributes of the local mango is better than imports, this is because the mango imports have advantages in terms of fruit texture, while the local flavor and aroma of mango superior.

SUGGESTIONS

Usually consumers in buying import fruit because of the price factor, besides the price is cheap, the quality is also good, thus it is expected to have an integrated program from related Ministry so that the price in the consumer level will be cheap and with a good quality, but also the farmers are not harmed. In addition to increasing consumer awareness that local fruits are not inferior to imported fruit, it is necessary to educate to the consumers that buying import fruits does not mean more prestigious.

To increase the *value added* of local fruits, it is necessary to adjust the quality and other things contained in fruit attributes which are tailored to the needs of consumers. Just as when the local fruits are for local consumption in traditional markets, it is not necessary to consider the attributes that consumers want

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New Romanian nectarine and brugnone cultivars

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Keywords: *Prunus persica* var. *nucipersica*, assortment, quality of fruit, processing, can

ABSTRACT

The nectarine is the species with a good development under soils and climatically Romanian's conditions. The studies regarding its breeding and extension of new cultivars are achieved well. The objectives of nectarine and brugnone breeding were diversified as: quality of fruit, productivity of trees, ripening time, size, form, color, flavor, sugar, taste and so many others characteristics and traits. This paper presents these new nectarine cultivars, their biological performances and their future for extension in culture. All this varieties, like: 'Cora', 'Delta', 'Romamer 2', 'Costin', 'Marina', 'Creola', 'Liana', 'Valerica' and 'Anemona', having very good sensory indices, improving the Romanian assortment.

INTRODUCTION

Nectarine and brugnone derive from peach and they are natural variation of *Prunus persica* (Cepoiu, Manolache, 2006; Dumitru, 2003; Encycloperdia Britanica – Nectarine, 2004).

Brugnone is like pavie and both are recommended for processing (Dumitru and colab., 2005; Dumitru, 2007; Fideghelli, 2002). They have a very good taste and flavor, a ferm flesh and a big adherence of stone.

MATERIALS AND METHODS

The researchers selected the best genitors and made different combinations annually. So many hybrids and selections have been obtained at research Station for Fruit Growing Constanta, in the last years.

These hybrids and selections was observed from the phenological point of view; there were made physico-chemical analyses; biometrical measurements; appreciations on precocity, productivity, behavior to the attack of main diseases and parasites, etc.

Many competitions crop was organized in the last 30 years.

The planting density was 625 or 833 trees/ha, for standard trees and 2222 trees/ha for dwarf trees.

RESULTS AND DISCUSSIONS

Our Research Station is known for our early and middle nectarine cultivars and for the "sandwich"nectarine groupe.

Near 'Cora', 'Delta', 'Romamer 2' and 'Costin', wich have classical fruit (spherical or ovoidal one), were created and homologated new cultivars with flat fruit, like: 'Marina', 'Creola' and 'Liana'.

These cultivars have good quality of fruits and a high productivity (Table 1).

The brugnone cultivars 'Valerica'(semidwarf) and 'Anemona' (standard tree) are the most productive.

Their yield are 21.0 kg/tree (46.6 t/ha) and 30.5 kg/tree (25.5 t/ha), Table 1.

For us is very important the aspect and the quality of fruits, no so much their size. So, the fruits are spherical, ovoidal or flat; have nice colour (red or orange). The flesh is yellow (Cora, Delta, Romamer 2, Costin), orange (Marina, Creola, Valerica, Anemona), or white (Liana).

The pulp is juicy (Cora, Costin, Marina, Creola, and Liana), or ferm (Valerica and Anemona).

Fruit weigh is between 65.0 g (Creola) and 115.0 g (Costin), Table 2.

The dry matter is high: 'Valerica' (12.3%), 'Marina' (13.0%),'Creola'(13,5%) 'Costin' (14.3%), 'Liana' and 'Anemona' (14.5%).

The taste of flat cultivars (Marina, Creola and Liana) remembers the fig and honey one.

CONCLUSIONS

The studies show that the new nectarine and brugnone cultivars, obtained in the south-eastern of Romania, have good quality of fruits, high and constant productivity of trees, and enriched the actual assortment as for fresh consumption as for canneries (jam, nectar, compote, etc.)-too.

We recommend cultivating these nectarine and brugnone varieties which are very good for eat, and also have many therapeutically proprieties.

All these new cultivars will be used in the next stage of our breeding programmers.

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TABLES

Table 1. Ripening time and average yield (2009-2011), R.S.F.G. Constanta, Romania

Genotype	Group	Ripening time	Yield	
			kg/tree	t/ha*
Cora	extra-early nectarine	22.06-30.06	22.5	18.7
Delta	extra-early nectarine	25.06-03.07	24.0	20.0
Romamer 2	early nectarine	30.06-15.07	30.0	25.0
Costin	early medium	01.07-17.07	25.0	20.8
Marina	early medium with flat fruit	01.07-19.07	29.0	24.2
Creola	medium nectarine with flat fruit	07.07-25.07	28.0	19.2
Crimsongold (Control)	medium nectarine	07.07-22.07	22.0	18.3
Liana	medium with flat fruit	10.07-23.07	28.0	23.3
Valerica	medium brugnone, semidwarf	14.08-20.08	21.0	46.6
Anemona	medium-tardive brugnone	17.08-25.08	30.5	25.5

*The orchard density: 833 trees/ha for standard trees 2222 trees/ha for dwarf trees

Table 2. Quality test of fruit (2009-2011), R.S.F.G. Constanta, Romania

Genotype	Fruit appearance	Flesh quality	Destination of fruits	Fruit mean weigh (g)	Dry matter (%)	Acidity* (mg%)
Cora	sphaerical red-dark	yellow juicy	For fresh consumption	90.0	9.1	0.72
Delta	ovoidal, red	yellow juicy	fresh consumption	93.0	10.2	0.67
Romamer 2	ovoidal, red	yellow juicy	fresh consumption	100.0	9.5	0.75
Costin	spheric-ovoidal red	yellow juicy	fresh consumption and can	115.0	14.3	0.66
Marina	flat, orange	orange, juicy	fresh consumption and processing	83.0	13.0	0.93
Crimsongold (Control)	sphaerical, orange-red	yellow juicy	fresh consumption and can	105.0	12.2	0.73
Liana	flat, red-carmine	white, juicy and flavored	fresh consumption and processing	67.0	14.5	0.51
Valerica	ovoidal, orange 75% red colour	orange, ferm and flavored	for processing and fresh consumption	105.0	12.3	0.60
Anemona	spheric-ovoidal orange	orange, ferm flavoured	for processing and fresh consumption	110.0	14.5	0.39

*Acidity: mg malic acid/100 g flesh fruit

Punica granatum – decorative variety with perspective in parks and gardens

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Keywords: ornamental, shrubs, woody, characteristics, cuttings.

ABSTRACT

***Punica granatum* is a decidous shrub, originary from Central Asia, very decorative through their big, red or orange flowers, remarkable in the middle of the summer.**

During 2003-2009, the *Punica* genus was studied at Research Station for Fruit Growing Constanta.

The researches followed aspects regarding plant description, phenology, resistance to draught and low temperature as well as the multiplication of *Punica* by green cuttings in different substratum and period of growing.

***Punica granatum* is a perspective variety for Black Sea Coast green spaces, both to their remarkable ornamental aspect and long period of decor (80-90 zile). It is required shaltered places, sunny and periodically watering. The plants can be easy multiplied by cuttings using perlite as substratum.**

INTRODUCTION

Punica granatum is a deciduous shrub, original from Central Asia, very decorative through their big, red or orange flowers, remarkable in the middle of the summer. It has a very long decor (80-90 days).

The effect of the plant is relieved by planting as specimen shrub, in homogenous or combined mass or in free hedges.

MATERIALS AND METHODS

Punica granatum has been studied at Research Station for Fruit Growing Constanta between 2003-2009. The biological material used was represented by the shrubs from ornamental collection of the Research Station for Fruit Growing.

The plant description, phenology, resistance to draught and low temperature was noticed. The cuttings were taken from healthy and typical parent plants in June and July of each year of study. These were made from middle part of the shoots and had 2-3 internodes length. The cuttings were made in perlite and peat as substratum, both with light texture. Radistim 2 was used as stimulator of striking roots. The space used for studies was our greenhouse. During this period, the following works were carried out: weeding out, wetting and phyto-sanitary treatments. During summer temperature was more than 35°C in the greenhouse. This required cuttings shading and repeated leaf spraying.

RESULTS

Punica belong to *Punicaceae* family and it is a shrub with upright habit and branches are slightly or non-spiny. Long, narrow leaves, 3-8 cm, and glossy green and turning yellow in autumn. In July, the flowers are arranged at the end of previous year's vigorous branches, red or orange colored. Small fruit follow, but are sporadic and not very numerous.

As any deciduous shrub that flower on previous year's growth, *Punica granatum* need minimal pruning. These consist in removing of wayward or crossing shoots to maintain permanent, healthy frame in late spring when dormant. The plant is quite sensitive to low temperature and requires sheltered and sunny places, fertile soil and it is prefers to be well watered during the active vegetation.

The best percentages of rooted cuttings were obtained in perlite, in July (60%) and it was only 24% in peat, in June (table 1). The root-promoting growth regulator (Radistim 2) are helpful increasing the rooting percentage up to 33% in the both substratum.

CONCLUSIONS

Punica granatum shrubs are very decorative its and can be easy multiplied by green cuttings.

Although the plant is quite sensitive to frost during the years with very cold winters, *Punica* can be reestablishing by severe pruning.

Due to it spectacular flowers and long décor, *Punica granatum* doesn't has to miss from parks, summer gardens and green spaces.

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TABLE AND FIGURE

Table 1

Results regarding the striking roots at *Punica granatum*
Average data 2003-2009, Valu lui Traian

Period of harvest cuttings	Substratum	Variant	Average number of cuttings	Average number of striking roots	% of rooting
June	perlite	Control	120	39	33
June	perlite	Stimulator	120	45	38
June	peat	Control	120	29	24
June	peat	Stimulator	120	32	27
July	perlite	Control	120	60	50
July	perlite	Stimulator	120	72	60
July	peat	Control	120	51	43
July	peat	Stimulator	120	55	46

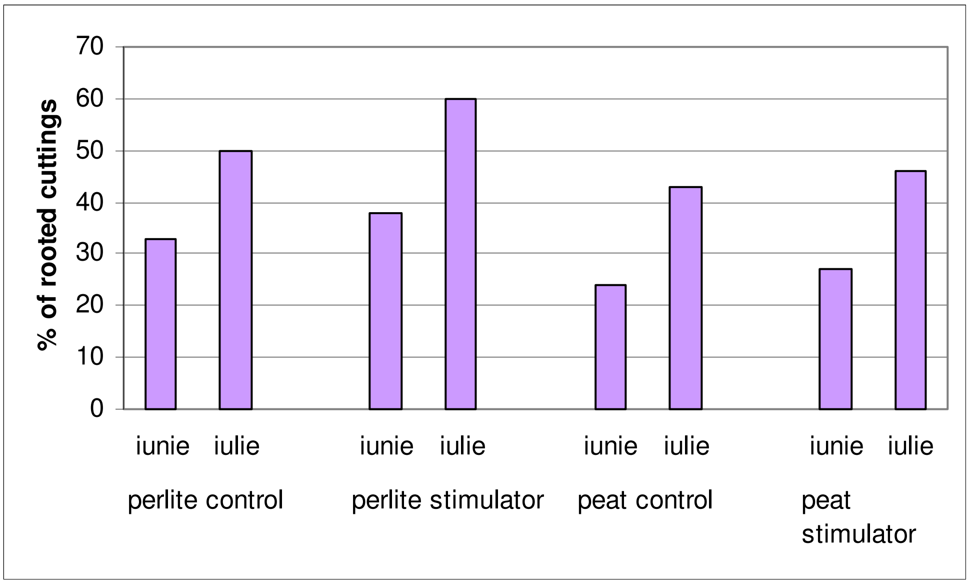

Fig. 1. The results of *Punica granatum* striking roots, average data 2003-2009, Valu lui Traian

Correlations between the biometric and the productive indicators for some apple tree varieties, as a result of differentiated pruning

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Keywords: apple tree, pruning, correlations, biometric indicators, productivity

ABSTRACT

The calculation of some correlations between the main biometric and productive indicators for some apple tree varieties, which differentiated pruning was applied to, highlighted the fact that the fruit production is not strictly dependent on a certain vegetative indicator (trunk section, annual growth, length of shoots etc.). The production per tree correlated only with the number of fruit buds. The indirect connection between the quantity and quality of fruit was also verified in the present experiment. The severe pruning of the trees stimulated the vegetative growth and negatively influenced the fructification.

INTRODUCTION

The pruning has been and will remain one of the most important technological links to maintain the equilibrium between growth and fructification, through which the relative constant fructification of the trees and quality fruit are ensured. The moment of intervention and the intensity of the pruning depend on a series of factors and still lead to discussions and opinions more of less in contradiction.

The pruning in detail, perhaps with managing the branches in order to obtain an early fructification, is expensive and hard to be accepted by the fruiters (Isac, 1992). The differentiated pruning per variety and even per tree, through standardization of the fruit and maintaining the trees in the space ensured by the planting distance, is the leading method applied nowadays (Cepoiu, 2003). Several researchers recommend certain values for a series of productivity indexes, computed as a ratio bet the biometric and productive parameters, indexes that allow a better comparison of the productive potential of the trees in orchards of different density (Sumedrea and Sumedrea, 2005; Căpraru, 2010; Hoza et al., 2011). Too severe pruning interventions can cause imbalances for the trees.

The present paper presents a series of correlations between the biometric and productive indicators, in order to establish the degree of dependence and the influence they have on the production.

MATERIALS AND METHODS

The experiment was conducted at the Research-Development for Fruit Growing Institute Piteşti, Mărăcineni, during 2005-2008, in an apple tree plantation founded in 1995, with a planting distance of 3.5/1 m and a density of 2777 trees/ha.

Four biological resistant apple varieties were used: Pionier, Prima, Generos and Florina, grafted on M9 rootstock. In order to observe the reaction of the trees to pruning, four pruning variants were used, as follows:

- V1 – shortening the semiscaffold by ½ of length;
- V2 - shortening the semiscaffold by ½ of length + shortening the annual branches by ½ of length;
- V3 - shortening the semiscaffold by 2/3 of length;
- V4 – shortening the semiscaffold by 2/3 of length + shortening the annual branches by 2/3 of length.

[*] Ph candidate

On the basis of the results obtained for the biometric and productive parameters, a series of correlations were made, in order to highlight the dependence between them and the degree on intervention on the trees.

RESULTS AND DISCUSSIONS

In the high density plantation, more sever pruning of the trees, in order to maintain the capacity to garnish at the base of the crown, determined a stronger growth of the trees, expressed through trunk thickness, length of the annual branches and sum of annual growths. Between variants, it was observed that, for the majority of varieties, the growths were strong for the variants with shortening the semiscaffold by 2/3 of length and the capacity to differentiate fruit buds and the production decreased. In order to observe the manner in which the biometric indicators correlate with the productive ones, a series of correlations were made, and the results were not typical for a plantation in which the intensity of the pruning was not the same for all trees. Thus, through differentiated pruning, a direct correlation between the area of transversal section of the trunk (TSA) and crown volume was obtained and the capitalization of the correlation coefficient, r = 0.32, shows a medium dependence between these two parameters (fig. 1).

If TSA correlated rather well with crown volume, the correlation with the sum of the annual growths was weak, the value of the correlation coefficient being only r = 0.12, which showed that the thickness of the trunk is not the important factors the determines the ramification capacity of growth of the shoots (fig. 2), the process being more complex and depends on more biological and technological factors.

The existence of a connection between thickness of the trunk and production was verified through the correlation between TSA and fruit buds, TSA and size of the fruit and TSA and production. The correlation coefficient did not have high values for none of these correlations; in fact, no direct connection was highlighted (fig. 3, 4, 5). For the first correlation, the value of the coefficient „r" was 0.0098, for the second 0.0084 and for the third 0.07.

The shortening of the annual branches determined large growths, which were negatively correlated with the production, as well known. Also in the present case two out of four variants had this type of interventions, which determined a decrease in the production and a negative correlation of the production both with the length of the shoots and with the sum of annual growths. The value of the correlation coefficient was 0.22 for the correlation production-growth of shoots, which showed a medium correlation, and 0.03 for the correlation production-sum of annual growths, which showed a weak correlation (fig. 6 şi 7).

The fruit production did not depend on crown volume. The value of the coefficient for this correlation was 0.086, showing a negative weak correlation, demonstrating that a tree does not have to be large to produce more (fig. 8).

The relation quality-quantity was confirmed by the correlation between the size of the fruit and fruit production, where a negative correlation and a value of the coefficient of 0.23 were obtained, which showed a medium dependence between the two parameters (fig. 9).

The only strong correlation was highlighted between the number of fruit buds and production, where the coefficient had the value 0.78 (fig. 10) and showed that, in order to have production, the bud differentiation must be stimulated.

CONCLUSIONS

After processing the primary data and correlations using the correlation coefficient, the following conclusions can be drawn: the growth and fructification are complex processes, influenced by many biological and technological factors, pruning being one of them; pruning determined the growth of the trees, between the transversal section area of the trunk and crown volume being observed a positive correlation; fruit production obviously depended on the number of fruit buds.

The vigor indicators: TSA, length of shoots and sum of annual growths, did not have a strong, direct influence on the production, the correlations being positive weak or very weak. Also in the present case the indirect connection between the size of the fruit and production per tree was verified.

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FIGURES

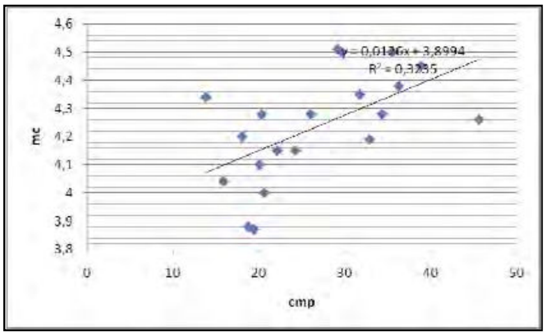

Fig. 1 Correlation between TSA and crown volume

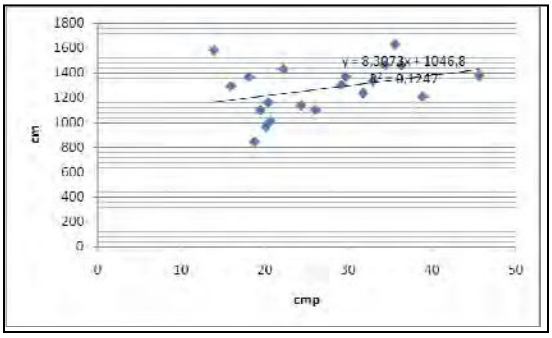

Fig. 2 Correlation between TSA and the sum of annual volume

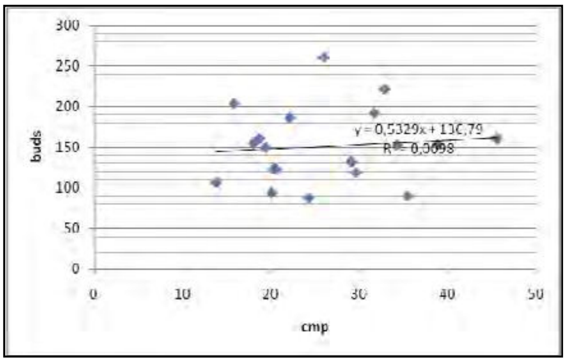

Fig. 3 Correlation between TSA and the number of fruit buds

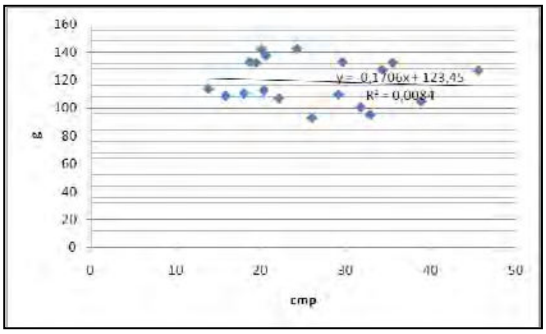

Fig. 4 Correlation between TSA and the average fruit weight

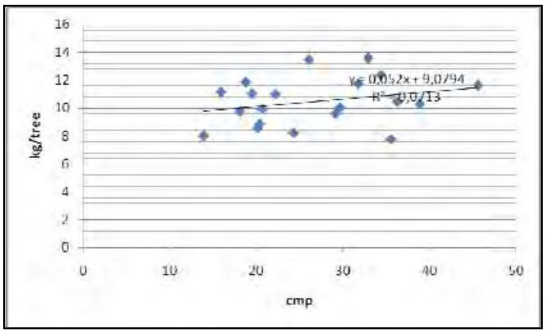

Fig. 5 Correlation between TSA and fruit production

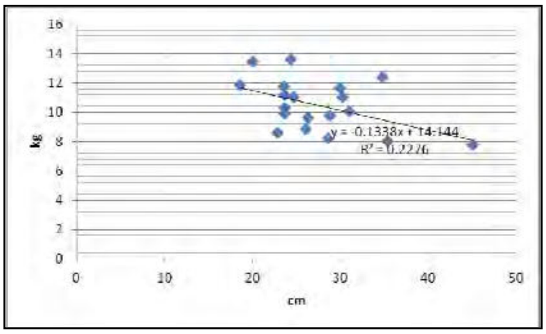

Fig. 6 Correlation between the growth of shoots and production

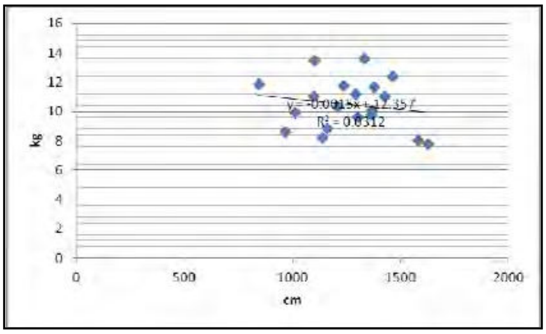

Fig. 7 Correlation between the sum of annual growths and production

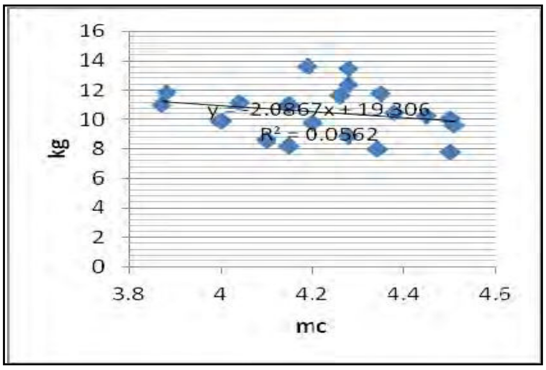

Fig. 8 Correlation between crown volume and production

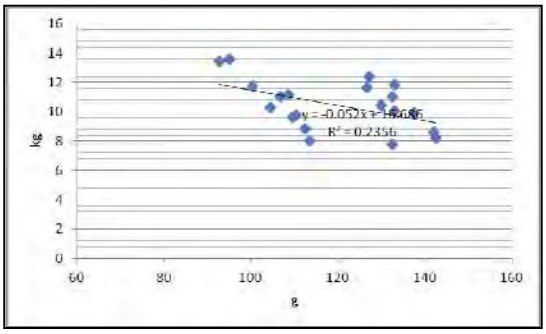

Fig. 9 Correlation between the average fruit weight and production

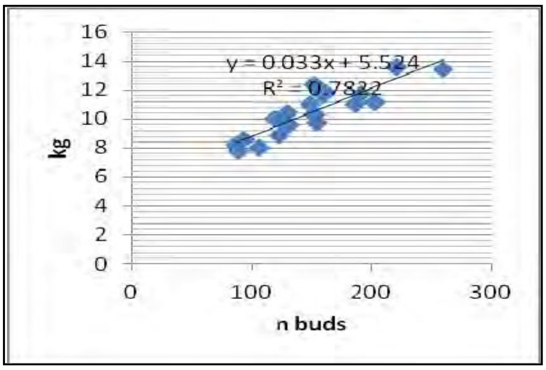

Fig. 10 Correlation between the number of fruit buds and production

Research on the behavior of some new, disease-resistant apple-tree varieties, cultivated in the environmental conditions of Voineşti area, Dâmboviţa County

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Keywords: variety, vigor, fructification type, growth potential, production, productive efficiency

ABSTRACT

The present research, developed on Voineşti Station for Research and Development of Tree-culture, was based on the study of 8 native or foreign apple-tree varieties with genetic resistance to diseases, in their 7th year of age, compared to 2 control varieties, sensible to diseases: *Jonathan* and *Golden Delicious*. *Redix, Iris, Remar, Inedit, Voinicel, Real* and *Irisem* varieties are the most recent creations of Voineşti Station for Research and Development of Tree-culture in the domain of disease-resistant apple-tree varieties and *Florina* is a well-known apple-tree variety, with genetic resistance to apple-scab and with partial resistance to powdery-mildew, created at INRA Angers, France, also known as *Querina*. The 8 apple-tree varieties were appreciated in order to determine the morpho-productive particularities, distinguished by their growth vigor, production potential, productive efficiency and their resistance to the main diseases. In order to establish the growth vigor we determined through measurements trunk diameter, tree height and crown diameter, also analyzing the fructification type. The production potential was determined by weighing the fruits obtained on a tree, for three consecutive years. By dividing the fruit production (kg/tree) to trunk's transversal section we calculated the productive efficiency index for each variety and the values were compared to those of the 2 control variants, Jonathan and Golden Delicious. It was also determined the resistance of the studied apple-tree varieties to the attack of the main pathogen agents –*Venturia inaequalis* and *Podosphaera leucotricha*- and the result for all the studied varieties was 0 attack of Venturia inaequalis and an improved resistance to Podosphaera leucotricha, with a minimal attack.

INTRODUCTION

Because of the multiple technological activities required to produce fruits at normal quality and quantity parameters, which damage the ecosystem, also generating high production costs, the studies and researches of the last years were directed on replacing the mechanical works in the tree culture with biological means of controlling the diseases, in order to increase the natural balance and decrease the technological activity (Hoza, 2005). The most rated requests are those concerning the creation and promotion of the apple-tree varieties with total resistance to apple-scab (Vf) and with partial resistance to powdery mildew, cultivated without pesticides or with a small number of treatments, 6-8 each year, in comparison to 12-14 treatments needed for the maintenance of the classic, disease-sensible varieties. As a result of the research 141 disease resistant apple-tree varieties were created in 17 countries until 2004 (Branişte, 2004)

An important progress concerning the creation of disease-resistant apple-tree varieties was also made in Romania, at Voineşti Station for Research and Development of Tree-culture, through the new created apple-tree varieties, immune to apple-scab and with increased resistance to powdery mildew.

MATERIALS AND METHODS

The present research was based on the study of 8 native or foreign apple-tree varieties with genetic resistance to diseases, in their 7th year of age, compared to 2 control (Ct) varieties, sensible to diseases: *Jonathan* and *Golden Delicious*.

The first 7 studied varieties*: Redix,Iris, Remar, Inedit, Voinicel, Real* and *Irisem* are the most recent creations of Voineşti Station for Research and Development of Tree-culture in the domain of disease-resistant apple-tree varieties and were obtained through irradiation of the pollen or seeds (from natural or artificial pollination) from *Prima* apple-tree variety. *Florina* is a well-known apple-tree variety, with genetic resistance to apple-scab and with partial resistance to powdery-mildew, created at INRA Angers, France, also known as *Querina*.

Depending on the evolution in culture of these disease-resistant apple-tree varieties, concerning their growing and fruit-bearing abilities, compared to the control varieties, the most valuable ones were appreciated, in order to multiply and promote them for the culture.

The morpho-productive characteristics of the studied apple-tree varieties were pointed out by their growth vigour, the production potential, the productive efficiency (calculated by dividing the fruit production of a tree to the area of the transversal section of the trunk) and their resistance to diseases: the apple-scab, caused by *Venturia inaequalis* and the powdery mildew, caused by *Podosphaera leucotricha*.

RESULTS AND DISCUSSIONS

1. The first analyzed parameter was *growth vigor*, genetically determined, which represents the most important factor in order to establish the cultivation technology (planting distances, rootstocks, crown shapes, pruning types). The vigor of the trees for the studied, disease-resistant apple-tree varieties is expressed by the volume of vegetative growth accumulated every year, through trunk dimensions, tree height, crown volume, determined by the vigor of the tree but, also, by the fertility of the soil, the planting distance, the unchanged factor being the rootstock

In the 7th year of age, when the growth potential was well-defined, the growth vigor indicated the fact that between the studied apple-tree varieties there are significant differences concerning the growth in width of the trunk, the height of the trees, crown diameter, tree vigor and fructification type (table 1). Therefore, trunk diameter of the disease-resistant apple-tree varieties had values between 22.7 cm for *Voinicel* variety and 37.6 cm for *Florina*, which is the most vigorous in comparison to the other studied varieties, for whom the trunk diameter was between 26.0 and 34.0 cm .

The statistical calculation of trunk diameter values for the studied apple-tree varieties revealed some differences between them. Therefore, compared to *Jonathan* variety, 1st control variety, the majority of the disease-resistant apple-tree varieties, excepting *Florina*, present smaller growth, with very significant negative differences: *Iris, Inedit, Voinicel, Real* and *Irisem*. Compared to *Golden delicious*, 2nd control, more vigourous compared to *Jonathan* variety, the same varieties as before plus *Remar* variety show very significant negative differences and *Redix* variety shows significant negative differences. *Florina* apple-tree variety shows very significant positive differences compared to Jonathan(Ct1) and significant positive differences compared to Golden Delicious(Ct2).

The tallest trees are those of *Florina, Redix, Remar* and *Real* varieties and smaller height present *Iris, Irisem, Voinicel* and *Inedit*. *Florina, Remar, Redix* and *Real* have large crowns while *Voinicel, Iris* and *Irisem* have a smaller crown volume. Excepting *Remar, Inedit* and *Voinicel*, with fructification on thorns (short branches), all the other varieties have fructification on short branches, as well as on long branches (thorns, twigs).

According to their growth potential, the studied disease-resistant apple-tree varieties, grafted on MM106 rootstock, can be classified into medium vigor varieties: *Florina, Redix, Remar, Real* and small vigor varieties: *Voinicel, Inedit, Irisem* and *Iris*.

Considering the vigor data and the observations on the field, when these varieties are grafted on MM106 rootstock, for the medium vigor varieties we recommend a distance of minimum 2.5 m between trees in a row. For the small vigor varieties, the distance between trees on a row can be reduced to 1.5-2 m. The distance of 4 m between rows is enough to ensure normal growth of the trees and enough space for vehicles trespassing and for the execution of the technological work, when the crown is flattened on the row's direction.

Therefore, the planting density values are as follows: for 4 x 2.5 m (1000 trees/ha); for 4 x 2 m (1250 trees/ha) and for 4 x 1.5 m (1666 trees/ha).

2. The annual registration of the *fruit production* for each variety indicates differences between them concerning the production levels (table 2.).

With an annual fructification and high yields were registered *Iris, Remar, Redix, Real* and *Inedit* varieties. Smaller yields were marked for *Voinicel, Irisem* and *Florina*.

The yield summed for the 3 years of production shows a better image of the real production potential and reveals the possibility of a correct analyze in comparison with the 2 control varieties.

The cumulative production for the period 2008-2010, between the 5th and the 7th year of age of the trees, grouped the studied apple-tree varieties into three categories. The first one is that of very productive varieties, *Iris, Remar, Redix*, with a cumulative production for 3 years of 99.9 – 105.5 kg/tree, exceeding Jonathan variety with 40.1 – 45.7 kg/tree and the positive difference to Golden delicious is 15.6 – 21.2 kg/tree. The second category contains the varieties with economical yields, which exceed Jonathan (Ct1) with 15.4 – 18.0 kg/tree and with smaller productions than Golden delicious (Ct2): *Real* and *Inedit*. The last category is that of less productive apple-tree varieties: *Voinicel, Irisem* and *Florina*, with a cumulative production of 44.1-52.9 kg/tree, with 6.9-15.7 kg/tree less than Jonathan (Ct1) and 31.4-40.2 kg/tree less than Golden delicious(Ct2).

3. *The productive efficiency* of the apple-tree varieties, pointed out by assigning the production per tree to cm^2 of trunk section is, in fact, the productivity index which, through its values, designates the productive apple-tree varieties.

The production on a tree divided to the area of trunk's section showed that there are apple-tree varieties with an efficient production and varieties dominated by the vegetative growth (Table 3.).

There was an efficient production registered for *Iris, Inedit, Voinicel, Real, Remar*, for whom the productive efficiency index had values between 0.30 and 0.53, exceeding both controls. For the other disease resistant apple-tree varieties, the productive efficiency index was between 0.13 kg fruits/cm^2 trunk section for *Florina* and 0.25 kg fruits/cm^2 trunk section for *Redix* variety.

4. About the *resistance to the main diseases*, the apple-scab and the powdery mildew, the research conducted on the 8 disease-resistant apple-tree varieties revealed the fact that all of them have a very good resistance to the apple-scab, even in the years with the best conditions for the attack (frequent rainfalls and high air humidity). They also showed an increased resistance to the powdery mildew (Table 4.).

Concerning the apple-scab, for all the studied apple-tree varieties, which contain the resistance gene Vf, both on the leaves and on the fruits we recorded a correct expression of the *Venturia floribunda 821* gene, which didn't allow the infection with the pathogen (attack degree = 0).

About the behavior of the studied resistant apple-tree varieties to the powdery mildew we can state that all of them showed an increased degree of resistance. The values of the attack degree are insignificant (0.7-11.5%), very small values compared to Jonathan variety, known as a standard for the sensitivity to the powdery mildew (10.2-30% when the treatments with pesticides were applied and 70% without any treatments for the whole period of the study).

It must be mentioned that, during the years with favorable conditions for the pathogens to develop, for the studied apple-tree varieties there are 2 necessary treatments with fungicides that must be applied each year. For the first treatment a copper based product has to be applied in order to stop the attack of *Erwinia amylovora* (although the attack was not stated until now). Before the last treatment we will use a contact fungicide to prevent the attack of *Gleosporium*, quite frequent in the rainy years, which decreases the commercial aspect of the apples.

CONCLUSIONS

The 7 new disease resistant apple-tree varieties, created at Voineşti Station for Research and Development of Tree-culture, along with Florina variety, already well-known, are valuable creations, for their resistance to the main diseases and also for their productivity and the quality of the fruits.

According to their growth potential, the studied disease-resistant apple-tree varieties, grafted on MM106 rootstock, can be classified into medium vigor varieties: *Florina, Redix, Remar, Real* and small vigor varieties: *Voinicel, Inedit, Irisem* and *Iris*.

Considering the vigor data and the observations on the field, when these varieties are grafted on MM106 rootstock we recommend a planting distance of 4 m between rows and 1.5-2.5 m between the trees in a row, according to the growth vigor of the trees.

With an annual fructification and high yields were registered *Iris, Remar, Redix, Real* and *Inedit* varieties. Smaller yields were marked for *Voinicel, Irisem* and *Florina*.

The productive efficiency of the studied apple-tree varieties showed that there was an efficient production registered for *Iris, Inedit, Voinicel, Real, Remar*.

All of the resistant apple-tree varieties had a very good resistance to the apple-scab, even in the years with the best conditions for the attack (frequent rainfalls and high air humidity). They also showed an increased resistance to the powdery mildew.

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TABLES

Table 1

The growth potential of some apple-tree varieties, grafted on MM106 rootstock, in the 7th year of age

No.	Variety	Trunk diameter			Tree dimensions(cm)		Tree vigor	Fructification type
		cm	Dif.± to Ct1	Dif. ± to Ct2	Tree height	Crown diameter		
1	Jonathan (Ct1)	34.2	-	-1.6º	385	250	medium	standard
2	Golden delicious (Ct2)	35.8	+1.6xx	-	386	210	medium	standard
3	Redix	34.0	-0.2	-1.8 º	390	215	medium	standard
4	Iris	29.3	-4.9 º	-6.5 º º º	315	180	medium	standard
5	Remar	33.1	-1.1	-2.7 º º º	380	220	small	standard
6	Inedit	26.0	-8.2 º º º	-9.8 º º º	330	190	medium	spur
7	Voinicel	22.7	-11.5 º º º	-13.1 º º º	320	160	small	spur
8	Real	30.3	-3.9 º º º	-5.5 º º º	350	210	medium	standard
9	Irisem	27.2	-7.0 º º º	-8.6 º º º	320	190	medium	standard
10	Florina	37.6	+3.4xxx	+1.8x	420	230	medium	standard

DL 5% = 1.32 cm; DL 1% = 1.81 cm; DL 0.1% = 2.47 cm.

Table 2

Fruit production, at tree-level, for the studied varieties, between 2008-2010

No.	Variety	Production obtained (kg/tree) in the year:			Cumulative production kg/tree 2008-2010	± Difference to	
		2008	2009	2010		Ct1	Ct2
1	Jonathan(Ct1)	16.5	24.6	18.7	59.8	-	-
2	Golden delicious(Ct2)	17.4	43.5	23.4	84.3	-	-
3	Redix	20.6	56.6	22.7	99.9	+40.1	+15.6
4	Iris	33.1	36.2	36.2	105.5	+45.7	+21.2
5	Remar	25.6	52.4	26.5	104.5	+44.7	+20.2
6	Inedit	19.9	29.8	25.5	75.2	+15.4	-9.1
7	Voinicel	17.0	16.3	17.0	50.3	-9.5	-34.0
8	Real	20.6	30.4	26.8	77.8	+18.0	-6.5
9	Irisem	14.6	25.2	13.1	52.9	-6.9	-31.4
10	Florina	12.1	16.4	15.6	44.1	-15.7	-40.2

Table 3

The productive efficiency of some disease-resistant apple-tree varieties in 2010

No.	Variety	Trunk section area (cm^2)	Fruit production (kg/tree)	Kg fruits/ cm^2 trunk section
1	Jonathan(Ct1)	92.92	18.7	0.20
2	Golden delicious(Ct2)	102.01	23.4	0.23
3	Redix	92.25	22.7	0.25
4	Iris	68.48	36.2	0.53
5	Remar	87.20	26.5	0.30
6	Inedit	53.82	25.5	0.47
7	Voinicel	41.02	17.0	0.41
8	Real	73.26	26.8	0.37
9	Irisem	58.88	13.1	0.22
10	Florina	112.66	14.7	0.13

Table 4

The reaction of the studied apple-tree varieties to *Venturia inaequalis* and *Podosphaera leucotricha* infection (2008-2010)

Nr.	Variety	Degree of pathogene attack (F%)	
		Venturia inaequalis	*Podosphaera leucotricha*
1	Jonathan (Ct 1)	2.1*	10.2-30.2**
		56.6**	70.0*
2	Golden delicious (Ct 2)	3.5*	0.0-0.10*
		70.2**	28.2**
3	Redix	0.0	0.7-1.6
4	Iris	0.0	0.6-1.6
5	Remar	0.0	1.1-1.3
6	Inedit	0.0	0.6-1.9
7	Voinicel	0.0	3.5-11.5
8	Real	0.0	1.7-6.5
9	Irisem	0.0	1.6-1.8
10	Florina	0.0	1.2-1.7

* when 14 pesticide treatments were applied
** without treatments

Study upon the impact of some soil maintenance systems upon apples' quality index of Pionier variety cultivated in conditions of the Didactic Station Timişoara

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Keywords: Pionier, apples, soil maintenance systems, quality

ABSTRACT

In this article we present some studies concerning the impact of some soil maintaining systems upon fruits' quality of Pionier variety cultivated in the western part of Romania, in the pedo-climatic conditions of the Didactic Station Timisoara. In this purpose, we tried soil maintenance in apple orchard in a less pollutant way, by using especially plants as green manure. There were established 8 experimental variants, as it follows: V1 – black field (2 manual hoeing + 2 mechanical hoeing) – control, V2 – seeding and incorporation in the soil with green manure (white clover), V3 – seeding and incorporation in the soil with green manure (bird's-foot trefoil), V4 – seeding with grass mixture 1 (2 manual hoeing), V5 - seeding with grass mixture 2 (2 manual hoeing), V6 - seeding with grass mixture + mulching, V7 - seeding with grass mixture + Roundup 360 SL (3 l/ha), V8 – mixed field, Roundup 360 SL (3 l/ha) + mechanical hoeing Experimentally. We determined the physical features of apples (big and small diameter, height, size index), dry substance and sugars content by refractometric method, acidity expressed in malic acid, total minerals, vitamin C content by spectrophotometry and microelements content (Fe, Mn, Zn, Cu) by atomic absorption spectrophotometry (AAS). In conclusion, the experimental variants in which we used green manure (*Lotus corniculatus* or *Trifolium repens*) had a higher content of sugars and minerals.

INTRODUCTION

Reducing the pollution degree of an orchard ecosystem by doing the chemical treatments at the optimum time, considering the prognosis and warning programs using the right substances, in the recommended doses, using a more ecological culture technology with positive effects upon the soil and fruit trees, as well as soil maintenance by efficient systems: grass sod between the rows, mulching on the fruit trees row and using a more reduced number of herbicides, or even reducing it by mechanical or agrotechnical control of weeds are some of the technological links, which were improved along time in order to increase the production and its quality (Cosmulescu Sina, 2005).

Fruits' quality, together with productivity, is an objective of high importance in Fruit Culture. This is a genetical feature strongly influenced by the climatic conditions and the culture technology. Primary metabolites' content is different for each species and variety and has values between certain limits. Over passing the high limit is permanently observed in fruit culture research. The quality parameters of production are completed with the morfo-pysiological features of fruits and for fresh consumption fruits these features highly determine their commercial value (Iordănescu Olimpia Alina, 2008).

MATERIALS AND METHODS

The researches were done in the didactic orchard of Fruit Culture department from the Faculty of Horticulture and Forestry, belonging to the Didactic Station Timişoara.

The biological material is Pionier apple tree variety, a variety which ripens in early September, is resistant to scab and powdery mildew, very productive, with low alternation of production, which usually overloads and as a consequence, the fruits remain small and low colored. Pionier apples are juicy, with a fine flavor and of a very good quality. The trees were grafted on MM106, the crown system being Palm Spindelbusch, while the trees were planted in 1997, at a distance of 4 m between the rows and 2 meters between the trees, being in full production.

By this research we proposed improving some technological links of apple culture in conditions of the western part of Romania and they belong to a Research project IDEI.

The experimental variants were: V1 – 2 manual hoes + 2 mechanical hoes – control variant, V2 - *Trifolium repens* on the interval, V3 – *Lotus corniculatus* on the interval, V4 - cover crops on the interval mixture 1 (2 manual hoes), V5 - cover crops on the interval mixture 2 (2 manual hoes), V6 - cover crops on the interval, mixed grass, and mulching, V7 - Roundup 360 SL (3 l/ha), cover crops on the interval, V8 - Roundup 360 SL (3 l/ha) + mechanical hoes on the interval.

Experimentally, there were determined the physical features of apples (big and small diameter, height, size index) and the chemical features (dry substance and the content of sugars by refractometric method, the acidity – g/l malic acid, minerals, the content of vitamin C by spectrophotometry), but also the microelements content of apples (Fe, Mn, Zn, Cu) by atomical absorption spectrophotometry (AAS) (Iordănescu Olimpia Alina, Micu Roxana Elena, 2010).

RESULTS AND DISCUSSIONS

The results obtained concerning the physical features of Pionier fruits in the two years of experiment are presented in tables 1 and 2.

Fruits' size is a very variable feature even for the same variety, considering trees' age, the climatic conditions and applied agrotechnique. Size elements are: big diameter (D), small diameter (d), height (H), all expressed in centimeters, and the size index (average value of the three elements D, d and H) (Mehinagic E. şi colab.,2004).

In 2008, the values did not vary within the variants, but we can remark that the biggest fruits were obtained in variants V_2 (*Trifolium repens* on the interval), V_4 (cover crops on the interval mixture 1+2 manual hoes) and V_7 (Roundup 360 SL (3 l/ha), cover crops on the interval), all having a size index of 7.66 (table 1).

In 2009, the size parameters had lower values than in the past year, although we can observe that the highest values of size index (7.30) were obtained in those variants where plants for green manure were used (variants 2 and 3) (table 2).

The results obtained concerning the chemical features of Jonathan apples in the two studied years are presented in tables 3 and 4.

Apples have a complex chemical composition, having a good effect for sick, convalescent and healthy persons (Drăgănescu E., 2006). Sugars rapidly go into blood circuit and remake liver's glycogen reserve. The alimentary and therapeutic effect of apples is given by vitamins C, A, B complex and by minerals. Apples are recommended in controlling different health problems, mainly hepatic, billiard, renal, blood and heart functions, rheumatism, insomnia and others. They are recommended for all persons, but mainly for children, elders, sick and convalescent persons (Drăgănescu E., 2006, Câmpeanu Gh. şi colab., 2009).

In general, in apples, the content of sugars varies between 7.59% and 16.40% for 100 g of fruit.

Out of table 3 we can see that in the climatic conditions of 2008 in Timisoara, the sugars content of Pionier apples varied between 10.89% for variant V_1 - 2 manual hoes + 2 mechanical hoes – control variant and V_8 - Roundup 360 SL (3 l/ha) + mechanical hoes on the interval and 11.53% in variant V_3 - *Lotus corniculatus* on the interval, all of the other variants having middle values.

The content of vitamin C in apples is normally of 1-47 mg/100g fresh fruit (mg %), while in our experiment the values varying between 7.40 mg/100 g fresh fruit in variant V_8 till 7.89 mg/100g fresh fruit in V_1 - 2 manual hoes + 2 mechanical hoes – control variant and in V_5 - cover crops on the interval mixture 2 (2 manual hoes).

In 2009, the content of sugars had lower values than in the past year due to the climatic conditions in the period of apples' growth and maturation. Concerning variants' impact upon sugars content in fruits, we observed that in those variants where plants for green manure were used there were registered the higher values (11.42 % in V_2 and 11.32% in V_3), while the lowest values were obtained in the apples of the control variant (V_1).

The content of vitamin C in 2009 was similar to the one obtained in 2008, the values varying between 7.12 mg/100 g fresh fruit in V_1 - 2 manual hoes + 2 mechanical hoes – control variant and 7.89 mg/100 g fresh fruit in V_6 - cover crops on the interval, mixed grass, and mulching on the tree row (table 4).

Results obtained concerning the metal content in Pionier apples in the two studied years are being presented in tables 5 and 6.

Microelements are very important in fruits, though they are hard to assimilate in the human organism. For these elements it is important that they do not overpass the highest limit established by Romanian Government Decision no. 189/2002.

Iron and copper have a good effect for human organism, in normal limits being part in the synthesis of red cells of blood. Iron is a nutritive element essential for living organisms, necessary for production of haemoglobin, mioglobin and some enzymes. Copper, cobalt, manganese and vitamin C are necessary for iron assimilation from vegetal products (fruits, vegetables, cereals), because this metal is indispensable for vitamin B complex metabolization. Zinc helps in stimulating the neural and muscular activity, but also in immunization. Zinc from vegetal proteins cannot be used by organism, such as zinc from animal proteins. Manganese acts like a coenzyme and easies many metabolic processes in the organism. It is involved in bone formation, thyroid function, forming connection tissues and it is involved in sexual hormones functions, absorption of calcium, a good content of sugars in blood, immunization system and metabolism of fats and carbohydrates (Lee Susan, 1990).

The content of Zinc and Copper in both years, for all the experimental variants was under the maximum admissible limit 5.0 mg/kg, limit determined for the ecological culture of apple trees (Government Decision no. 189/2002).

In 2008, Zinc had the lowest values in V_1 and in V_6, of 1.66 ppm. The highest content of Zinc was determined in the apples of variant V_4, of 3 ppm. Cooper's dynamic in fruits was different to the one of Zinc element, the highest value being observed in V_1, of 3.33 ppm, while the lowest value was observed in the control variant and V_4, of 1.83 ppm (table 5).

In 2009, for zinc V_5 - cover crops on the interval mixture 2 (2 manual hoes) had the lowest values (1.66 ppm), while variant 8, where we used herbicides, had the highest content of 2.83 ppm Zinc. Copper had the lowest value in variants 2 and 6 (1.83 ppm) and the highest value in variant 8 (3.33 ppm) (table 6).

The highest content of iron, in 2008, was obtained in the apples of V_8 (8.16 ppm), while the content of manganese reached the highest value in variant 7 (1.00 ppm). In 2009, the highest content of iron was determined in the apples of variant V_3 (8.33 ppm) and of manganese in the apples of variant V_2 (1.01 ppm).

CONCLUSIONS

The experimental variants where we used plants for green manure, such as *Lotus corniculatus*, gave higher quality fruits (a higher content of sugars and minerals, metals), than in variant 1, the control.

The content of microelements for all studied variants was under the maximum admissible limit for the ecological culture of apple trees

The use of plants for green manure, but also of some other soil maintaining systems in apple orchards is favorable for obtaining good quality fruits.

The use of recommended doses and reducing the number of treatments with herbicides in apple orchards have favorable effects for obtaining apples at the standards required by the European Community.

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TABLES

Table 1

Physical features of Pionier apples in 2008

Variant	Big diameter (cm)	Small diameter (cm)	Height (cm)	Size index
V_1 – 2 manual hoes + 2 mechanical hoes – control variant	8.1	7.8	6.8	7.56
V_2 – *Trifolium repens* on the interval	8.1	7.9	7.0	7.66
V_3 – *Lotus corniculatus* on the interval	8.0	7.8	6.9	7.56
V_4 – cover crops on the interval mixture 1 (2 manual hoes)	7.9	7.9	7.2	7.66
V_5 – cover crops on the interval mixture 2 (2 manual hoes)	7.9	7.6	7.2	7.56
V_6 – cover crops on the interval, mixed grass, and mulching	7.9	7.8	6.9	7.53
V_7 – Roundup 360 SL (3 l/ha), cover crops on the interval	8.3	8.1	6.6	7.66
V_8 – Roundup 360 SL (3 l/ha) + mechanical hoes on the interval	7.8	7.6	7.0	7.46

Table 2

Physical features of Pionier apples in 2009

Variant	Big diameter (cm)	Small diameter (cm)	Height (cm)	Size index
V_1 - 2 manual hoes + 2 mechanical hoes – control variant	7.4	7.1	5.9	6.80
V_2 - *Trifolium repens* on the interval	7.7	7.5	6.7	7.30
V_3 - *Lotus corniculatus* on the interval	7.6	7.5	6.8	7.30
V_4 - cover crops on the interval mixture 1 (2 manual hoes)	7.6	7.5	6.6	7.23
V_5 - cover crops on the interval mixture 2 (2 manual hoes)	7.7	7.4	6.7	7.27
V_6 - cover crops on the interval, mixed grass, and mulching	7.7	7.4	6.0	7.03
V_7 - Roundup 360 SL (3 l/ha), cover crops on the interval	7.2	7.0	5.7	6.63
V_8 - Roundup 360 SL (3 l/ha) + mechanical hoes on the interval	7.2	7.1	6.3	6.87

Table 3

The chemical features of Pionier apples in 2008

Variant	Minerals (%)	Vitamin C (mg/100 g fruit)	Dry substance (%)	Sugar (%)	Acidity (g/l malic acid)
V_1 - 2 manual hoes + 2 mechanical hoes – control variant	0.13	7.89	12.6	10.89	0.198
V_2 - *Trifolium repens* on the interval	0.16	7.67	13.0	11.31	0.143
V_3 - *Lotus corniculatus* on the interval	0.19	7.79	13.2	11.53	0.143
V_4 - cover crops on the interval mixture 1 (2 manual hoes)	0.21	7.51	12.8	11.10	0.232
V_5 - cover crops on the interval mixture 2 (2 manual hoes)	0.14	7.89	12.8	11.10	0.244
V_6 - cover crops on the interval, mixed grass, and mulching	0.17	7.56	13.1	11.42	0.141
V_7 - Roundup 360 SL (3 l/ha), cover crops on the interval	0.17	7.51	12.9	11.21	0.195
V_8 - Roundup 360 SL (3 l/ha) + mechanical hoes on the interval	0.15	7.40	12.6	10.89	0.193

Table 4

The chemical features of Pionier apples in 2009

Variant	Minerals (%)	Vitamin C (mg/100 g fruit)	Dry substance (%)	Sugar (%)	Acidity (g/l malic acid)
V_1 - 2 manual hoes + 2 mechanical hoes – control variant	0.12	7.12	11.9	10.15	0.201
V_2 - *Trifolium repens* on the interval	0.19	7.40	13.1	11.42	0.182
V_3 - *Lotus corniculatus* on the interval	0.21	7.37	13.0	11.32	0.161
V_4 - cover crops on the interval mixture 1 (2 manual hoes)	0.16	7.24	12.7	11.00	0.142
V_5 - cover crops on the interval mixture 2 (2 manual hoes)	0.13	7.21	12.4	10.68	0.173
V_6 - cover crops on the interval, mixed grass, and mulching	0.17	7.89	12.9	11.21	0.177
V_7 - Roundup 360 SL (3 l/ha), cover crops on the interval	0.19	7.28	12.2	10.47	0.182
V_8 - Roundup 360 SL (3 l/ha) + mechanical hoes on the interval	0.18	7.37	12.3	10.57	0.173

Table 5

Metals content in Pionier apples in 2008

Variant	Fe ppm	Mn ppm	Zn ppm	Cu ppm
V_1- 2 manual hoes + 2 mechanical hoes – control variant	6.00	0.73	1.66	3.33
V_2 - *Trifolium repens* on the interval	6.33	0.91	1.83	2.50
V_3 - *Lotus corniculatus* on the interval	5.33	0.85	2.50	2.83
V_4 - cover crops on the interval mixture 1 (2 manual hoes)	7.50	0.88	3.00	1.83
V_5 - cover crops on the interval mixture 2 (2 manual hoes)	6.83	0.71	2.16	2.66
V_6 - cover crops on the interval, mixed grass, and mulching	7.00	0.86	1.66	2.33
V_7 - Roundup 360 SL (3 l/ha), cover crops on the interval	7.83	1.00	2.83	3.16
V_8 - Roundup 360 SL (3 l/ha) + mechanical hoes on the interval	8.16	0.81	2.00	2.16

Table 6

Metals content in Pionier apples in 2009

Variant	Fe ppm	Mn ppm	Zn ppm	Cu ppm
V_1 - 2 manual hoes + 2 mechanical hoes – control variant	8.16	0.98	2.66	2.33
V_2 - *Trifolium repens* on the interval	7.00	1.01	2.50	1.83
V_3 - *Lotus corniculatus* on the interval	8.33	0.85	3.16	2.83
V_4 - cover crops on the interval mixture 1 (2 manual hoes)	7.83	0.85	2.50	3.16
V_5 - cover crops on the interval mixture 2 (2 manual hoes)	7.50	0.83	1.66	2.66
V_6 - cover crops on the interval, mixed grass, and mulching	8.16	0.73	2.16	1.83
V_7 - Roundup 360 SL (3 l/ha), cover crops on the interval	6.83	1.00	2.50	3.22
V_8 - Roundup 360 SL (3 l/ha) + mechanical hoes on the interval	7.00	0.81	2.83	3.33

Theoretical aspects on estimate the geometrical shape changing of apples during storage

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ABSTRACT

The value and quality of fruit are reduced both through injury by crushing the pulp tissue as well as strains and deviations from the characteristic geometric shape of the fruit. Major cause of production of the two forms (types) of mechanical defects in apples is static compression as they are subject to packaging (containers) due to the weight of the upper ranks, during periods of storage - warehousing - transport. The static compressive forces were evaluated, producing either cruses of the tissue of the fruit, or geometric shape changing characteristic, based on the application in a first approximation of the theory of Hertz bodies with convex surfaces, with applications to apples (apple - apple, apple - rigid flat surface).On this basis has developed a methodology for determination – evaluating pack height (container) for storage - warehousing, provided that the fruit in the bottom of the pack does not suffer mechanical defects.

INTRODUCTION

Apple production percentage of total fruit production in Romania is 60%, of which 60 – 80% is consumed fresh, large quantities being stored for medium and long periods of time (3 – 8 months) (Căsăndroiu et al., 2011).

During the storage may occur injuries of the fruits, due to the stress of compression of the fruits from the lower ranks of the packaging used. The quality of the fruits is affected by the injuries which are produced when the stresses exceed the elastic limit of the fruit flesh, reaching the strength breaking of these (Căsăndroiu et al., 2011).

Due to the injuries like: bruiseing of tissue, the appearance of internal cracks, chaps (tearing) of tissue, deformation - modification of specific geometric shape (deformations remaining visible) , the fruit quality is greatly diminished.

Visible residual deformations, by changing specific geometric shape, contribute to increased losses of quality, leading to reduced commercial value of the apples (Căsăndroiu et al., 2009; Căsăndroiu et al., 1994).

Therefore the total losses of fruits after harvest can reach 30% of production, and during storage, the losses can exceed sometimes 10 - 12% (Căsăndroiu et al., 2011).

Injuries from the apples produced during the storage period are caused by the superficial injuries previously produced under the epicarp which spread through apples pulp and of injuries caused by the application of constant compressive forces determined by the weight of the fruits from the superior layers upon the fruits from the lower layers, creating a force-deformation relationship characterizing the rheological behavior of the creep, (Căsăndroiu et al., 2009; Căsăndroiu et al., 2011). In this case the size of package has an important role (particularly the available storage height) and it must not exceed certain limits. Exciding those limits can produce certain damages to the inferior fruits layers which affects the quality and the class of the apples (Căsăndroiu et al., 2009; Căsăndroiu et al., 1994; Căsăndroiu et al., 2009; Căsăndroiu et al., 2011).

Based on this information the right recommendations can be given in order to choose the appropriate design and packaging method according to the category of fruits, the degree of ripeness, the duration and conditions of storage (Masoudi et al., 2008).

Appropriate mathematical models have been developed to describe these correlations, as close as possible to the real conditions in order help predict, for certain condition, the mechanical injuries caused by storage in certain packages, or imposing the maximum permitted level of defects or injuries related to deviations from the geometrical shape in order to choose and to design the appropriate packaging (Căsăndroiu et al., 2009; Căsăndroiu et al., 1994; Căsăndroiu et al., 2009; Lu and Tipper, 2009; Masoudi et al., 2008).

The researches were initially based on fundamental theoretical about homogeneous and isotropic bodies with ideal elastic or viscous-elastic behavior (Abbott and Lu, 1996; Căsăndroiu et al., 2009; Căsăndroiu et al., 1994), then thoroughly developed accordingly to the parenchymatous structure of the apple tissues in order to correct and adjust the mathematical models to be as close as possible to the real conditions (Abbott and Lu, 1996; Branişte and Militaru, 2005).

Being considered biologic materials, the fruits do not react to tensions (stress) in a purely elastic manner. Their reaction combines an elastic and viscoelastic behavior (purely elastic responses do not depend of time stress action, but the viscoelastic responses are dependent on the time), (Andrei et al., 1994, Căsăndroiu et al., 2011).

From numerous researches developed so far, whose results are synthesized in various papers, we can conclude that the behavior of the apples at different mechanical stress can be represented by the behavior of the linear viscoelastic bodies described by the rheological Burgers model made by elastic and viscoelastic elements, who are generally linear and nonlinear, (Amir et al., 2008).

Modern research methods regarding the utilization of the finite element method in the analysis of the mechanical contact between apples and regarding the modeling of the apples response to static loads using images technique for reproducing the spatial distribution of the cells mechanically affected by considering the maximum crushing stress level (Bollen et al., 1999; Căsăndroiu et al., 2011).

This paper presents some theoretical aspects regarding the evaluation of pulp tissue stress apples to contact at compression deviations from the geometrical shape and strength of pressure that produces a distortion imposed on the apples assumption of elastic behavior.

These data were made assessment of leight storage containers (not allowed to appear injury of fruit in the bottom of the pack.).

THEORETICAL CONSIDERATIONS

In the fresh fruit packing in containers or boxes for various palette handling, transport or storage or for temporary storage during a large period of time, they come into contact with each other or with walls of pack and supports various loads of pressure relative constant, due to own mass and depending on the position row, that is on the height of the pack, the most requested is the fruit of the bottom pack (Căsăndroiu et al., 2009).

It requires that the height of the pack to be limited provided that the fruit of the last row should not be injured by mechanical damage cells in pulp tissue contact points or defects not related to head deviations from geometric shape as a result of strains due to the phenomenon of remnant deformation due creep phenomenon of material viscoelastic proprieties (Mohsenin, 1986; Yang, 1966).

For small deformation of fresh fruit pulp tissue to limit point bioyield (characterized by the emergence of the first cell crushing) this behavior can be considered elastic, being valid to Hook theory (Căsăndroiu et al., 1994; Mohsenin, 1986; Shahabasi et al., 1995; Henry et al., 2000).

Also, although in reality the material pulp fruit (apples) are scratchy (anhomogeneous) and anisotropic properties (Abbott and Lu, 1996; Gao and Pitt,1991; Gherghi,et al.,1979) is considered a fruit pulp that is homogeneous and isotropic.

In the latter sense will present theoretical considerations, (Mohsenin, 1986; Shahabasi et al., 1995), on the stress and strains in the contact points of the fruit.

Based on the theory of Hertz to a contact of elastic homogeneous and isotropic bodies, (Mohsenin, 1986; Shahabasi et al., 1995), with the consideration of 6 hypotheses (Mohsenin,

1986) for the contact of two bodies with spherical convex surface near the contact point (Mohsenin, 1986), we can write:

$$r=\left(\frac{3}{8}\frac{FA}{\frac{1}{d_1}+\frac{1}{d_2}}\right)^{1/3} (1)\ ;\ \sigma_{\max}=\frac{3}{2}\frac{F}{\pi r^2} (2);\ \alpha=\frac{k}{2}\left[\frac{36}{\pi^2}F^2A^2\left(\frac{1}{d_1}+\frac{1}{d_2}\right)\right]^{1/3} (3);\ A=\frac{1-\upsilon_1^2}{E_1}+\frac{1-\upsilon_2^2}{E_2} \quad (4)$$

k=1,3514 (Mohsenin, 1986) (5)

Notation for (1)-(4) eq. are: **r** - radius of circular area of contact between bodies; σ_{max} – the maximum normal stress in the center of contact area; α -the near of the bodies center (equal to the sum of the maximum strains); F-force of pressure (compression), d_1, d_2 - spherical calotte diameters (1 and 2 are indices which refers to the two bodies), E_1, E_2 - Young modules of elasticity; υ_1, υ_2 -Poisson coefficients.

Taking into account (1) after calculations of eq. (2) becomes: $\sigma_{\max}=0{,}918\left[\frac{F}{A^2}\left(\frac{1}{d_1}+\frac{1}{d_2}\right)^2\right]^{1/3}$ (6)

Eq.(1) - (6) are general and can be customized for different particulary cases.

It will be considered a particularly case apple/apple fruit with the same spherical diameter ($d_1=d_2=d$), with the same properties ($E_1=E_2=E$, $\upsilon_1=\upsilon_2=\upsilon$) when $A=\frac{2(1-\upsilon^2)}{E}$, eq. (6) will become: $\sigma_{\max}=0{,}918\left[\frac{E^2}{(1-\upsilon^2)^2}\frac{F}{d^2}\right]^{1/3}$ (7)

a. The contact case of two fruits

Note maximum deformation with δ of a fruit can then α = 2δ, and taking into account the k value from eq. (3) is obtained: $\delta=1{,}04\left[\frac{F^2}{d}\frac{(1-\upsilon^2)^2}{E^2}\right]^{1/3}$ (8)

In the same context, the radius *r* of circular contact area from eq. (1) becomes :

$$r=0{,}721\left(Fd\frac{1-\upsilon^2}{E}\right)^{1/3} (9)$$

b. The contact case of fruit with a plate surface.

In this particular case $E_2 >> E_1$ and thus $\frac{1-\upsilon_1^2}{E_1}\rangle\rangle\frac{1-\upsilon_2^2}{E_2}$, and the eq. (4) becomes $A\approx\frac{1-\upsilon_1^2}{E_1}$

For the calculation of the radius r of circular contact, in eq. (1) is taken into account that $d_2 \rightarrow \infty$ and we obtain: $r=\left(\frac{3}{8}Fd\frac{1-\upsilon^2}{E}\right)^{1/3}=0{,}721\left(Fd\frac{1-\upsilon^2}{E}\right)^{1/3}$ (10)

Replacing the expression (10) of the r in eq. (2) we found: $\sigma_{\max}=0{,}918\left[\frac{E^2}{(1-\upsilon^2)^2}\frac{F}{d^2}\right]^{1/3}$ (11)

For calculation the maximum deformation δ of the fruit, we consider, besides the previous conditions, that in this case, α is the near of center of fruit and is even the deformation δ, in other words δ = α and substituting in eq. (3) is obtained (for the value of k from (5):

$$\delta=1{,}04\left[\frac{F^2}{d}\frac{(1-\upsilon^2)^2}{E^2}\right]^{1/3} (12)$$

Analyzing pairs of equations (7) and (11); (8) and (12);(9) and (10) is found that they have identical terms respectively, which means that at the same force pressure, contact stress

(σ_{max}), deformation (δ) and the radius of circular contact surface (r) have the same values in the two examined situations (a) and (b), situations in which is found the fruits of the last row of the bottom container (boxes) packaging. These eq. (7) - (12) allow us to evaluate the forces F pressing of the fruit from the line at the bottom of the pack, from the condition of limiting, either the voltage contact or deformation of δ, to not produce defects which can reduce the quality value and on this basis to assess the rational height of the packaging (container),from the consideration of elastic behavior of the fruit.

CONSIDERATION AND METHODS

Limiting height of the pack fresh fruit corresponds to maximum compressive force admitted which is exerted on fruit from the bottom row of the pack to avoid the appearance the mechanical injury either in the form of bruise these tissue pulp, either pulp tissue contusion, or the distortion form of geometrical shape (the grade of distortion). Therefore it is necessary to assess the maximum allowable compression force . Can be broach two method.

a. The way which corresponds to theories of resistance of maximum normal stress or maximum stress shearing

According to these theories, (Căsăndroiu et al.,2009) an body is found on limit of load if into a point of his the normal stress or stress shearing achieve value for simple loads compression, respectively shearing.

Using eq. (7) or eq. (11) which can be put in a convenient form, it can evaluate the maximum allowable compression. Thus is obtained: $F = 1{,}293\frac{\left(1-\upsilon^2\right)^2}{E^2} d^2 \sigma_{max}^3$ (13)

Take into account that in the elastic bodies which are subjected to compression appear stress shearing too, and in elastic contact case Hertz, for $\upsilon = 0.3$, they have a maximum value at a depth of approx. 0.5r from the contact point, namely : $\tau_{max} = 0{,}27\sigma_{max}$ (14)

Replacing in the eq. (13) we found: $F = 65{,}69\frac{\left(1-\upsilon^2\right)^2}{E^2} d^2 \tau_{max}^3$ (15)

From eq. (13) respectively (15) is obtained the maximum compressive forces allowable F_a.

b. Method true to maximum deformation δ allowable from condition geometric shape distortion

According to this way, is introduced the concept distortion index of geometric shape (β) defined by the ratio: $\beta = \frac{\delta}{d}$ (16)

Using Eq. (8) or (12) and taking into account (16), we finds expression for evaluating the force F of compression respectively: $F = 0{,}943\beta^{3/2} d^2 \frac{E}{1-\upsilon^2}$ (17)

In eq. (17) is replaced by the β distortion index admitted determined experimentally, which can be considered $\beta_a = 0{,}015$ for the permanent strains of Jonathan apples in storage during larges times (> 3 months), (Căsăndroiu et al., 2011).

It evaluated the maximum compression forces corresponding to the two ways presented using experimental data from one adequate and one from the relations (13) or (15), respectively (17), choosing the lowest value obtained, to determined the maximum allowable height of the pack.

To estimate the maximum allowable height of the container ware made calculations based on the theory of Hertz to a contact of elastic homogeneous and isotropic bodies, (Abbott and Lu, 1996; Milică and Bărbat, 1977).

Will adopt a scheme based on experimental and theoretical considerations of (Mohsenin, 1986; Nelson and Mohsenin, 1968; Ross and Isaacs, 1961; Shahabasi et al., 1995). According to this scheme is considered the spherical fruit with diameter d which is placed in the container, after a model of rhombic organization. Accordingly to this scheme we have arranged fruit represented like in fig. 2.a, (Mohsenin, 1986; Nelson and Mohsenin, 1968; Ross and Isaacs, 1961).

In Fig. 2.b must be considered in accordance with rhombic arrangement of apples which are with spherical diameter d in the volume of the container, 4 forces F_{i-1} exerted by apples from the bottom row (i -1) to an apple from the (i) raw and 4 forces F_i exerted by apples from the law raw, all these forces with the same angle of inclination θ of the scheme (a) from Figure 2.

From the equation of the vertical projection corresponding to the state of equilibrium, it results: $4F_i \sin\theta = 4F_{i-1}\sin\theta + G$ (18)

This relationship can be arranged in the form: $F_i = \frac{G}{4\sin\theta} + F_{i-1}$ (19)

In particularly eq. (19) for all the rows starting from the first raw until to the penultimate noted with (n-1) from the bottom of the container and the added member with member and taking into account that $F_0 = 0$, is obtained: $F_{n-1} = \frac{(n-1)G}{4\sin\theta}$ (20)

For the apples on the last raw noted with (n), the force of pressing on the bottom of the container F_{vn} , from the equation of equilibrium protection of vertical for scheme of forces in Fig. 2 c is: $F_{vn} = G+4\,F_{n-1}\sin\theta$ (21)

Taking into account the equation (20), substituting in (21) is obtained: $F_{vn} = nG$ (22)

It is noted that the maximum pressure forces due to their own fruit weight in the container which are submitted fruits of the last row of the bottom, considering spherical fruit with the same diameter and for the location corresponding to the rhombic organization are given by equation (20) for the contact apple/apple and by equation (22) for the contact of the apple with a plate of bottom of the container. These forces depend on the weight of a fruit and by the number of rows fruit, caused by the height of the container and their size, should be limited to not produce mechanical injury (bruise of the pulp tissue or distortion of the fruit surface.

θ angle (fig.2) is determined from the expression in two ways of the number N per unit volume (1 m^3)

Appropriate to how we arranged after rhombic model of apples with spherical diameter d (m) the number N of fruit volume (1 m3) is given by (Căsăndroiu et al., 1994; Milică and Bărbat, 1977): $N = \frac{1}{4d^3\cos^2\theta\sin\theta}$ (23)

If the fruits have a medium density ρ (kg/m^3), then the weight of a fruit is:

$G = \frac{\pi d^3}{6}\rho g$ (24)

Considering the fraction of the gaps between the fruit container ε, which is expressed through the known relationship, (Mohsenin, 1986): $\varepsilon = 1 - \frac{\rho_v}{\rho}$ (25)

where ρ_v (kg/m^3), is the density of fruit in stacks (bulk density).

The number N of fruit per unit volume (1 m^3), taking into account the relationship (25), is given by the equation: $N = \frac{6\rho}{\pi d^3\rho} = \frac{6(1-\varepsilon)}{\pi d^3}$ (26)

From the equation (23) and equation (26), after the calculations we obtain the equation: $\sin^3\theta - \sin\theta + \frac{\pi}{24(1-\varepsilon)} = 0$ (27)

And, also, we obtain the angle θ.

Using equation (20) or equation (22) where G is calculated from the eq. (22) after the evaluation of forces F_{n-1} or F_{vn} we evaluate the number n of rows of fruit admitted.

In this case, we can express the length Lθ on the axis direction (fig. 2): $L_\theta = nd$ (28)

It can value the H maximum allowable depth (height) of the container, fig.2:

$$H = L_\theta \sin\theta = nd \sin\theta \qquad (29)$$

In this way, the methodology presented can value the maximum allowable height of the container for packaging fruit in storage or in temporary storage during a long period of time.

APPLICATION OF NUMERICAL CALCULATION

We consider the case of fresh Jonathan apples with the following characteristics, values used in the literature in this field and in our research, namely: d=64,2 mm, G=1,31 N, $E=3x10^6P_a$ (Căsăndroiu et al., 2011; Masoudi et al.,2008); υ =0,35 (Căsăndroiu et al.,2011; Masoudi et al., 2008); $\sigma_c=0{,}34*10^6P_a$ (Căsăndroiu et al., 2011); ε=0,39, (Căsăndroiu et al., 2011); β=0,015 (Căsăndroiu et al., 2011). With these data from equation (13) is obtained:

$$F = 1{,}293\frac{\left(1-0{,}35^2\right)^2}{\left(3\cdot 10^6\right)^2}(0{,}0642)^2\left(0{,}34\cdot 10^6\right)^3 = 17{,}21N$$

When using equation (17) is obtained: $F = 0{,}943(0{,}015)^{3/2}(0{,}0642)^2\frac{3\cdot 10^6}{1-0{,}35^2}$=24,4 N

Further, for F is considered the smallest value to be F=17,21N.

Using equation (27), after replacement, we finds: $\sin^3\theta - \sin\theta + 0{,}21459 = 0$ (30)

By solving equation (30) is obtained: $\sin\theta = 0{,}8675$ and $\sin\theta = 60{,}17^0$

From equation (20) for F_{n-1}=F=17,21N result $n = \frac{4F_{n-1}\sin\theta}{G} + 1 = \frac{4\cdot 17{,}21\sin\left(60{,}17^0\right)}{1{,}31} + 1 = 46{,}58$ rows

Using eq. (22) in which F_{vn} =F = 19,21 N, is find $n = \frac{F_{vn}}{G} = \frac{17{,}21}{1{,}31} = 13{,}13$ rows

It is considered the lowest value of n, n = 13 to ensure the condition to avoid injury of fruit.

For these values n =13, d = 64,2mm and θ = 60.17^0 replaced in equation (29) maximum allowable height of the container, , H = 13 x 64,2sin ($60{,}17^0$) = 724,01 mm, a lower value than the real.

In agricultural practice, in harvesting apples are using containers with height H =900mm (Căsăndroiu et al., 2009).

CONCLUSIONS

During the storage fruits, from the bottom rows of these packages are submitted to static compressive forces, due to fruit weight from the upper ranks, which determine the major cause of possible producers of mechanical injury, such as damage by crushing of the fruit pulp tissue or strains and deviations from the characteristic geometric shape in the surface of fruit (Căsăndroiu et al., 2011).

Were evaluated the maximum static compression forces allowable, which produces either contortion of fruit pulp tissue [equation (13) and (15)] or distortion surface [equation (17)], based on the application in a first approximation of general theory tensions of Hertz elastic contact of bodies with convex surfaces, with applications to apples (apple and apple-apple and apple-rigid flat surface).

On this basis has developed a methodology for determining-evaluation of the maximum allowable height of the packaging for storage-warehousing , provided that the fruit in the bottom of the pack does not suffer mechanical injury.

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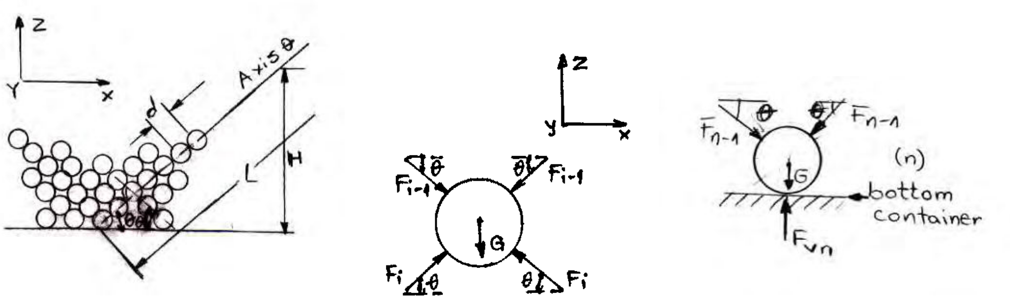
FIGURES

a) b)

Fig.1. Elastic contact for two convex bodies, sphere on sphere (a), sphere on flat plate (b)



a) **b)** **c)**

Fig.2. The arrangement of apples in rows corresponding spherical model rhombic arrangement (a); scheme of forces acting on an apple in the row (rows are numbered starting on the surface of the containers) (b), scheme of forces acting on an apple on the last raw (c)

Experimental aspects regarding the geometrical shape changing of apples during storage

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ABSTRACT

After storage, the quality of apples is reduced due to deformations and deviations from their geometric shape, a major cause of these mechanical defects produce a being faced by static compression in the lower ranks due to the weight of packaging in the upper ranks. For the evaluation (prediction) of the package height, so that the apples that are placed on the bottom do not undergo changes of the characteristic geometrical shape, was necessary to achieve adequate equipment to perform measurements to determine the compressive strength of packed apples. With apparatus designed the static compressive forces were evaluated, producing either cruses of the tissue of the fruit, or geometric shape changing characteristic, based on the application in a first approximation of the theory of Hertz bodies with convex surfaces, with applications to apples (apple - apple, apple - rigid flat surface).

Experiments will be performed by a methodology of determination – assessment of the height of the package (containers), developed for keeping-storage (provided that the fruit on the bottom of the pack would not suffer mechanical failure).

INTRODUCTION

The economic conditions in the last yers have required the use of bulk transport and the storage of the agricultural products in containers. The material in these situations can be subjected to excessive pressure that leads to internal and external defects of the deformation of the products characteristic shape, cracks, internal bruising and other defects that may affect the quality and class of the material (Căsăndroiu et. al., 2011).

Being considered biologic materials, the fruits do not react to tensions (stress) in a purely elastic manner. Their reaction combines an elastic and viscoelastic behavior (purely elastic responses do not depend of time stress action, but the viscoelastic responses are dependent on the time), (Andrei et al., 1994, Căsăndroiu et al., 2011).

During the storage the apples undergo a long-term static stress. Maximum allowable load study, so that the apples at the bottom of the pack would not suffer changes in shape, must be done considering the time and temperature during storage (Căsăndroiu et. al., 2011).

The method for determining these maximum allowable loads must be accurate but simple enough to allow testing of sufficiently large samples.

The goals of testing the constant static stress on apples were to determine:

- the maximum allowable load to constant dead load
- important mechanical features of apples and their effects on bruises
- the investigation of the effect of temperature on resistance to bruising.

Firmness is one of the most important quality factors of the apple growing (Amir et al., 2008). It is a simple method for determining physiological characteristics of the apple. So far no standard method has been introduced to determine the firmness of the texture. The methods and devices used (textometer, loading device Effegi and Magnes-Taylor) were based on the force required for a rod to break into a fruit texture. This is the main index for firmness assessment (Amir et al., 2008; Bollen et al., 1999).

Creep test is an indicator of visco-elasticity who decides the quality of textur.

To estimate the maximum allowable height of the container so the bottom of apples does not undergo changes in geometric shape was necessary to perform some especial apparatus.

These devices must allow the possibility of measuring the strains at different time intervals. Also they must reproduce the stress that occurs on fruit in containers during storage.

THEORETICAL ASPECTS

From a theoretical point of view, the subject was detailed in the article: „*Theoretical aspects on estimate the geometrical shape changing of apples during storage*” In synthesis, will be presented some useful mathematical patterns in the applications for the evaluation of the height of storage containers so that the deformation of fruit on the bottom of containers does not exceed certain limits that can prejudice the marketing quality of the fruits.

For small deformation of fresh fruit pulp tissue to limit point bioyield (characterized by the emergence of the first cell crushing) this behavior can be considered elastic, being valid to Hook theory (Căsăndroiu et al., 1994; Mohsenin, 1986; Shahabasi et al.,1995; Henry et al., 2000).

Also, although in reality the material pulp fruit (apples) are scratchy (anhomogeneous) and anisotropic properties (Abbott and Lu, 1996; Gao and Pitt, 1991; Gherghi, et al.,1979) is considered a fruit pulp that is homogeneous and isotropic.

In the latter sense will present theoretical considerations, (Mohsenin, 1986; Shahabasi et al., 1995), on the stress and strains in the contact points of the fruit.

The calculations used, were developed based on the Hertz theory of elastic contact of homogeneous and isotropic bodies (Mohsenin, 1986, Shahabasi et al., 1995) for two particular situations encountered in packing apples in containers: two spherical bodies in contact (a) and spherical body in contact with a rigid flat surface (b). These are:

- for calculation the maximum normal stress in the center of contact area:

$$\sigma_{\max} = 0{,}918\left[\frac{E^2}{\left(1-\upsilon^2\right)^2}\frac{F}{d^2}\right]^{1/3} \text{(a)}$$

$$\sigma_{\max} = 0{,}918\left[\frac{E^2}{\left(1-\upsilon^2\right)^2}\frac{F}{d^2}\right]^{1/3} \text{(b)}$$

- for calculation the maximum deformation of the fruit:

$$\delta = 1{,}04\left[\frac{F^2}{d}\frac{\left(1-\upsilon^2\right)^2}{E^2}\right]^{1/3} \text{(a)}$$

$$\delta = 1{,}04\left[\frac{F^2}{d}\frac{\left(1-\upsilon^2\right)^2}{E^2}\right]^{1/3} \text{(b)}$$

- for calculation the radius of circular contact:

$$r = 0{,}721\left(Fd\frac{1-\upsilon^2}{E}\right)^{1/3} \text{(a)}$$

$$r = \left(\frac{3}{8}Fd\frac{1-\upsilon^2}{E}\right)^{1/3} = 0{,}721\left(Fd\frac{1-\upsilon^2}{E}\right)^{1/3} \text{(b)}$$

were:
σ_{max} – the maximum normal stress in the center of contact area;
α -the near of the bodies center (equal to the sum of the maximum strains);
F-force of pressure (compression), d- spherical calotte diameters;
E - Young modules of elasticity;
υ -Poisson coefficients.

Analyzing pairs of equations is found that they have identical terms respectively, which means that at the same force pressure, contact stress (σ_{max}), deformation (δ) and the radius of circular contact surface (r) have the same values in the two examined situations (a) and (b), situations in which is found the fruits of the last row of the bottom container (boxes) packaging.

These equations allow us to evaluate the forces F pressing of the fruit from the line at the bottom of the pack, from the condition of limiting, either the voltage contact or deformation of δ, to not produce defects which can reduce the quality value and on this basis to assess the rational height of the packaging (container), from the consideration of elastic behavior of the fruit.

To determine the maximum allowable height of the container is used the relationship:

$$H = L_{\theta} \sin\theta = nd \sin\theta$$

were : θ – angle between the apples on rhombic organization model; L_{θ} – apples length axis θ.

MATERIALS, METHODS AND EQUIPMENTS

In order to conduct the creep tests and determine the relaxation of the elasticity modulus and the time of relaxation at static compression of apples (Amir et al., 2008; Ross and Isaacs, 1961), a simple creep apparatus was designed and made (Fig. 1.a). In Figure 1.b and 1.c are presented the views of the device ready to make measurements. In accordance with the testing, the apple is subjected to static compression by pressing, with a constant load, or a rigid plane surface Figure 1.c, or another half–apple Figure 1.b and the deformation is measured on a dial gauge, at different moments in time.

For experiments three varieties of apples: Jonathan, Golden Delicious and Idared are using.

With the help of sphero-meter the radiuses R_1 and R_2 are determined in two perpendicular planes, in the contact point of the apple with the rigid plane surface.

Before each test the geometric dimensions of apples were measured with a digital caliper, with an accuracy of 0,02 mm.

The experiments were performed in two variants according to Figure 1b and Figure 1c.

Apple is cut off in an axial plane using a sharp knife with rigid blade and one half was placed on the fixed flat surface of the device. The superior turntable was loaded with the loading mass corresponding to a constant pressure force of: 12,5 N; 15 N; 17,5 N; 20N.. The rigid board was brought into contact with the apple surface and was released the turntable rod to achieve compression application.

Deformation δ(t) was measured at different moments of time, measured in seconds, at the beginning of the application at first every 15 seconds for 10 readings, every 30 seconds for 5 readings, every minute for 5 readings, every 5 minutes for 5 readings, every 10 minutes for 5 readings and every 15 minutes for 5 readings, which necessitated a total period of 2,5 hours for each experiment consisting in 35 readings.

In each point the elastic modulus E was calculated using the Equation (3) or (4) and with the values obtained the Equation (5) of the relaxation modulus E(t) was researched and tested.

$$E(t) = 0{,}531 \frac{F(1-\upsilon^2)}{\delta(t)^{3/2}} \cdot \left(\frac{1}{R_1} + \frac{1}{R_1^{'}}\right)^{1/2} \tag{3}$$

$$E(t) = 1{,}498 \frac{F(1-\upsilon^2)}{\delta(t)^{3/2}} \cdot \left(\frac{1}{R_1} + \frac{1}{R_1^{'}}\right)^{1/2} \tag{4}$$

where: F - constant load force E(t) - Young's modulus of elasticity of the convex body during the creep test on loading; R_1, $R_1^{'}$ – radius of convex body surface at the point of contact in the normal planes of section; υ – Poisson's ratio of convex visco-elastic body; d – diameter of the rigid spherical surface; δ - deformation of convex bodies in elastic contact

The relaxation E(t) modulus equation for the Maxwell model as part of Burgersmodel, (Fridley and Adrian, 1966) namely: $E(t) = E_e + E_d e^{-\frac{t}{T_r}}$ (5)
where:
E_e - the equilibrium module (E(t) for $t \to \infty$);
E_d - the mitigation module (E_d=E(0)-E_e);
T_r – relaxation time (T_r= η/E_d; η is the viscosity of the viscous element from the Maxwell model);
t – time since the beginning of creep test.

Several requirements had be considered in developing the dead load tests (fig.2 and fig.3). The first, which of achieving a simple but accurate measuring device, which was manipulated easily without disturbing the test, was achieved by mounting an ordinary dial gauge on a special fixture. The gauge was then free to swing in a circle, while undergoing no unwanted vertical displacement (Mohsenin, 1986; Nelson and Mohsenin, 1968).

Another requirement was to have a stable system, so that there would be no motion of the weights or sample during the test.

This led to the use of an arrangement of three fruits of the same approximate diameter at the corners of an equilateral triangle, each impaled on a small nail affixed to the base of the testing shelf. A light-weight plywood plate was placed over this triangle and loaded by three equal weights, one over each fruit. The arithmetic average deformation of the three apples was then measured directly from the centre of the fruit triangle (Mohsenin, 1986; Nelson and Mohsenin, 1968)

Weights of 850, 1000, 1250, 1500, 1850 and 2250 g were used. Nine fruits were subjected to each load, using a total of 54 fruits. Six triangles were arranged around each central shaft, so that their centres lay along the circle described by the dial gauge plunger.
The apples were arranged in groups of three having nearly the same diameter to insure a level base for the weights. The apples were then marked with consecutive numbers.

The plate was then set on the fruit triangles and the initial dial gauge reading was recorded for each triangle. The loads were then carefully placed on each triangle and the apparatus was left undisturbed (Nelson and Mohsenin, 1968).

At the end of the test the loads were removed and the dial gauge readings again recorded. The static tests were then performed and the apples were put back into cold storage. After the bruises had been given time to develop, a wedge was cut from the bruised area with a sharp knife and the bruise depth and diameter were measured (Nelson and Mohsenin, 1968).

Firmness is a simple method for determination of some physiological characteristics of apple. However, so far no standard method has been introduced to determine the texture firmness (Amir et al., 2008).

Afkari Sayyah reported that the creep test is an indicator of visco-elasticity which can determine the quality of texture (Amir et al., 2008).

CONCLUSIONS

During the storage fruits, from the bottom rows of these packages are submitted to static compressive forces, due to fruit weight from the upper ranks, which determine the major cause of possible producers of mechanical injury, such as damage by crushing of the fruit pulp tissue or strains and deviations from the characteristic geometric shape in the surface of fruit (Fridley and Adrian, 1966).

Were evaluated the maximum static compression forces allowable, which produces either contortion of fruit pulp tissue, based on the application in a first approximation of general theory tensions of Hertz elastic contact of bodies with convex surfaces, with applications to apples (apple and apple-apple and apple-rigid flat surface).

Based on the theoretical investigations and studied has developed a methodology for determining-evaluation of the maximum allowable height of the packaging for storage-warehousing , provided that the fruit in the bottom of the pack does not suffer mechanical injury and have developed two devices that measurements.

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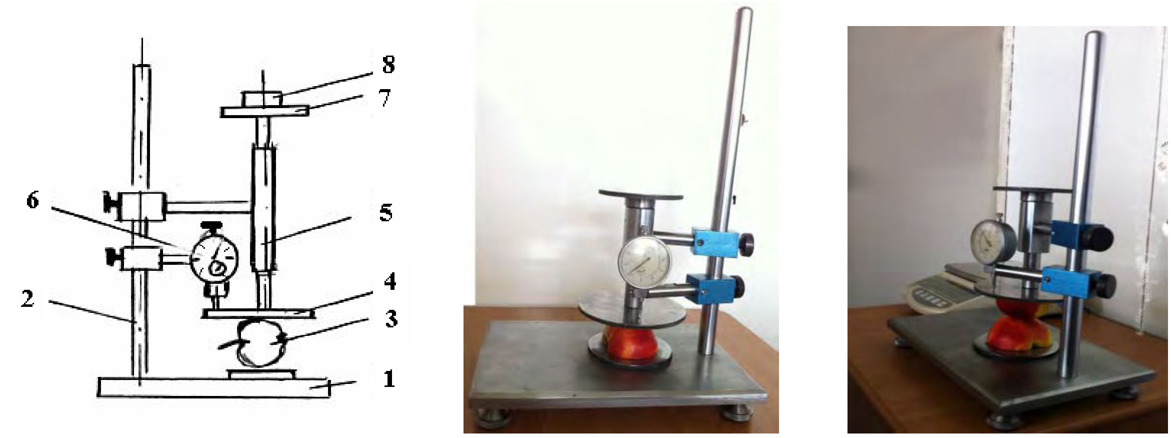
FIGURES



a) b) c)

Fig. 1. Creep apparatus: 1 - device frame; 2 - support; 3 - apple;
4 - compression rigid surface; 5 - guide; 6 - dial gauge; 7 - plane; 8 - constant load.

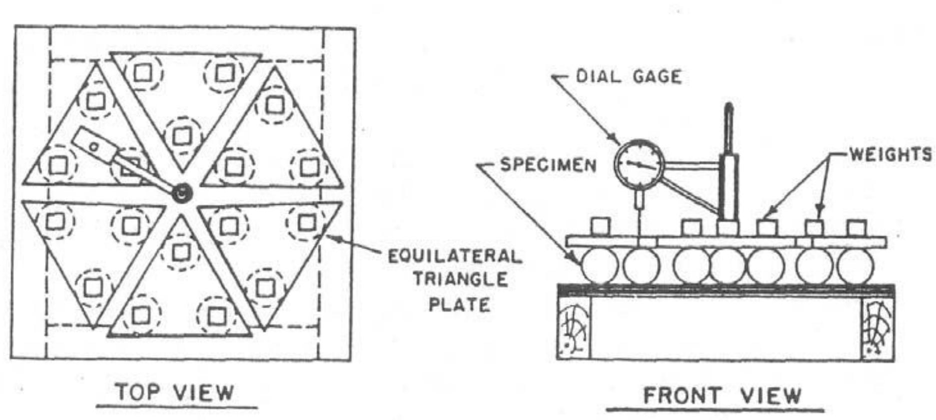


Fig. 2. Apparatus for measuring distortion of fruits under dead load
(Mohsenin, 1986, Nelson and Mohsenin, 1968)

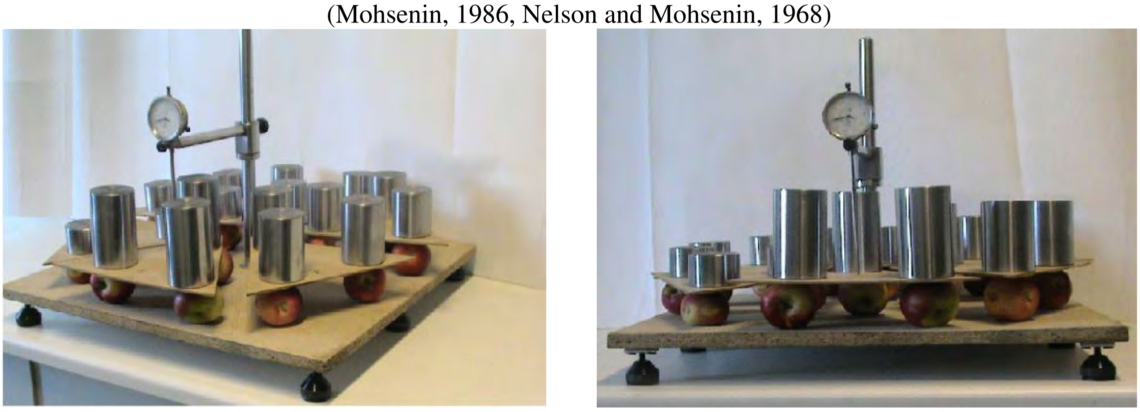


Fig. 3. Dead load testing apparatus

The dynamics of dry matter accumulation in leaves and shoots of peach trees (*Prunus persica L.*) cultivated in modern systems of planting on reddish preluvosol from the Romanian Plain

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Keywords: training system, dry matter content, peach varieties, Tatura Trellis

ABSTRACT

The peach is probably the third species of fruit trees cultivated in the world after apple tree and orange tree. Because it is a perishable fruit it cannot be kept fresh for long time, therefore, in an orchard, it is necessary to cultivate more varieties with different ripening periods to ensure a gradual production to cover the market requirements. The modern pomiculture always brings many novelties concerning peach cultivation. Modern culture systems (the intensive and super-intensive systems) induces the production of large amounts of fruit per hectare ever since the first years of the culture. The paper presents the behaviour of new peach varieties introduced in Romania: Royal Time, Royal Time Isthara, Royal Lee, Royal Estate, Early Rich, October Star, Ruby Rich, Late Luka, grown on two rootstocks: GF 677 and Ishtar in Tatura Trellis training system. The researches were made conducted in the experimental field of the University of Agricultural Sciences and Veterinary Medicine from Bucharest. The dynamics of dry matter accumulation was studied in the trees cultivated on the reddish preluvosol from the Romanian Plain. During the intense growing period of the fruit trees, the accumulation of dry matter in the leaf reached a maximum intensity, with a value of 73.93% in Early Rich and Ruby Rich variety recorded a value of 71.32% at the level of the shoots.

INTRODUCTION

The peach culture is one of the most important crops in the temperate zone, the worldwide peach plantations nearly doubled their number since 1974, and China contributed to a great extent to this (FAOSTAT). In the same time, the production per hectare increased from 9.7 to 10.4 tons and, in the most developed countries, production is about 15 t/hectare.

This difference is given by different production techniques, including the training systems and design of orchard (combination of cultures, rootstocks, training systems, planting distances and tree size). The worldwide orchard design varies widely; it is known that different training systems may have different production potential. A large number of studies have been worldwide conducted since 1950 to elucidate some aspects of peach performance and they have been recently reviewed (Marini and Corelli Grappadelli, 2006).

The second half of the century revealed a major change in the peach forms in a way that increased constantly the fruit production in an efficient manner. The force behind this evolution was mostly the economy of the operation.

While some studies on the planting density have revealed positive results on yield (Miles et al., 1999, Marini and Corelli-Grappadelli, 2010), several authors have observed the yield per hectare decreases in direct proportion to the density of trees. (Giuliani et al., 1998, DeJong et al., 1999, Marini and Sowers, 2000, Marini and Corelli-Grappadelli, 2010). Caruso et al., 2008 compared three different density planting systems and revealed that the trees' planting density effect on yield production of trees varies for each guidance system and in some cases the increase of planting density causes a cumulative decrease in yield.

MATERIALS AND METHODS

Measurements in the experimental field and laboratory analysis were performed in dynamics, from April to October.

During the vegetation period at the critical development phases of plants (flowering, early binding fruit, the end of fruit development) samples of plants were colected (shoots and leaves), biometric measurements were made and at the end of experiments samples were analyzed to determine the macroelements and the dry matter content. The paper presents the dynamics of dry matter accumulation in leaves and shoots of peach varieties cultivated on the reddish preluvosol from the Romanian Plain and the difference due to the cultivated varieties and the modern planting systems.

The research took place on the experimental area of the Faculty of Horticulture, USAMV, Bucharest. The peach plantation was established in 2008 on a 1000 sqm surface, this research study was conducted in 2010.

Biological material on which research was conducted consists in a number of eight peach varieties: Royal Time, Royal Time, Isthara, Royal Lee, Royal Estate, Early Rich, October Star Rubyrich, Late Luka, two rootstocks: GF 677, Ishtar and one form of crown: Tatura Trellis. The planting distances applied were: 5.0 x 1.0 m, with the following technology of support systems: Tatura Trellis, a system of support wires (galvanized wire at distances of 1 m between them and ground), treated pine tutors resistant to moisture, placed in V at a distance of 10 m. The drip irrigation is done with a dropper placed in front of each peach tree. Fertilization was achieved with Fertisol and Fertiplant (foliar), a single application was made on 06. 06. 2010.

In dynamics, during the vegetation period were made analyses of plant and soil. Macroelements, total forms and dry matter content was determinated in the leaves and shoots of peach harvested in critical nutrition period. For the plant analysis samples were collected leaves not from the fructification (one-year-old shoots), ones from the shoots mid, at the same height and with the same placement. There were also analyzed the shoots sampled at three different moments: 05/22/2010 (before fertilization), 07/05/2010 and 08/02/2010 (after fertilization). Nitrogen, phosphorus and potassium content and dry matter were evaluated in the samples of leaves and shoots.

The paper presents the results on the dynamics of dry matter accumulation in the tree depending on the variety grown, the time of sample and planting system.

RESULTS AND DISCUSSIONS

In the first period of analysis, the dry matter content(%) in peach leaf ranged from 31.70% (October Star GF 677) and 73.93% (Early Rich GF 677), and in shoots between 50.00% (October Star GF 677) and 71.32% (Ruby Rich GF 677). As the vegetation advanced, the dry matter accumulation in the plants decreased in peach leaves and increased in shoots in the 2nd period of analysis, before the intense growth of the shoots, corresponding to the 12-14 weeks phenophase from flowering to all variants, the limits are: 37.46% (October Star GF 677) and 45.15% (Royal Estate GF 677) in leaves and 50.93% (Early Rich GF 677) and 80.14% (Ruby Rich GF 677). The third period of analysis, corresponding to slow and stop the shoots growth phenophase, the accumulation of dry matter in leaves and shoots decreases for most varieties of peaches grown in this experience concerning to modern systems of planting on the reddish preluvosol of the Romanian Plain. (Fig. 1, 2)

The variance analysis of the dry matter accumulation in peach leaves and shoots planted in modern systems on reddish preluvosol from the Romanian Plain performed by Student test indicates the following experimental data:

Factor A= sample period	Factor B= peach variety
A1 = 22.05.2010 A2 = 05.07.2010 A3 = 02.08.2010	B1 = Royal Time GF 677 B2= Royal Time Isthara B3= Royal Lee GF 677 B4= Royal Estate GF 677 B5= Early Rich GF 677 B6= October Star GF 677 B7= Late Luka GF 677 B8= Ruby Rich GF 677

The dynamics of dry matter accumulation indicates maximum intensity in the intensive growth of the shoots phenophase (A1), followed by the 12-14 weeks period after flowering (A2).

The accumulation of dry matter at the same cultivated variety (constant B) during the vegetation period (variable A) was carried out with maximum intensity in the first period for all varieties, except the B6 (October Star GF 677).

Comparing the cultivated varieties (variable B) in terms of dry matter accumulation (%), at the same time of analysis (constant A), it is observed that at A1 (22/05/2010) the highest dry matter accumulation in peach leaves is registered to B2 (Royal Time Isthara GF) and B5 (Early Rich GF 677), at A2 (05/07/2010), the varieties: B4(Royal Estate GF 677), B7 (Late Luka GF 677) and B8 (Ruby Rich GF 677) recorded values of the highest dry matter content and at A3 (02/08/2010) the highest values are reached by B5 (Early Rich GF 677) and B7 (Late Luka GF 677). (Table 1)

The dry matter accumulation at the same variety cultivated (constant B) during the vegetation period (variable A) was carried out with maximum intensity in the second period of analysis for most varieties, except B3 (Royal Lee GF 677) and B5 (Early Rich GF 677)

Comparing varieties (variable B) in terms of dry matter accumulation (%) at the same period of analysis (constant A) it is observed that at A1 (22/05/2010) the highest dry matter accumulation in peach shoots is registered in B8 (Ruby Rich GF 677), followed by B1 (Royal Time GF 677), at A2 (07/05/2010) B8 variety (Ruby Rich GF 677), followed by B1 (Royal Time GF 677) recorded the highest content of dry matter and at A3 (02/08/2010) the highest values are in B1 (Royal time GF 677), followed by B2 (Royal time Isthara). (Table 2)

CONCLUSIONS

The dry matter accumulation in the leaves and shoots was influenced by the period of analysis and peach varieties.

It was observed that before the fertilization period, which coincides with the period of intense growth of the trees, the dry matter accumulation in leaves had a maximum intensity, with a value of 73.93% in Early Rich and in shoots, Ruby Rich variety recorded a 71.32% value.

During the vegetation period, when nutrients consumption is intense (at 12-14 weeks from flowering) the values of dry matter in leaves decreases to 37.46% in October Star, but in the shoots, Ruby Rich registered higher values compared with the vegetation phase before fertilization with a 80.14 percent of dry matter.

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*** http://faostat.fao.org

TABLES AND FIGURES

Table 1

The influence of sample period (A factor) and variety (B factor) on the dry matter accumulation % in peach leaves

A/B	B1 = Royal Time GF 677	B2= Royal Time Isthara	B3= Royal Lee GF 677	B4= Royal Estate GF 677	B5= Early Rich GF 677	B6= October Star GF 677	B7= Late Luka GF 677	B8= Ruby Rich GF 677
A1= 22.05.2010	a66.89c	a73.00a	a61.42d	a60.37d	a73.93a	b31.70f	a52.25e	a69.91b
A2= 05.07.2010	b40.74c	c38.98d	b40.60c	b45.15a	b42.87b	a37.46e	b45.03a	b44.59a
A3= 02.08.2010	b39.92c	b41.45b	b40.14b	c38.76c	b43.87a	a37.48d	b43.59a	c36.6d

DL 5% = 1.72 % (B ct. A var.); DL 5% = 1.35 % (A ct. B var.)

Table 2

The influence of sample period (A factor) and variety (B factor) on the dry matter accumulation % in peach shoots

A/B	B1 = Royal Time GF677	B2= Royal Time Isthara	B3= Royal Lee GF 677	B4= Royal Estate GF 677	B5= Early Rich GF 677	B6= October Star GF 677	B7= Late Luka GF 677	B8= Ruby Rich GF 677
A1= 22.05.2010	b65.28b	b52.54e	a64.16c	b60.50d	b51.09f	b50.00g	b52.88e	b71.32a
A2= 05.07.2010	a77.77b	a57.95e	b53.14g	a61.95d	b50.90h	a55.94f	a72.06c	a80.14a
A3= 02.08.2010	c55.54a	b52.22b	c46.89e	c46.60e	a52.20b	c47.20e	c51.25c	c48.20d

DL 5% = 0.97 % (B ct. A var.); DL 5% = 0.85% (A ct. B var.)

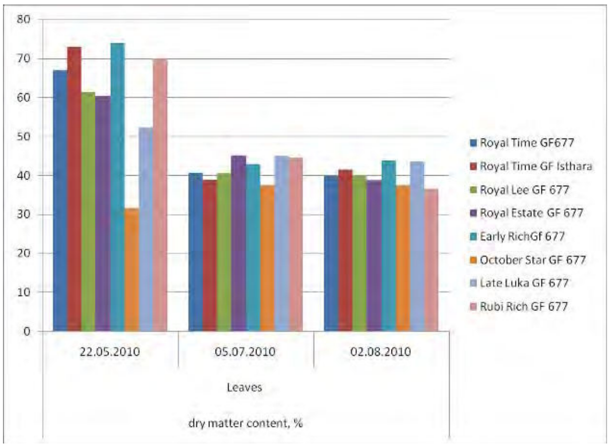

Fig. 1 Dry matter accumulation in peach leaves during the vegetation period at the three analysis moments

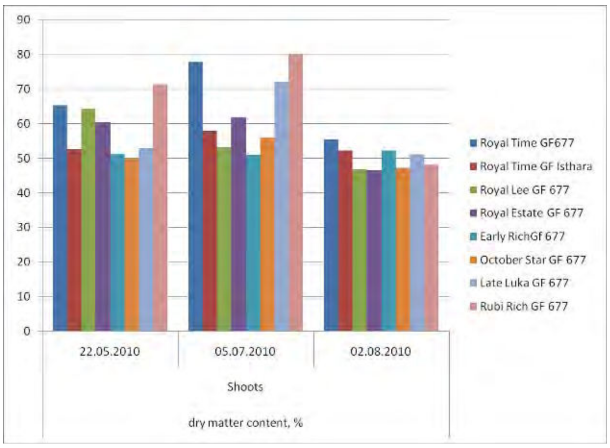

Fig. 2 Dry matter accumulation in peach shoots during the vegetation period at the three analysis moments

Behavior of some plum varieties to the attack of the plum moth *Grapholitha funebrana* Tr.

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Keywords: pheromone traps, Stanley, Centenar, Minerva

ABSTRACT

In Romania the plum moth *Grapholitha funebrana* Tr. is one of the key pests of the plum orchards, the damages produced can reach 70% from the yield. In order to establish the behavior of some plum varieties to the attack of *Grapholitha funebrana* Tr. at the S.D. Valcea has been set up experiences in a collection of plum varieties. The plum moth population has been surveillance using pheromone traps, one trap for each variety. The recorded data shows that the largest number of male butterflies captured in traps in 2010, was recorded at the Stanley variety, followed by Centenar and Minerva variety.

INTRODUCTION

Grapholitha funebrana is an oligophagous pest, attacking the fruits of plum, cherry, peach, and other hosts typically within the plant family Rosaceae. This species is generally distributed in Europe, the Middle East, and northern Asia. This pest is also known as the red plum maggot and the plum fruit maggot (Zhang1994).

In Romania, due to the plum economic importance the complex of the pests that attack the plum have concern a great number of researchers. Thus, the plum moth *Grapholitha funebran*a Tr. has constitute the object for many and complex studies regarding the spreading, the biology and the control using different means (Tuca 2007).

Pheromone traps have been used effectively to monitor adult flight activity and make treatments recommendations (Iacob 1977). Apostolov (1980) recommend placing traps on the edge of orchards, rather than in the center, to improve detection efficiency.

Sex pheromones have been used for mating disruption of *C. funebrana*. In Switzerland, Germany, and Romania, two component blends were used with mixed success (reviewed in Audemard 1992).

MATERIALS AND METHODS

Experiences made during 2010 were located in the SD Valcea, in a collection of plum varieties, 20 years old, were have been reported the presence of different species of animal pests.

Observations were made on varieties Stanley, Centenar and Minerva.

The surveillance of the pest in plantation was done with pheromone traps atraFUN type, one trap for each variety. Registration of males captured in traps was done weekly, and glue boards and pheromone capsules were replaced monthly.

RESULTS AND DISCUSSIONS

Climatologically speaking, in Valcea County, 2010 was a year characterized by average temperatures slightly higher compared with climatologically normal's, and in terms of rainfall there is an increasing amount of annual rainfall compared with multiannual amount. Air temperature regime was close to average annual values. In the last part of the year air temperature was close to normal.

The average annual temperature has been of 11.5°C. Absolute maximum temperatures were high but did not exceed the maximum absolute recorded in this region, ranging between 35.8°C. Absolute minimum temperatures were recorded in January (January 25 to 26) at all meteorological stations considered, with values between -17.3° C in the mountains and -18.0°C in the hillside and plateau.

In terms of rainfall, there is an annual quantity of precipitation increase compared with the multi annual quantity. At the weather stations in Valcea County wind speed did not exceed 11 m/s ranging between 9 m/s and 11 m/s (Table nr.1).

In 2010, the flight of the butterflies begun in the first decade of May (3.5), the last butterflies recorded in the last decade of September (21.09) (Table 2).

The most numerous captured butterflies were recorded at the Stanley variety.

For hibernating generation (G III), maximum flight (64 butterflies/trap) was recorded in the first decade of June (02.06.).First generation (GI) presented a maximum flight (130 butterflies/trap) at the end of the second decade of July (19.07.).

Regarding the second generation (G II), maximum flight (97 butterflies/trap), was recorded at the end of August (30.08.) (Figure 1).

In 2010 at the Centenar variety for the hibernating generation (G III) the largest number of captured butterflies (57 butterflies/trap) was recorded in the first decade of June (02.06.) For the first generation (GI), maximum flight (90 butterflies/trap) was recorded at the end of the second decade of July (19.07.).

Regarding the second generation (G II), maximum flight (75 butterflies/trap), was recorded at the end of August (30.08.) (Figure 2)..

For Minerva variety, in 2010, for the hibernating generation (G III) the greatest number of butterflies (55 butterflies/trap) was recorded first decade of June (02.06.). Maximum flight (87 butterflies/trap) for first generation (GI) was recorded at the end of the second decade of July (19.07.).

For second generation (G II), maximum flight (68 butterflies/trap), was recorded at the end of August (30.08.) (Figure 3).

CONCLUSIONS

According to recorded data, the most sensitive variety to the attack of the plum moth (Grapholitha funebrana Tr.) was Stanley.

Throughout the vegetation period at the Stanley variety, were captured a total of 1384 butterflies males/traps, followed by Centenar variety with a total of 1194 butterflies males/trap and Minerva variety with a total of in the 936 butterfly males/traps.

In the climatic conditions of Valcea plum moth present two complete generation and one partial.

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TABLES AND FIGURES

Table 1

Climatic main features of the Rm. Valcea region in 2010

Weather stations	Temperature (^0C)			Rainfall (mm)	Wind		
	Average	Maximum	Minimum		Dominant direction	Predominant direction %	Maximum (m/s)
Rm. Valcea	11.3	35.8/15 VIII	- 18.0/26 I	948.4	N	37.8	9/dir. V

Table 2

Number of captured males at the varieties Stanley, Centenar and Minerva in 2010

Date	Buterflies/Trap		
	Stanley	Centenar	Anna Späth
03.05	10	5	3
09.05	21	15	10
15.05	38	25	20
21.05	49	39	37
28.05	56	45	44
02.06	**64**	**57**	**55**
08.06	43	39	35
13.06	52	48	42
20.06	69	56	50
27.07	80	62	57
03.07	94	73	62
12.07	112	85	76
19.07	**130**	**90**	**87**
25.07	93	67	59
02.08	64	44	38
08.08	52	35	27
15.08	78	56	49
22.08	85	66	57
30.08	**97**	**75**	**68**
07.09	57	43	37
15.09	28	20	18
21.09	12	8	5
Total	1384	1194	936

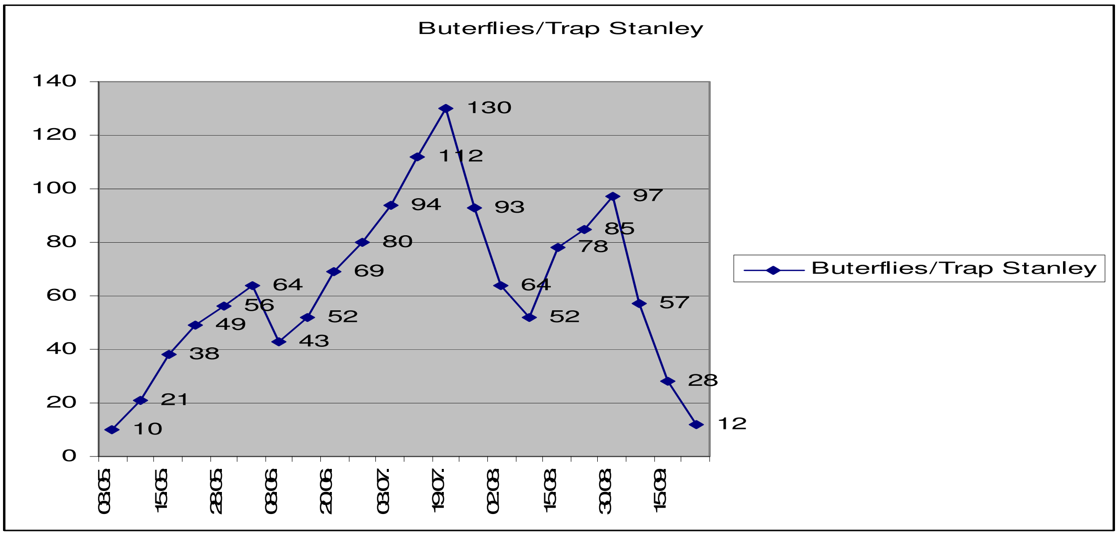

Fig. 1. *Grapholitha funebrana* Tr. flight dynamics at the variety Stanley in 2010

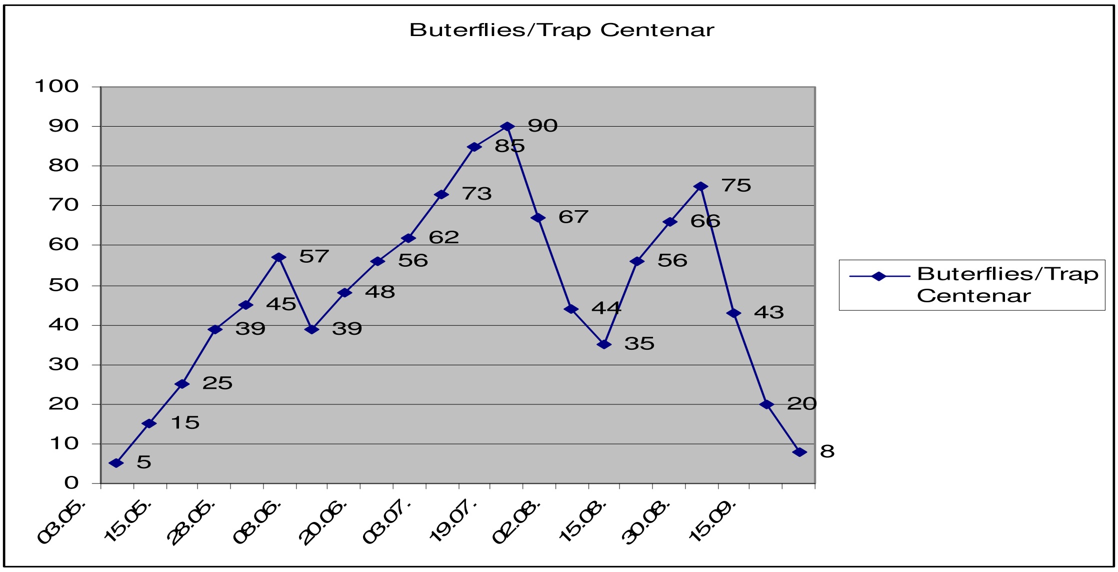

Fig. 2. *Grapholitha funebrana* Tr. flight dynamics at the variety Centenar in 2010

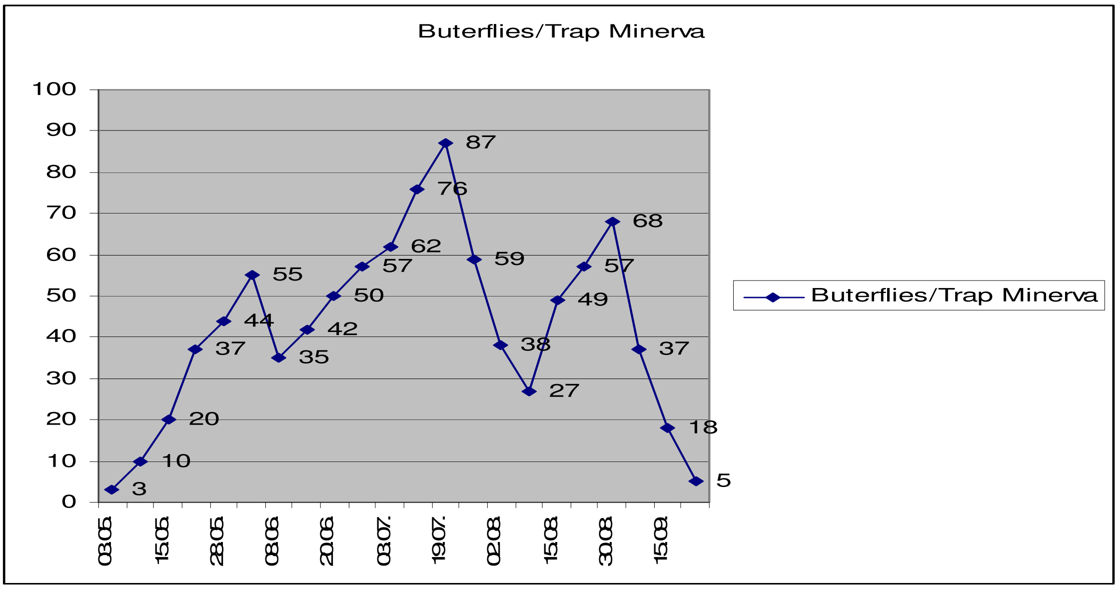

Fig. 3. *Grapholitha funebrana* Tr. flight dynamics at the variety Minerva in 2010

Research regarding the choice of mother plants of wild cherry seeds in Transylvanian Plain

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Keywords: *Cerasus avium* genotypes, vigor of growth, crown shape, capacity and state of health

ABSTRACT

After the existing statistical data (FAO, 2006) the areas planted with cherry fell in the last 10 years, to 9317ha, with 28.31% less than in 1996, when 12,995 ha were cultivated, so cherry culture has the 3rd place in Romania as acreage as plums 95,478 ha and 72,740 ha of apple, but before the hair, apricots, peaches and nectarines. The aim of this paper is to present the characteristics of some wild cherry genotypes from Targu Mures vicinity used to obtain after scientific examination new orchard of cherry.

INTRODUCTION

In Romania, the cherry fruits are grown in most areas and all forms of relief, mainly in orchards, and gardens in addition to houses and roadsides. For the period 2010-2015 is expected at least maintaining planted with cherry. FAO statistics show a significant reduction in cherry production in Romania in recent years. In 2005 we achieved the lowest production of cherry in the last 30 years, 32,001 tons, which was lower by 18,987 tons compared to 2004 and 66,499 tons compared to 2003. Most cherry production was obtained in 1993, record production of 106,400tons being (Bujdosó, 2004).

Evolution of cherry production was influenced by several factors – including climate – which led to drastic decrease in production. Cherry culture over the last 20-25 years has been concentrated in the most favorable place, rainfall between 500-600mm and average annual temperatures of 9-10^{o}C, in places located in the foothills of Oltenia and Muntenia: Arges, Valcea, Prahova, Buzau, Dambovita, Dolj and Olt, in the north-east of Transylvania: Bistrita Nasaud, Salaj, Satu Mare, Maramures, Bihor and Arad (Chira, 2006, Budan, 2000). Also cherry culture has spread around some cities such as Bucharest, Timisoara, Arad and Oradea.

After the existing statistical data (FAO, 2006) the areas planted with cherry fell in the last 10 years, to 9317ha, with 28.31% less than in 1996, when 12,995 ha were cultivated, so cherry culture has the 3rd place in Romania as acreage as plums 95,478 ha and 72,740 ha of apple, but before the hair, apricots, peaches and nectarines.

The aim of this paper is to present the characteristics of some wild cherry genotypes from Targu Mures vicinity used to obtain after scientific examination new orchard of cherry.

MATERIALS AND METHODS

The experience used wild cherry selections from an area located near the village Sabed from Mures County, a distance of 17 km north of Targu Mures. Highest altitude above sea level the area where there are selected genotypes of wild cherry was 491m.

Selection of wild cherry genotypes occurred in a plantation of cherry aged 30years, where those copies came from the nursery as grafted material, but were actually directed and used rootstock seedlings nursery. In such planting were also found over 200 copies, which were observed in the vigor of growth, crown shape, capacity and state of health. From this material have been selected 18 genotypes which by their characteristics have proved to be valuable as seed parent plants. The next step was the analysis of fruit characteristics, determining the efficiency of stone and checking behavior in school selection of seedlings, that the percentage of emergence, vigor and uniformity of growth characteristics of rooting. Seedlings derived from selections with the best behavior in the school of saplings were planted in the field grafting. They were grafted cherry varieties valuable in order to check their affinity with these selections (Gyuró, 1974).

RESULTS AND DISCUSSIONS

Were identified, marked and described 18 genotypes of *Cerasus avium*. These types of wild cherry were marked with letters and numbers, as follows: **KM 1, KM 1', KM 2, KM 3, KM 4, KM 5, KM 7, KM 8, KM 9, KM 10, KM 11, KM 12, KM 13, KM 15, KM 16, KM 21, KM 22, KM 29.**

To obtain seedlings generative fruits were collected from the wild cherry select and mark. If the selection of parent seed plants, attention was given to examining the following aspects: tree vigor, crown shape, crown density, capacity, and time of flowering. The main characteristics of wild cherry selections are presented in Table 1.

Regarding **the vigor of growth of trees** (Figure 1) can be seen that most of them, 61.11% are characterized by force middle, 22.22% of existing trees with high growth, 11.11% and 5.56% effective force than semi – small.

Crowns genotypes (Figure 2) which have a broad diffuse, helps to make lower the average height of trees. Most trees have broad pyramidal crown form 44.44%, diffuse type of crown have 16.67% of the trees, wreath reverse pyramid is a percentage of 5.56% and 33.33% of the crowns are narrow pyramidal form which is characteristic of wild cherry.

The crown can be characterized by their density, which depends on the number of branches of the skeleton, the skeleton branches branching distance of their thickness, the number of branches, shoots and their position in space. If the skeleton branches are located at a distance from each other, the crown is rare, airy, well lit inside. The opposite type rare crown density is dense, stuffed, in which the light penetrates hard and is prone to attack from pests and diseases, their maintenance is difficult.

Trees take their crown rare observation of 50%, 27.78% is semi dense, which helps to better ventilation and lighting them. At 22.22% of the trees the crown is dense (Figure 3).

Production capacity is assessed on a scale of 1-5, where 1 is poor and 5 where the production is the highest value. Genotypes KM 1, KM 4, KM 9, KM 16 and KM 29 showed a very good production capacity and type KM 13 standing at the opposite end, with the weakest capacity.

Period of flowering wild cherry genotypes is another important factor in the knowledge and description of the types selected. Cherry blossoms vegetation starts early, almost simultaneously with peaches, late spring frosts can cause them great damage, which is limiting factor for growing cherry trees. Limit resistance in cherry bud and full bloom stage in late spring frost is -2.2^{o}C (Chira et al., 2008).

Observations on flowering genotypes selected from wild cherry were made two years consecutively in 2007 and 2008 respectively.(Table 2). Flowering began in early 2007 (5-10 April) than in 2008, when there was almost a week later (11-15 April).The earliest flowering in the years of observation, had genotype KM 2 and KM 1, and the later blooming type were KM 8 and KM 21. Flowering period in 2008 was between 5-24 April and in 2008 between 11-26 April (Table 2).

CONCLUSIONS

Cerasus avium genotypes selected characteristics as the parent plant semicer were:

1. The vigor of growth trees 61.11% of the selected cherry wild trees are characterized by force middle, 22.22% of them have high growth, 11.11% have small force and 5.56% semi small effect;
2. Most trees have broad pyramidal crown form, 44.44% were diffuse type of crown and only 33.33% of crowns are narrow pyramidal form which is characteristic of wild cherry;

3. From the point of view of the density of the crown only 50% of selected wild cherries have rare crown;
4. Genotypes KM 1, KM 4, KM 9, KM 16 and KM 29 showed a very good production capacity.

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TABLES AND FIGURES

Table 1

The vigor of growth, crown shape, production capacity of genotypes of wild cherry and state of health

No.	Cod of genotype	Vigor of growth	Crown Characteristics		Production capacity
			Form	Density	
1.	KM 1	Small	broad pyramidal crown	Rare	5
2.	KM 1'	Middle	broad pyramidal crown	Rare	3
3.	KM 2	Middle	Conversely pyramidal	Rare	3
4.	KM 3	Middle	broad pyramidal crown	Semidense	4
5.	KM 4	Middle	broad pyramidal crown	Dense	5
6.	KM 5	Small	Diffuse	Semidense	3
7.	KM 7	Middle	Narrow pyramidal	Dense	3
8.	KM 8	Middle	Narrow pyramidal	Dense	4
9.	KM 9	Middle	Diffuse	Rare	5
10.	KM 10	Height	Narrow pyramidal	Rare	3
11.	KM 11	Height	Narrow pyramidal	Semidense	4
12.	KM 12	Height	Diffuse	Rare	3
13.	KM 13	Middle	Narrow pyramidal	Rare	2
14.	KM 15	semi-small	broad pyramidal crown	Rare	4
15.	KM 16	Middle	broad pyramidal crown	Semidense	5
16.	KM 21	Middle	Narrow pyramidal	Rare	4
17.	KM 22	Middle	broad pyramidal crown	Semidense	3
18.	KM 29	Height	broad pyramidal crown	Dense	5

Table 2

The period of flowering of genotypes of wild cherry, years 2007, 2008

No.	Cod of genotype	Beginning of flowering				Flowering				The end of flowering			
		2007		2008		2007		2008		2007		2008	
		mounth	day	mounth	day	mounth	day	mounth	day	mounth	day	mounth	day
1.	KM 1	Apr.	5	Apr.	12	Apr.	12	Apr.	18	Apr.	17	Apr.	22
2.	KM 1'	Apr.	7	Apr.	12	Apr.	13	Apr.	18	Apr.	17	Apr.	23
3.	KM 2	Apr.	5	Apr.	11	Apr.	13	Apr.	17	Apr.	19	Apr.	22
4.	KM 3	Apr.	7	Apr.	12	Apr.	14	Apr.	19	Apr.	20	Apr.	24
5.	KM 4	Apr.	6	Apr.	12	Apr.	12	Apr.	19	Apr.	17	Apr.	24
6.	KM 5	Apr.	6	Apr.	11	Apr.	12	Apr.	18	Apr.	17	Apr.	23
7.	KM 7	Apr.	6	Apr.	11	Apr.	13	Apr.	17	Apr.	19	Apr.	22
8.	KM 8	Apr.	10	Apr.	15	Apr.	18	Apr.	21	Apr.	24	Apr.	26
9.	KM 9	Apr.	8	Apr.	13	Apr.	14	Apr.	20	Apr.	20	Apr.	24
10.	KM 10	Apr.	9	Apr.	13	Apr.	16	Apr.	19	Apr.	23	Apr.	23
11.	KM 11	Apr.	10	Apr.	14	Apr.	16	Apr.	19	Apr.	22	Apr.	24
12.	KM 12	Apr.	10	Apr.	13	Apr.	17	Apr.	20	Apr.	23	Apr.	25
13.	KM 13	Apr.	10	Apr.	14	Apr.	16	Apr.	20	Apr.	21	Apr.	25
14.	KM 15	Apr.	6	Apr.	12	Apr.	12	Apr.	18	Apr.	17	Apr.	22
15.	KM 16	Apr.	9	Apr.	13	Apr.	14	Apr.	19	Apr.	19	Apr.	24
16.	KM 21	Apr.	10	Apr.	15	Apr.	18	Apr.	21	Apr.	24	Apr.	25
17.	KM 22	Apr.	10	Apr.	14	Apr.	15	Apr.	20	Apr.	22	Apr.	24
18.	KM 29	Apr.	8	Apr.	13	Apr.	14	Apr.	20	Apr.	20	Apr.	25

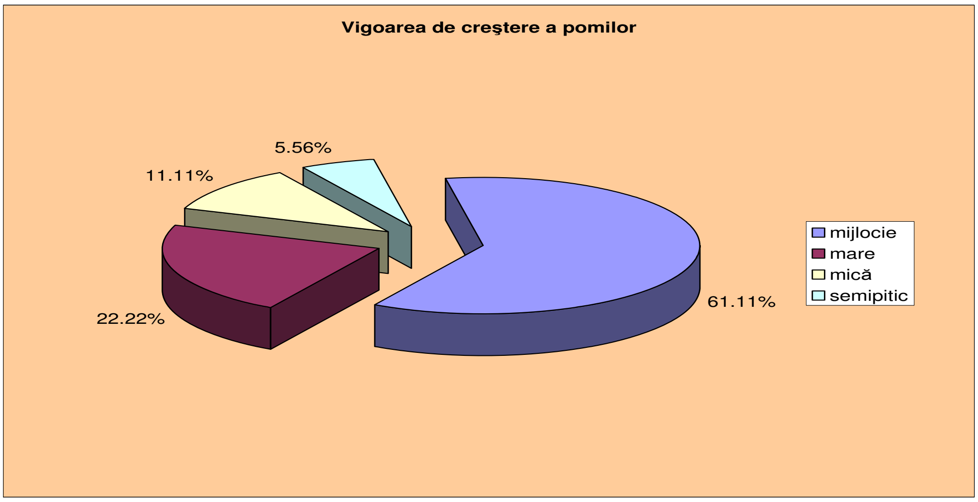

Fig. 1. The vigor of growth of cherry trees (%)

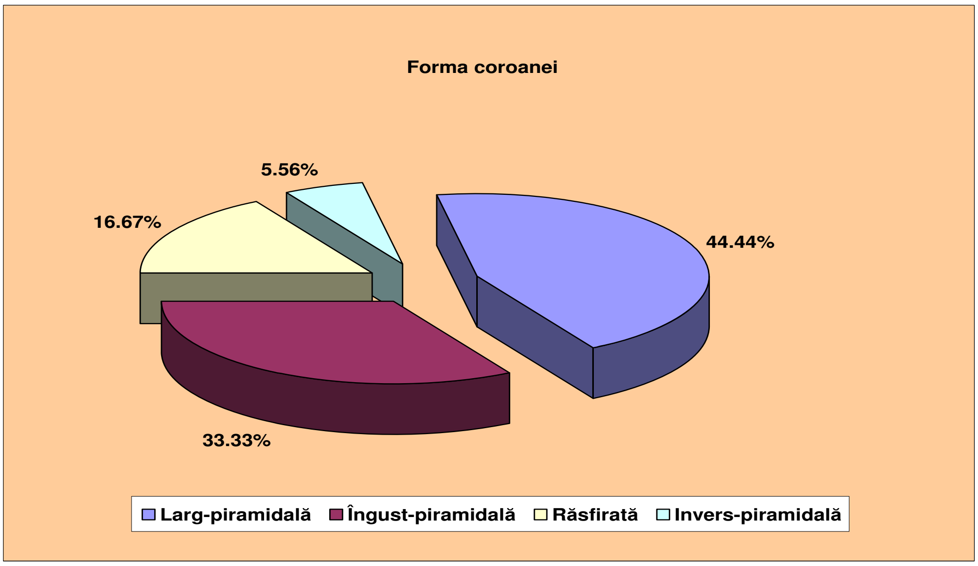

Fig. 2. The shape of crown (%)

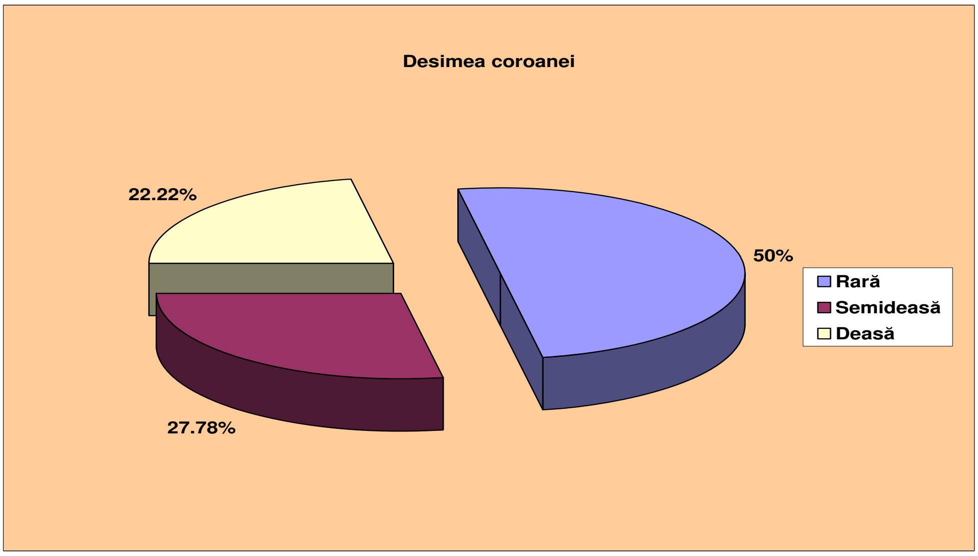

Fig. 3. Crown density (%)

Survey on the behavior of seedlings obtained from different types of wild cherry

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Keywords: kernel performance, 1000 kernel weight, percentage of emergence of stoning

ABSTRACT

Use cherry rootstocks culture is beneficial because of their qualities lend rootstock rootstocks: a better use of soil, climate where it was founded orchard. After decades of research on the influence of rootstocks, we can say that there is no noble variety that rootstocks influence would not in any way, what is true and vice versa, influencing a variety noble way or another rootstock. Were identified, marked and described 18 genotypes of *Cerasus avium*. These types of wild cherry were marked with letters and numbers, as follows: KM 1, KM 1', KM 2, KM 3, KM 4, KM 5, KM 7, KM 8, KM 9, KM 10, KM 11, KM 12, KM 13, KM 15, KM 16, KM 21, KM 22, KM 29. From the 18 selected genotypes of wild cherry, 5 types of kernel yield values is between 15.17% to 19.31%, which far exceeds the average kernel yield characteristic of wild cherry presented in the literature. In the case of wild cherry nine selections, the rate of emergence of stoning exceeds 60% which is a very valuable leaming pepinieristic. From the 18 selected genotypes of wild cherry, 5 types of kernel yield values is between 15.17% to 19.31%, which far exceeds the average kernel yield characteristic of wild cherry presented in the literature. In the case of wild cherry nine selections, the rate of emergence of stoning exceeds 60% which is a very valuable leaming pepinieristic. Seedlings derived from most selections (except the 3 selections) falls into the category of force under middle with value between 4.1 to 6 mm package thicknesses. With reference to the above, we conclude that wild cherry selections under study have provided valuable descendence generative, with important features in terms pepinieristic such as reduced growth and vigor of high school uniform seedlings

INTRODUCTION

Use cherry rootstocks culture is beneficial because of their qualities lend rootstock rootstocks: a better use of soil, climate where it was founded orchard. After decades of research on the influence of rootstocks, we can say that there is no noble variety that rootstocks influence would not in any way, what is true and vice versa, influencing a variety noble way or another rootstock.

The most important effect of rootstock on noble variety is reducing its vigor of growth, with effect dwarfs up to 80-90%. This influence is very important, because these rootstocks are most often used for the intensive cultivation of cherry. Different rootstocks influence and abundance during flowering, pollination and productivity of the variety. Abundance of flowers is not always a big production, example is that graft rootstock Cob abundant blooms, but without much fructification (Webster, 1980). Rootstock can influence directly or indirectly and fruit quality: the rootstock Maxmem 14 into first fruits of cherries is earlier, the color is better. Intense fruit color can be tenuous crown effect, where light can penetrate deeper (Hrotkó and Magyar, 1998). The influence of rootstock on the rootstock is not exploited; few studies focus on the subject. Many researchers argue that affect graft growth, and even the angle of growth of roots branching rootstock.

MATERIALS AND METHODS

Were identified, marked and described 18 genotypes of *Cerasus avium*. These types of wild cherry were marked with letters and numbers, as follows: **KM 1, KM 1', KM 2, KM 3, KM 4, KM 5, KM 7, KM 8, KM 9, KM 10, KM 11, KM 12, KM 13, KM 15, KM 16, KM 21, KM 22, KM 29.**

Sampling of fruits on marketed selections took place in late June 2007. Extracted seeds were kept until the final stratification in moist perlite at a temperature of approximately 10^{o}C. Stratification took place in December in wet sand. Stoning sowing was done on March 24, 2008, in separate rows for each genotype, on the ground ready in autumn sowing density was 70 seeds per ml. Seedlings emergence occurred 3 weeks after sowing. The main activity of care were: repeated wetting, weeding weeds in 2-3 weeks, phasial fertilization with N, P, K 15:15:15 complex fertilizers and foliar fertilizers with microelements, maintenance work loosening the soil, combating diseases and pests.

For disease control – a purple staining bean cherry or cherry leaves (Brumeriella jaapii) – have used the following fungicides: Dithane M-45, M-70 WP and Rubigan Topsin 12 EC, and for pest control – wasp leaves of cherry (caliroa limacine), lice black cherry (Myzus cerasi), mites and aphids – were used insecticides: Karate Zeon 5 CS, Reldane 40 EC, Sumi-Alpha 5 EC and 10WP Nissorun.

Harvesting seedlings took place in early November of 2008. During experimental measurements and observations were made:

1. Determination of kernel performance- by taking the 4 x 100 fruit in the sample of 5kg;
2. 1000 kernel weight variability on all 18 selections;
3. The percentage of emergence of stoning- these determinations were made after a month of emergence of juveniles;
4. Force growth of juveniles- was determined by measuring the thickness of the package;
5. Determination of root system: no of roots, length of main and secondary roots.

These latter determinations were made by harvesting seedlings, then they started to sot – linking their genotypes after stratification seedlings. Statistical processing of data was done by Past program, significant differences in the degree of freedom to set $p<0.01$ giving a 99% difference between genotypes.

RESULTS AND DISCUSSIONS

a. Kernel yield. One of the most important attributes of different genotypes of wild cherry for their optimal use in school is the efficiency of stone trees, which is inversely proportional to the weight of fruit. Among the genotypes examined most efficient kernel that gave genotype had the lowest fruit weight (Table 1). Fruits with pulp close to the value of 1g dehydrate easily during baking, which adversely affects the germination capacity pips. Those fruits higher flesh weight compared with stoning – so weight and size of fruit is higher – can be used in food, but the selection of rootstocks less.

The largest genotypes were measured at km 10 (average 3.83g), Km 13 (3.5g), and KM 5 (3.46g) and lowest fruit weight had genotypes KM 1 and KM 3, both with the same average of 1.46g, followed by KM 8 (1.6g), KM 2 (1.66g), KM 1 and KM 4 both with an average weight of 1.83g of fruit (Fig.1).

It should be stressed that selection KM 3 kernel yield was the highest 19.31% followed by selections KM 2 with 16.86%, 15.31% at KM 4, KM1 to 15.17% and KM 8 with 15.00%. These types, fruit weight was between 1.45 to 1.66g, which shows that yield is inversely proportional to the weight of stone fruit (Fig.2.).

These results are promising because in the literature to yield kernels *Cerasus avium* is between 9-14% (Hrotko, 1999). The average weight of stoning is between 0.22 to 0.34g values, is normal compared with average weight of fruit.

b. 1000 kernel weight

To find the weight of 1000 kernels were measured using digital scales 1000 pips in each type of selected wild cherry. The smallest mass of 1000 seeds is a KM 1 type 1230g, KM1` (1290g), KM 15 (1350g), KM 4 (1370g), KM 3 (1380g) and KM8 (1390g) had low mass of 1000 kernels. Most weight has 3090g at KM 13. In most selections of 1000 kernel weight values range from 1500 to 2500g (Fig.3.).

c. The percentage of emergence of stoning

Table 2 shows the number of seeds that were planted in each genotype of wild cherry and the number of those seeds that have germinated. From type KM 5 were planting the largest number of seeds respectively 5833 pieces, trying to get as many seedlings as this genotype have the best features (small force growth, diffuse form of semi-dense crown), obtaining an emergence 3578 pieces. The best results were obtained at the type emergence KM 21, where from 666 seeds have sprung 461, and the KM 1 got the worst emergence of sown seeds where from 1790pieces sprung 284. (Fig.3.).

The percentage of literate specialist was between 30-50% (Hrotko, 1999), so we can say halfway genotype (nine selections) was obtained a germination media over existing values presented by the literature. It was obtained a 50% rises over the types KM 21 (69.2%), which is the best results, KM 12 (67.2%), KM 11 (66.7%) , KM 29 (65.5%), KM 8 (63.5%), KM 10 (62.8%), KM 5 (61.3%), KM 1 (60.8%) and KM 9 (60.8%). Six types of results are averages and other three genotypes, the results are below the 30% emergence, the lowest germination resulting in the type KM1 (15.9%).(Fig. 4.).

d. Examination of the package thickness (growth vigor of seedlings)

The package thickness measurements were obtained values, showing that generation progeny of wild cherry types selected have a high degree of uniformity.

Significant differences in the values were obtained only if the selection of seedlings resulting from KM 16, which has significant results from the type KM 1, KM 1`, KM 2, KM 3, KM 4, KM 5, KM 7, KM 8, KM 9, KM 10, KM 11, KM 12, KM 13, KM 15, KM 21, KM 22 şi KM 29. In addition to the KM 16, the other genotypes were obtained mean values and results are not significant to each other. Thickness values package type KM 1 type results approaching is KM 16, there are no differences between the two selections significant. The worst results were obtained at type KM 22, which has significant value to the type KM 1 and KM 16. Type KM 22 had the worst result o the thickness of the package, no statistically different from the type KM 1`, KM 2, KM 3, KM 4, KM5, KM 7, KM 8, KM 9, KM 10, KM 11, KM 12, KM 13, KM 15, KM 21 and KM 29, which have an average thickness of 4.73 to 5.70mm package between values (Fig.5.).

From figure 6 it could be seen the variability in wild cherry selections with regard to uniformity of thickness of the package. It were determined four groups with increasing values: 2.1 to 4 mm, 4.1 to 6 mm, 6.1 to 8 mm and form 8.1 to 10mm. the results show that in most selections, values fall into one category increase (4.1 to 6 mm). Variability is very low values obtained, which gives a high uniformity of growth vigor, it is very important pepinieristic terms.

The KM 1` genotype most seedlings respectively 72% are classified as growth from 4.1 to 6 mm, 10% of the trees belong to the category with a higher increase (6.1 to 8 mm) and the remaining seedlings 18% have small increase respectively 2.1 to 4 mm. uniformity on seedlings, values shows that the type KM 1 obtained the best results, followed by types KM 11 and KM 22, and these types across a low variability, most seedlings (68-72%) fall in the growth category between 4.1 to 6 mm. It were assumed that uniformity of wild cherry seedlings, has a predisposition to auto fertility of wild cherry.

Seedlings derived from genotypes KM 3, KM 5, KM 8, KM 9, KM 12, the proportion of 60-66% belong to the category from 4.1 to 6 mm of growth, and here there is marked increase uniformity.

The types Km 2, KM 4, KM 10, KM 13, KM 15, KM 16 and KM 29 results show that over 50% of trees belong to the category from 4.1 to 6 mm of growth; the number of seedlings is very homogeneous on growth values.

Types KM 1 and KM 21 show that the number of seedlings results, greater variability, resulting in a heterogeneous fabric, which is not beneficial in terms pepinieristic.

CONCLUSIONS

1. From the 18 selected genotypes of wild cherry, 5 types of kernel yield values is between 15.17% to 19.31%, which far exceeds the average kernel yield characteristic of wild cherry presented in the literature;
2. In the case of wild cherry nine selections , the rate of emergence of stoning exceeds 60% which is a very valuable leaming pepinieristic;
3. Seedlings derived from most selections (except the 3 selections) falls into the category of force under middle with value between 4.1 to 6 mm package thickness;
4. With reference to the above, we conclude that wild cherry selections under study have provided valuable descendence generative, with important features in terms pepinieristic such as reduced growth and vigor of high school uniform seedlings.

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TABLES AND FIGURES

Table 1

Medium Weight of fruits. seeds and percent of seeds

Genotype cod	Medium weight of fruits (g)	Medium weight of seeds (g)	The pulp of fruit (g)	Percent of seeds (%)
KM 1	1.45	0.22	1.23	15.17
KM 1'	1.83	0.28	1.55	15.31
KM 2	1.66	0.28	1.38	16.86
KM 3	1.45	0.28	1.17	19.31
KM 4	1.83	0.28	1.55	15.31
KM 5	3.46	0.24	3.22	6.93
KM 7	2.50	0.26	2.24	10.40
KM 8	1.60	0.24	1.36	15.00
KM 9	2.33	0.27	2.06	9.45
KM 10	3.83	0.26	3.57	6.78
KM 11	2.83	0.26	2.57	9.18
KM 12	2.70	0.24	2.46	8.88
KM 13	3.50	0.34	3.16	9.71
KM 15	2.00	0.26	1.74	13.00
KM 16	3.00	0.30	2.70	10.00
KM 21	2.30	0.22	2.08	9.56
KM 22	2.55	0.26	2.29	10.19
KM 29	2.33	0.26	2.07	11.15

Table 2

Number of seedling seeds and number of rising seeds

No.	Genotype cod	Number of seedling seeds (pieces)	Number of rising seeds (pieces)	Percent of rising (%)
1.	KM 1	1790	284	15.85
2.	KM 1'	2425	1474	60.77
3.	KM 2	1883	478	25.40
4.	KM 3	2959	951	32.15
5.	KM 4	2952	966	32.72
6.	KM 5	5833	3578	61.34
7.	KM 7	3560	1255	35.25
8.	KM 8	919	583	63.45
9.	KM 9	2623	1593	60.72
10.	KM 10	1241	780	62.83
11.	KM 11	875	584	66.70
12.	KM 12	866	582	67.20
13.	KM 13	1083	218	20.16
4.	KM 15	683	231	33.85
15.	KM 16	1301	461	35.42
16.	KM 21	666	461	69.18
17.	KM 22	721	293	40.64
18.	KM 29	1001	655	65.45

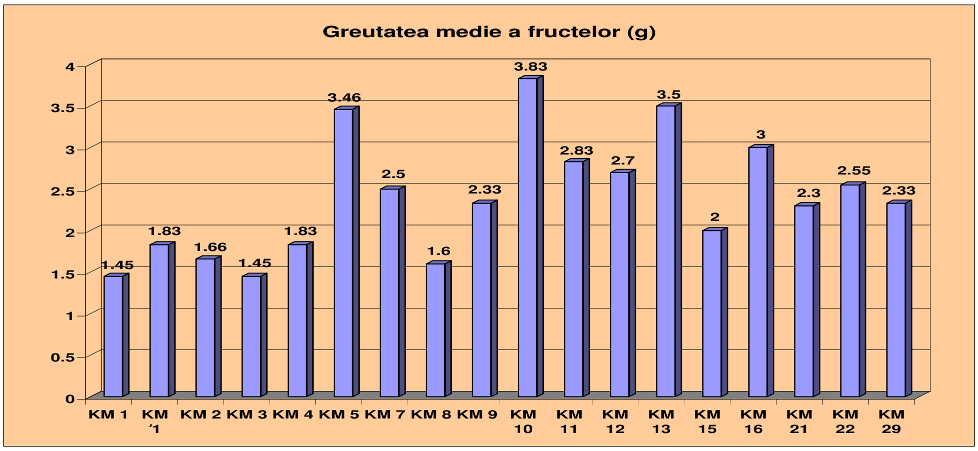

Fig. 1. Medium weight of wild cherry fruits (g)

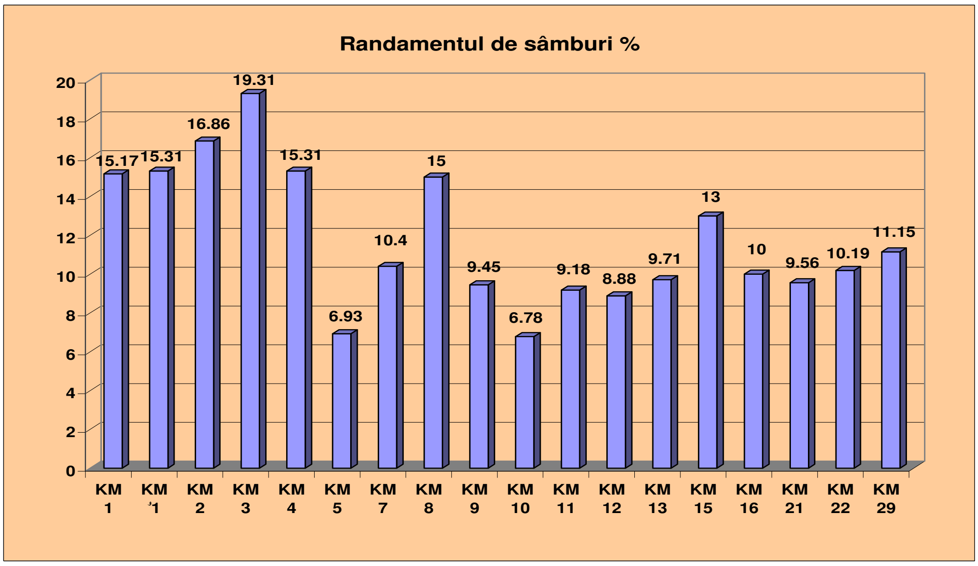

Fig. 2. The yield of seeds (%)

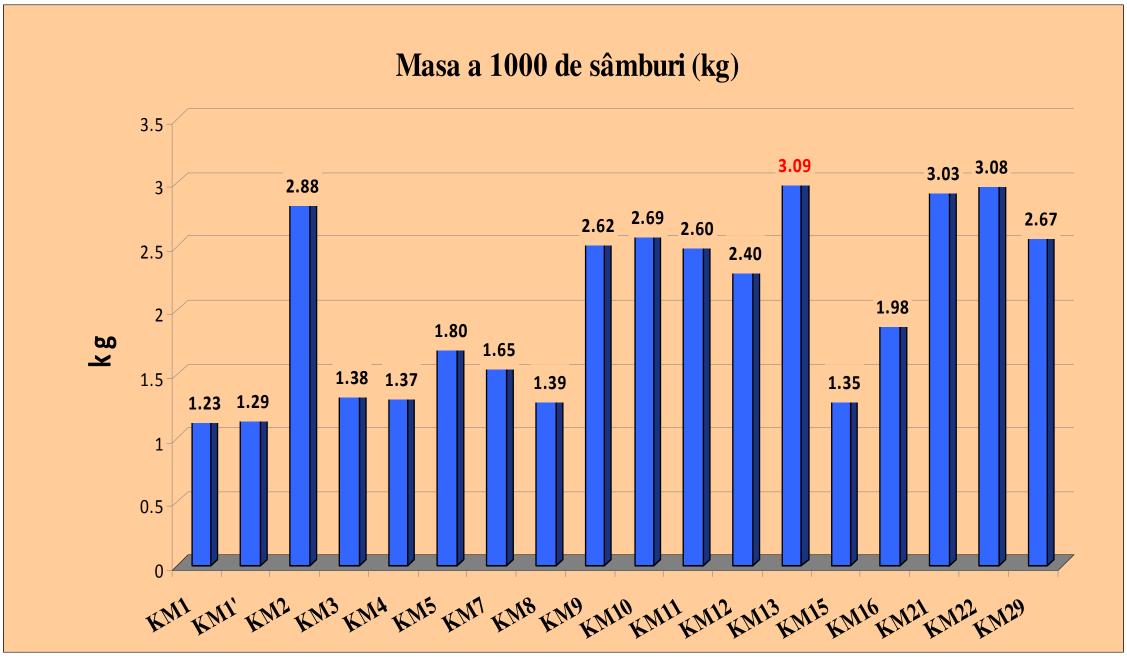

Fig. 3. The variability of 1000 seeds

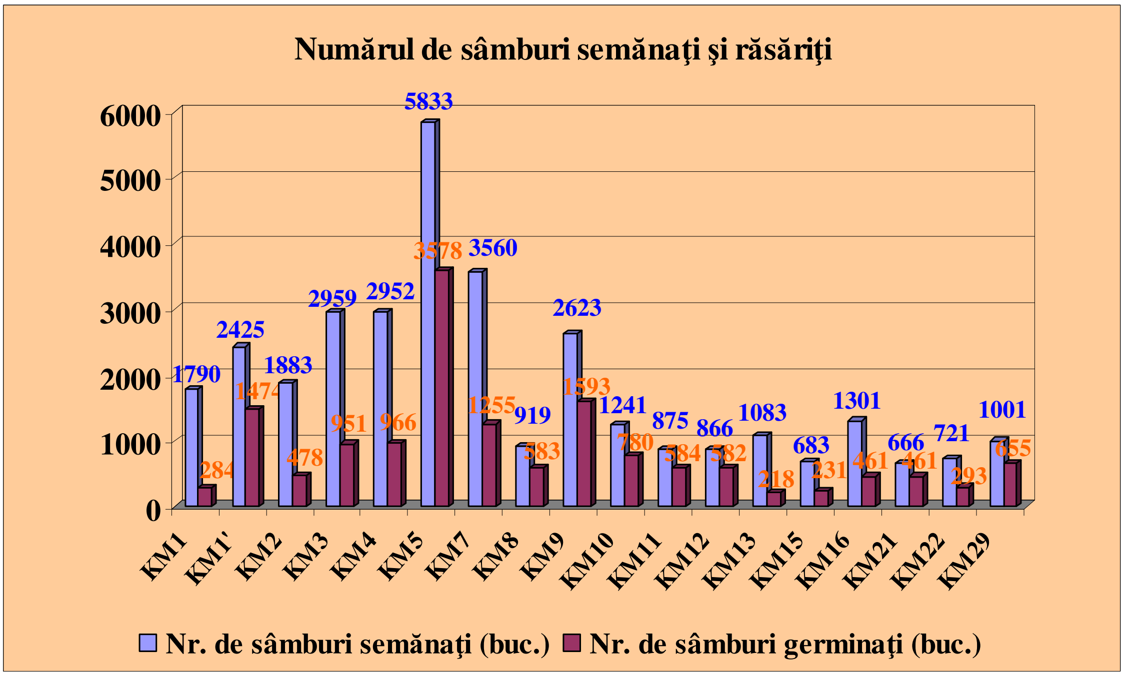

Fig. 4. Number of seedling seeds and number of rising seeds

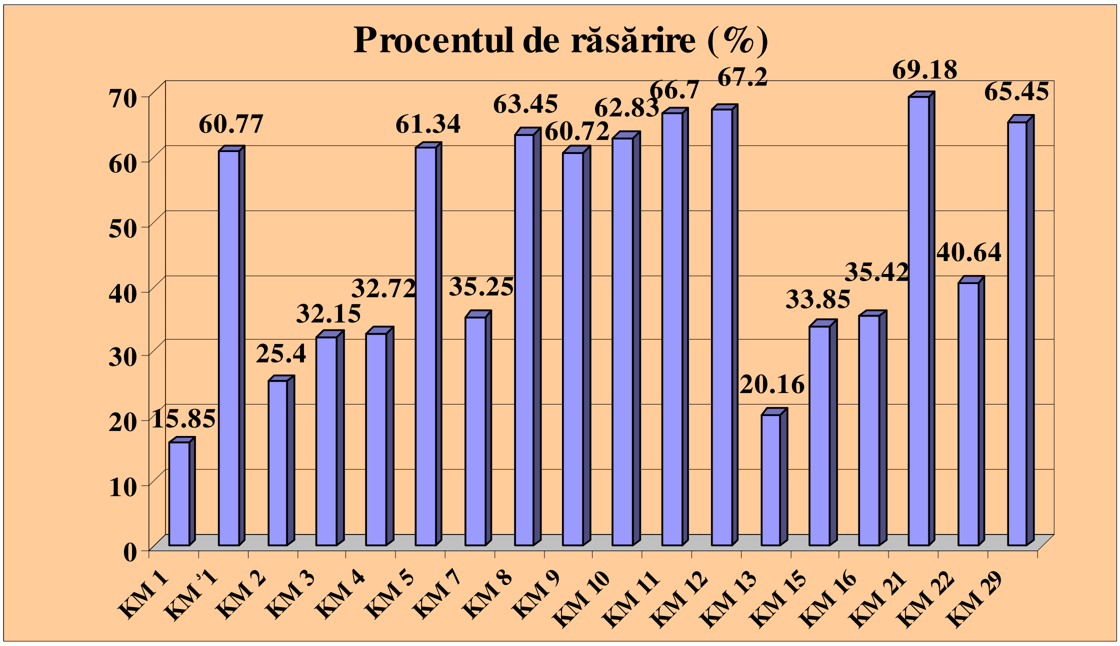

Fig. 5. The percent of wild cherry seeds rising

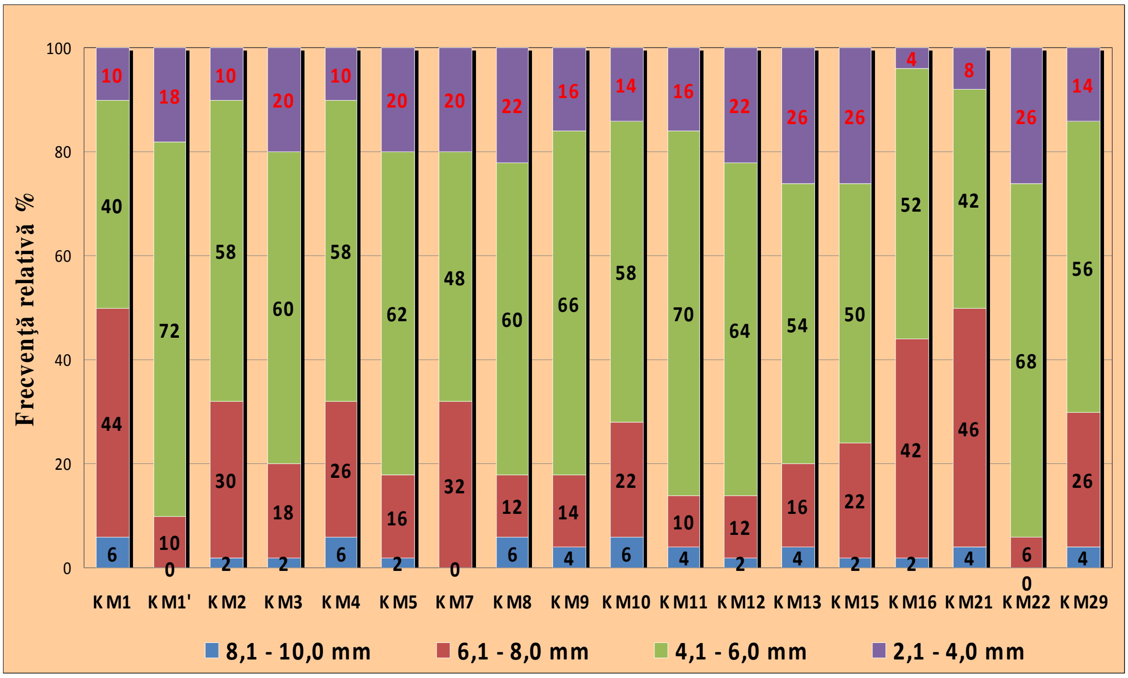

Fig. 6. Limits of trees vigor on the selections

Fruits characteristics obtained from apple species from mutagenesis induction

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Keywords: fruit characteristics, mutagenesis process, agrochemical characteristics

ABSTRACT

Apple seeds treated with variable intensity doses of irradiation, produced alterations of heredity of apple species and cultivars, which characterized by the reduction of apple heights, modification of fructification type, crop capacity, shape, color, and biochemical contents of fruits. Researches made in 2010 year were about the morph productive particularities of trees and the apples quality of twelve apples genotypes, which were in culture at S.C.P.D. Voinesti, and as controls were Jonathan and Delicious Golden species. To registered data regarding the morpho productive characteristics there were made biometrical measurements regarding: heights of apple trees, diameter of trunks and diameter of apple crowns. Biochemical determination were water content, total dry matter , total sugar, acidity, vitamin C and mineral elements total nitrogen, protein, phosphorus, potassium, calcium, iron, and heavy metals Cu, Zn, Pb, Cd. The analyses for the growing potential of some apple genotypes obtained through mutagenesis induction show that between the apple trees existed significant differences in the heights, diameter of trunks and diameter of apple crowns and types of fructifications. Another characteristics which were research, were biochemical ones. The mutagenesis process made influenced medium values of biochemical characteristics of apple genotypes.

INTRODUCTION

In the last decades, obtaining some apple species by mutagenesis induction become an important concern for the researches from our country. The scientific data obtained at different tree - stations, presented that apple seeds treated with intensity variable doses of irradiation, which produced sudden alterations of heredity of apple species and cultivars, which characterized the reduction of apple heights, modification of fructification type, crop capacity, shape, color, biochemical contents of fruits (Addiscott T.M.et al,1990, Davidescu V.et al,1999, Dejeu L.et al, 1997).

Because of those important changes, researches obtained and promoted in culture apple species as Redix, Irisem, Iris, Real.

MATERIALS AND METHODS

Researches made in 2010 year were about the morpho productive particularities of trees and the apples quality of twelve apples genotypes, which were in culture at S.C.P.D.Voinesti, and as controls were Jonathan and Delicious Golden species.

Biological material was obtained through post-maturated irradiation seeds, from some cultivars with genetically resistance at apple pests. Irradiation doses used were 8000+10000 R.

To registered data regarding the morpho productive characteristics there were made biometrical measurements regarding: heights of apple trees, diameter of trunks and diameter of apple crowns.

Biochemical determination were water content, total dry matter , total sugar, acidity, vitamin C and mineral elements total nitrogen, protein, phosphorus, potassium, calcium, iron, and heavy metals Cu, Zn, Pb, Cd.

To obtain water content and dry matter was used the drying closet method at 105^{o}C, sugar content Abbe method, total acidity through volumetric method with NaOH 0,1n, vitamin C iodometric method, nitrogen content with Kjeldahl, phosphorus with colorimetric method and potassium with flam photometric method. Heavy metals contents were determined with wet mineralization and spectrophotometer method.

RESULTS AND DISCUSSIONS

The analyses for the growing potential (Table 1). of some apple genotypes obtained through mutagenesis induction show that between the apple trees existed significant differences in the heights, diameter of trunks and diameter of apple crowns and types of fructifications.

After trunks diameter there are small vigorous genotypes like G-6/42, middle G-1/8, large at G-4/101 and super large at G-3/123.

The highest trees have right trunk, with the genotype G-1/123, and the ones with small trunk are from genotype G-6/42.

Large crowns were presented at genotypes G-3/123 and G-9/11 and with tight crowns were at genotypes G-6/42 and G-5/56.

For apples culture and for the other fruits trees cultivated in our country characteristics is the fruits crop.

Another characteristics which were research were biochemical ones. Medium values of **biochemical characteristics** of apple genotypes (Table 2) were presented in table 2 and were influenced by the mutagenesis process made.

The highest **values of water** content of fruits was registered at genotypes G – 9/11, G – 3/123 and G – 4/50, values were between 86,11 – 87,09%. The heighest **content of dry matter** were at genotypes G – 5/79, G – 5/56 and G – 1/7 and smallest contents were at genotypes G – 9/11, G – 6/42, G – 3/123, G – 4/50 and G – 4/56.

Regarding the sugar content there were normal accumulation in all genotypes comparatively with values presented in scientific literature, high contents of sugar were registered at G – 1/7, G – 1/8, G – 1/26, G – 4/50, G – 4/131, G – 5/56 and G – 6/42.

Vitamin C contents were superior in values at all variants comparatively with control 1.At genotypes G – 1/8, G – 1/26, G – 4/50, G – 4/131, G – 5/56 and G – 5/79 vitamin C contents were double and triple comparatively with the content of Jonathan and Delicious Golden

Acidity contents were at the values near the controls values with the exception of genotypes G – 1/8, G – 5/56 and G – 6/42 at which acidity had higher values.

Mineral elements contents were higher in values at apples from genotypes G – 1/7 and G – 4/101, which values were over controls values.

From the mineral elements analyses (Table 3) resulted a high content of total nitrogen and protein in the apples of genotypes G – 1/7, G – 1/8, G – 3/123, G – 4/131, G – 9/11 and a small contents at variants G – 6/42, G – 4/56, G – 4/50 and G – 5/79. With the exception of genotype G – 9/11 which had the higher content of phosphorus, with the value 0,408%, apples of the other genotypes presented the same values.

Contents of another mineral elements analyzed were in normal variability for apple specie but between genotypes there were not high differences.

Apples from genotypes G – 4/101 and G – 4/131 were predicted to accumulate high quantity of nitrates and G – 6/42 and G – 1/26 accumulated small quantities of nitrates. All nitrates quantities accumulated in apple genotypes were over the maximum admissible levels of 60ppm NO_3^- predicted in the legislation of our country regarding security consume condition for fresh fruits.

The accumulation levels of Cu and Zn were low and were under the maximum admissible limits for those elements presented by the „Ordinul Autorităţii Naţionale pentru Protecţia Consumatorilor nr.1 din 2002”. The levels of lead and cadmium were in trace values which showed the good quality of fruits.

CONCLUSIONS

1. The analyses for the growing potential of some apple genotypes obtained through mutagenesis induction, show that between the apple trees existed significant differences in the heights, diameter of trunks and diameter of apple crowns and also types of fructifications.
2. Regarding trunks diameter the smallest was obtained at G – 6/42 and the largest one was obtained at G – 3/123, the highest tree was at variant G – 3/123 and the smallest tree was at G – 6/42. Another measurement analyzed was the crown diameter of apple tree. The largest crown were obtained at G – 3/123, G – 9/11 and the tightest were at variant G – 6/42 and G – 5/56.
3. Another characteristics which were research were biochemical ones. The mutagenesis process influenced medium values of biochemical characteristics of apple genotypes. The values of dry matter, acidity, sugar and vitamin C had large variability between variants;
4. From the mineral elements analyses resulted a high content of total nitrogen and protein in the apples of genotypes G – 1/7, G – 1/8, G – 3/123, G – 4/131, G – 9/11 and a small contents at variants G – 6/42, G – 4/56, G – 4/50 and G – 5/79. With the exception of genotype G – 9/11 which had the higher content of phosphorus, with the value 0,408%, apples of the other genotypes presented the same values;
5. Apples from genotypes G – 4/101 and G – 4/131 were predicted to accumulate high quantity of nitrates. All nitrates quantities accumulated in apple genotypes were over the maximum admissible levels of 60ppm NO_3^- predicted in the legislation of our country regarding security consume condition for fresh fruits.
6. The accumulation levels of Cu and Zn were low and were under the maximum admissible limits for those elements presented by the „Ordinul Autorităţii Naţionale pentru Protecţia Consumatorilor nr.1 din 2002”.

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*** Hotărârea Guvernului României nr 1 din 3 ianuarie 2002 care stabileşte condiţiile de securitate şi calitate pentru legumele proaspete destinate consumului uman

TABLES

Table 1

The development of apple genotypes studied

Genotypes	Trunk diameter cm	Tree heights cm	Crown diameter cm	The vigor of tree	Crop kg/tree
Ionathan (Control 1)	34.2	485	350	medium	18.7
Golden Delicios (Control 2)	35.8	486	310	medium	23.4
G – 1/7	34.1	456	275	medium	28.3
G – 1/8	34.3	420	230	medium	25.6
G – 1/26	33.1	380	240	medium	26.5
G – 3/123	36.7	460	460	very high	32.5
G – 4/50	32.1	510	204	high	18.0
G – 4/56	34.8	495	215	medium -high	16.6
G – 4/101	32.6	489	240	high	15.5
G – 4/131	33.1	401	310	medium	28.1
G – 5/56	35.2	495	210	high	14.5
G – 5/79	34.3	480	350	medium - high	17.4
G – 6/42	30.6	365	190	lower	25.6
G – 9/11	32.5	385	330	medium	18.3

Table 2

The biochemical characteristics of apple trees

Genotypes/Species	Water %	Dry matter %	Total sugar %	Acidity %	Vitamin C mg/100g fruit	Mineral substances %
Ionathan (Control 1)	86.30	13.70	10.61	0.21	9.21	1.66
Golden Delicios (Control 2)	85.90	14.10	11.36	0.156	12.63	1.93
G – 1/7	85.60	14.40	**12.10**	0.188	8.31	1.86
G – 1/8	85.10	**14.90**	11.80	0.195	15.20	1.25
G – 1/26	86.90	13.10	12.03	0.244	17.31	1.76
G – 3/123	87.34	12.66	9.84	**0.345**	7.66	1.58
G – 4/50	88.46	11.54	**9.53**	0.173	7.89	1.73
G – 4/56	86.20	13.80	9.75	0.214	8.75	2.10
G – 4/101	86.30	13.70	10.96	0.310	19.21	2.30
G – 4/131	85.90	14.10	9.81	0.293	9.35	2.30
G – 5/56	87.62	12.38	10.00	0.195	7.56	1.98
G – 5/79	85.18	14.82	**9.53**	0.157	17.40	1.26
G – 6/42	89.32	10.68	10.94	0.232	7.67	1.35
G – 9/11	90.15	**9.85**	**9.53**	**0.127**	7.19	1.36

Table 3

Mineral elements apples contents

Genotypes/Species	Nt %	Protein %	P_2O_5 %	K_2O %	CaO %	FeO %
Ionathan (Control 1)	1.7514	10.60	0.295	0.65	0.451	2.301
Golden Delicios (Control 2)	1.8513	10.75	0.346	0.68	0.255	2.341
G – 1/7	2.0131	11.21	0.321	0.75	0.265	2.307
G – 1/8	1.9615	10.95	0.314	0.65	0.265	2.205
G – 1/26	1.8048	11.24	0.363	0.65	0.148	2.204
G – 3/123	1.8514	11.75	0.310	0.55	0.246	2.305
G – 4/50	1.5792	9.83	0.3285	0.55	0.276	2.341
G – 4/56	1.7776	11.61	0.276	0.45	0.275	2.205
G – 4/101	1.9766	11.45	0.2176	0.30	0.252	2.204
G – 4/131	2.1714	13.52	0.2765	0.50	0.2450	2.352
G – 5/56	1.7672	11.00	0.3285	0.55	0.260	2.212
G – 5/79	1.7390	10.83	0.3460	0.65	0.158	1.896
G – 6/42	1.2690	7.90	0.3805	0.55	0.210	2.488
G – 9/11	2.0304	12.64	0.4150	0.45	0.269	2.526

Table 4

Components and potential toxic elements

Genotypes/Species	NO_3- ppm	Cu ppm	Zn ppm	Pb ppm	Cd ppm
Ionathan (Control 1)	210.1	3.5	2.3	Trace	Trace
Golden Delicios (Control 2)	296.9	2.1	4.2	Trace	Trace
G – 1/7	189.3	3.2	3.1	Trace	Trace
G – 1/8	175.4	3.3	3.2	Trace	Trace
G – 1/26	132.3	3.2	3.8	0.21	Trace
G – 3/123	272.1	3.8	3.6	Trace	Trace
G – 4/50	170.1	4.1	2.2	Trace	Trace
G – 4/56	189.2	3.5	3.8	0.25	Trace
G – 4/101	151.2	2.8	4.2	Trace	Trace
G – 4/131	173.2	3.1	3.6	Trace	Trace
G – 5/56	189.0	3.5	3.8	0.25	Trace
G – 5/79	170.1	4.3	4.8	0.15	Trace
G – 6/42	151.2	3.7	4.9	Trace	Trace
G – 9/11	170.1	3.6	3.7	Trace	Trace

The impact of manual thinning upon fruits' chemical features of some peach varieties cultivated in conditions of the western part of Romania

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Keywords: peach, neactarine, thinning, sugars, acidity

ABSTRACT

Peaches' main chemical substances content are sugars, organic acids, pectic substances, tannins, vitamins and minerals. Manual thinning of peaches is almost compulsory and gives high results by assuring a sufficient space between fruits, increasing their quality. In this article we present the impact of manual thinning upon the content of soluble dry substance, rephractometrical determined, sugars, determined by soluble dry substance method, total acidity, determined by juice extraction and titration with NaOH, and gluco-acidimetric index. The studied varieties were 2 varieties of peach Spring Lady and Maja, and 2 nectarine varieties Caldesi 2000 and Nectaross. The trees were planted at a distance of 4.0 x 2.5 m, having a density of 1000 trees/ha and the crown system is Palm Spindelbusch. The soil is maintained clean by mechanical hoes and the use of Roundup 360 SL herbicide. Manual thinning was done when fruits had the size of a walnut till the stoning of stones. There was done a severe thinning at 15 cm, a moderate one at 10 cm and a softer one at 5 cm. Manual thinning had different intensities, such as: 5 cm between fruits, 10 cm between fruits and 15 cm between fruits, and the results obtained showed that sugars increase in those variants where thinning was more severe, than in those with slightly thinning.

INTRODUCTION

The peach tree is one of the most valuable fruit species mainly because of fruit's quality. The peaches are nice colored fruits, flavored, juicy, with excellent taste, rich in organic and mineral substances (1,2,5).

This is a species that has each year a great number of flower buds and it does not alternate, only in rare and particular cases. If it counters favorable climatic conditions, the peach tree has a large binding degree of 90-95%, sometimes all flower buds giving fruits. The existence in a bud group of two flower buds and the small space between the bud groups determine a low space between fruits, with insufficient growth and nutrition space. That is why it is very important to do thinning for this species even if it is made by chemical, mechanical or manual means (3,4,6).

Researchers consider that, even if there was applied a chemical or mechanical thinning of peaches, the only method that assures high quality fruits is manual thinning, which gives sufficient spaces between fruits of 5 cm, 10 cm or 15 cm (1,3,4,6).

MATERIALS AND METHODS

The experiment was placed in an orchard at Periam, a locality near Timisoara, very well known for the old peach orchards that used to be there. There were observed 4 peach varieties, of which 2 real peaches: *Spring Lady* and *Maja* and 2 nectarine varieties: *Caldesi 2000* and *Nectaross*. These varieties are representative for the actual sortiment and behave well in Periam fruit tree culture area.

The trees were planted at a distance of 4.0 x 2.5 m, having a density of 1000 trees/ha and the crown system is Palm Spindelbusch. The soil is maintained clean by mechanical hoes and the use of Roundup 360 SL herbicide.

Manual thinning was done when fruits had the size of a walnut till the stoning of stones. There was done a severe thinning at 15 cm, a moderate one at 10 cm and a softer one at 5 cm.

In this article we present the content of soluble dry substance, rephractometrical determined, sugars content, determined by soluble dry substance method (4 x refractometric dry substance/100 -4.25), total acidity, determined by juice extraction and titration with NaOH, expressed in malic acid and the gluco-acidimetric index, which expresses the taste of fruits, so at high values of this index fruits have a low acidity, while at low values of this index, they have too much acidity.

RESULTS OBTAINED

Out of the analytical data, we see that total sugars increase in those variants where severe thinning was done, which is normal because the trees feed a lower number of fruits and these grow big and with a higher content of sugars.

Spring Lady variety had a content of dry soluble substance of 8.8% in variant 1 and 9.5% in variant 3. Total sugars increased from 6.85% in variant 1 (thinned at 5 cm) to 7.59% in variant 3 (thinned at 15 cm). Total acidity had values between 0.52% in variant 1 and 0.47% in variant 3. We can see that in the variant with severe thinning acidity is more intense than in the other variants. Gluco-acidimetric index had values of 13.17 in variant 1 and 16.5 in variant 3 (table 1).

Caldesi 2000 had a content of soluble dry substance of 10.4% in variant 1 and 11.4% in variant 3. Total sugars varied between 8.55% in variant 1 and 9.61% in variant 3, while total acidity had values of 0.38% in variant 1 and 0.35% in variant 3. Gluco-acidimetric indev varied from 22.55 in variant 1 and 27.45 in variant 3 (table 2).

Nectaross had a content of refractometric soluble dry substance of 11.6% in variant 1 and 12.1% in variant 3. Total sugars had values of 9.82% in variant 1 and 10.35% in variant 3, total acidity varied from 0.45% in variant 1 and 0.41% in variant 3, and the gluco-acidimetric index and acidity had lower values in variant 1 (21.82) and higher in variant 3 (25.24) (table 3).

Maja variety had a content of soluble dry substance, determined by refractometer of 12.4% in variant 1 and 13.3% in variant 3. Total sugars had values of 10.67% in variant 1 and 11.63% in variant 3, total acidity varied from 0.42% in variant 1 and 0.38% in variant 3, and the gluco-acidimetric index was lower in variant 1 (25.0) and higher in variant 3 (30.60), so that the fruits were sweet and only a bit sour (table 4).

CONCLUSIONS

Manual thinning at 15 cm gave the best results concerning fruits' quality, with chemical features superior than those obtained in the variants where soft thinning was done (5 cm).

The differences between the varieties are mainly genetically determined, but also because of some phenological differences, which were not well appreciated when the treatments were applied.

The obtained results show that sugars increase in those variants where severe thinning was done, which is normal, because the trees give nutrients for a smaller number of fruits, which grow larger and of a better quality.

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TABLES

Table 1

Chemical composition of fruits according to thinning distance at Spring Lady variety

Variant	Soluble dry substance (%)	Total sugars (%)	Total acidity (malic acid %)	Gluco-acidimetric index
V1-thinning at 5 cm	8.8	6.85	0.52	13.17
V2-thinning at 10 cm	9.2	7.27	0.48	15.14
V3-thinning at 15 cm	9.5	7.59	0.47	16.15

Table 2

Chemical composition of fruits according to thinning distance at Caldesi 2000 variety

Variant	Soluble dry substance (%)	Total sugars (%)	Total acidity (malic acid %)	Gluco-acidimetric index
V1-thinning at 5 cm	10.4	8.55	0.38	22.50
V2-thinning at 10 cm	10.8	9.34	0.36	25.94
V3-thinning at 15 cm	11.4	9.61	0.35	27.45

Table 3

Chemical composition of fruits according to thinning distance at Nectaross variety

Variant	Soluble dry substance (%)	Total sugars (%)	Total acidity (malic acid %)	Gluco-acidimetric index
V1-thinning at 5 cm	11.6	9.82	0.45	21.82
V2-thinning at 10 cm	11.9	10.14	0.42	24.14
V3-thinning at 15 cm	12.1	10.35	0.41	25.24

Table 4

Chemical composition of fruits according to thinning distance at Maja variety

Variant	Soluble dry substance (%)	Total sugars (%)	Total acidity (malic acid %)	Gluco-acidimetric index
V1-thinning at 5 cm	12.4	10.67	0.42	25.40
V2-thinning at 10 cm	12.8	11.10	0.39	29.21
V3-thinning at 15 cm	13.3	11.63	0.38	30.60

Study on fruits production of densely gooseberry bush plantation

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Keywords: gooseberry, variety, yield, intensive plantation, irrigation.

ABSTRACT

This work presents the results of scientific researches made on 2007-2010, concerning the motivation on the productivity of gooseberry culture in intensive plantation on the irrigate growing conditions. Rationally using the land to plantations on irrigated land by planting distance of 1.5 x 1.0 m depending on the quality can get a variety of fruit production up to 25-32 t/ha. The average mass of fruit, gooseberry bush on the train irrigated varieties ranged from 2.1 to 3.9 g studied, and the maximum mass of fruit, from 2.4 g to 4.4 g. up large fruit varieties are: Captivator (3.9 g), Sadko (3.6 g), Smena (3.3 g). Small fruited are Gruşenca and Severnîi captain (2.1 g). Average yield of gooseberry bush varieties studied ranged from 7.4 to 19.5 t/ha on irrigated land. Studied varieties of gooseberry bush Colobok, Grushenca, Captivator, Sadco, Smena, Severni kapitan, Slivovi or acted as highly productive varieties with a yield of over 6 t/ha.

INTRODUCTION

Plants react strongly to shading, gooseberry bush, which is why a prematurely terminated thickening too much growth, branches aging, decreases productivity (Putîrschii et al. 2004).

To maintain soil moisture and plant better grip in young plantations, late autumn or early spring, under the bushes in continuous strips of 1 m is applied soil mulching with peat processed (decomposed) compost or straw, the thickness of 3-5 cm, using an aggregate of spreading the 1ПТУ-4 with the regulator. Barberry especially for this procedure is necessary on soils that dry quickly. The distances between the rows are processed by the grower to maintain moisture and weed control (Ciuhliaev and Iaroslavţev 1982, Truşecichin 1971).

Large industrial plantations, gooseberry bush as recommended planting distances requires the 3x1 m, or 3333 pl/ha and smaller plantations, where the interval between rows does not work mechanically, can be used for distances less than 1.5 to 2.5 x 1 m (Hoza 2000). The gooseberry plantations, existing varieties average over a distance of 3x1 m planting stuffed, leads to a harvest increased 1.5 times (Tolstoguzova 2009).

The most common gooseberry bush growing form, and rarely the trunk 25-110 cm tall (Alto), which requires a support system as a tutor or trellis planting distances that vary depending on the technical work available namely from 2.5 to 3 m between rows and 1.2 to 1.5 m at a time - for commercial plantations, and 1.5 m between rows and 0.7 m at a time - for gardens attached to houses (Childers, Norman Franklin 1976, Chira, Lenuţa 2000).

MATERIALS AND METHODS

Investigations on the influence of cultivation in developing plant production and quality of fruit, gooseberry bush in intensive plantations, which were established in experimental field of the Scientific Practical Institute of Horticulture in the years 2007-2010 on irrigated land with planting distance of 1.5x1.00 m. The investigations were carried out according to established methods for studying shrubs. The study included seven varieties introduced, gooseberry bush: Colobok, Captivator, Grushenka, Sadko, Smena, Severni captain, Slivovi.

RESULTES AND DISCUSSIONS

Increasing the number of plants per hectare in densely plantations, gooseberry bush makes it possible to obtain increased yields compared with regular plantations where coefficient use of land is much lower. Age planting, plant maintenance conditions significantly influence the quantity and quality of fruit and total yield in irrigated plantations obtained. Densely application allows obtained more fruits, with greater weight and results in increased yields.

Gooseberry fruits are classified by size in the following categories: large - more than 4 g, medium - 2-4 g and small - less than 2 g (Hapova 2003).

The results on the table fruit, gooseberry bush varieties under study are included in Table 1.

According to research conducted and obtained data (Table 1) was established that the highest average of fruit weight (2007-2010) it had the varieties Captivate (3.9 g), Smena (3.6 g), Sadko (3.3 g) and the lowest average weight of fruits – the varieties Grushenka, Severni kapitan (2.1g). Limit of variation on studied gooseberry varieties the fruit weight ranged from 1.6 to 4.4g. Number and fruit mass, the quantity of obtained production on studied varieties varies depending on plants vigor, training conditions during fruit formation etc.

Productivity depends on the capabilities gooseberry increases proportionally with increasing variety and number of plants per hectare. When choosing planting distances is important to take into account the characteristic features biologic variety (Tolstoguzova 2009).

Gooseberry cultivation on smaller areas is possible on a rather chunky scheme, where the distance between rows of plants can be reduced up to 1.5 m and between plants in turn, depending on the vigor of growth, characteristic of the variety (fig.1).

Productivity depends on the capabilities gooseberry increases proportionally with increasing variety and number of plants per hectare. Besides increasing production, effective use of land are some drawbacks: the performance of maintenance, processing between the lines require special equipment or processing mini-manual, protection against pests and diseases, especially against American powdery mildew, if the varieties are not resistant to this disease are needed chemical application of treatments to prevent disease and pests, also require more fertilizer in May with organic or mineral fertilizers, as the number of plants per unit area is higher and the use of nutritional soil substance is more intensive.

Gooseberry is a plant with a well developed root system better supports temporary lack of water (Cazacov I. et al. 2009).

Drought resistance of gooseberry can afford to get good crops without irrigation, but when applied for irrigation, increasing yields significantly.

Research on the quantity obtained production under irrigation allowed to obtain the following results displayed in Table 2.

According to research data presented in Table 2 for the 2007-2010 average harvest the largest plantations with irrigation, densely gooseberry bush varieties was obtained from immersive size of 19.5 t/ha, captain Severni 18.6 t/ha, Colobok 13.8 t/ha, while the lowest average yield was set at the variety Grushenka worth of 7.4 t/ha. Deviation limit the amount of fruit, gooseberry bush yields obtained varied between 6.0 and 32.7 t/ha. Highest yield was obtained in 2010, which ranged from 10t/ha-variety Smena up to 32.7 t/ha in variety.

CONCLUSIONS

As a result of investigations it was established that the land use more rationally the plantations after planting distance of 1.5 x 1.0 m depending on the quality irrigated land can get a variety of fruit production up to 25-32 t/ha.

1. The average mass of fruit, gooseberry bush on the train irrigated varieties ranged from 2.1 to 3.9 g studied, and the maximum mass of fruit, from 2.4 g to 4.4 g. up large fruit varieties are: Captivate (3.9 g), Sadko (3.6 g), Smena (3.3 g). Small fruited are Grushenca and Severni captan (2.1 g).

2. Average yield of gooseberry bush varieties studied ranged from 7.4 to 19.5 irrigated train t/ha. Studied varieties of gooseberry bush Colobok, Captivator, Grushenca, Sadco, Smena, Severni capitan, Slivovi or acted as highly productive varieties with 6 t/ha.

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TABLES AND FIGURE

Table 1

Gooseberry fruits weight, year of plantation 2004, planting distance 1,5x1,0 m, irrigated land

Variety	Fruit weight, g				Mean, g	Limit of variation
	2007	2008	2009	2010		
1. Colobok	2.0	2.7	2.9	3.7	**2.8**	2.0-3.7
2.Captivator	3.1	4.0	4.1	4.2	**3.9**	3.1-4.2
3. Grushenka	2.2	1.9	2.2	2.0	**2.1**	1.9-2.2
4. Smena	2.7	3.6	3.5	4.3	**3.6**	2.7-4.3
5. Sadko	2.9	3.1	2.7	4.4	**3.3**	2.7-4.4
6. Severni kapitan	1.6	2.0	2.0	2.7	**2.1**	1.6-2.7
7. Slivovi	2.3	2.8	3.0	2.3	**2.6**	2.3-3.0

Table 2

Fruit production of gooseberry bush varieties studied on planting year 2004, planting distance 1.5 x1, 0 m, irrigated land

Variety	Production, t/ha				Mean, t/ha	Limit of variation
	2007	2008	2009	2010		
1. Colobok	12.0	6.7	12.0	24.0	13.8	6.7-24.0
2. Captivator	10.0	11.3	24.0	32.7	19.5	10.0-32.7
3. Grushenka	8.0	8.0	6.3	-	7.4	6.3- 8.0
4. Smena	10.0	9.3	8.0	10.0	9.3	8.0-10.0
5. Sadko	6.6	6.0	6.1	19.3	9.5	6.0-19.3
6. Severni kapitan	14.7	18.0	16.2	25.3	18.6	14.7-25.3
7. Slivovi	7.3	5.3	14.0	13.5	10.0	7.3-13.5

Fig. 1. Densely gooseberry bush plantation

Horticulture in Sulawesi Utara Province - Indonesia

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Keywords: species, tropical fruits, vegetables, ornamental plants, cropping systems

ABSTRACT
Located few degrees north from the Equator, Sulawesi Utara Province (North Sulawesi) Indonesia, is a rich land were horticulture is well developed. The paper presents some aspects regarding the Horticulture sector. After a brief presentation of the geographical position and province relief, some data regarding the climate characteristics, population and labor force are detailed. For the most important fruit and vegetable crops, total cultivated area, average yield and total production are presented. Tropical fruit production is dominated by three crops: coconut cloves and nutmeg, those crops being representative at the national level. Some of the native ornamental plants are also described. The plants name are presented both in English, Bahasa Indonesia and Latin.

INTRODUCTION

Sulawesi Utara Province (North Sulawesi) is one of the 33 Indonesian provinces, located in the northern part of the Sulawesi Island. Grace to its fertile land and climate characteristics Sulawesi Utara is a perfect area for the most important tropical crops (BPS Statistics Province of Sulawesi Utara, 2009).

The coat of arms of the Sulawesi Utara represents centrally a coconut tree, the most important fruit crop in the province (Fig. 1).

PRESENTATION

GEOGRAPHICAL POSITION, RELIEF AND CLIMATE

The Province of Sulawesi Utara, with capital city in Manado, is located between 0°15'– 5°34' North Latitude and 123°07'– 127°10' East Longitude. This province is bounded by Sulawesi Sea, Republic of Philippines, and Pacific Ocean at the north side and Maluku Sea at the east side. Bound of south and west are Golf of Tomini and the Province of Gorontalo.

The area of Province Sulawesi Utara is 15,273.10 square km which includes eleven regencies and four cities. Sulawesi Utara has 150 districts and 1,580 villages.

Sulawesi Utara has 41 mountains. This mountains stands in three regencies that are: Bolaang Mongondow, Minahasa and Sangihe Talaud. There are 17 lakes and 30 rivers in Sulawesi Utara.

Sulawesi Utara has a typical equatorial climate. According to the data from Sam Ratulangi Meteorogical Station average temperature in Manado and around recorded 26.0 °C. There are no differences between the monthly average temperatures (Table 1).

Annual rainfall is around 5000 mm. The recorded data show a certain increase in the total precipitations in the last 5 years. The rainiest months are January and February with around 500 mm and the most dried, August and September with around 100 mm (Table 2). The distribution of rainfalls per months is presented in the Figure 2.

The duration of sunshine is around 51.4%, the relative air humidity 88% and the number of rainy days 24.25 (Table 3).

POPULATION AND LABOR FORCE

The number of population in Sulawesi Utara according 2008 data year is 2,208,012 peoples. Since the area of Sulawesi Utara is 15,273.10 square km, population density reached 144.57persons/km^2.

Basically the population can be divided into two groups, those in the labor force group and those are not. The labor force group includes persons aged 15 years and over who during once a week prior to the time of enumeration were not jobless.

Labor force of the whole working in Sulawesi Utara is 1,020,952 people and about 912,198 people have working.

HORTICULTURE

Horticulture is one of the main sectors of agriculture beside the rise cultivation and animal husbandry.

To raise farmer's income is one several goals of the province development in agriculture. Intensification, extensification, diversification and land improvement are policies imposed to achieve such a target.

Land area of Sulawesi Utara Province is 15.273 km^2. It consists of 65,629 Hectares wetland (4.30 %) and 1,461,698 hectares dry land (95.70 %).

FRUIT GROWING

Coconut, Clove, Nutmeg, Coffee and Cocoa are potential estate crops commodities in Sulawesi Utara.

Based on 2008 data obtained from Plantation Agency in Sulawesi Utara, registered area of coconut were 272,137.22 hectares, clove were 74,383.00 hectares, nutmeg were 13,774.93 hectares, coffee were 9,271.43 hectares and cocoa were 13,048.50 hectares.

Total planted area of **dry fruits and spices tree**s is 395,802.68 ha with a total production of 242,449.97 tons (Table 4).

The most important dry fruit crop as cultivated area and production is Coconut – Indonesian Kelapa (*Cocos nucifera*) (Fig. 3) with 272,137.22 ha and 209,994.88 tones. The highest registered production was of 362,841.82 tons of coconuts.

The second fruit crop is Clove – Indonesian Cengkeh (*Syzygium aromaticum*) (Fig.4) with 74,383.00 ha and 284.99 tons followed by Nutmeg – Pala (*Myristica fragrans*) (Fig. 5) with 13,774.93 ha and 9,645.58 tons.

Other important crops are Cocoa – Coklat (*Theobroma cacao)* with 13,048.50 ha and 5,141.36 tons, Coffee - Kopi (*Coffea arabica*) with 9,271.43 ha and 3,304.67 tons, and Palm nuts – Aren (*Arenga pinnata*) with 5,763.74 ha and 12,096.56 tons.

The production of **tropical fruits** (Table 5) is realized on 3,057,781 trees, the average yield being 115.11 kg/tree and the total 133,130 t. The most important fruit specie is Banana – Pisang (*Musa ssp*.) (Fig. 6) with a total production of 56,112 tons produced by 825,169 trees with an average yield of 68,0 kg/tree.

Good production is registered at Rambutan (*Nephelium lappaceum*) – 13,708 tons from 133,360 trees (102.79 kg/tree). Mango – Mangga (*Mangifera indica*) ranks three (Fig. 7), with 12,305 tons produced by 104,170 trees (118.12 kg/tree).Other important species are Duku (*Lansium domesticum*) with 146,410 trees and Durian (*Durio zibethinus*) with 134,886 trees and fruit production more than 10,000 tons each.

VEGETABLE GROWING

Sulawesi Utara Province is an important vegetable producer. Total vegetable production is 367,534 tons is obtained on 41,857 ha with an average yield of 9.214 tons/ha.

The highest production is obtained by Potatoes crop – Kentang (*Solanum tuberosum*) with 139,025 tons produced on 8,565 ha.

Other important tuber crops are Cassava – Ubi kayu (*Manihot esculenta*) (Fig. 8) with a production of 83,654 tons and Sweet potatoes – Ubi manis (*Ipomoea batatas*) with a production of 42,059 tons.

Tomatoes (Fig. 9) are produced on 2,247 ha and the production is 27,590 tons. Other Solanaceae vegetables are represented by Egg plants (Fig. 9) and Peppers including Chili, the last ones being extremely important in the Sulawesi diet.

Spinach group is dominated by the Water Spinach – Kangkung (*Ipomoea aquatica*) with a production of 7,865 tons, cropped on 450 ha.

Onion is represented by Spring onion – Bawang Daun (*Allium fistulosum*) (Fig. 10) and Shallot – Bawang Merah (*Allium ascalonicum*).

Different types of beans are cultivated besides the normal Beans – Buncis (*Phaseolus vulgaris*): Mung beans – Kacang Hijau (*Vigna radiata*), Red-streaked bean – Kacang Merah (*Phaseolus vulgaris cv.*) and Long bean – Kacang Panjang (*Vigna sesquipedalis*) (Hutton and Mealin 2004).

In the Tomohon highlands, Rurukan village, the production is realized on raised beds placed on the slope curves (Fig. 11). An interesting system of ditches allows the collection of the rain water on the slope to reduce erosion (Fig. 12). The main vegetables cultivated are: carrots (Fig. 13), spring onion, leak, cabbage, Chinese cabbage etc.

FLORICULTURE AND ORNAMENTAL PLANTS GROWING

Many of the European indoor plants are growing widely in Sulawesi Utara in nature and as outdoor plants in court yards.

Besides some imported species from tropical areas of South America, Africa and India, Sulawesi Utara Province is rich in Indonesian native species (Warren and Invernizzi Tettoni, 2004).

Some of the most important native species are presented bellow.

Pagoda Flower – Bunga pagoda (Clerodendrum paniculatum) is a tall, woody shrub with very large, glossy, three-lobed leaves. The red-orange flowers appear at the top of the plant in a conical inflorescence. Each flower is about 1,5 cm in diameter with along protruding stamens. Flowers are unscented but attract butterflies and Birdwing.

Crepe Ginger – Pacing tawar (*Costus speciosus*) produces curve spirally stalks up to 3 m high from the underground tuber. On the top its form large brownish-red bracts, resembling small pineapple, from wich emerge the delicate white flowers. The young shoots may be eaten as vegetables.

Torch Ginger – Nikolaia (*Nicolaia elatior* sin. *Phaeomeria speciosa*) is a spectacular member of the ginger family: Zingiberaceae, being one of the most beautiful of all flowering tropical plants (Fig. 14). Leaf and flower stalks emerge separately from the underground tuber. Leaf stalks grow as tall as 5 m. Colored bracts protect the small tubular flowers and open outward to expose them, forming a rounded red structure that looks artificial. There is also a pink flower variety. Before opening the bracts the flower head is edible having a ginger flavor. The plant was named after the Russian

Bat Lily – Keladi murai (*Tacca integrifolia* sin. *Tacca cristata*) named also Black Lily, is one of the most unusual plants grown in the jungle. From its rosette of glossy-green leaves emerges a series of purplish-black flowers with beautiful petals and sepals, and long whiskery appendages.

Ixora – Soka (*Ixora sp.*) is a free-flowering shrub with big round inflorescences with more than 60 flowers in the top of the branches. The colors are different depending on specie and variety.

Gardenia – Kaca piring (*Gardenia jasminoides; G. carinata*) is a common plant in the tropical Indonesian gardens. The bushy shrub can grow from 3 m for *G. jasminoides* till 10 m for *G. carinata*. The plant has glossy green oval leaves and pure-white double flowers intensely fragrant.

Jasmine – Melati (*Jasminum sp*.) is one of the most popular flowers in South-Eastern Asia. The climber plant produces white simple or double petal flowers, with very intense fragrance.

Water Lily – Padma (Nymphaea sp) is one of the most common aquatic flowers (Fig. 15). With a large variety of color, sizes and period of flowering, Water Lilies are displayed in every pond.

Lotus – Seroja (*Nelumbo nucifera* sin. *Nelumbian nelumbo*) is a sacred symbol in Asian religions. The flowers stalks rise above the water and hold five-petal large pink or white flowers (Fig. 16). Leaves are large, round and covered with microscopic hairs.

Banana – Pisang (*Musa spp*.) have few ornamental varieties that can be founded in gardens. There are generally smaller that commercial bananas, with attractive leaves and sometime colored flowers (*M. coccinea*).

New Guinea Creeper – Mukuna New Guinea (*Mucuna bennetii*) is the most beautiful between the tropical climbers. The plant forms long pending clusters with large pea-type flowers of bright orange-red color (Fig. 17).

Jade Vine – Strongilodon (*Strongylodon macrobotrytis*) is a rampant climber that produces pea-type flowers grouped in a one meter long cluster. The flowers are bluish jade-green a very rare flower color in the world (Fig. 18).

Orchid Tree – Daun Lilin (Bauhinia sp.) has typical two-lobed or twin leaves. There are more than 500 species in the Bauhinia genus with different color flowers.

Orchids – Anggerek are represented by many species with a high variability of form, sizes, shapes and colors. The most common genus is: *Dendrobium, Vanda, Phalaenopsis, Cattleya, Paphiopedilum* etc. Apart of those, there are many less known genus and species (Fig. 19).

The most important flower producing area is located in the Tomohon highland region on rich volcanic soils. Flower are sold locally by the producers or sent to Manado and some other Indonesian provinces (Fig. 20).

CONCLUSIONS

Horticulture in Sulawesi Utara is an important branch of the local economy. Production of coconut, clover and nutmeg are the most important for all Indonesia. Vegetables are widely cultivated and appreciated for their quality. The production under plastic covered bamboo tunnel starts to be extended, especially for rain protection. Also plastic film mulching largely use for the new introduced strawberry crop.

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TABLES AND FIGURES

Table 1

Average monthly temperature (°C) in Manado: 2001 – 2008

Month/Year	2001	2002	2003	2004	2005	2006	2007	2008	AVERAGE
January	25.8	25.7	26.2	25.7	25.4	25.3	25.9	25.8	25.73
February	25.6	25.9	25.5	25.9	25.3	25.2	25.3	25.7	25.55
March	25.6	26.5	25.9	26.7	25.8	26.0	25.7	25.5	25.96
April	26.2	26.7	26.9	27.1	26.1	25.8	26.3	25.6	26.34
May	26.8	27.1	27.6	26.9	26.6	26.2	26.5	26.8	26.81
June	26.7	27.0	27.3	27.4	26.6	26.0	26.3	26.5	26.73
July	26.7	27.3	26.3	26.2	26.6	27.6	26.9	25.6	26.65
August	27.4	27.8	27.1	27.1	27.5	27.5	26.7	26.2	27.16
September	26.1	27.1	27.0	27.1	27.3	27.1	27.3	26.2	26.9
October	27.2	27.3	26.8	27.1	26.3	27.3	26.3	26.2	26.81
November	27.1	26.8	27.4	27.5	26.3	26.1	25.9	25.6	26.59
December	26.4	26.8	25.8	26.8	26.0	25.9	25.9	25.9	26.19
AVERAGE	26.5	26.8	26.7	26.8	26.3	26.3	26.2	26.0	26.45

Table 2

Average monthly rainfall (mm) in Manado: 2001 – 2008

Month/Year	2001	2002	2003	2004	2005	2006	2007	2008	AVERAGE
January	299	844	387	548	374	431	668.6	461	501.58
February	325	295	364	282	435	959	471.3	232	420.41
March	316	125	363	388	358	294	341.2	440	328.15
April	357	225	194	129	271	252	176.4	366	246.3
May	233	288	282	374	255	265	336.5	135	271.06
June	143	217	93	166	328	199	287.2	133	195.78
July	61	0	217	329	91	14	121.2	437	158.78
August	68	17	211	9	36	10	200.9	140	86.49
September	208	55	89	83	95	99	85.0	193	113.38
October	272	149	264	150	355	36	180.8	286	211.6
November	264	335	152	298	524	202	302.1	562	329.89
December	93	173	755	109	395	341	265.6	250	297.7
SUM	4640	4725	5374	4869	5522	5108	5443.8	5643	5165.6

Table 3

Sunshine, relative humidity, rainfall and number of rainy days in Manado 2008

MONTH	Duration of sunshine	RELATIVE HUMIDITY	RAINFALL	Number of rainy days
	(%)	(%)	(mm)	(NO)
January	50	88	461.00	27.00
February	46	88	232.00	24.00
March	40	88	440.00	27.00
April	44	89	366.00	24.00
May	68	82	135.00	14.00
June	58	86	133.00	24.00
July	50	89	437.00	27.00
August	62	84	140.00	21.00
September	55	87	193.00	23.00
October	50	90	286.00	26.00
November	43	93	562.00	27.00
December	51	92	250.00	27.00
Average	51.4	88	302.91	24.25

Table 4

Planted area (ha) of fruit trees in Sulawesi Utara 2008

CROP (ENGLISH)	CROP (INDONESIAN)	CROP (LATIN)	Harvested area (HA)	Total production (T)
COCONUT	KELAPA	*COCOS NUCIFERA*	272,137.22	209,994.88
CLOVE	CENGKEH	*SYZYGIUM AROMATICUM*	74,383.00	284.99
NUTMEG	PALA	*MYRISTICA FRAGRANS*	13,774.93	9,645.58
COFFEE	KOPI	*COFFEA ARABICA*	9,271.43	3,304.67
COCOA	COKLAT	*THEOBROMA CACAO*	13,048.50	5,141.36
VANILLA	VANILI	*VANILLA PLANIFOLIA*	5,372.22	435.88
CASHEW	JAMBU METE	*ANACARDIUM OCCIDENTALE*	450.96	28.69
CINNAMON	KAYU MANIS	*CASSIA VERA*	248.50	155.81
PEPPER	LADA	*PIPER NIGRUM*	541.93	887.13
CANDLENUT	KEMIRI	*ALEURITES MOLUCCANA*	810.25	474.42
PALM NUTS	AREN	*ARENGA PINNATA*	5,763.74	12.096.56
TOTAL			395,802.68	242,449.97

Table 5

Fruit harvested area, yield rate and total production in Sulawesi Utara 2008

CROP (ENGLISH)	CROP (INDONESIAN)	CROP (LATIN)	Harvested area (TREE)	Yield (KG/TREE)	Total production (T)
AVOCADO	ALPUKAT	*PERSEA AMERICANA*	42,959	153.26	6,584
STARFRUIT	BELIMBING	*AVERRHOA CARAMBOLA*	5,822	94.13	548
DUKU/LANGSAT	DUKU/LANSAT	*LANSIUM DOMESTICUM*	146,410	72.20	10,571
DURIAN	DURIAN	*DURIO ZIBETHINUS*	134,886	85.44	11,524
GUAVA	JAMBU BIJI	*PSIDIUM GUAJAVA*	14,062	58.95	829
WATER APPLE	JAMBU AIR	*SYZYGIUM AQUEUM*	8,929	59.13	528
ORANGE	JERUK SIAM	*CITRUS NOBILIS*	12,194	102.35	1,248
POMELO	JERUK BESAR	*CITRUS MAXIMA*	6,712	112.19	753
MANGO	MANGGA	*MANGIFERA INDICA*	104,170	118.12	12,305
MANGOSTEN	MANGGIS	*GARCINIA MANGOSTANA*	14,411	95.27	1,373
JACKFRUIT	NANGKA	*ARTOCARPUS HETEROPHYLLU*	28,977	74.27	2,152
PINEAPPLE	NANAS	*ANANAS COMOSUS*	1,403,199	4.38	6,149
PAPAYA	PEPAYA	*CARICA PAPAYA*	64,423	76.80	4,948
BANANA	PISANG	*MUSA SPP.*	825,169	68.00	56,112
RAMBUTAN	RAMBUTAN	*NEPHELIUM LAPPACEUM*	133,360	102.79	13,708
SALAK	SALAK	*SALACCA SPP.*	92,008	30.19	2,778
SOURSOP	SIRSAK	*ANNONA MURICATA*	16,211	40.28	653
BREADFRUIT	SUKUN	*ARTOCARPUS ALTILIS*	3,879	94.61	367
	TOTAL		3,057,781	80.13	133,130

Table 6

Vegetables harvested area, total production and yield rate in Sulawesi Utara 2008

Crop (English)	Crop (Indonesian)	Crop (Latin)	Harvested area (Ha)	Yield (t/ha)	Total production (t)
Cassava	Ubi kayu	*Manihot esculenta*	6,388	13.095	83,654
Sweet Potatoes	Ubi manis	*Ipomoea batatas*	4,278	9.833	42,059
Peanuts	Kacang Tanah	*Glycine max*	6,573	1.314	8,639
Mung beans	Kacang Hijau	*Vigna radiata*	1,791	1.330	2,381
Shallot	Bawang Merah	*Allium ascalonicum*	597	6.28	3,751
Spring onion	Bawang Daun	*Allium fistulosum*	5,084	0.89	4,519
Potatoes	Kentang	*Solanum tuberosum*	8,565	16.23	139,025
Cabbage	Kubis	*Brassica oleracea var. Capitata*	178	19.68	3,503
Chinese cabbage	Petsai/Sawi	*Brassica pekinensis cylindrica*	518	11.61	6,013
Carrot	Wortel	*Daucus carota*	690	9.48	6,542
Red-streaked bean	Kacang Merah	*Phaseolus vulgaris cv.*	976	3.76	3,671
Long bean	Kacang Panjang	*Vigna sesquipedalis*	395	11.48	4,536
Chilli	Cabe Rawit	*Capsicum annuum cv. longum*	1,198	3.45	4,132
Tomatoes	Tomat	*Lycopersicon esc.*	2,247	12.28	27,590
Eggplant	Terung	*Solanum melongena*	663	12.73	8,442
Beans	Buncis	*Phaseolus vulgaris*	236	7.70	1,817
Cucumber	Ketimun	*Cucumis sativus*	570	10.21	5,818
Water spinach	Kangkung	*Ipomoea aquatica*	450	17.48	7,865
Spinach	Bayam	*Spinacea oleracea*	460	4.38	2,017
Watermelon	Semangka	*Citrullus lanatus*	141	11.06	1,560
	Total		41,998	9.2149.214	367,534

Fig.1. Coat of Arms of the North Sulawesi Province with the coconut tree in centre

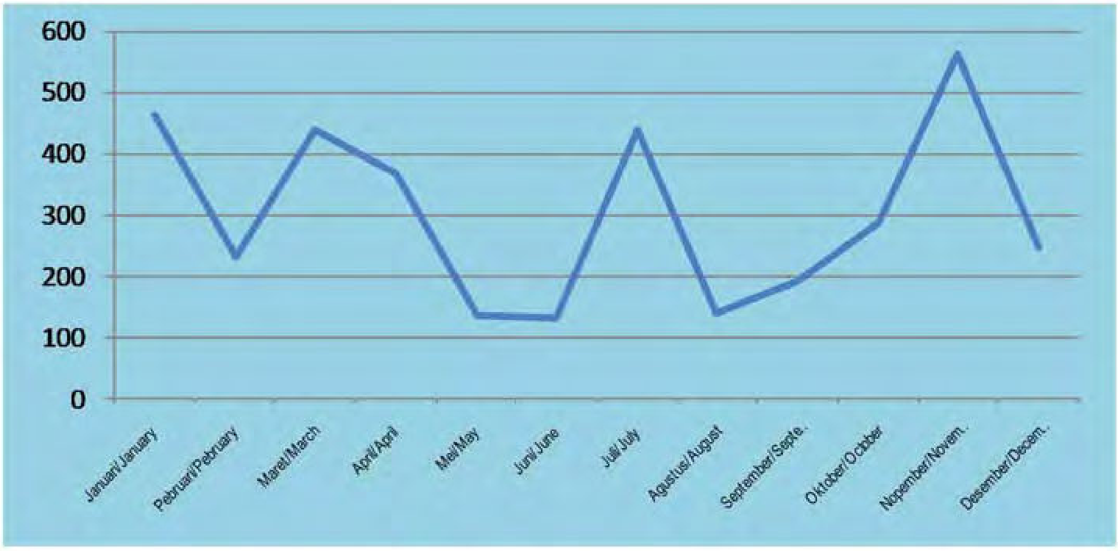

Fig.2 Distribution of rainfall (mm) in Manado

Fig. 3 Coconut – Kelapa (*Cocos nucifera*)

Fig. 4 Clove – Indonesian Cengkeh, (*Syzygium aromaticum*)

Fig. 5 Nutmeg – Pala (*Myristica fragrans*)

Fig. 6 Banana – Pisang (*Musa spp*.) – Pisang Gapi Cv.

Fig. 7 Mango – Mangga (*Mangifera indica*)

Fig. 8 Cassava – Ubi kayu (*Manihot esculenta*)

Fig. 9 Vegetables on the Rurukan village market, North Sulawesi

Fig. 10 Spring onion – Bawang Daun (*Allium fistulosum*)

Fig. 11 Vegetables fields at Rurukan village, North Sulawesi

Fig. 12 Soil preparation for vegetables planting on the Rurukan village, North Sulawesi

Fig. 13 – Carrot production on slope at Rurukan village, North Sulawesi

Fig. 14 Torch Ginger (center) – Nikolaia (*Nicolaia elatior* sin. *Phaeomeria speciosa*)

Fig. 15 Water Lily – Padma (Nymphaea sp)

Fig. 16 Lotus – Seroja (*Nelumbo nucifera* sin. *Nelumbian nelumbo*)

Fig. 17 New Guinea Creeper – Mukuna New Guinea (*Mucuna bennetii*)

Fig. 18 Jade Vine - Strongilodon (*Strongylodon macrobotrytis*)

Fig. 19 Indonesian native orchid (*Phaius tankerville*)

Fig. 20 Local flower market in Tomohon – North Sulawesi

Researches on the *in vitro* micropropagation of certain species of fructiferous arbutus in the spontaneous flora

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ABSTRACT

The researchers are part of a more ample project, whose main objective is the selection from the spontaneous flora of certain valuable biotypes of the *Rosa canina* L., *Hippophae ramnoides* L., Sambucus *nigra* L. *species,* as well as the determining of the propagation methods. By analyzing the results obtained in the phase of initiation of the *in vitro* culture, the best results were obtained with the briar, on the Neculae & Teodorescu (1994) growth medium with 35% grown explants, followed by the sallow thorn, on Lee & Fossard (1977) growth medium + 3.2 ml/l NaFeEDTA, 1ml/l GA3, 0.1 ml/l IBA, 40 g/l dextrose, 8 g/l agar with 23% grown explants and elder with 22% on the Murashige & Skoog (1962) + 3.2 ml/l NaFeEDTA, 1ml/l GA3, 0,1 ml/l IBA, 40 g/l dextrose, 8 g/l agar. Within the multiplication phase for the briar species the highest values of the propagation rate were obtained on the Murashige & Skoog (1962) and Neculae & Teodorescu (1994) growth mediums with values of 12 respectively 10 micro sprouts/explant, 8 in the sallow thorn on Lee & Fossard (1977) growth medium, and in the common elder the highest propagation rate was 7 on Murashige & Skoog (1962) growth medium. The highest percentage of micro cuttings rooted *in-vitro* was of 60 – 80 and it was obtained in the three species on Neculae & Teodorescu (1994) growth medium, containing 0.5 mg/l IAA. In the acclimatization phase the best results were obtained on the support of peat + perlite culture (1:1), in the briar with 80% acclimatized plants, followed by the sallow thorn with 73% and the common elder with 71%.

INTRODUCTION

The researches within this work register in a very ample research project which is in the final execution phase. The main objective of the project is the monitoring, from the spontaneous flora, of the most valuable biotypes of the *Rosa canina* L., *Hippophae ramnoides* L., *Sambucus nigra* L. *species,* their hierarchisation and the formation of a databank, comprising the characterization of each biotype and the precise position in the field.

With the perspective of establishing national collections with these biotypes, that would allow further researches with a view to promote in the production the most valuable selections, it was necessary to be organized experiences for setting the behavior to the *in-vitro* micropropagation of these species. The results obtained are at the basis of the biotechnological elaboration of *in vitro* propagation of *Rosa canina* L., *Hippophae ramnoides* L., *Sambucus nigra* L. species, which will allow the rapid propagation for the taking in the culture of the biotypes required by the market.

MATERIALS AND METHODS

The researches took place within the University of Piteşti and S.C. DICPROD S.R.L. Ştefăneşti during the period 2008-2011.

The biological working material was ensured by SCDP (*Research Station for Fruit Growing)* Voineşti from the pilot research Station of Bilceşti Argeş and consisted of branches harvested in the first decade of March 2010, which corresponds to the end of the resting phase.

The branches uninodally micro cut to 1–1.5 cm were successfully disinfected, into 94% ethanol and 6% calcium hypochlorite for 10, respectively 20 minutes, following which the biological material was washed off with sterile water.

The explants formed from the meristematic tissue with 2-3 leaflets were sampled under the binocular, under aseptic conditions, at the hood with sterile laminar air flux.

As culture tubes, were employed for the phase of initiating the *in vitro* culture in which one explant was inoculated in the tubes and for multiplication and rooting were used special recipients, in which 10 micro sprouts were inoculated.

The explants growth, multiplication and *in vitro* rooting were carried out in the growth room, where were ensured conditions of temperature and light in a scheduled regime and automatically controlled, at parameters of 16 hours photoperiod, with an intensity of the light of 3000 lux and 23°C±2°C.

The growth mediums tested for the phases of initiation of the *in vitro* culture, multiplication and rooting are presented in tables 1, 2, 3.

Following the assignation to the culture tubes, the growth mediums were sterilized by autoclaving to 121°C for 20 minutes.

For the acclimatization of the vitroplants three sublayers of culture were employed: peat, peat + perlite (1:1) and perlite.

RESULTS AND DISCUSSIONS

1. Results obtained in the initiation phase of *in vitro* culture

Analyzing the results obtained in the phase of initiation of the *in vitro* culture to briar, sallow thorn and common elder, on the four variants of growth mediums, it is ascertained that the growth percentage of the explants is within 5–35.

On the same growth medium, the results differ depending on the genotype with higher or lower limits of values. Thus, on the Murashige & Skoog (1962) growth medium, the values are between 14-25% explants grown, on the Lee & Fossard (1977) growth medium 11-23%, on the Quoirin & Lepoivre (1977) growth medium 18-19% and on the Neculae & Teodorescu (1994) growth medium 10-35%.

Each studied species behaved differently on the four variants of growth medium. The briar registered percentages of grown explants of 17-35%, the sallow thorn 10-23% and the common elder 5-22%.

The best results were obtained in the briar, on the Neculae & Teodorescu (1994) growth medium, with 35 % explants grown, followed by sallow thorn on Lee & Fossard (1977) growth medium with 23% and the common elder on the Murashige & Skoog (1962) growth medium with 22%.

By statistically analyzing the variation of the number of explants (%) depending on the growth medium for the breeds studied, it is ascertained that at the average effect the highest values of the percentage of explants grown were reported by the use of Murashige & Skoog (1962) and Neculae & Teodorescu (1994) growth medium with 20%, the differences from all the other growth mediums being statistically ensured (Duncan test for $P \leq 0.05$).

The percentages immediately inferior were obtained on the Fossard growth medium (17%). The Quoirin & Lepoivre (1977) growth medium determined the obtaining of the lowest percentage of explants grown, that of 12, the differences being statistically ensured (figure 1).

2. Results obtained in the multiplication phase

For the briar species, the highest values of the multiplication rate were obtained on the Murashige&Skoog (1962) and Neculae & Teodorescu (1994) growth mediums, being of 12 respectively 10 micro sprouts/explant.

In the sallow thorn, it was recorded the highest value of the multiplication rate of 8 micro sprouts/explant in the variant of Lee & Fossard (1977) growth medium, ands in the common elder the highest multiplication rate was of 7 micro sprouts/explant, on Murashige & Skoog (1962) growth medium.

By the statistical interpretation of the results obtained it is ascertained that at the average effect, the highest values of the multiplication rate of 8, respectively 7, are obtained on Murashige & Skoog (1962) and Neculae & Teodorescu (1994) growth mediums. The differences from the other two growth mediums are statistically ensured (figure 2).

3. Results obtained in rooting phase

The percentage of rooted micro cuttings was between 22-80%, depending on the species and the growth medium. By species, the best results were obtained in the briar with 45-80% rooted micro cuttings, depending on the growth medium, followed by sallow thorn with 24-65% and common elder with 22-60%. For all the species, the best results of 60-80% rooted micro cuttings, were obtained on the Neculae & Teodorescu (1994) growth medium with 0. 5 mg/l IBA.

By interpreting the results obtained in the *in vitro* rooting phase, it is ascertained that the differences are statistically ensured (figure 3).

4. Results obtained in acclimatization phase

Plants' behaviour in the acclimatisation process was different, depending on the species and the culture support. The percentage of plants survival within the acclimatization phase was between 55 and 81%. By species, the best results were reported by the briar (73-81%), followed by the sallow thorn (69-73%) and the common elder (55-71%). The best culture support proved to be the mixture of peat + perlite, to which the percentage of acclimatization was of 71-81%, depending on the species. By interpreting the results obtained during the in-vitro rooting phase, it is ascertained that the differences are statistically ensured.

CONCLUSIONS

1. Based on the results obtained, it may be established the biotechnology of the *in-vitro* propagation for the *Rosa canina* L., *Hippophae ramnoides* L. and *Sambucus nigra* L. species.
2. In the phase of initiating the in-vitro culture, the best results were obtained by the briar, on Neculae & Teodorescu (1994), growth medium with 35% explants grown, followed by the sallow thorn on the Lee & Fossard (1977) growth medium with 23% and the common elder on Murashige & Skoog (1962) growth medium with 22%.
3. For the multiplication phase in the species *Rosa canina* L. and *Sambucus nigra* L., it is recommended to be used the Murashige & Skoog (1962) growth medium, on which the highest values of the multiplication rate were obtained, of 12 respectively 7 micro sprouts/explant. In the *Hippophae ramnoides* L. species, the highest multiplication rate (8 micro sprouts/explant) was obtained on Lee & Fossard (1977) growth medium.
4. For the acclimatization of the vitroplants it is recommended to be used as a culture sublayer the mixture of peat + perlite (1:1), on which all the species behaved best, the percentage of plants acclimatized being of 71-81, depending on the species.

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TABLES AND FIGURES

Table 1

Nutritive media tested for initiation and establishment of *in vitro* cultures

Specification	**Murashige & Skoog (1962)**	**Quoirin & Lepoivre (1977)**	**Lee & Fossard (1977)**	**Neculae & Teodorescu (1994)**
Macroelements (mg/l)				
NH4NO3	1650	400	800	1650
KNO3	1900	1800	1011	1900
CaCl2*2H2O	440	-	330	440
MgSO4*7H2O	370	360	370	370
KH2PO4	170	270	-	170
Ca(NO3)2*4H2O	-	1200	-	-
NaH2PO4	-	-	138	-
Microelements (mg/l)				
FeSO4 *7H2O	27.9	-	10.7	-
MnSO4 *4H2O	22.3	0.75	8.45	22.3
ZnSO4 *7H2O	8.6	8.6	5.75	8.6
H3BO3	6.2	12.0	3.09	6.2
CuSO4 *5H2O	0.025	0.025	0.024	0.025
Na2MoO4 *2H20	0.25	0.25	0.024	0.25
CoCl2 *6H2O	0.025	0.025	0.118	0.025
KI	0.3	0.08	0.415	0.83
Na2EDTA 2 H20	-	-	18.61	-
Na Fe EDTA	32	32	32	32
Na2SO4	-	-	144.99	-
Vitamins (mg/l)				
Inositol	100	100	54.048	100.0
Thiamine HCl	0.1	0.4	0.674	0.1
Nicotinic acid	0.5	-	2.462	0.5
Pyridoxine HCl	0.5	-	0.616	0.5
Glycine	2.0	-	-	2.0
Choline	-	-	0.104	-
Biotin	-	-	0.048	-
Ca pantothenate	-	-	0.476	-
Riboflavin	-	-	0.376	-
Ascorbic acid	-	-	0.176	-
Auxins ANA (mg/l)	-	-	-	0.004
Indole butyric acid (mg/l)	0.1	0.1	0.1	-
Gibereline (mg/l) GA3	1.0	1.0	1.0	-
Citokinine (mg/l) BAP	-	-	-	2
Sucrose	-	-	-	20
Dextrose	40	40	40	-
Agar	8	8	8	7

Table 2

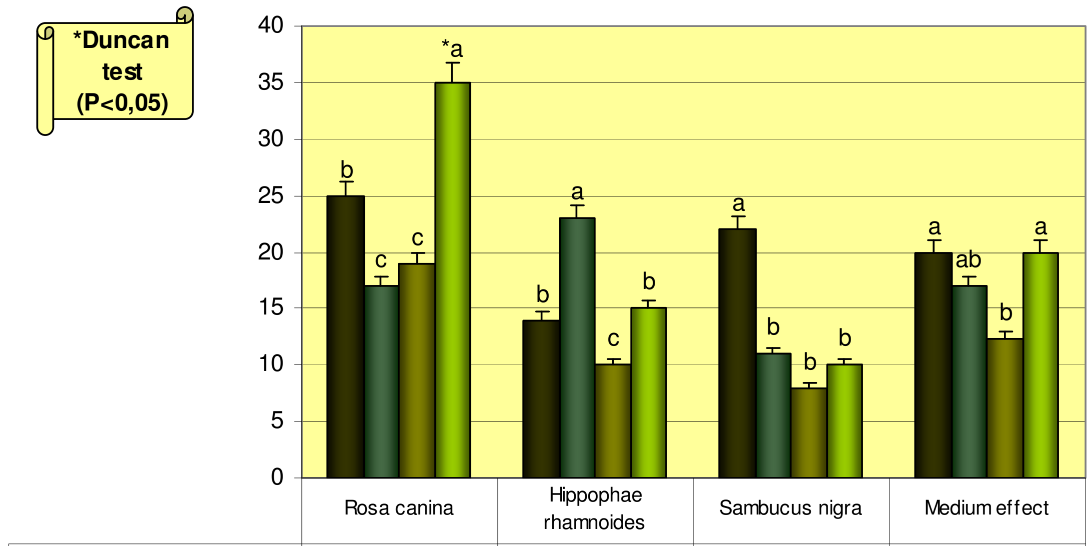
Nutritive media composition tested for *in vitro* multiplication

Specification	**Murashige & Skoog (1962)**	**Quoirin & Lepoivre (1977)**	**Lee & Fossard (1977)**	**Neculae & Teodorescu (1994)**
Macroelements (mg/l)				
NH_4NO_3	1650	400	800	1650
KNO_3	1900	1800	1011	1900
$CaCl_2$*$2H_2O$	440	-	330	440
$MgSO_4$*$7H_2O$	370	360	370	370
KH_2PO_4	170	270	-	170
$Ca(NO_3)_2$*$4H_2O$	-	1200	-	-
NaH_2PO_4	-	-	138	-
Microelements (mg/l)				
$FeSO_4$ *$7H_2O$	27.9	-	10.7	-
$MnSO_4$ *$4H_2O$	22.3	0.75	8.45	22.3
$ZnSO_4$ *$7H_2O$	8.6	8.6	5.75	8.6
H_3BO_3	6.2	12.0	3.09	6.2
$CuSO_4$ *$5H_2O$	0.025	0.025	0.024	0.025
Na_2MoO_4 *$2H_20$	0.25	0.25	0.024	0.25
$CoCl_2$ *$6H_2O$	0.025	0.025	0.118	0.025
KI	0.83	0.08	0.415	0.83
Na_2EDTA 2 H_20	-	-	18.61	-
Na Fe EDTA	32	32	32	32
Na_2SO_4	-	-	144.99	-
Vitamins (mg./l)	-	-	-	
Inositol	100	100	54.048	54.048
Thiamine HCl	0.1	0.4	0.674	0.674
Nicotinic acid	0.5	-	2.462	2.462
Pyridoxine HCl	0.5	-	0.616	0.616
Biotin	-	-	0.048	0.048
Ca pantothenate	-	-	0.476	0.476
Riboflavin	-	-	0.376	0.376
Ascorbic acid	-	-	0.176	0.176
Choline chloride	-	-	-	0.104
Aminoacids (mg/l) Glycine Cysteine	2.0 -	- -	- -	0.375 7.269
Auxins (mg./l) Naphthylacetic acid	-	-	-	0.004
Indole butyric acid	0.1	0.1	0.1	0.004
Gibereline (mg./l) GA3	1.0	1.0	1.0	-
Citokinine(mg./l)				-
Benzylaminopurine	2	2	2	1.2
Dextrose (g/l)	40	40	40	40
Agar (g/l)	8	8	8	7

Table 3.

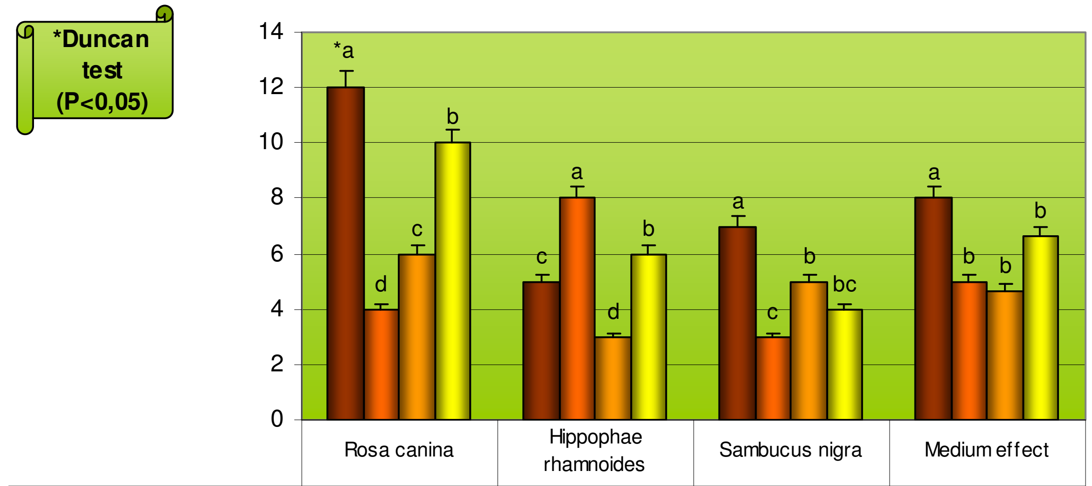
Tabelul 3. Nutritive media tested for *in vitro* rooting

Specification	Neculae & Teodorescu (1994)	Neculae & Teodorescu (1994)	Neculae & Teodorescu (1994)
Macroelements (mg/l)			
NH_4NO_3	825	825	825
KNO_3	950	950	950
$CaCl_2$*$2H_2O$	220	220	220
$MgSO_4$*$7H_2O$	185	185	185
KH_2PO_4	85	85	85
NaH_2SO_4	72.49	72.49	72.49
Microelements (mg/l)			
$MnSO_4$ *$4H_2O$	4.125	4.125	4.125
$ZnSO_4$ *$7H_2O$	2.875	2.875	2.875
H_3BO_3	1.545	1.545	1.545
$CuSO_4$ *$5H_2O$	0.012	0.012	0.012
Na_2MoO_4 *$2H_20$	0.012	0.012	0.012
$CoCl_2$ *$6H_2O$	0,59	0.59	0.59
KI	0.207	0.207	0.207
Na Fe EDTA	32	32	32
Vitamins (mg./l)			
Inositol	100.0	100.0	100.0
Thiamine HCl	0.1	0.1	0.1
Nicotinic acid	0.5	0.5	0,5
Pyridoxine HCl	0.5	0.5	0.5
Amino acids (mg/l)			
Glycine	2.0	2.0	2.0
Auxins (mg./l)			
Indole butyric acid	**0.1**	**0.5**	**1.0**
Dextrose (g/l)	40	40	40
Agar (g/l)	8	8	7



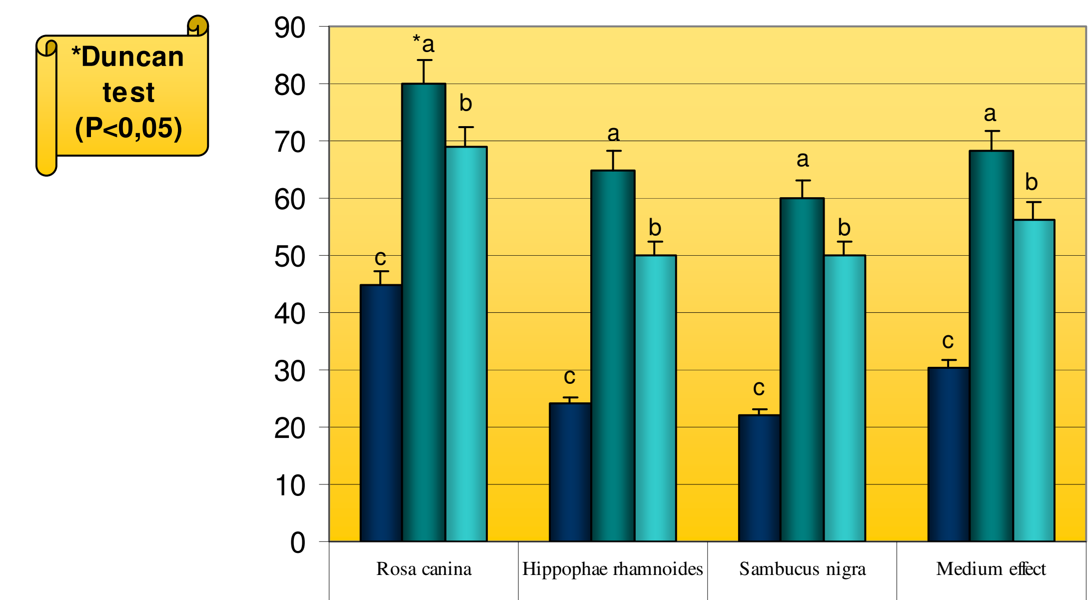
	Rosa canina	Hippophae rhamnoides	Sambucus nigra	Medium effect
Murashige&Skoog (1962)	25	14	22	20
Fossard (1977)	17	23	11	17
Lepoivre (1977)	19	10	8	12,33
Neculae &Teodorescu (1994)	35	15	10	20

Fig. 1. Explants growth depending on the species and nutritive medium



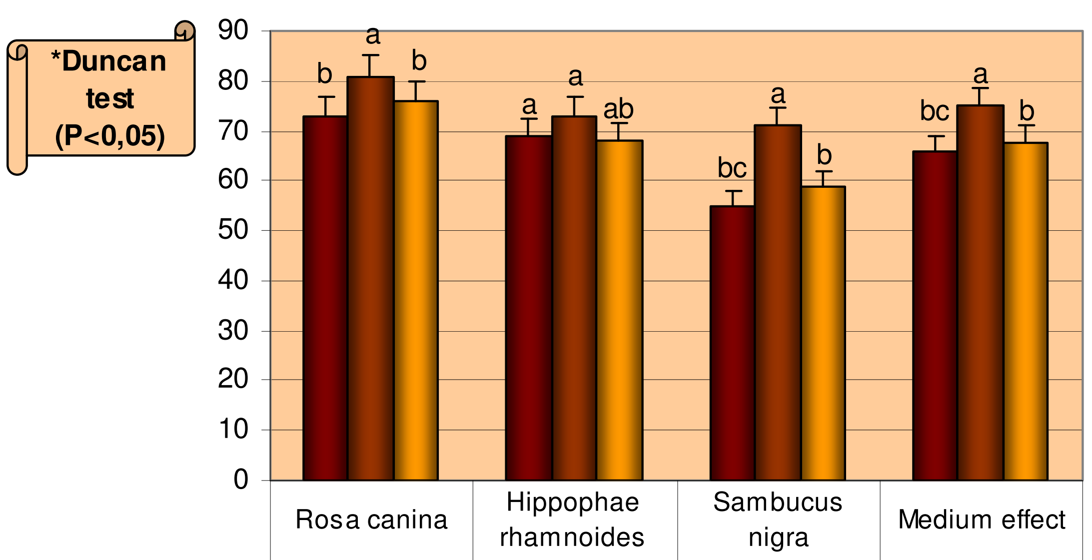
	Rosa canina	Hippophae rhamnoides	Sambucus nigra	Medium effect
Murashige&Skoog (1962)	12	5	7	8
Fossard (1977)	4	8	3	5
Lepoivre (1977)	6	3	5	4,66
Neculae &Teodorescu (1994)	10	6	4	6,66

Fig. 2. Multiplication rate depending on the species and nutritive medium



	Rosa canina	Hippophae rhamnoides	Sambucus nigra	Medium effect
Neculae &Teodorescu 0,1mg/l IBA	45	24	22	30,33
Neculae &Teodorescu 0,5mg/l IBA	80	65	60	68,33
Neculae &Teodorescu 1,0mg/l IBA	69	50	50	56,33

Fig. 3. *In vitro* rooting depending on the species and nutritive medium



	Rosa canina	Hippophae rhamnoides	Sambucus nigra	Medium effect
Peat	73	69	55	65,67
Peat+Perlite (1:1)	81	73	71	75
Perlite	76	68	59	67,67

Fig. 4. Vitroplantes acclimatization depending on the species and nutritive medium

Fructification apple trees depending on the normalization of the fruit load

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Keywords: spindle-shaped, thinning fruit, variety,

ABSTRACT

Investigations were conducted in the years 2009 - 2010 in apple orchard in SA Zubreşti planted in the spring of 2003, with 4x2 m planting scheme. Trees are driven by thin spindle-shaped crown improved. We studied the apple fruit thinning by chemical thinning, manual and mixed in 3 varieties Golden Delicious, Idared and Florina, grafted on rootstock M26. It was determined by counting the number of blossoms button flower, fruit number and weight. The variety Golden Delicious fruit were the lowest recorded in the control variant (106 g) with an amount of 16.5 kg/tree and 20.6 t/ha, and most fruits were two options - (136 g) and an amount of 22.7 t/ha, and variant 4 (138 g) and a total quantity of fruit per hectare to 24.1 t/ha.

INTRODUCTION

In the practice of fruit growing orchards are subject to the rare species that tend to over load of fruit. Manufacturers of apple fruit a rare chemical used in order to produce quality fruit and to increase overall yield. (Richard 1998) Effect of thinning varies according to climate and growing conditions fruit tree species. (Black 1995, Sally 1991, Stopar 1999, 2001). As different substances are tested for thinning chemicals such as NAA, BA, NAD+ NAA, carbaryl. Advantages of chemical thinning of fruit are: Getting a high quality production in terms of size, color, etc. increase fruit quality, and price realization default, increases labor productivity in harvesting, sorting and packaging, as the number of fruit is smaller; prevent breakage and split branches, keeping the crown volume production for years; prevents and increased alternation of fruition, increase resistance to disease and frost trees due to sequestration of sufficient reserve substances, ensuring training requirements that annual shoots formations will form fruit in coming years. (Stopar 2001). Argumentation practice and refine the use of chemicals to obtain quantitative and qualitative production of fruit is a matter of great value to modern orchards.

MATERIALS AND METHODS

Investigations were conducted during 2009 - 2010 in the orchard of apple company "Zubreşti" SA, planted with trees grafted 2 years old near the village Zubreşti district Straseni. A plantation was conducted in spring 2003 varieties Golden Delicious, Florina, Idared, grafted on rootstock M 26. Distance planting trees 4x2 m.

They studied four variants with fruit thinning:

Variant 1 - control

Variant 2 - Management of chemicals when the central fruit diameter is of 10-12 mm blossoms Bioprzerzedzacz 060 SL preparation in a concentration of 0.075%.

Variant 3 - Administration of chemicals when the central fruit diameter of 10-12 mm is blossoms Bioprzerzedzacz 060 SL preparation in a concentration of 0.075% + manual fruit thinning.

Variant 4 - manual thinning is carried out after the fall of physiological fruit when the fruit reaches 16-18 mm in diameter.

Number was determined by counting blossoms button flowers on the same three trees growing force.

Yield was determined for each tree individually, weighing from 24 trees and production by the arithmetic mean. The average fruit weight was determined by weighing and dividing the fruits of 100 to 100. Commercial quality of fruit was determined according to European standard apple No.85/2004.

RESULTS AND DISSCUSION

The variety Golden Delicious (Tab 1) in control variant was recorded the lowest number of blossoms 125 pieces. With a higher growth in chemical thinning version where the number was 137 pieces.

In 2010 the variety Golden Delicious and witness the difference between the variants with a slow version is higher so that the control variant was blossoms number of 128 pieces, and the largest number was in the version with manual fruit thinning which was 184 pieces. In the other two versions were recorded 163 pieces. in version 2 and 170pieces. in variant 3.

The Idared variety in 2009 was number 180 blossoms in variant 4, and most or recorded in the control variant – 191 blossoms.

In 2010 of blossoms lowest number was recorded in the control variant with 100 pieces. And greatest was in variant 2 with 194 pieces. Other variables were recorded from 176 pieces in variant 3 and 196 in variant 4 blossoms.

The variety Florina in 2009 the amount of blossoms in all variants is almost the same, the difference being only in version 3 where there was 187 pieces.

In 2010 the number of blossoms the control variant was lower due to lower deposit and fruit buds was 180 pieces. Most blossoms were in variant 4 with 209 pieces.

In 2009 the Golden Delicious variety of a fruit average weight was determined by the number of fruit per tree and biological characteristics depending on the variety and method of thinning the fruit.

The smallest fruits were recorded in the control variant (106 g) with an amount of 16.5 kg/tree and 20.6 t/ha, and most fruits were variant two - (136 g) and quantity 22.7 t/ha, and variant 4 (138 g) and a total quantity of fruit per hectare to 24.1 t/ha.

In 2010 the average fruit weight increased to 2009 and was the smallest fruit in the control variant as in the previous year (2009) with average weight 110 g and the variants with a slow fruit mass increased more, from 21 % in variant chemical fruit thinning to 25% in version manual fruit thinning. Yields per hectare of fruit thinning were 23.2 t/ha up to 27.8 t/ha with as low version of the fruit.

The variety Idared in 2009 the average weight of a fruit was determined by the influence of thinning fruit that depending on how performance was the lowest recorded weight control variant (95 g). In other variants the average weight ranged from 154 g to 159 g in version 2 and version 4, with an increase in harvest from a tree up to 22.1 kg/tree in hand with a slow version of the fruit.

In 2010, fruit weight increased so that the fruits were smaller in the control variant (130 g/fruit) and fruit were highest in variant 4 (180 g/fruit) and fruit production as a tree, ha increased in the control variant of 17.8 kg/tree and 22.2 t/ha. The largest fruit production were recorded in version 4 with 29.7 t/ha.

The variety Florina year study in 2009 - 2010 to reveal the same phenomenon as in variants of fruit thinning, the average weight of their superior did not apply where the witness variant fruit thinning.

In 2009, fruit weight control variant was the lowest and 112 g per fruit was, and highest in variant 4 with 175 g per fruit. Such as a tree fruit production as well as a unit area was highest in variant 4 19.4 kg/tree and 24.3 t/ha.

In 2010, average fruit weight increased in the control variant was recorded average fruit weight of 138 g per fruit, and the largest in version 4 of 167 g weight per fruit. A higher increase of weight of fruit was in version 2 where in 2009 the average weight was 127 g/fruit but in 2010 - 159 g/fruit. Fruit production per hectare in 2010 ranged from 24.0 t/ha in control variant and 27.0 t/ha in variant 4.

CONCLUSIONS

The Golden Delicious variety blossoms number in the control variant was recorded the lowest number of blossoms125 pieces. With a higher growth in chemical thinning version where the number was 137 pcs.

In 2010 the number of blossoms the control variant was lower due to lower deposit and fruit buds was 180 pieces. Most blossoms was in version 4 with 209 pieces

The variety Idared in 2009 the average weight of a fruit was determined by the influence of thinning fruit that depending on how performance was the lowest recorded weight control variant (95 g), version 4, with an increase in the harvest at a tree of up to 22.1 kg/tree in hand with a slow version of the fruit.

The variety Florina year study in 2009 - 2010 to reveal the same phenomenon as in variants of fruit thinning, the average weight of their superior did not apply where the witness variant fruit thinning.

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TABLES

Table 1

Inflorescence according to variety and method of thinning fruit (2009- 2010)

Variant	Number of blossoms, pieces/tree					
	Golden Delicious		Idared		Florina	
	Year 2009	Year 2010	Year 2009	Year 2010	Year 2009	Year 2010
1	125	128	191	100	198	180
2	137	163	189	191	196	199
3	128	170	183	176	187	194
4	129	184	180	196	197	209

Table 2

Production of fruit in function of variety and fruit thinning method
(M26 rootstock, planting distance 4x2, SA "Zubreşti." 2009 - 2010)

Variant	Average mass 1 fruct, gr		Kg/tree		t/ha	
	Year 2009	Year 2010	Year 2009	Year 2010	Year 2009	Year 2010
Variety Golden Delicious						
1	106	110	16,5	16,2	20,6	20,2
2	136	165	18,2	18,6	22,7	23,2
3	133	167	18,7	22,3	23,4	27,8
4	138	170	19,3	22,1	24,2	27,6
Variety Idared						
1	95	130	15,4	17,8	19,3	22,2
2	154	164	18,4	20,6	22,9	25,7
3	157	170	21,7	23,3	27,2	29,1
4	159	180	22,1	23,8	27,6	29,7
Variety Florina						
1	112	138	17,4	19,2	21,7	24,0
2	127	159	18,6	20,1	23,2	25,1
3	141	163	18,8	20,7	23,5	25,8
4	165	167	19,4	21,6	24,3	27,0

VITICULTURE & OENOLOGY

Enhancement of the volatile profile of Royal Feteasca wine by using selected enzymes and yeasts

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Keywords: Royal Feteasca, electronic nose, Heracles, sensory profile, aroma fingerprint

ABSTRACT

Royal Feteasca is a Romanian wine grape variety cultivated in almost all viticultural regions of the country due to its versatility and high productivity. The wines are very popular in Romania, but the rustic aroma does not appeal to many foreign consumers. The volatile profile of a wine can be modify and enhanced by using, in the winemaking process, selected yeasts specially designed to produce more aromatic compounds during fermentation and enzymes which can contribute to the release of the aromatic compounds from the grapes. For Royal Feteasca the enzymes tested proved to be of limited importance in changing the typical aromatic profile, while some of the yeasts, such as QA-23 and NT-116, made a significant difference in improving the final aroma of the wine. Other yeasts, such as Cross Evolution, had a lower impact on the general volatile profile, the results obtained by using an electronic nose showing that the wine aroma of these wines is close to that of wines made by the natural fermentation. More yeasts is currently being tested for the establishment of an improved technology to make this variety more commercially attractive.

INTRODUCTION

Royal Feteasca (Feteasca regală) is a Romanian wine grape variety cultivated in almost all viticultural regions of the country due to its versatility and high productivity which reaches around 13-18 t/ha. The surface covered with Royal Feteasca (Table 1) is at present around 13.000 ha (Müller and Antoce, 2011), placing this variety in the first position among the cultivated wine grape varieties in the country, surpassing the White Feteasca, which for a long time ranked first in Romania.

The wines produced of this variety, with a moderate alcohol concentration and medium dry-content, are very popular in Romania due to their characteristic aroma that confers the wine its typicality, irrespective of the production region. However, its intense and particular floral aroma is considered by foreign wine consumers rather heavy for a young wine and for this reason the Royal Feteasca wines produced by traditional technologies are rarely exported. Moreover, the Royal Feteasca wines, being rather light bodied, are suitable for consumption only as young wines; therefore, their aroma should also be lighter and finer in order to be in accordance to the consumers' expectations.

In our department several experiments were performed in order to modify the traditional aroma of Royal Feteasca wines. In this paper one of the possibilities, which consists of the application of some enzymes and selected yeasts, is presented and discussed.

In order to compare the results obtained with the natural fermentation and selected yeasts, two different fermentation procedures were employed: the first made use of two selected yeast (Lalvin QA23 and NT 116 Anchor) able to become dominant and quickly eliminate all other yeasts present in the must, and the second employed a yeast which simulates the natural fermentation (Anchor Cross Evolution), in fact being a cross-breed of several wine yeasts. The main stream enologists are using at present yeasts that are fast in developing and fermentation, in order to inhibit the effect of the natural microflora considered detrimental (Heard, 1999), while some other winemakers insist on "natural fermentations", expected to better preserve in wines their natural character expressed in a certain location (Clemente-Jimenez *et al.*, 2004). Because the "natural fermentations" can in many cases lead to stuck fermentations or sensory deviations, the new trend is aimed at tailoring yeast strains for wine fermentation (Pretorius *et al.*, 2003) and some of them are tailored in such a way as to result in a wine aroma similar to that obtained through natural fermentation.

MATERIALS AND METHODS

Wines were made from grapes of Royal Feteasca harvested in Bucharest from the 0.5 ha plantation of the Department of Viticulture and Enology of USAMV Bucharest, using 5 technological variants (for each variant there were 3 repetitions), as shown in Table 2.

The enzyme Lallzyme Cuvée Blanc, a complex formulation of pectinases and glycosidases, has been developed to confer the white wines good structure and intense mouth feel in semi-aromatic wines such as Sauvignon Blanc, Chardonnay and Semillon. It was selected to be applied in Royal Feteasca winemaking, because this variety too is considered semi-aromatic, although the wines are normally not obtained by skin-contact maceration.

The yeast Enoferm QA 23 is a killer positive phenotype yeast classified as a *Saccharomyces cerevisiae bayanus* selected from Portugal, being recommended for the fermentation of Chardonnay, Sauvignon blanc, Chenin blanc, Colombard and Semillon in which produces fresh, fruity, clean aroma. The producers mention that "it enhances aromas of terpenic varietals through its beta-glucosidase activity and is an excellent thiol converter making it complementary yeast for developing varietal Sauvignon Blanc passion fruit character".

The yeast Cross Evolution is yeast that resulted from a natural cross between *Saccharomyces cerevisiae* strains selected for certain winemaking properties. Cross Evolution is not a genetically modified yeast, but a natural cross hybrid of several strains used in order to optimize the performance of the resulting yeast strains without affecting its biological nature, as well as increase biodiversity and ensure a closer organoleptic similarity of the resulted wines with that of wines produced by natural fermentations. In this way, this yeast is supposed to promote the tipicality and balance of white wines such as Chardonnay, Chenin Blanc, Gewürztraminer, Pinot Blanc, Pinot Gris, Riesling, Sauvignon Blanc and Voignier. Being killer yeast, Cross Evolution prevails against spontaneous yeast flora in short time after the inoculation.

The yeast Anchor NT 116 is a *Saccharomyces cerevisiae* (hybrid), combining the aromatic potential of a *Saccharomyces cerevisiae* subspecies *cerevisiae* with the fast fermentation capabilities of *Saccharomyces cerevisiae* subspecies *bayanus*. It is a killer positive phenotype and it is also a product of the yeast hybridization process, which is a natural method of breeding, different than the GMO process (van Rensburg P., 2005).

The NT 116 is highly tolerant to musts concentrated in sugar and to higher concentrations of alcohol, which makes its suitable for the production of full-bodied red wines destined for wood maturation. For white wines NT 116 is recommended for the production of fresh and fruity wines, for early release on the market. The producers indicate that "it enhances volatile thiol aromas (passion fruit, grapefruit and guava) and produces acetate esters (tropical fruit salad). It specifically enhances the citrus aromas in wines." This yeast is recommended for the winemaking of varieties such as Chardonnay, Chenin Blanc, Sauvignon Blanc and Pinot Gris.

The wines have been analyzed using a Flash Gas Chromatograph with two columns (Heracles Analyzer produced by Alpha M.O.S., France), which works on the principle of an Electronic Nose. For processing multiple groups of samples the apparatus is equipped with a Combi PAL Auto-Sampler System (CTC Analytics AG, Switzerland). The analyzer is endowed with a dedicated software package capable of performing advanced multivariate statistic data processing.

The analysis methods used in this paper are described in previously presented papers (Alpha MOS, 2002; Antoce and Nămoloşanu, 2011, 2009).

The five variants and their repetitions were analyzed with this electronic nose at 30 and 60 days after fermentation. In this work only the results obtained at 60 days are presented (in the Figures 1-7 the letter *b* at the end of the variant code is added to identify the analysis after 60 days.

RESULTS AND DISCUSSIONS

In order to differentiate the wines produced with various yeasts and with or without enzymes, for the Discriminant Factor Analysis, of all the sensors (chromatographic peaks) which can discriminate the samples, only those with a discrimination power between 0.7 and 1.0 have been selected.

As it can be seen in Figure 1, both controls, C without enzyme and yeast and E with enzyme but without yeast, have not been discriminated by the electronic nose, fact that suggests that the enzyme has not influenced the aroma profile of wine significantly. Both controls were obtained by fermentation with natural flora occurring in the vineyard and because the volatile profile is influenced mainly by the yeasts, these two groups are not differentiated, overlapping each other. Although the enzymes produce musts easier to clarify and also are expected to release some aromatic compounds bound by glucides, this particular enzyme that we used did not influence the volatile profile of the final wine. Some more enzymes should be tested in future experiments to find a suitable one that is able to enhance the aromatic profile of Royal Feteasca wines.

The tested yeasts, however, have made a significant difference in the aromatic profile of Royal Feteasca wines, being clearly discriminated in groups by the electronic nose (Fig. 1).

The discrimination of the wines prepared with the selected yeasts is best shown by using the method of Discriminant Factor Analysis or DFA (Fig. 1), but we can obtain a similar result by the use of Principle Component Analysis or PCA (Fig. 2). The last type of analysis, in which the aroma profile of the wines prepared with the yeast Cross Evolution overlaps with that of the wines obtained by natural fermentation, also suggests that this selected yeast behaved somehow similarly with the natural microflora. This fact also correlates with a slower fermentation observed for both natural microflora and Cross Evolution yeast. This result is not surprising since the Cross Evolution yeast was produced by cross-hybridization of other wine yeasts, in order to induce to the wines exactly what we have obtained: an aromatic profile closer to the fermentation with a combination of natural epiphytic grape flora.

The selected yeasts NT116 and QA23, both killer yeasts able to perform faster fermentations, led to wines with similar volatile profile, but clearly different than the profile of the wines obtained with slower fermentations (Fig. 2). The fact that the results of slower fermentations were overlapping, while the wines from faster fermentations were also partially overlapping, can be seen in the value of the discrimination index for this PCA analysis, which was of a negative value, -8. The wines were therefore classified by the electronic nose in two groups, in accordance with the speed of the fermentation allowed by the type of yeasts used.

If we compare only the wines that formed the group of slower fermentations wines we can see that a slight differentiation between the wines is still possible by the use of electronic nose (Fig. 3), with a positive discrimination index (47), which is, however, rather low to allow for a clear differentiation. This result shows that although the electronic nose can differentiate natural fermentation from the fermentation performed with the Cross Evolution yeast, the consumer will not be able to find a difference among the wines. This fact confirms that the

Cross Evolution yeast, resulted by natural cross of several selected *Saccharomyces cerevisiae* strains, can be successfully used in fermenting wines which are supposed to display an aromatic profile similar to that obtained by spontaneous natural fermentation.

From the data analyzed so far it appeared that the presence of the Cuvée Blanc extraction enzyme added before fermentation does not significantly influence the final aroma of the wines. Therefore, the control without enzyme (namely control C) was eliminated from the next analyses, the wines obtained with selected yeasts being compared only with the control which has enzyme added (control E). The results of these analyses are shown in Fig. 4 and they again indicate that the wines tend to be classified in two groups: the slower fermentation group, obtained by spontaneous natural fermentation and by Cross Evolution yeast, and the faster fermentation group, in which wines fermented with Lalvin QA23 and NT 116 yeasts are included.

The sensory analysis (data not shown here) confirmed that the wines produced by natural microflora with or without enzymes displayed rather vegetal notes, at the expense of those floral and fruity. The Cross Evolution yeast, also included in the same slower fermentation group as the natural microflora, showed a similar aromatic profile, with vegetal and balsamic notes. As opposed to this group, the QA23 yeast induced more floral aroma, while NT 116 yeast provided a fruitier aroma.

By analyzing the same results with the DFA method the discrimination of the wine samples is much better (Fig. 5). For the wines obtained by fermentation with NT 116 yeast the discrimination is better on the axis DF2, while the rest of the samples are better discriminated by sensors used to derive the axis DF1.

Finally, if only the wine samples produced with selected yeasts are compared (without any control samples) we can see that the electronic nose discriminates them very well, with a discrimination index of 78 for the PCA method (Fig. 6). The volatile profiles of these wines are clearly different and it is expected that the consumers will also be able to detect the differences by normal tasting.

From the DFA analysis (Fig. 7) performed also only on the wine samples produced with selected yeasts we can see that most of the sensors (chromatographic peaks of volatile substances) which determine the sample discrimination extend mainly along the DF1 axis, most of the variation being included in the first principal component axis. Only for the NT116 yeast we observed a different behavior, the samples produced with this yeast being discriminated mainly due to the projection of the sensors (volatile compounds) on the second axis, DF2 (Fig. 7). The wines produced with this yeast displayed more intense aroma during the wine tasting sessions than any other samples, with clear citrus notes, complexed with notes of temperate and tropical fruits (data not shown).

CONCLUSIONS

The Royal Feteasca wine aromatic profile can be enhanced by the use of selected yeasts, in accordance to their nature and fermentation behavior. The faster fermentation yeasts were able to overcome rapidly the natural microflora and to imprint their aromatic profile on the wine. These differences are easily discriminated by the electronic nose, but the wines can also be discriminated by the consumers in a normal wine tasting, especially in the case of the ester-producing yeasts which induce floral aroma (QA23 yeast) or fruity aroma (NT116 yeast).

Regarding the wine samples produced with the Cross Evolution yeast, although the electronic nose can differentiate them from the wines resulted from spontaneous natural fermentation; the discrimination index is very small, showing that normally the consumers will not be able to find a difference among the wines. This fact confirms that the Cross Evolution yeast, resulted by natural hybridization of several selected *Saccharomyces* *cerevisiae* yeasts, has similar behavior and characteristics with the yeast mixture from the grapes that performs the spontaneous fermentation in the non-inoculated wines. However, due to these characteristics, the Cross Evolution is not suitable for the enhancement of the aromatic profile of Royal Feteasca wines and it is not recommended for this variety.

The pectolytic enzyme does not produce a significant effect on the final aroma of wine, but it helps the later clarification of wines, after fermentation. However, for the purpose of aroma enhancing in this variety, other enzymes should be tested and applied.

The yeasts used in this experiment and recommended for the enhancement of the volatile profile of Royal Feteasca wines are QA23 for more floral aroma and NT 116 for fruitier aroma. More yeast should be tested in order to obtain a larger selection of aromatic profile for this versatile variety and consumer tests should also be performed.

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TABLES AND FIGURES

Table 1

Surfaces covered by the main wine grape varieties in Romania in 2009 (Müller and Antoce, 2011)

Variety	Surface (ha)	Proportion of the total viticultural surface (%)
White wine grapes		
Royal Feteasca	13391.38	7.4
White Feteasca	13250.21	7.3
Riesling	7451.72	4.2
Aligoté	7129.93	3.9
Sauvignon blanc	4138.16	2.3
Total	*45361.40*	***25.0***
Aromatic wine grapes		
Muscat Ottonel	3655.3669	2.0
Tamaioasa romaneasca	1287.1154	0.7
Total	*4942.48*	***2.70***
Red wine grapes		
Merlot	11563.7269	6.4
Cabernet Sauvignon	4069.8737	2.2
Black Babeasca	3184.88	1.8
Rosioara	2902.2499	1.6
Black Feteasca	1738.5733	1.0
Total	*23459.30*	***13.0***

Table 2

Winemaking experimental variants for Royal Feteasca

Variant code	Repetitions	Winemaking technology*
FR1 (control with no enzyme and no yeast = Control C)	FR1-1 FR1-2 FR1-3	Winemaking based on natural fermentation, without the addition of enzymes or selected yeasts.
FR2 (control with enzyme but with no yeast = Control E)	FR2-1 FR2-2 FR2-3	Winemaking in the presence of 2 g/hl pectolythic enzyme Cuvée blanc and without the addition of a selected yeast.
FR3	FR3-1 FR3-2 FR3-3	Winemaking in the presence of 2 g/hl pectolythic enzyme Cuvée blanc and fermentation with 20 g/hl selected yeast QA 23.
FR4	FR4-1 FR4-2 FR4-3	Winemaking in the presence of 2 g/hl pectolythic enzyme Cuvée blanc and fermentation with 20 g/hl selected yeast Cross Evolution.
FR5	FR5-1 FR5-2 FR5-3	Winemaking in the presence of 2 g/hl pectolythic enzyme Cuvée blanc and fermentation with 20 g/hl selected yeast NT 116.

* all the musts used in these variants were clarified with bentonite and protected against oxidation with 60 mg/l potassium metabisulfite.

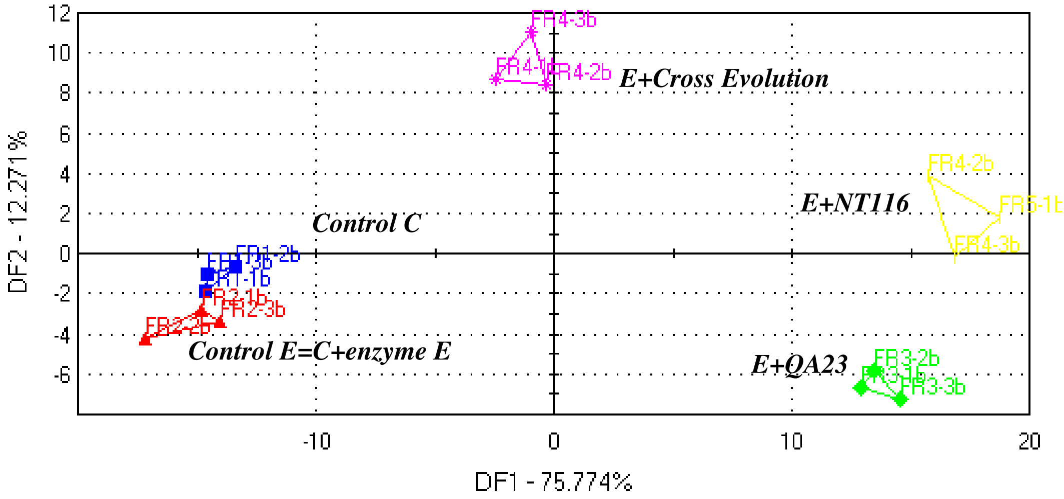

Fig. 1. Discrimination of the wines fermented in the presence of various selected yeasts and enzymes by Discriminant Factor Analysis (group blue=control with no enzyme and no yeast; group red = control with enzyme but no yeast; group green = variant with enzyme and QA23 yeast; group magenta = variant with enzyme and Cross Evolution yeast; group yellow= variant with enzyme and NT116 yeast).

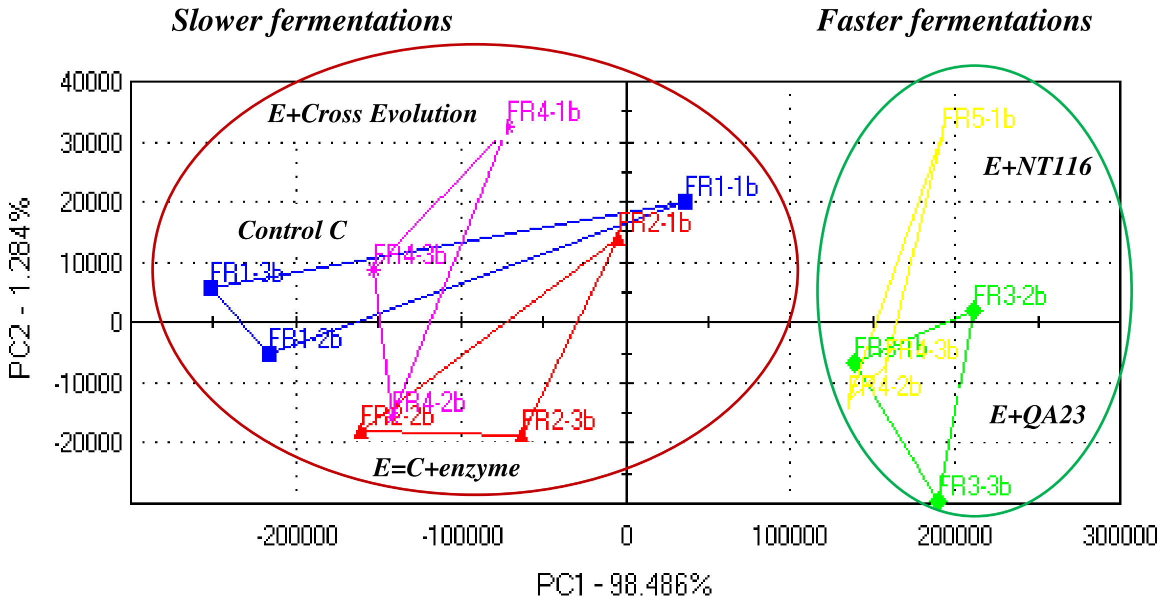

Fig. 2. Discrimination of the wines fermented in the presence of various selected yeasts, with oor without enzymes by Principle Component Analysis (Group blue=control with no enzyme and no yeast; group red = control with enzyme and no yeast; group green = variant with enzyme and QA23 yeast; group magenta = variant with enzyme and Cross Evolution yeast; group yellow= variant with enzyme and NT116 yeast. Group in red circle = slower fermentations; group in green circle = faster fermentations). Discrimination index: – 8.

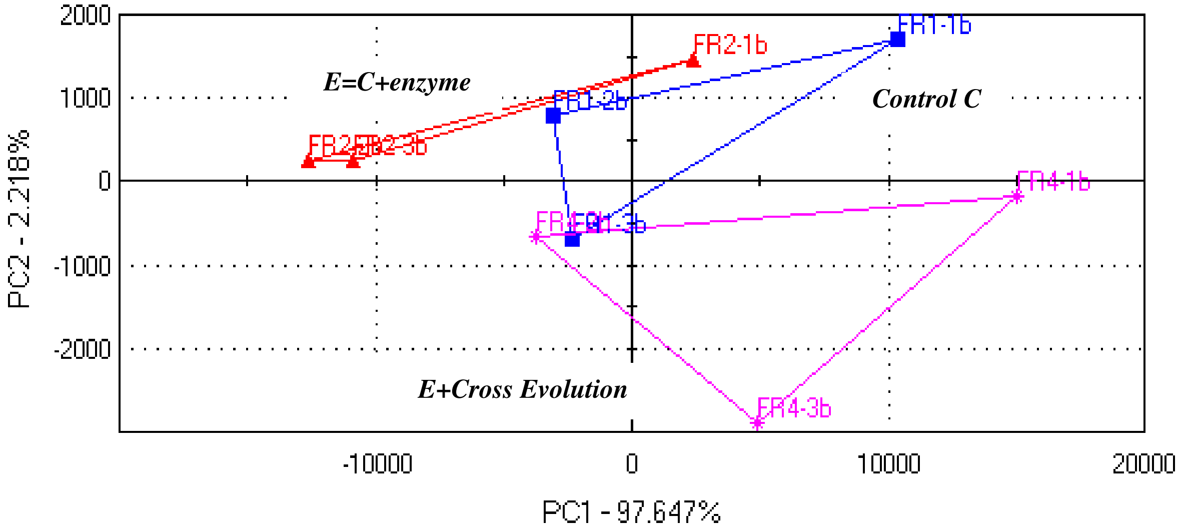

Fig. 3. Discrimination by Principle Component Analysis of the wines obtained by slower fermentations (group blue=control with no enzyme and no yeast; group red = control with enzyme and no yeast; group magenta = variant with enzyme and Cross Evolution yeast). Discrimination index: 47.

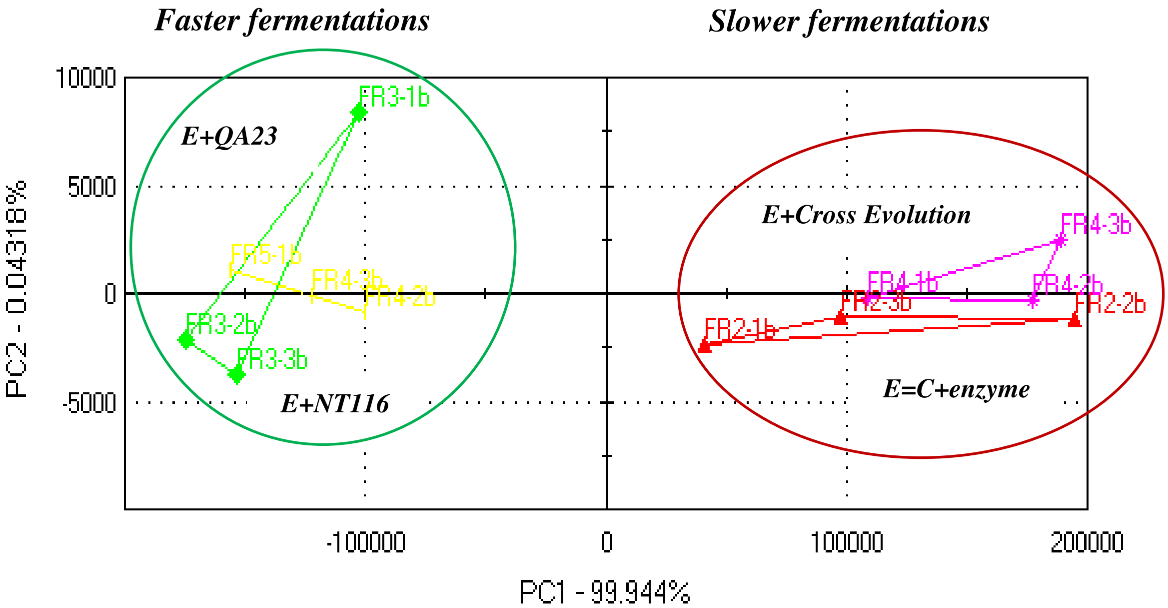

Fig. 4. Discrimination of the wines fermented in the presence of various selected yeasts and enzymes by Principle Component Analysis (Group blue=control with no enzyme and no yeast; group red = control with enzyme and no yeast; group green = variant with enzyme and QA23 yeast; group magenta = variant with enzyme and Cross Evolution yeast; group yellow= variant with enzyme and NT116 yeast. Group in red circle = slower fermentations; group in green circle =faster fermentations). Discrimination index: 0.

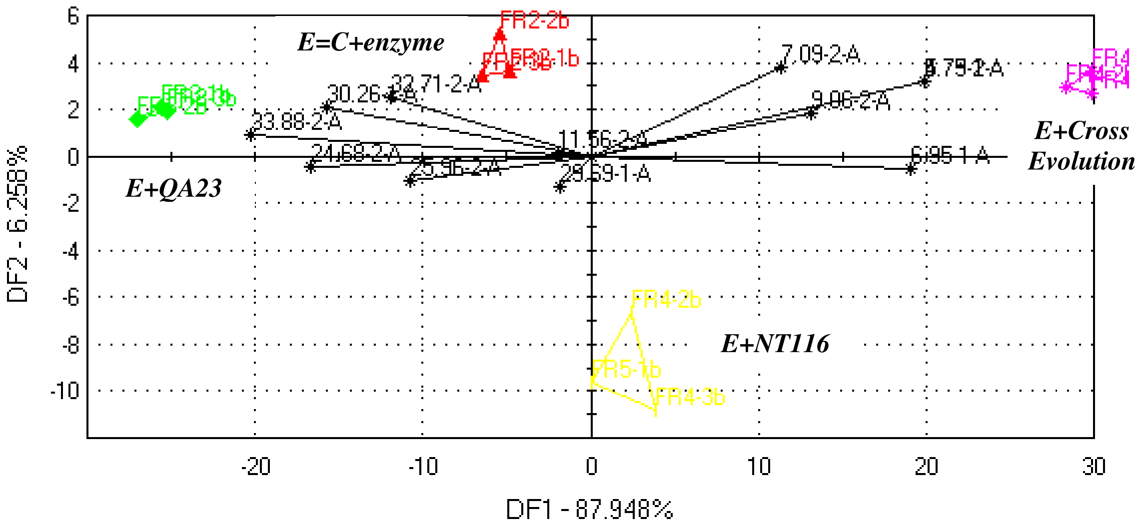

Fig. 5. Discrimination of the wines fermented in the presence of various selected yeasts and enzymes by Discriminat Factor Analysis (Group red = control with no enzyme and no yeast; group green = variant with enzyme and QA23 yeast; group magenta = variant with enzyme and Cross Evolution yeast; group yellow = variant with enzyme and NT116 yeast). Discriminating sensors are also displayed.

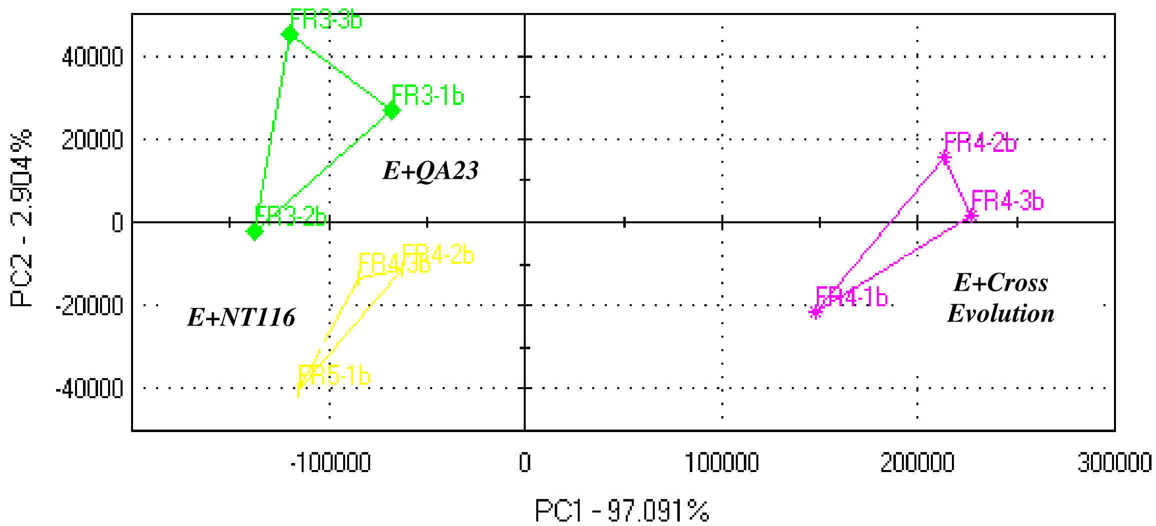

Fig. 6. Discrimination of the wines fermented in the presence of various selected yeasts by Principle Component Analysis (Group green = variant with enzyme and QA23 yeast; group magenta = variant with enzyme and Cross Evolution yeast; group yellow = variant with enzyme and NT116 yeast). Discriminating factor: 78.

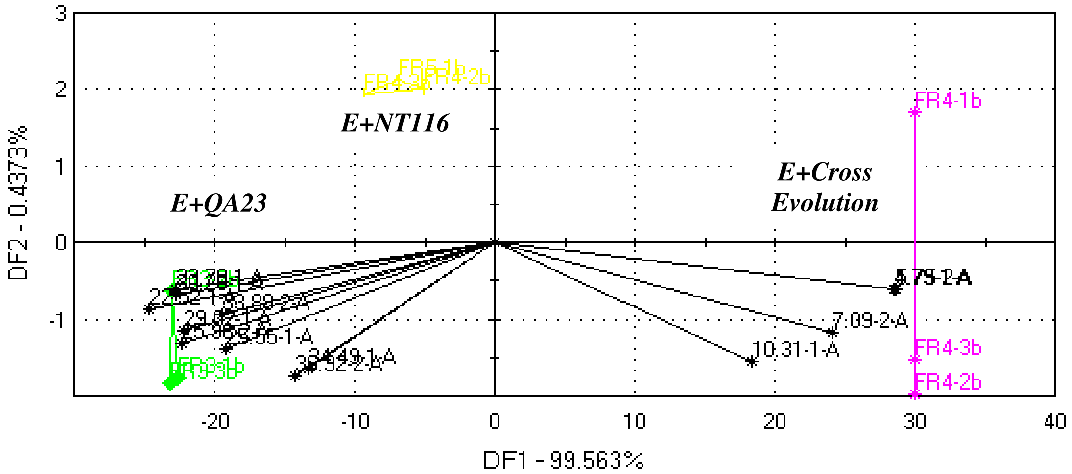

Fig. 7. Discrimination of the wines fermented in the presence of various selected yeasts by Discriminat Factor Analysis (green = variant with enzyme and QA23 yeast; group magenta = variant with enzyme and Cross Evolution yeast; group yellow= variant with enzyme and NT116 yeast). Discriminating sensors are also displayed.

Comparative study of the economic efficiency of using some commercial bentonites for fining white wines

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ABSTRACT

The most applied treatment which ensures protein stability of white wines is the bentonite fining. Many bentonites are available commercially, differing on composition, granulation, the sediment they produce in wine and cost per unit of product. Although the differences in prices may not seem extensive, correlated with the final result of wine fining, a difference of 0.1 euro per liter of treated wine, at industrial scale, may prove to be significant. The paper presents a comparative study of some commercially available bentonites and their economic efficiency. In the study 5 Na-bentonites and 2 Ca-bentonites were used, of which 6 from international providers and one from a national provider. The results showed that the most efficient was Bentonite Sodium Volclay Granular, followed by the indigenous Bentovin, both Na-bentonites. Other Na-bentonites from the same international provider, Microcol Powder and Microcol Granulated, ranked last due to their relative high price and loss of wine in the relative high amount of sediment they produce. The two Ca-bentonites, CLARSOL KC2 and CLARIT L455 JD, as far as the price and sediment were concerned, ranked in the middle and they are not preferred also due to their release of undesirable Ca ions in the wine. The Bentogran, another Na-bentonite, ranked also in the middle, producing a sediment of 10% of the total wine treated and can be an option for use provided the price drops a little.

INTRODUCTION

Bentonite is clay used for absorbing and subsequently removing undesirable proteins in order to stabilize white wines against protein hazes. The treatment with bentonite is preferred by most of the wine producers due to its efficiency, availability and its relative low cost. Being mineral clay extracted by mining, in accordance to the origin and the industrial processing which it undergoes, bentonites can have, within limits, different chemical composition. Basically it consists mostly of montmorillonite, plus various proportions of oxides and hydroxides of Si, Al, Fe, Ca, Mg, Na, and K. Other impurities may also be present and in some cases some rare earth elements can be transferred to wine during the treatment (Mihucz V. G., *et al.*, 2006; Tatár E. *et al.*, 2007). On the other hand, bentonite may help reduce the concentration of some toxins or pesticide residues (Čuš F. *et al.*, 2010; Var I. *et al.*, 2008). Beside proteins, bentonites may also reduce the content of some polyphenolic substances, heavy metals or biogenic amines.

The type of wine can also influence the success of the treatment with bentonite (Sun X. *et al.*, 2007) but this aspect was not taken into consideration in our study, tests being comparatively conducted on the same wine with various bentonites.

MATERIALS AND METHODS

In accordance with the dominant metal present in a bentonite, they are classified as sodium (Na), calcium (Ca), potassium (K) or aluminum (Al) bentonites. In wine treatment mostly Na- and Ca-bentonites are used, due to their good swelling properties and protein adsorption capacity.

In this study, 5 Na-bentonites and 2 Ca-bentonites were used as follows:

- Na-bentonites:
    - Microcol Powder and Microcol Granulated from Laffort, France
    - Volclay Granulated from Pestell Group, Canada
    - Bentogran from AEB Group, France

  - o Bentovin from Valea Chioarului, Romania
- Ca-bentonites:
  - o Clarsol KC2 from Sud-Chemie AG, Germany
  - o Clarit L455 JD from Sud-Chemie AG, Germany

Taking into account the results of protein stability tests of the wine used, the dosage applied was 0.9 g/l for Voclay Granulated Bentonite, 1 g/l for Microcol Powder, 1.1 g/l for Microcol Granulated, Clarsol K2C and Clarit L455, 1.4 g/l for Bentogran and 1.5 g/l for Bentovin.

The bentonite is added and swells in 10 times its weight in water, then it is mixed strongly for 2 hours until a homogenous gel is obtained.

The granular bentonites differ from ones in powder form by being easier to be handled by the personnel, the latter creating some dust that can be a hazard for the respiratory tract.

The wine treated in micro-tests and in industrial scale tests is a dry white wine with 12.6% v./v. alcohol, 6.94 g/l total acidity expressed as tartaric acid and a pH of 3.55.

The parameters followed in this study were: the turbidity of the wines after treatment, the sediment volume resulted from the treatment, the filterability index and the cost of the treatment. The filterability index, a modification of the Bensch Filterability Test (Bensch, 1977), is measured as the volume that can be vacuum filtered through a 1.2-micron analysis membrane with 25 or 47 mm diameter at room temperature before blockage (FI=volume passed before blockage/surface of the membrane). For simplification, the filterability index was expressed here only as the volume passed through the membrane.

RESULTS AND DISCUSSIONS

The bentonites were applied individually in glass sample vials of 1 liter and left for sedimentation for 72 hours. The turbidity of each sample was determined at 2.5, 24, 48 and 72 hours. As it can be seen in Fig. 1, the evolution of the turbidity depends on the type of the product, but the maximum limpidity of the wine is already obtained after 48 hours from the bentonite application in each case. The lowest turbidity was obtained for the treatment with the Na-bentonite Volclay Granulated bentonite (6.2 NTU), followed by the two Ca-bentonites, Clarsol KC2 and Clarit L455 JD, and the Romanian Na-bentonite, Bentovin (8.7 NTU). The dominant ion in the bentonite does not seem to be of importance when it comes to the clarification power of the product, the least efficient bentonites being also Na-bentonites, as was the product that led to the best clarification. The granular or powder state of the bentonites is also not correlated to the clarification power in the wine. The origin of the bentonite is the most important in relation to the clarification efficiency, bentonites from the same producer having similar behaviors, for instance, Microcol Powder and Microcol Granulated from Laffort France form a group in Fig. 1, as do Clarsol KC2 and Clarit L455 JD from Sud-Chemie Germany.

The sediment volume resulted after the treatment of each sample was also determined at 2.5, 24, 48 and 72 hours. As in the case of the clarification, the sediment volume did not change after 48 hours from the treatment (Fig. 2). Five of the bentonites led to a compact sediment, under 8% of the total volume, while the Microcol bentonites from Laffort led to 12.5% sediment in the case of powder form product and 13.6% in the case of the granulated one. In winemaking compact sediment is desirable, because besides the proteins and other substances adsorbed form the wine, smaller sediment contains less wine. In case of compact sediments the clear wine is easier to be racked and the resulted sediment removed more easily too, while in case of a lax sediment, the wine remaining in the turbid part after racking should be recovered by vacuum filtering, thus involving supplementary costs. Of all the bentonites, the Volclay Granulated formed the most compacted sediment, amounting to only 6.9%. This was followed by other four, Bentovin, Clarsol KC2 and Clarit L455.

Bentogran produces very compact lees (Fig. 2), but, contrary to their technical sheet statement, which says that "has an activity that enables to reduce up to 70% application doses if compared with common bentonites", it actually requires for the same effect a superior dosage (1.4 g/l) as compared to all the other imported bentonites (for which the dosage varies from 0.9-1.1 g/l).

The efficiency of the clarification obtained as a result of the treatment is confirmed also in Fig. 3, where the filterability index shows that the highest volume that passes through a membrane in a fixed amount of time is obtained also for the Volclay Granulated, followed by Clarsol KC2, Clarit L455, Bentogran and Bentovin. The Microcol bentonites have the lowest filterability indices representing only 17-19% of the filterability of the Volclay Granulated.

The highest yield of clarified wine is produced by the Vovclay granulated bentonite, followed by Bentovin and then by the two Ca-bentonites, Clarsol KC2 and Clarit L455 (Fig. 4). Figure 4 shows the results obtained at industrial scale in 500 hl tanks, the sediment and limpid recovered wine being evaluated in percentages. In all the cases the percentages of the lees added to the percentages of the limpid wine exceed the expected total 100 by 1—3 %, these percentages coming from the wine recovered from the lees by vacuum filtering after the racking of the limpid wine.

In Fig. 5 the costs of wine treatment performed with various bentonites are presented, calculated by taking into account the price of the bentonite, the dosage used in order to obtain the same effect of protein stability plus the cost of the water, energy and the labor used. The lowest cost is recorded again for the Volclay Granulated, followed by the group of the bentonites that also led to the most effective clarification: Bentovin, Clarsol KC2, Clarit L455 and Bentogran. The Microcol bentonites proved to be the most expensive in spite of the fact that they are used in the lowest dosages (1.0-1.1 g/hl) after the Volclay Granulated.

In addition to the costs calculated and reported in Fig. 5, there are some other invisible costs generated by the wine which is lost with the lees in case the sediment is not compact enough. In order to rank the bentonites in accordance to the cost efficiency, in Fig. 6 the treatment costs of various bentonites are plotted against the percentage of the resulted sediment. As it can be seen in Fig. 6, the most cost-effective bentonite is Volclay Granulated, followed by the Romanian Bentovin, and Clarsol KC2 and Clarit L455 on the same rank. Bentogran ranks in the middle, while Microcol bentonites rank the last in the group, as being the most expensive and the least efficient in treating wines.

The difference in the costs of the treatment of 1 hl volume of wine between the most cost-effective bentonite and the least cost-effective bentonite is only 0.1 Euro. However, if we take into account that at industrial scale tens or hundreds of thousands of hl are treated this may result in an economy of several thousands of euros.

CONCLUSIONS

The origin of the bentonite is the most important in relation to the clarification efficiency, bentonites from the same producer having similar behaviors. The lowest turbidity was obtained for the treatment with Volclay Granulated bentonite.

The same Volclay Granulated bentonite led to the most compact sediment (6.9%) making it a good product for wine fining and protein stabilization. Other four bentonites led to compact sediments, under 8% of the total volume, while the wines resulted from the treatment were of a very good limpidity, with turbidity under 10 NTU. Among these four ranked the Romanian bentonite called Bentovin.

Although Bentogran leads also to good clarification and compact sediment, the same effect as for all the other imported bentonites is obtained at a superior dosage (1.4 g/l), which is 55% more compared to the dosage of Voclay Granulated Bentonite (0.9 g/l) and 27-40%

more than the dosage of the others. The highest dosage is required by the Romanian Bentovin, but the cost induced by this higher dosage is compensated by the lowest cost of the product and a clarification efficiency and compactness of the sediment similar to the one obtained for the best ranked bentonite.

The Microcol bentonites have the lowest filterability indices representing only 17-19% of the filterability of the Volclay Granulated. They are also the ones that generate the highest costs of the treatments, in spite of the fact that the dosages needed are among the lowest.

The study showed that some bentonites can bring about more quality of the treated wine and less sediment than others, leading to the conclusion that choosing carefully the products can results in economic advantages for the company. Taking into account all the parameters measured, from the studied bentonites the most efficient from all viewpoints is the Volclay Granulated bentonite of Laffort. The second best choice for a national wine company is the Bentovin, a Romanian bentonite obtained in Valea Chioarului, as the product is cheapest, readily available and its application leads to wines with similar limpidity and volume of lees as the first ranked bentonites in this study.

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FIGURES

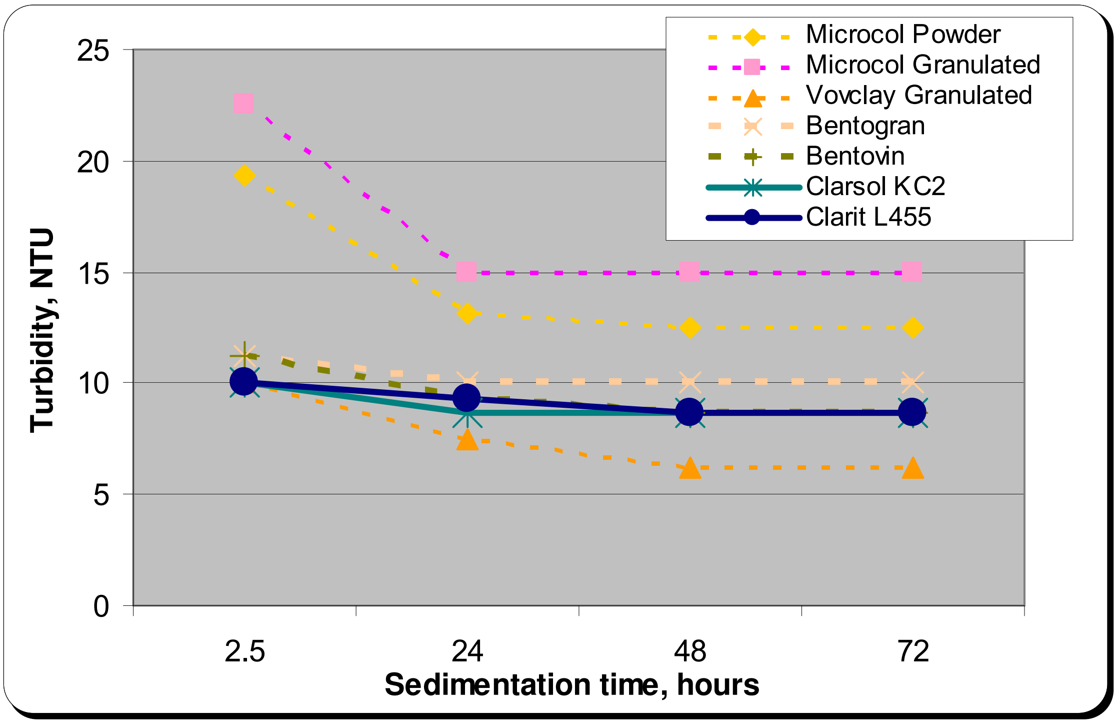

Fig.1. The evolution in time of the turbidity of the wine resulted after fining with various bentonites. (Na-bentonites are shown in dotted lines and Ca-bentonites in continuous lines).

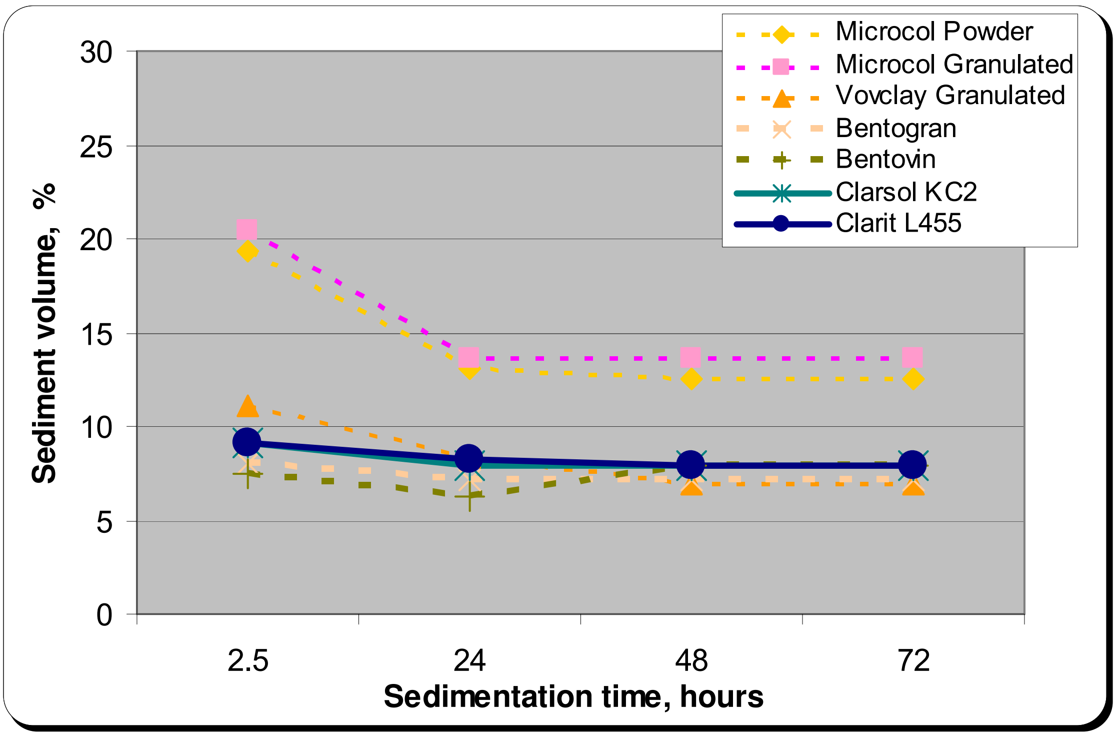

Fig.2. The evolution in time of the volume of lees resulted after wine fining with various bentonites, expressed in percentages of total wine. (Na-bentonites are shown in dotted lines and Ca-bentonites in continuous lines).

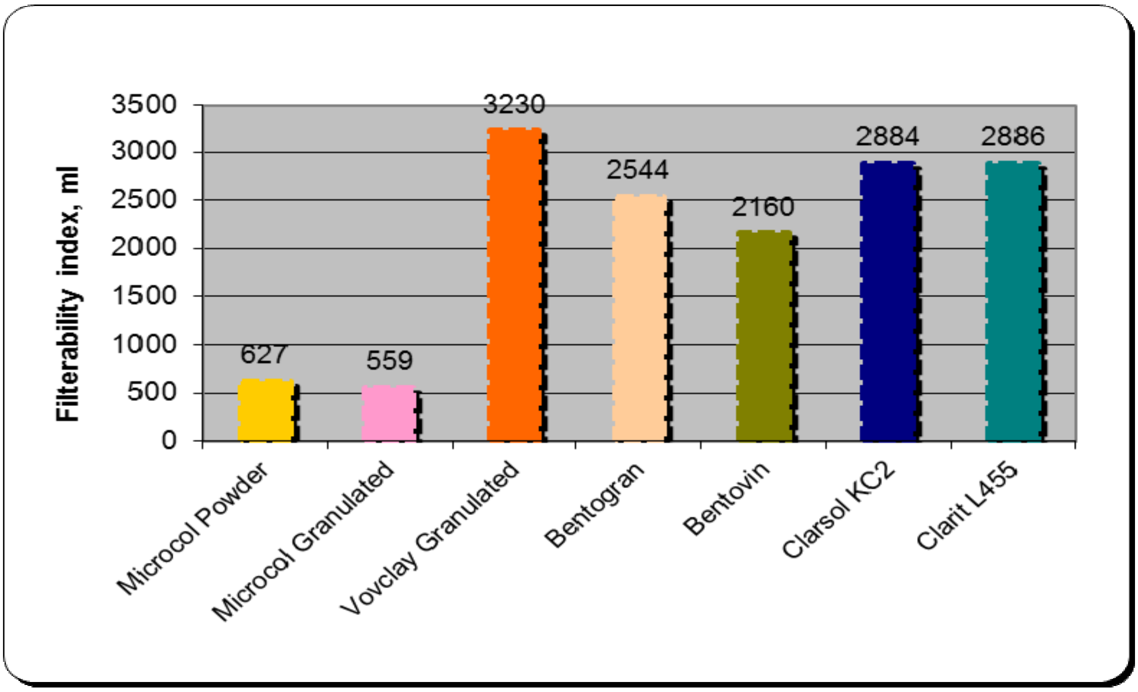

Fig.3. Filterability index of the wines after fining with various bentonites

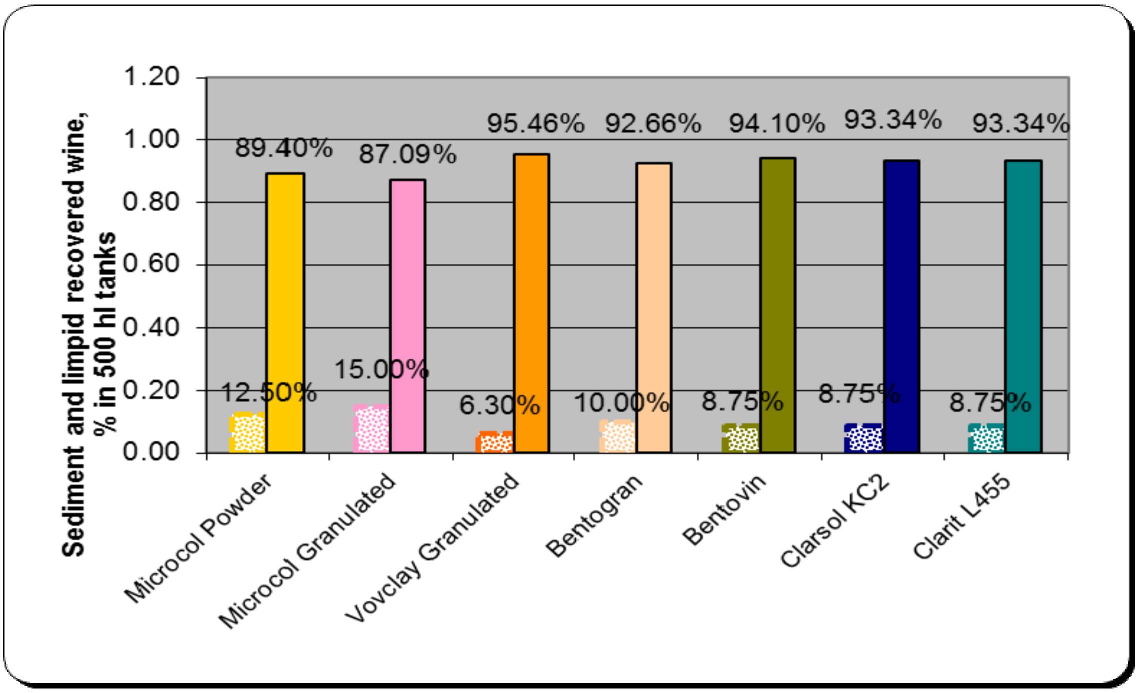

Fig.4. Sediment obtained after fining with various bentonite products and the limpid recovered wine after the treatment expressed in percentages. The limpid wine values include also the wine recovered from the lees after vacuum filtering. (The bars colored homogeneously represent the limpid wine, while the bars filled with dotted patterns represent the lees.)

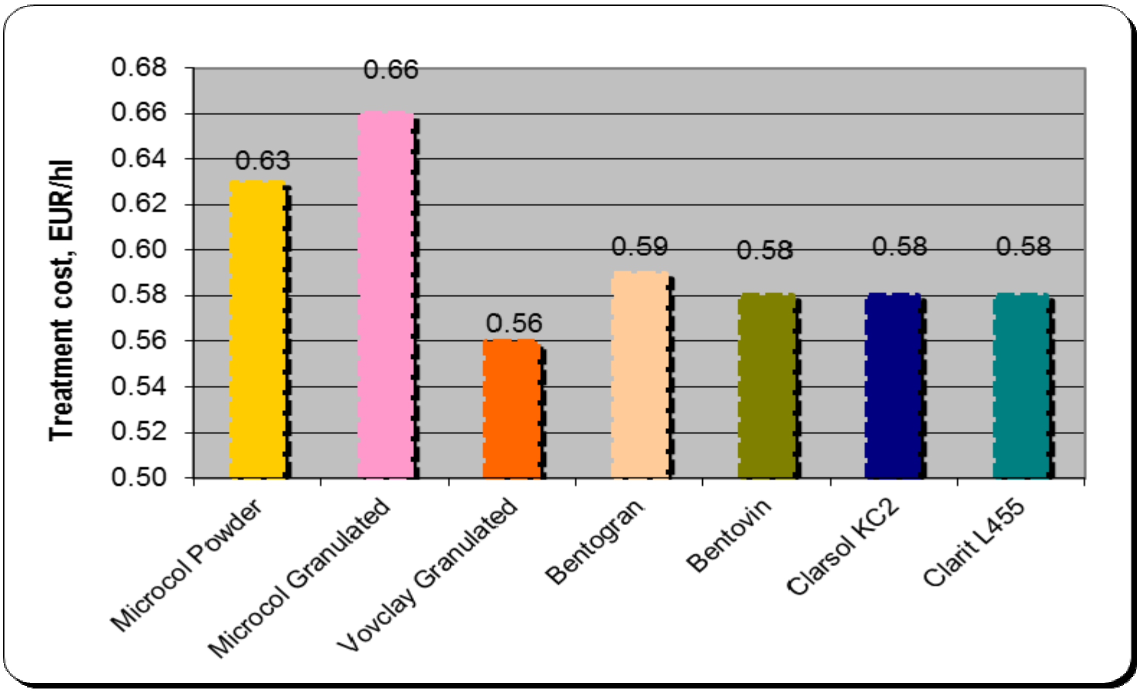

Fig.5. The cost of wine treatment performed with various bentonites, expressed in Euro per hectoliter of treated wine; the total cost includes the raw materials, energy and labor costs.

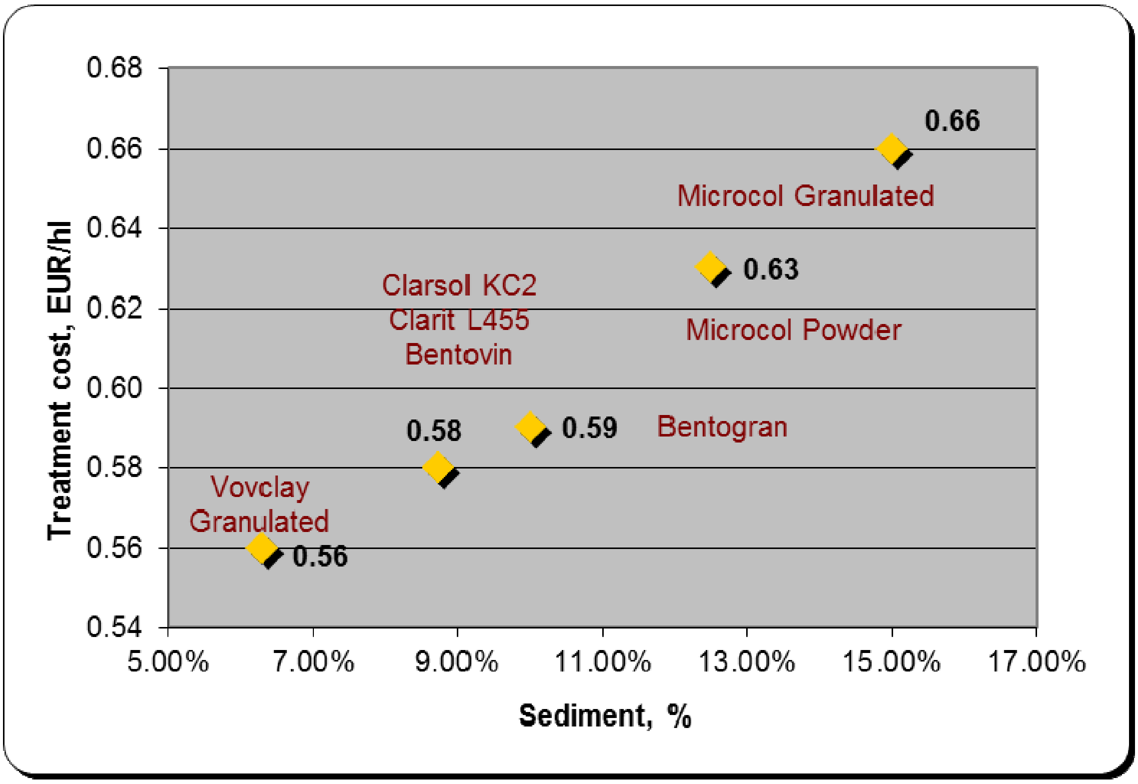

Fig.6. Cost efficiency of the bentonites, evaluate in accordance to the cost of wine treatment performed with various bentonites and the percentage of lees resulted from the treatment

The influence of climatic changes on quality of wines obtained from the Romanian varieties of grapes

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Keywords: climatic changes, wines, varieties, vineyards

ABSTRACT

In Romania, the climate heating changed the quality of wines obtained from the Romanian varieties of grapes and their geographical spreading. So, one of the well known Romanian variety of grapes used for the quality of white wines, named Fetească albă, restricted its growing area comparing with the last century. During the last years this variety is less and less cultivated in the Southern vineyards of the country, where the annual medium temperature is over 11^0 C.

INTRODUCTION

The vine is a plant with a large capacity of accommodation from ecological point of view. This is the reason why it is grown on all continents between 55°C (fifty five Celsius degrees) northern latitude and 45°C (forty five Celsius degrees) southern latitude, starting with the sea level up to altitudes of 2500–3000 m (two thousand and five hundred – three thousand), on the Peruan or Bolivian plateau and also from arid areas with yearly few rainfalls to areas with 1000 mm (one thousand) rainfalls. In both northern and southern Earth hemisphere, the vine is grown between the yearly average isothermal line of 9 °C northern hemisphere and the 10°C one southern hemisphere.

The vine growing is more developed having high quality results between the isothermals of 9 °C and 25°C in both northern and southern hemispheres (Olteanu 2000).

The vine growing efficiency, its crops productivity and quality are in a large measure dependent on the ecological offer of the viticultural area, respectively dependent on the interaction of the factors that define the notion of environment. From all the components of the natural environment, the climatic factor is the first that influences the spreading of the vine growing. From this point of view are important the notions of macroclimate, mezoclimate and microclimate. The macroclimate is the result of the combination of some natural factors that act on a large scale, as so the latitude, the large water areas, the large relief shapes, that determine a Mediterranean, an Alpine or a Marin climate. The mezoclimate is the result of the action of some factors that act on a more reduced scale as so the landscape features (altitude, exposition). The microclimate represents the atmosphere layer next to the vine.

As well as for all the grown herbage species and trees there is a botanic limit for the vine too. The plant cannot live out of this limit if its minimal demands of temperature, light and humidity are not ensured. There is too, an economical limit that makes the grapes crop no satisfactory because of some climatic events (frost, high air humidity, excessive draught) (Calò et al., 1999).

The climate changes that become manifest as global worming, have a large impact on the vine growing and wine making, all over the world.

Since 1860 until nowadays, the average temperature of the Earth surface, increased with 0.6 °C (zero point six) (with an uncertainty of plus minus 0.2°C). The twentieth century was the warmest of the latest 1000 years and the latest ten years knew the most important worming of the entire century (Seguin 2007). A global climate changing will certainly influence the local climate and the viticultural activity (Quenol and Monteirro, 2007). The effect of the global worming of the latest two decades stand on the base of the enological evolution characterized by the precocity of the data of the different fenological stages and in the same time by the shortage of the fenological phases (Chabin et al., 2007).

MATERIALS AND METHODS

In order to state the relation between the climate changes and the quality of the wines produced in different viticultural areas, the researches followed two different directions: the study of the climatic data and the study of the oenological data. For the first direction, we analyzed a lot of climatic data supplied by some Romanian meteorogical stations and by scientific works that contain analyses of the climatic factors, made during a long time period. For the second direction we compared present – day data and older data regarding the main wine composition and sensorial features.

Our information sources were, doctor's degree written works, books, reviews, the Annals of the Vine Growing and Wine Preparation National Researches Institute, media articles. We also analyzed many customs and traditions regarding the vine growing and wine preparation practices. We obtained valuable information regarding the climatic changes and their influence on the wine quality, on some aspects of vine growing technology, on the biological cycle of the vine and also on the spreading of some vine kind.

RESULTS AND DISCUSSIONS

The results after the studies and analyses we made indicate clearly the fact that the global warming is a reality. Our century beginning is certainly wormer than the previous century one and the global worming determined already changes in the quality of wine produced in different areas. How vast is this phenomena is difficult to estimate because some data that lead to this conclusion are relative. But is sure that the beginning of our century is wormer comparing with the last century one, and is also sure that the climate worming produced changes in the quality of the wines produced in different areas.

Before the Phylloxera, that destroyed the Romanian viticultural patrimony, at the end of the XIX century, in Romania were under crop tens of Romanian kinds of vines. At present, their number is more reduced, but they are in all the groups of kinds for vine (Table 1).

The present spreading of the Romanian kinds is different by the one existing 50–100 years ago. Ones of the white wines kinds stinted their culture area. Is the case of the best Romanian white quality vine kind – Fetească albă, that in the latest years is more and more less cultivated in the southern half of Romania, were the average yearly temperatures are higher than 11°C. Because of these temperatures this kind of vine has important losses of acidity and the produced wines have not fineness and harmony.

On the other hand, in the northern half of the country vineyard, in Moldova and Transylvania, where the climate is not so worm and dry, every year they produce of this kind of vine, high quality wines, having a lot of personality, liveliness, freshness, fine specific aroma, highly appreciated by the competent consumers. In the worm south of the country these qualities cannot be emphasized in all years.

The heating phenomenon has had also influence on the changing of the white wines quality and composition of the varieties: Zghihară de Huşi, Plăvaie and especially Galbenă de Odobeşti.

The alcoholic degree of these white wines had increased with 1 % vol., comparatively with the white wines obtained with 50 years ago, because the sugars content in grapes is higher.

Also for the black grapes varieties used for obtaining red wines, the climatic changes were favorable. The most well know variety named Fetescă neagră extended its growing area in the vineyards of the Sub-Carpathians hills and in the Southern part of Moldavia. The Fetească neagră wines are very colored, harmonious and fullness. From the quality point of view generally speaking the Fetească neagră, is higher than Merlot or even Cabernet Sauvignon wines. Therefore this is the most wanted variety for cultivate in the red wine vineyards from Romania.

The climatic change influence on the Romanian viticulture is revealed in the oldest Romanian vineyards, over 2000 years – Dragăşani vineyard. This is situated in the Southern of the Carpathians Mountains, among the river Olt, with a length of 60 km, was famous for its white wines, agreeable, suppleness and aromatic. The varieties for the red wines have entered in the vineyard only after the *Phylloxera* attack at the end of the XIX century, but in the last decades it's extended very much. Presently the grapes varieties for the white wines are cultivated in the third Northern part of the vineyards closely to the Carpathians mountains, the Southern part is used mostly for obtaining red wines especially local creating –Novac and Negru de Dragăşani. These changes regarding the types of wines obtained in the Dragăşani vineyard and their quality are the consequences of the climatic changes, which had encouraged the varieties for the red wines.

Also in the Dragăşani vineyard the climat heating determined qualitative changes at the famous variety from the vineyard – Tamâioasă Românească. Lot of time, from this variety were obtained white, aromatic and lightly wines. In the last decades, from this variety are obtained natural and sweet white wines, very appreciated and wanted.

CONCLUSIONS

The climate changes have an important impact on the vine growing and wine production:

- changes of the biological cycle of the vine – shortage of the duration of some fenological phases
- accumulation of higher quantities of sugars and anthocyans, diminution of the grapes total acidity
- changes of the features of composition and organoleptical of the wines:

White wines	Red wines
more alcohol more residual sugar less acidity restriction of the culture of kinds of vine that easily lose their acidity	more alcohol more colored wines increasing of the red wines quality increasing of the favorability degree for quality red wine production for some areas

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TABLE

Table 1

Grapevine varieties for wine recommended and authorized in Romania

Varieties for		Varieties and quality category		
		High quality	**Quality**	**Mass consuption**
Withe wines	A*	Chardonnay Sauvignon Pinot gris ***Grasa deCcotnari*** ***Feteasca alba*** Traminer roz Riesling de Rin	Riesling italian ***Fetească regală*** ***Frâncuşă*** Aligoté Furmint Neuburger	***Galbena de Odobesti*** ***Zghihara de Husi*** ***Plavaie*** ***Mustoasa de Maderat*** ***Iordana*** ***Creata*** ***Majarca alba*** Steinschiller roz Rkaţiteli
	B*		***Şarba*** ***Donaris*** ***Columna*** ***Furmint de Miniş*** ***Crâmpoşie selecţionată***	***Băbească gris*** ***Mioriţa***
Red wines	A*	***Fetească neagră*** Cabernet Sauvignon Pinot noir Merlot	Burgund mare Cadarcă	***Băbească neagră*** Oporto Alicante Bouschet ***Roşioară*** Sangiovese
	B*		Blauerzweigelt	***Codană*** ***Pandur*** ***Haiduc*** ***Purpuriu***
Flavored wines	A*	***Tămâioasă românească*** Muscat Ottonel ***Busuioacă de Bohotin***		
	B*		***Negru aromat***	

A* = Varieties with spreading in crop; B* = new varieties created or recently introduced in crop

Composition and sensorial features of multivarietal red wines from Vânju Mare vineyard

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Keywords: wines, assortment, composition, sensorial features

ABSTRACT

The red wines, assortment type, as technological blend of many sorts in various proportions, represent a suitable solution in order to increase the quality of wines obtained in winegrowing region of Oltenia, particularly in Vânju Mare vineyard. According to the results obtained in 2007 – 2009 the wines produced by the combination of various sorts of quality, get superior parameters of composition, and chromatic and sensorial features comparing with the wines produced of the same sorts but processed as pure sorts.

INTRODUCTION

The colline area of Oltenia is one of the most favourable Romanian areas for high quality red wines. The climate and soil conditions typical of this region vineyards, meet the requirements of vine regarding the natural factors that influence the quality of grapes and wines production (Gheorghiţă et al., 2006).

This is the reason why the red wines obtained in this region are able to express their enological potential at high quality level, due their chemical composition and their characteristics of colour, aroma and taste (Băducă Cîmpeanu 2007).

The Vinju Mare area of Dealurile Severinului vineyard is one of the well-known viticulture areas for the production of quality red wines as Cabernet Sauvignon, Merlot, Pinot Noir and Fetească Neagră. Monovarietal wines, well structured as composition, intense coloured, well-balanced as aroma and taste and very typical can be obtained of this varieties of grapes (Băducă Cîmpeanu et al., 2008). Lately appeared the necessity of wine production diversification by obtaining multivarietal assortment type wines, as blends of different varietals in well-established proportions.

The results of the researches in this area are promising. The wines obtained up to now were satisfactory and are promising as future evolution.

MATERIALS AND METHODS

This material was issued based on the results of the study regarding the multivarietal wines in the Vinju Mare area of Dealurile Severinului vineyard. The study has started in 2007 and will continue till 2011. During this study, combinations in different proportions between two or more varietals were made. The main elements for the combination plan are the varietals, proportions, the wine blending moment. All the wines obtained after blending were periodically analyzed (at least two times by year) from organoleptic and composition point of view. The results were compared between them and with the results obtained for the monovarietal wines used for blending.

The tests referred to the main parameters of the chemical composition: alcohol content, glycerol, residual sugar, total acidity, volatile acidity, dry extract, ashes, total polyphenols, tannins, anthocyanins. Other features tested were colour intensity and shade. The wines were tasted by tasting juries based both on the OIV – UIOE tasting sheet and special sheets drown up by the Craiova University Oenology Department.

Although the study is still running and the results presented in this study are partial ones they are conclusive enough and permit the stipulation of preliminary conclusions, which will be completed of the end of the study.

Depending on the number of varietals and blending proportions, the combination plan is presented below:

2 varietals blend		3 varietals blend	
Varietals	Proportions	Varietals	Proportions
Cabernet Sauvignon + Merlot	3 +1	Cabernet Sauvignon + Merlot + Pinot noir	1 + 1 + 1
Cabernet Sauvignon + Fetească neagră	2 + 1	Cabernet Sauvignon + Merlot + Fetească neagră	1 + 1 + 2
Merlot + Fetească neagră	1 + 1	Cabernet Sauvignon + Pinot noir + Fetească neagră	1 + 2 + 1
Merlot + Pinot noir	1 + 2	Merlot + Fetească neagră + Pinot noir	1 + 2 + 2
	1 + 3		2 + 1 + 1
			2 + 1 + 2
			2 + 2 + 2

RESULTS AND DISCUSSIONS

In table 1 is presented a synthesis of the results regarding the chemical composition of monovarietal wines that were the bases of the technological blends.

For each of the four varietals presented in the study, the table contains the maximum and the minimum values of the composition parameters analyzed for the wines obtained in the years 2007, 2008 and 2009.

Analyzing the data in table 1, we see that the wines of the 4 varietals present values of the composition parameters that permit classifying them in the quality wine category.

We emphasize mainly the high content of alcohol; glycerol and extract proving that the grapes used were of remarkably quality, well ripened and in good health.

Among all the 4 types, the Cabernet Sauvignon was first placed concerning all the analyzed parameters, during all the years.

Thus the Cabernet Sauvignon wines had the alcohol content between 13.2 and 14.9 % vol., the glycerol content between 10.4 and 12.8 g/l and the extract between 28.4 and 32.8 g/l.

The same wine is also on the first place concerning the total polyphenols content and colour intensity.

The data in the table, also emphasize the very good behavior of the indigenous variety Feteasca Neagra which can be placed on the same level with the Merlot wine concerning the composition parameters.

The analyses of the wines obtained by blending 2 or 3 types emphasize the fact that all the wines no matter the varietals they were made of, and the proportions of the types in the blends presents values of the chemical composition that permit classifying them in the quality wine category. The main parameter of the chemical composition – alcohol content – presents, in all combinations values of over 12.5% vol. alcohol, the higher values corresponding to the blends with higher content of Cabernet Sauvignon.

The glycerol content was less than 10 g for the wines with content of Pinot Noir higher than 50%.

The dry extract content was higher than 28 g/l for all the wines over passing 30g/l for blends with Cabernet Sauvignon or Feteasca Neagra in proportions higher than 50%.

The total polyphenol contents was higher than 3.5 g/l and the colour intensity had values between 1.10 and 1.30 – higher values corresponding for the higher proportions of Cabernet and Merlot in the blends and lower values corresponding to the blends containing over 50% Pinot Noir.

Taking into consideration that from point of view of chemical composition all the wines have parameters values corresponding to the quality wines category in order to establish the most suitable combinations of varietals the analyses of the sensorial characteristics is the most important.

Wine tasting showed that many assortment wines were better appreciated than the monovarietal wines obtained from the same grapes varieties.

The tasting method consists in analyses and score of 10 wine features, the total score being 100 points.

Table 2 presents the results of wines tasting according to the above-mentioned method.

The results indicate that the red wines are better appreciated and scored as they age. Among the monovarietal wines at any age were they tasted, the Cabernet Sauvignon was first placed with the highest score almost every time.

Comparing the evolution of the sensorial characteristics illustrated by the scores obtained, we can see that Cabernet Sauvignon is the one with the higher score increasing (78 points at 3 months tasting and 93 points at 2 years tasting)

The Merlot wine increases from 77 points to 90 points, Pinot Noir increases from 76 points to 87 points and Feteasca Neagra from 79 to 91 points. For the Cabernet Sauvignon the most imported increase was recorded in the time interval 18 – 24 months from 87 to 93 points. A different evolution can be seen for the Pinot Noir that increase the most in the period of 3 – 12 months (from 76 to 84), and in the next year only 3 points (from 84 to 87 points).

The sensorial analyses of multivarietal wines emphasised differences between the wines depending on the varietals of wines in combinations and on their proportions. As so, in many cases, the wines made from 2 or 3 varietals obtained higher tasting scores than the monovarietal wines.

Among the wines obtained by the combinations between 2 varietals, were remarkable the combinations Cabernet – Merlot – 2+1 and 1+1, that obtained at each taste higher scores comparing with each pure varietal.

The combination Cabernet Sauvignon – Merlot, 1+2, obtained higher scores at 3, 6 and 12 months. Except for 2 years tasting, the combination Cabernet Sauvignon – Feteasca Neagra 1+ 2 obtained permanently higher scores comparing with the monovarietal wines obtained from the two varieties.

At 3 and 6 months, the combination Merlot – pinot Noir 1+3 obtained the higher scores comparing with all the tasted wines, but it did not increase anymore, and at 24 months obtained less than at 12 months. This fact proves that it is a lightly wine having a lot of freshness and fruit driven that expresses better their characteristics in the first year but they are not suitable for ageing.

Among the 3 variety combinations, the blend Cabernet Sauvignon – Merlot – Feteasca Neagra 1+1+2 obtained superior scores at tastes, comparing with the wines of the 3 varieties. The situation is similar for the combination Cabernet Sauvignon – Merlot – Pinot Noir 2+2+1. These multivarietal wines, obtained by blending 3 varieties, were appreciated as very complex as aroma, well balanced as taste, structured and fleshy.

The combination Cabernet Sauvignon – Pinot Noir – Feteasca Neagra 1+2+1 were highly appreciated for their suppleness, roundness, and fruit driven especially at tastes of 3, 6 and 13 months.

Another target of the researches was the setting of the best moment of blending of monovarietal wines assembly. As so, assemblages were made at 2 years, at 1 year, at 3 months and the assemblage of grapes that were processed together. The results in table 3 show that all the wines presented better sensorial characteristics and they obtained higher scores at tasting when the blending was made earlier.

All the combinations with Pinot Noir were better appreciated when the assemblage was made as grapes. Regarding other combinations, the best results were obtained for grapes assemblies and when were blended wines 3 months age with alcoholic and malolactic fermentation completed.

CONCLUSIONS

The researches up to now emphasized that the assortment wines, obtained by combinations in certain proportions between the varieties cultivated in the viticultural area Vinju Mare of Dealurile Severinului Vineyard is a serious option in order to diversify the wine range of this area. Some of this blending succeeded to combine the qualities of 2 or many varietals that were involved in combination, being better appreciated comparing with control wines obtained by the same varietals individually processed. From the composition point of view, the assortment wines have intermediary values placed among the monovrietal wines ones. Regarding the sensorial point of view, the most successful combinations were higher scored comparing with the monovarietal wines, but for a successful joint of their qualities, the younger the wines, the better the blending.

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TABLES

Table1

Chemical and polyphenolic composition of monovarietal wines (2007 - 2009)

Varietal	Alcohol % vol.	Glycerol g/l	Residual sugar g/l	Total acidity g/l H_2SO_4	Volatile acidity g/l acetic acid	Extract g/l	Total Polyphenols g/l	I	T
Cabernet Sauvignon	13.2	10.4	2.1	3.6	0.32	28.4	3.8	1.21	0.48
	14.9	12.8	7.4	4.4	0.44	32.8	4.9	1.40	0.57
Merlot	12.4	9.8	3.2	3.8	0.38	27.8	3.4	1.14	0.54
	13.8	12.0	9.6	4.7	0.52	31.0	4.1	1.30	0.62
Pinot noir	12.1	9.2	3.8	4.0	0.36	27.1	3.1	1.02	0.58
	13.6	11.4	11.2	4.6	0.58	29.2	3.6	1.16	0.66
Fetească neagră	12.5	9.5	2.8	3.8	0.34	28.0	3.6	1.12	0.52
	13.5	11.8	10.2	4.5	0.48	29.7	4.2	1.28	0.60

Table 2

Results obtained at wines tasting

Wine		3 months	6 months	12 months	18 months	24 months
Cabernet Sauvignon		78	81	83	87	93
Merlot		77	80	81	86	90
Pinot noir		76	80	84	86	87
Fetească Neagră		79	82	85	87	91
C. S. – M.	2 + 1	79	82	84	89	94
	1 + 1	80	83	84	88	94
	1 + 2	79	83	85	87	91
C. S. – F. N.	1 + 1	78	81	84	88	91
	1 + 2	80	83	86	90	92
M. – P. N.	1 + 2	80	85	87	90	88
	1 + 3	83	89	89	88	87
C. S. – M. – F. N.	1 + 1 + 1	80	83	86	89	92
	1 + 1 + 2	80	84	87	89	94
C. S. – M. – P. N.	1 + 1 + 1	78	82	84	88	91
	2 + 2 + 1	79	82	85	88	93
C. S. – P. N. – F. N.	1 + 1 + 1	78	82	84	87	90
	1 + 2 + 1	79	83	86	88	90

Table 3

Results of tasting of wines blended at different ages

Combination	Grapes assembly	3 months wines assembly	1 year wines assembly	2 years wines assembly
C. S. – M.	83 – 85	86 – 90	85 – 90	84 – 88
C. S. – F. N.	84 – 87	87 – 91	86 – 90	85 – 88
M. – F. N.	83 – 88	85 – 89	86 – 88	84 – 87
M. – P. N.	86 – 90	85 – 89	83 – 87	80 – 85
C. S. – M. – F. N.	84 – 88	87 – 92	86 – 90	85 – 88
C. S. – M. – P. N.	87 – 91	86 – 90	84 – 89	84 – 87
C. S. – P. N. – F. N.	87 – 90	85 – 88	84 – 87	82 – 86

Research concerning the influence of types of pruning and bud loads on vegetative and yielding balance at grapevine

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Keywords: grapevine, pruning, vegetative and productive equilibrium

ABSTRACT

The results of the research made on Fetească regală variety in the experimental field of Viticulture and Enology Department from Bucharest University of Agronomic Sciences and Veterinary Medicine, for a period of three years (2008-2010) have allowed the highlighting of some valuable conclusions for rationalization of grapevine culture and maximization of yield's quality. The experiment has followed the interaction between pruning type (Guyot on demi-high trunk, Cazenave cordon and spur-pruned cordon) and bud loads (10 and 15 buds/sq m). The interaction between the two factors studied has as results some canopy architectures, leading to a differential reception of solar radiation, a specific microclimate inside the leaf wall and a certain quality of the yield. In order to maximize the quality, it is recommended, in case of normal yields, to assure some values of the vegetative and productive balance index between 20 and 25, a ratio „yield/pruning weight" between 4 and 6, and also 10 - 18 sq leaf area/g of grape.

INTRODUCTION

Considering the existent interest at global level regarding the optimization of culture technologies of grapevine and maximization of yield's quality, it is very important to choose the pruning type which has as result a superior yield from quantitative and especially from qualitative point of view, to determine an optimum bud load which has as result a balance between growth and production, respectively between quantity and quality and to establish the optimum valued for the indicators of vegetative balance and for yield indicators necessary for obtaining some good quality yields.

The latest research evinced the importance of pruning types and that of bud load on the vine's balance and the yield's qualitative optimization (Maccarone, Scienza, 1996; Ion, 2006; Belea, 2008; Mereanu, 2010).

This paper intends to determine the way in which the pruning type and the bud loads contribute to the maintenance of the vine's growth-yield balance and to ensure the highest qualitative parameters.

MATERIALS AND METHODS

The researches have been performed during the period 2008-2010 in the experimental field of the Viticulture and Enology Department from University of Agronomic Sciences and Veterinary Medicine Bucharest. The vineyard was established in 1995 with Fetească regală variety, clone 21 Bl, grafted on the Kober 5 BB rootstock, with planting distances of 2.2/1.2 m.

It has been studied three pruning type (Guyot on demi-high trunk; Cazenave cordon and spur-pruned cordon) with two bud loads: 10 and 15 buds/sq m.

The observations and determinations took into account the following: annual pruning weight (kg/vine); leaf area of the vine (sq m/vine); yield (kg/vine); average weight of a grape (g); average weight of 100 berries (g); the sugar contents (g/l).

There were also determined the indexes for the assessment of balance between vegetative and productive activities: the Ravaz index (the „yield/pruning" weight); the vegetative and productive balance index (IEVP) (by Maccarone and Scienza, 1996) and the leaf area necessary for the production of one gram of grapes (sq cm leaf area/g of grape).

RESULTS AND DISCUSSIONS

As a consequence of the variability of the climatic conditions from one year to another, the vegetative growth estimated on **the annual pruning weight** (table 1) was variable, the highest values were registered in 2008 (0.904 kg/vine) and the lowest in 2009 (0.622 kg/vine). The highest values were recorded at Cazenave cordon with 15 buds/sq m (0.888 kg/vine). The bud load had a lower influence on the vine vigor estimated on the pruning weight.

Important differentiations between types of pruning and bud load were noticed regarding **the leaf area of the vine** (table 2), generally between 3.619 sq m/vine (Cazenave cordon with 10 buds/sq m) and 4.764 sq m/vine (Guyot on demi-high trunk with 15 buds/sq m).

The yield of grapes varied in large limits, according to the year of culture (table 3): from 3.024 kg/vine (2010) to 5.630 kg/vine (2008). The type of pruning had a lower influence on the grape yield.

The type of pruning and bud load had a lower influence on t**he accumulation of sugar in the berries** on ripeness (table 4). The highest accumulations of sugar have been recorded in 2010 (216.4 g/l) and the lowest in 2009 (191.5 g/l).

The biggest sugar accumulations were recorded on Guyot on demi-high trunk (209.4 g/l) and the lowest at spur-pruned cordon (195.4 g/l).

Knowing the necessity of **ensuring a vegetative and productive balance** for the vine in order to obtain quality yields, the influence of the studied factors on certain indexes for the assessment of this balance was followed: the Ravaz index (the „yield/pruning" weight); the vegetative and productive balance index (IEVP) and the leaf area necessary for the production of one gram of grapes (sq cm leaf area/g of grape).

In average, for the majority of the studied variants, it was obtained a **balanced ratio between the grape yield and the pruning wood (the Ravaz index)** (table 5**.** An unbalanced ratio (with values lower than 4) was obtained in 2010, when assigning a bud load of 10 buds/sq m because of lower grape yield.

The vegetative and productive balance index (IEVP), which is showing the percentage contribution of the vegetative part to the total grape production realization, was slightly influenced by the type of pruning and the bud load and more by the culture year (table 6). The values of this index have varied between 14.93 for the spur-pruned cordon and 16.51 for Guyot on demi-high trunk. Higher values were obtained for all types of pruning and bud loads in 2010.

The leaf area necessary for the production of one gram of grapes was in average of experiment years, between 8.91 sq cm/g at Cazenave cordon and 11.26 sq cm/g on Guyot on demi-high stem, (table 7), the values being reduced when the bud load was 15 buds/sq m.

The data regarding the influence of the varieties, the bud loads and the cluster thinning have allowed the study of certain **correlations** between different indexes and sugar accumulation in the berries. The study of the relation between the „yield/pruning weight" ratio and the accumulation of sugars is emphasizing the existence of a linear correlation; according to those, for the maximum accumulations of sugars, a „yield/pruning weight" ratio between 4 and 6 is needed (figure 1).

It was ascertained that the increase of the vegetative and productive balance index, from 10 to 25 is determining an increase of sugar accumulation in the berries (figure 2).

It was also noticed that the increment of leaf area necessary for the production of one gram of grape to 10-18 sq cm of leaf area/g of grape determines a higher sugar accumulation (figure 3).

CONCLUSIONS

Following the correlation of the indexes for the assessment of the vegetative and production balance, with the sugar accumulation, **we are recommending,** in order to maximize the quality, under normal yields for the Fetească regală variety, values of the „yield/pruning” weight ratio between 4 and 6, of the vegetative and production balance index between 20 and 25, as well as 10 -18 sq cm of leaf area/g of grape.

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TABLES AND FIGURES

Table 1

Influence of type of pruning and bud load on the vine vigor estimated on the pruning weight (kg/vine) (2008 - 2010)

Type of pruning	Bud load (buds/sq m)	2008	2009	2010	Average 2008 – 2010
Guyot on demi-high stem	10	0.864	0.578	0.765	0.734
	15	1.185	0.532	0.842	0.853
	Mean	**1.024**	**0.550**	**0.803**	**0.792**
Cazenave cordon	10	0.859	0.772	0.846	0.825
	15	0.900	0.817	0.948	0.888
	Mean	**0.879**	**0.794**	**0.897**	**0.856**
Spur pruned cordon	10	0.800	0.527	0.650	0.659
	15	0.819	0.519	0.737	0.691
	Mean	**0.809**	**0.523**	**0.693**	**0.675**
Mean of bud load	**10**	0.841	0.625	0.753	0.739
	15	0.968	0.619	0.842	0.809
Mean		**0.904**	**0.622**	**0.797**	**0.774**

Table 2

Influence of type of pruning and bud load on the leaf area (sq m/vine) (2008 – 2010)

Type of pruning	Bud load (buds/sq m)	2008	2009	2010	Average 2008-2010
Guyot on demi-high stem	10	3.781	3.840	4.250	3.957
	15	5.050	4.632	4.610	4.764
	Mean	**4.415**	**4.236**	**4.430**	**4.360**
Cazenave cordon	10	3.412	3.525	3.920	3.619
	15	3.904	4.058	4.130	4.030
	Mean	**3.658**	**3.791**	**4.025**	**3.824**
Spur pruned cordon	10	3.704	3.804	3.950	3.819
	15	3.857	4.073	4.320	4.083
	Mean	**3.780**	**3.938**	**4.135**	**3.951**
Mean of bud load	10	3.632	3.723	4.040	3.798
	15	1.270	4.254	4.353	4.292
Mean		**3.951**	**3.988**	**4.196**	**4.045**

Table 3

Influence of type of pruning and bud load on the grape yield (kg/vine) (2008 - 2010)

Type of pruning	Bud load (buds/sq m)	2008	2009	2010	Average 2008-2010
Guyot on demi-high stem	10	4.803	3.785	2.366	3.651
	15	5.955	4.475	3.601	4.677
	Mean	**5.379**	**4.130**	**2.983**	**4.164**
Cazenave cordon	10	5.392	3.680	2.757	3.943
	15	6.774	5.208	4.194	5.392
	Mean	**6.083**	**4.444**	**3.475**	**4.667**
Spur pruned cordon	10	5.261	4.148	2.701	4.036
	15	5.573	4.470	2.528	4.190
	Mean	**5.417**	**4.309**	**2.614**	**4.113**
Mean of bud load	10	5.161	3.871	2.608	3.876
	15	6.100	4.717	3.441	4.753
Mean		**5.630**	**4.294**	**3.024**	**4.316**

Table 4

Influence of type of pruning and bud load on the grape yield (kg/vine)
(2008 – 2010)

Type of pruning	Bud load (buds/sq m)	2008	2009	2010	Average 2008-2010
Guyot on demi-high stem	10	203.8	203.4	217.7	208.3
	15	201.3	208.7	222.1	210.7
	Mean	**202.5**	**206.0**	**219.9**	**209.4**
Cazenave cordon	10	200.3	188.6	214.2	201.0
	15	198.9	193.9	217.2	203.3
	Mean	**199.6**	**191.2**	**213.7**	**201.5**
Spur pruned cordon	10	196.6	174.8	211.8	194.4
	15	194.0	180.1	215.6	196.5
	Mean	**195.3**	**177.4**	**213.7**	**195.4**
Mean of bud load	10	200.2	188.9	214.5	201.2
	15	198.0	194.2	218.3	203.5
Mean		**199.1**	**191.5**	**216.4**	**202.3**

Table 5

Influence of type of pruning and bud load on the „yield/pruning weight” ratio (Ravaz index)
(2008 – 2010)

Type of pruning	Bud load (buds/sq m)	2008	2009	2010	Average 2008-2010
Guyot on demi-high stem	10	5.55	6.54	3.09	506
	15	5.02	8.11	4.27	5.80
	Mean	**5.28**	**7.32**	**3.68**	**5.48**
Cazenave cordon	10	6.27	4.76	3.25	4.76
	15	7.52	6.37	4.67	6.18
	Mean	**6.89**	**5.56**	**3.96**	**5.47**
Spur pruned cordon	10	6.57	7.87	4.15	6.19
	15	6.80	8.61	3.64	6.35
	Mean	**6.68**	**8.24**	**3.89**	**6.27**
Mean of bud load	10	6.13	6.39	3.49	5.33
	15	6.44	7.69	4.19	6.10
Mean		**6.28**	**7.04**	**3.81**	**5.72**

Table 6

Influence of type of pruning and bud load on the vegetative and productive balance index
(2008 – 2010)

Type of pruning	Bud load (buds/sq m)	2008	2009	2010	Average 2008-2010
Guyot on demi-high stem	10	15.24	13.24	24.43	17.63
	15	16.59	10.62	18.95	15.38
	Mean	**15.91**	**11.93**	**21.69**	**16.51**
Cazenave cordon	10	13.74	17.34	23.48	18.18
	15	11.72	13.56	18.43	14.57
	Mean	**12.73**	**15.45**	**20.95**	**16.37**
Spur pruned cordon	10	13.19	11.27	19.39	14.61
	15	12.81	10.40	22.57	15.26
	Mean	**13.00**	**10.93**	**20.98**	**14.93**
Mean of bud load	10	14.05	13.95	22.43	16.81
	15	13.70	11.52	19.98	15.06
Mean		**13.88**	**12.73**	**21.20**	**15.93**

Table 7

Influence of type of pruning and bud load on the leaf area necessary to produce one gram of grape (sq cm/g) (2008 – 2010)

Type of pruning	**Bud load (buds/sq m)**	**2008**	**2009**	**2010**	**Average 2008-2010**
Guyot on demi-high stem	10	7.87	10.14	17.16	11.99
	15	8.48	10.35	12.80	10.54
	Mean	**8.17**	**10.24**	**15.38**	**11.26**
Cazenave cordon	10	6.32	9.57	14.21	10.03
	15	5.78	7.79	9.84	7.80
	Mean	**6.05**	**8.68**	**12.02**	**8.91**
Spur pruned cordon	10	7.04	9.17	14.62	10.27
	15	6.92	9.11	17.08	11.03
	Mean	**6.98**	**9.14**	**15.85**	**10.65**
Mean of bud load	10	7.07	9.62	15.59	10.76
	15	7.06	9.08	13.24	9.79
Mean		**7.06**	**9.35**	**14.41**	**10.27**

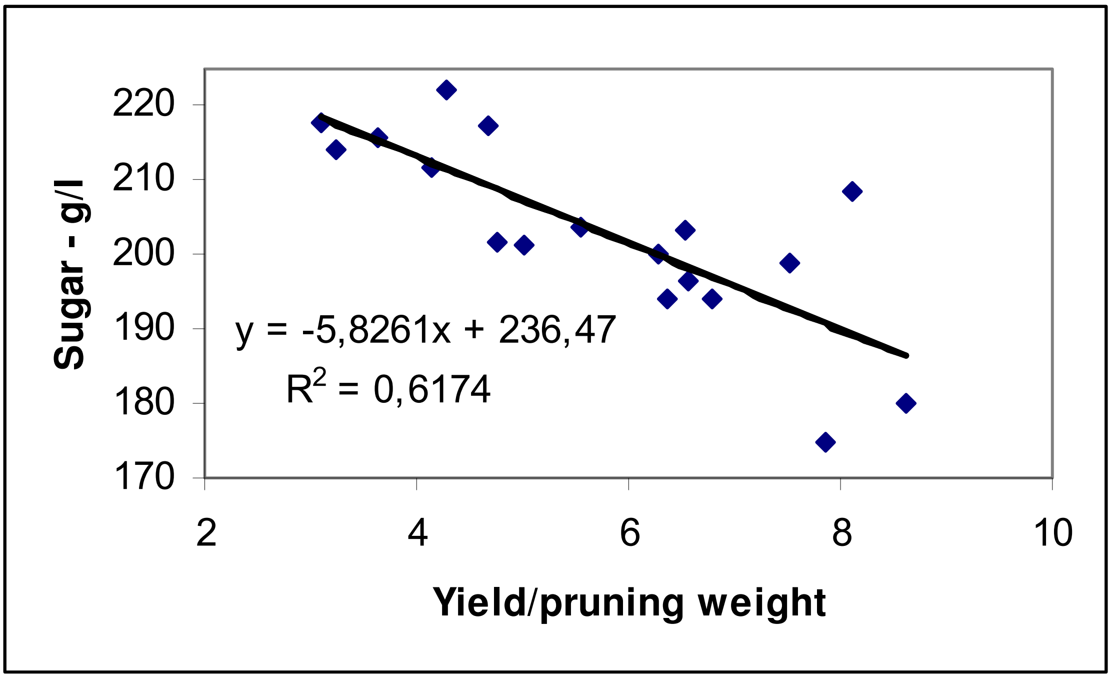

Fig. 1 – Correlation between Ravaz index (yield/pruning weight) and the sugar accumulation (g/l) (2008-2010)

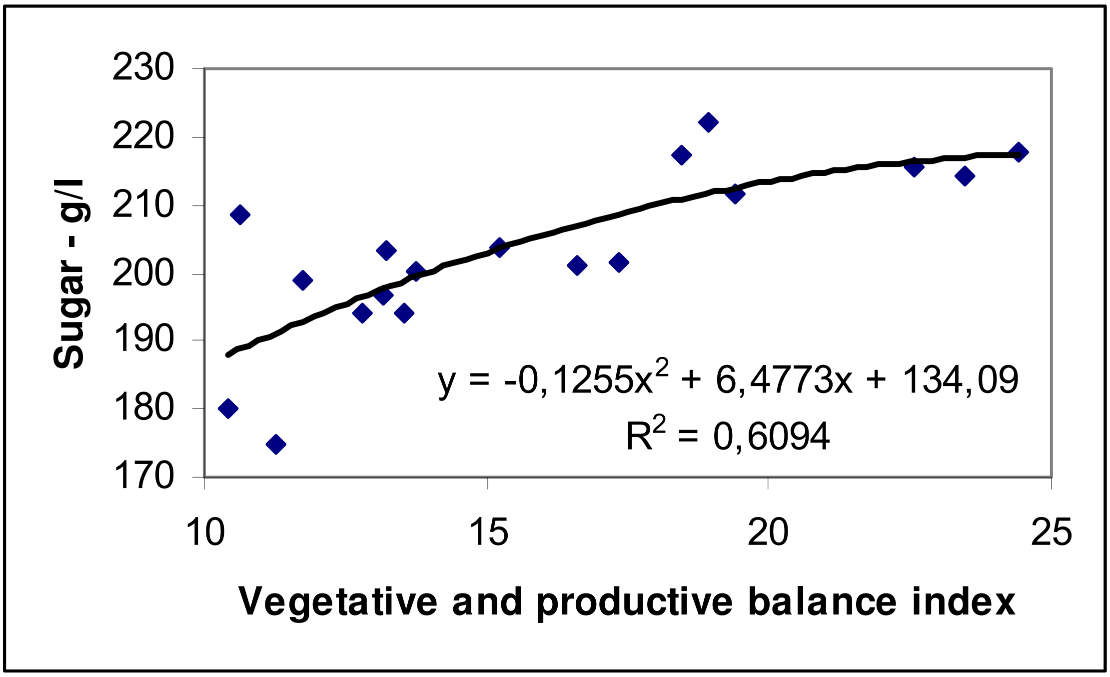

Fig. 2 – Correlation between the vegetative and productive balance index and the sugar accumulation (g/l) (2008-2010)

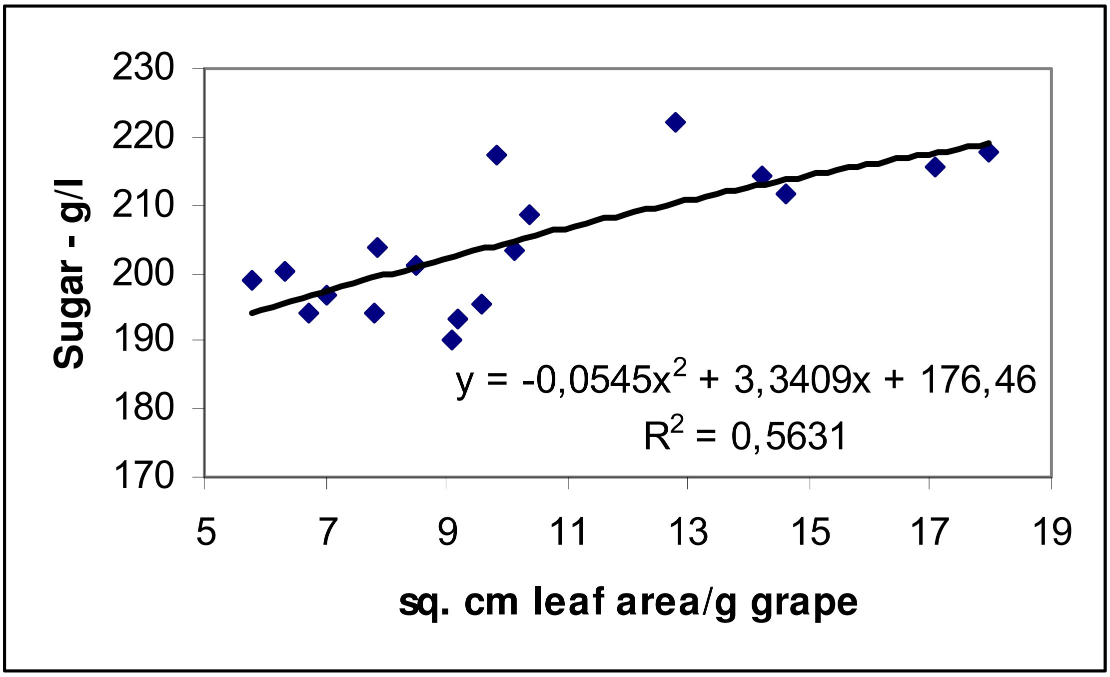

Fig. 3 – Correlation between leaf area productivity (sq cm leaf area/gram of grape) and the sugar accumulation (g/l) (2008-2010)

Color changes induced by fining treatments in red winemaking

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Keywords: gelatine, polivinilpolypirolidone, ovalbumine, CIELab, color analysis

ABSTRACT

The study shows the change of color composition after fining treatments of a red wine. Wine samples were analyzed with a spectrophotometer for color composition (D_{420}, D_{520} and D_{620}) and CIELab parameters were determined. Spectrophotometer readings were statistically analyzed by SPSS 17.0 and then interpreted under Duncan's test. Each treatment has a different effect on wine color and this study allows the winemaker to decide the appropriate fining method to use in accordance to the final product desirable characteristics.

INTRODUCTION

For early market release of red wines, winemakers can make some treatments with fining agents in order to stabilize the final product. Most of treatments required for the young red wines are those able to precipitate the excessive tannins (Antoce, 2007). It is well known that proteinaceus agents and highly cross-linked modification of polyvinylpyrrolidone interact with tannins (Cotea *et al.*, 2009; Braga *et al.*, 2007). The key for successful treatment of red wines is to set the correct amount of fining agent using lab samples. The study shows how color is affected by the fining treatments. Used doses in this study were within the limits reported in literature for each fining agent.

MATERIALS AND METHODS

The study was conducted at University of Agronomical Sciences and Veterinary Medicine, Bucharest on a wine produced in the viticultural center of Vânju Mare-Mehedinţi.

The wine used was a Merlot of the vintage 2010, obtained from grapes with 235 g/l sugar concentration and a total acidity of 6.8 g/l tartaric acid, inocculated with 20 g/hl Enoferm BDX yeast activated with 5 g/hl Fermoplus Energy Glu. To maintain an active fermentation, during the process, when density of 1.050 was reached, 150 mg/l diammonium phosphate (DAP) was added as a nutrient. The maceration and fermentation processes were performed in programmable roto-tanks. The physico-chemical parameters of the resulted wine were determined (Ţârdea, 2007; Jacobson, 2006) and are presented in Table 1.

Wine was treated with fining agents in 0.75 liter bottles and after a week, the limpid wine was analyzed by a spectrophotometer. CIELab parameters (Antoce, 2007; Brise, 2007), along with the classical optical densities at 420, 520 and 620 nm were preformed, then statistical analyses were made with SPSS Inc. The methodology is depicted in Fig. 1.

The fining agents tested were two proteins, ovalbumin (Ov) and gelatin (Ge), and a non-protein one, polyvinylpolypyrrolidone (PVPP). A control sample (blank) was also used to determine the effect of fining on the wine color parameters. The experiment is a 3 x 3 bifactorial, with 3 fining agents and with 3 repetitions, the dosages for each sample being summarized in Table 2.

RESULTS AND DISCUSSIONS

The color composition of samples is reported in Fig. 2. It is well known that any fining treatment reduces the color intensity of wine. Our study also showed that the composition of color was affected by fining treatments at any dosage. The highest modification of color proportion as compared to the control sample was found in wine treated with polyvinylpolypyrrolidone at maximum dose. This treatment can reduce the proportion of yellow and blue with 1.69% and 2.58%, respectively, and increase the proportion of red with 3.8%. For all the treatments, it can be observed that with increasing doses, the yellow and blue percent of the color decrease, while red percent increases. For the required effect of oxidation hue removal from the wine, the most powerful fining agent was polyvinylpolypyrrolidone and the weakest was gelatin. It can be concluded that the most effective treatment against oxidation is the one with polyvinylpolypyrrolidone.

The lightness variation depending on the fining agent, on constant levels of applied dosage are reported in Fig. 3. At the minimum dose it can be observed that the values of lightness are increased in the treated samples and differ statistically on the control sample. The highest values of lightness were reported for gelatin and ovalbumin fining treatments. At medium dose, the values of lightness are slightly increased in the treated samples, and the highest value was reported for the polyvinylpolypyrrolidone treatment, but without statistically significant difference from gelatin and ovalbumin. At the maximum doses values of lightness for all the samples are increased as compared to the values recorded for the medium doses.

The distribution of the samples in color *a-b* coordinates is included in Fig. 4. It can be observed that with decrease in color intensity due to fining treatments, oxidation was reduced by all treatments at any dosage.

An interesting conclusion could thus be drawn: The untreated sample (blank sample) was significantly different compared with all the samples which undergone fining treatments. The color in all treated samples was shifted towards values with less yellow and less red components. The effect is more dependent on the type of the fining agent rather on its dosage, especially when it comes to gelatin and ovalbumin, where, the samples are places very close in the color diagram. It can be observed in Fig. 4 that samples treated with gelatin and ovalbumin form, on the graphic representation, well defined groups. Only in the case of polyvinylpolypyrrolidone treatment, the dosage affects also the position of the sample in the color space, the samples being scattered and not forming a group. The more PVVP is used, the more is the color shifted towards blue and green components of the color, losing some of the red and yellow forming compounds.

This can be explained due to the proprieties of proteinaceous agents which have different mechanisms of wine clarification as compared with polyvinylpolypyrrolidone. This effect is also influenced by the pH of the treated wine. As the pH of a wine increases, the strength of the relative charge of suspended particles decreases. For example, at a high pH, organic protein fining agents may not have enough of a positive charge to sufficiently bind with the negatively charged particulates (Cotea and Sauciuc, 1988). However, in our experiments the effect of pH variation was not investigated.

Polyvinylpolypyrrolidone has a different mechanism, its capacity of phenolic compounds adsorption being due to its secondary structure. As a result, PVPP tends to sediment rapidly after its administration in wine (Cotea *et al.*, 2009).

CONCLUSIONS

The clarification and stabilization of wine with fining agents induced changes in the color of tested wine samples at any used dosage. Interestingly, tested protein agents had a limited effect on wine color. Therefore, when a color improvement is desired, polyvinylpolypyrrolidone seems to be the best choice of the winemaker because it induces clear changes eliminating partially the oxidation taint (yellow-brown color) and leaves apparently unaffected by sensorial properties of the wine. This product has a secondary structure with high adsorption capacity of the phenolic compounds in wine. Our study confirmed that polyvinylpolypyrrolidone removes the brownish color from the treated samples and of the entire fining agent tested it had the greatest effect on limiting the negative impact of oxidation in wines.

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TABLES AND FIGURES

Table 1

Physico-chemical parameters of the Merlot wine used for the fining tests

% vol. alc.	Volatile acidity, g/l (acetic acid)	*p*H	Total acidity, g/l (tartric acid titrated to 7.0 pH)	Malic acid (g/l)	Density (g/cm^3)	Reducing sugars (g/l)	Total dry matter (g/l)
13.7	0.09	3.6	5.78	0	0.9934	4.5	28.7

Table 2

Bifactorial model for the testing of the effect of fining agents on the color of the red wines

Factor 1 (Type of treatment)	Factor 2 (Applyed dose)	
Ovalbumin	Minimum dose	10 g/hl
	Medium dose	17,5 g/hl
	Maximum dose	25 g/hl
Gelatin	Minimum dose	5 ml/hl
	Medium dose	10 ml/hl
	Maximum dose	15 ml/hl
Polyvinylpolypirrolidone (PVPP)	Minimum dose	10 g/hl
	Medium dose	45 g/hl
	Maximum dose	80 g/hl

Fig. 1. Methodology of preparing samples and data collection

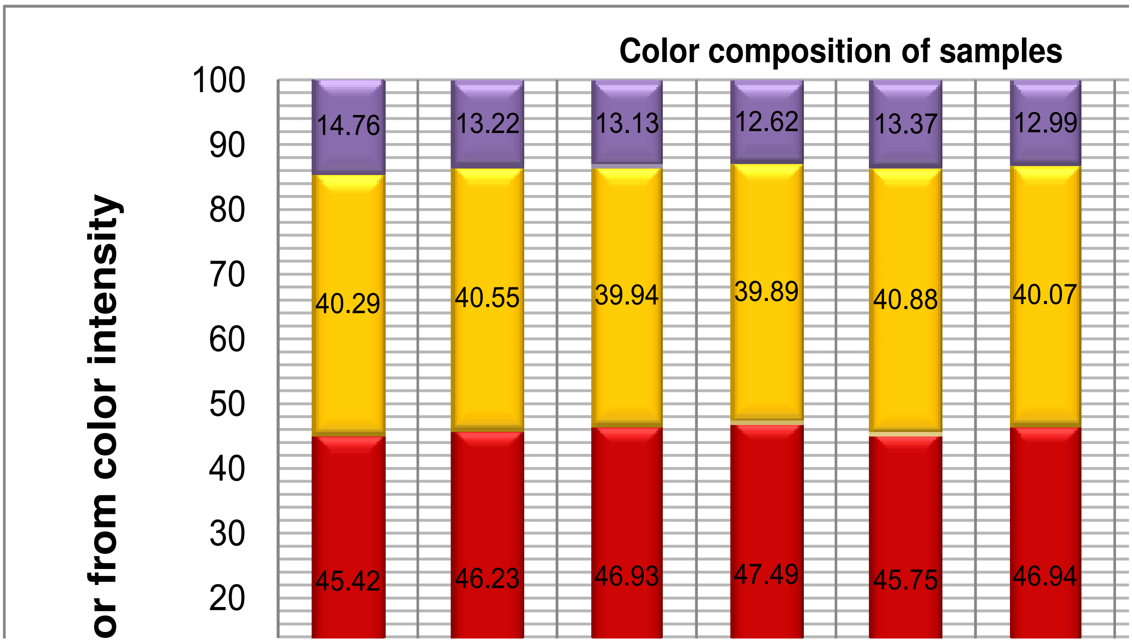

Fig. 2. Color composition of samples, in percentages

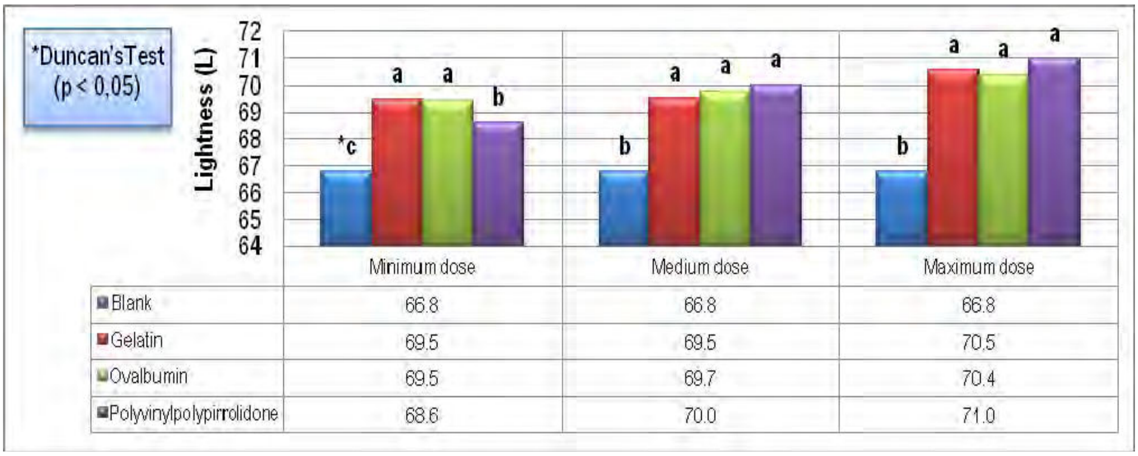

Fig.3. Lightness variation depending on the fining agent, on constant levels of applied dosage

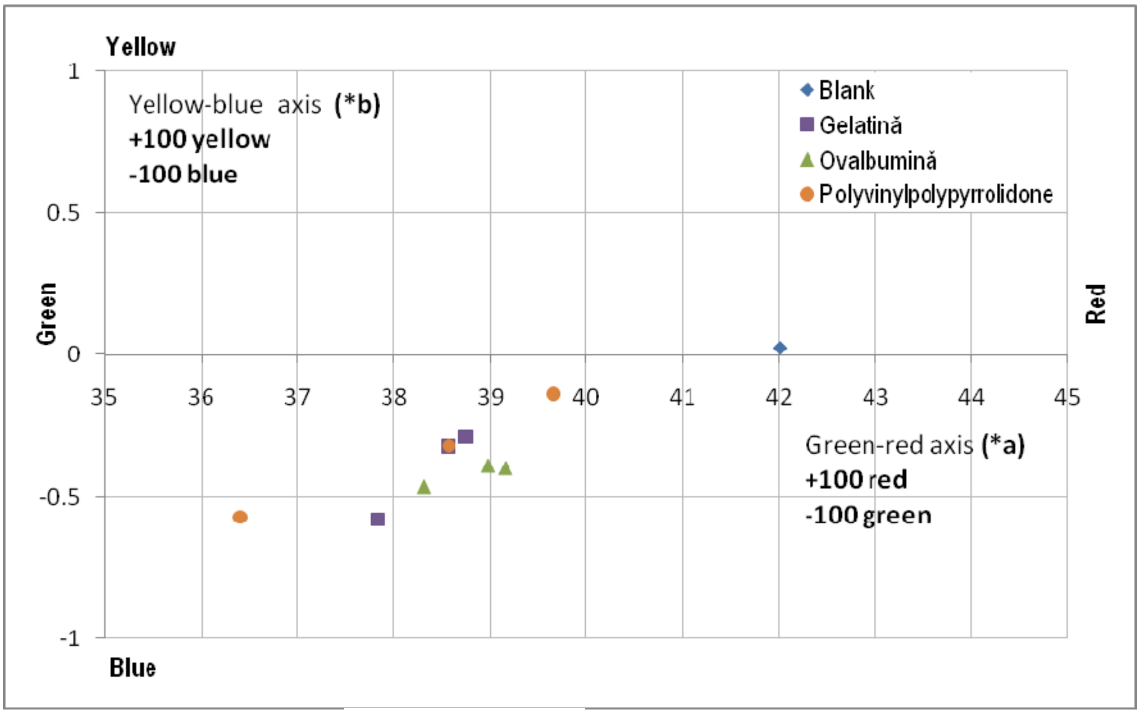

Fig.4. Distribution of the samples in color *a-b* coordinates.

Perspective clone elites from the Italian Riesling variety

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Keywords: elite clonal, quality, production

ABSTRACT

For the Italian Riesling variety, a number of other elite clones with special skills and quality production have been studied. Clonal selection has been made since 1983 and based on the principle of early stage of development. It is known that the Italian Riesling begins variety its maturity later, and in some years, it fails to reach full maturity, due to climatic conditions, deficit temperatures of the Tarnave vineyard. The two elites presented in the paper begin to ripen about 10 days earlier, compared with the control clone. The presented elites can be proposed for homologation as they register high grape production and accumulation of sugar with better values than the Italian Riesling clone – 3 Bl. taken as a witness.

INTRODUCTION

The Italian Riesling variety belongs to the category of the best known high quality white wines in many vineyards in our country.

The variety is admitted for the Tarnave vineyard for which S.C.D.V.V. Blaj homologated valuable clones for every basic variety, including the studied one. (Italian Riesling - 3 Bl. is a much appreciated clone both in the Tarnave vineyard and in the influence zone).

The Italian Riesling variety has certain qualities, but also some faults, out of which the most acute one is the maturing period. The variety (including the Italian Riesling - 3 Bl. clone) enters the beginning ripening period late enough.

The new clone selection is based especially on the earliness of the elites of the Italian Riesling variety. The research on the Italian Riesling was started by M. Toader (1966 - 1979), Ştefan Cristea (1977 - 2000), S.D. Moldovan (1975 - 2007) and Al. S. Băcilă (1982 - 2000).

MATERIALS AND METHODS

The cloning selection works started in 1981 and continued until 1998. In the year 1979, the Italian Riesling - 3 Bl. was homologated.

The research base included a plantation at the Campul Libertatii Farm, which belongs to the Blaj Station.

More than 2,400 Italian Riesling logs were examined, followed by the selection of 10 elites, which were planted in the comparative field in 1985.

These elites were grafted on the portgrafting Berlandieri x Riparia Kober 5 BB, in order to form the comparative field. The elites were selected according to their resistance to disease, grape production, the early stage of the beginning of the ripening stage and the sugar concentration in the grape juice when harvested.

In the comparative field, the clone elites were planted at a distance of 2 m between the rows and 1.2 m on the row, namely 4.167 logs/hectars.

Out of the 10 elites planted on the comparative field in 1985, the 18-15 elite proved to be the best.

The study of the 18-15 elite, compared to the homologated Riesling italian-3 Bl. clone has been carried out over a period of five years, period during which time the elite was studied in the trial field.

The climate conditions

The climate conditions were analysed during the studied period, when the elites were in the trial period.

The global thermal balance sheet exceeds the multi-annual average, being 3,081ºC compared to the multi-annual average of 2,953ºC.

The useful thermal balance sheet reached 2,983ºC compared to the multi-annual average which is of 2,866ºC.

The rainfalls were lower than the multi-annual average, registering 393 mm compared to 411 mm.

This period favoured the accumulation of sugar in the grape juice of at the studied elites. The real and global helio-thermal index had favourable values for the vine.

The bio-climate index was on average 5.9. In year 1992 the bio-climate index was 10.2 and in year 1991 were 3.3.

RESULTS AND DISCUSSIONS

A. Data from the comparative field

Analyzing the data from table 2, the conclusion was that the 18-15 elite, as well as the homologated Italian Riesling -3 Bl. clone, exceeded the clone average both in the fertility coefficients and the productivity indexes.

The Italian Riesling - 3 Bl. clone achieved on average a production smaller that the average of the clones (3,46 kg/log) being 3,07 kg/log.

The 18-15 elite achieved on average a production of 4.38 kg grapes per log, exceeding all the studied elites. The maximum production was achieved mainly due to the average weight of a the grape of 102 g. Due to the results achieved by the 18=15 clone elite, this was promoted in 1991 in the trial field, compared to the 18-16 elite and the homologated Italian Riesling – 3 Bl. clone.

B. The trial field – The phenological data in the studied period

The Italian Riesling generally reaches the beginning stage of its ripening later in the year and, even if it has the highest maturing period of the grapes, in some years it cannot get to high levels of accumulating sugar in the grape juice. The clone elite 18-15 starts to ripen about 10 days earlier than the homologated Italian Riesling – 3 Bl. clone elite.

The clone elite 18-15 reaches its adulthood between September 15 and 25 while the homologated clone gets to adulthood between September 25 and October 5.

During the years when the early autumn hoarfrost starts to show in October, the grapes continue to have reduced accumulations of sugar, and the grape must has to be sweetened.

C. Fertility and productivity

In table 3, there are comparative data between the 18-15 elite and the homologated Italian Riesling – 3 Bl clone. The percentage of fertile scions has close enough values – 62,6% for the newly promoted elite compared to 61,2 % for the homologated clone.

The fertility coefficient and the productivity index have close values, a little bit better for the 18-15 elite. The weight of a grape is a little bit higher at the 18-15 elite, being of 97 g compared to 92 g at the homologated clone.

The 18 – 15 elite fields a 3,59 kg/log production, having again 14,960 kg/hectare, exceeding the homologated clone both in the production of grapes and in the accumulation of sugar in the grape juice. The sugar calculated per hectare is of 345 kg more than the one in the homologated elite. The acidity is a little bit lower because the grapes are more mature.

CONCLUSIONS

1. The 18 – 15 elite exceeds the witness regarding the production of grapes and the quality of the grape juice.
2. The 18 – 15 elite should be homologated in order to complete the varieties in the Tarnave Vineyard.

3. The 18 – 15 is more precocious than the basic variety it comes from, thus succeeding in putting the agro-eco-pedological conditions of the Tarnave Vineyard to good use.
4. The 18 – 15 elite is meant for the superior quality white wines.

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TABLES AND FIGURES

Table 1

Data from the comparative field

No	The cloning elite	Fertility coefficient		Productivity index		No. of grapes	The average weight of a grape	The production Kg/log
		absolute	relative	absolute	relative			
1	6 – 18	1.56	0.82	1.51	80	39	97	3.78
2	7 – 6	1.39	0.85	1.30	80	40	94	3.76
3	9 – 12	1.46	0.86	1.37	81	39	89	3.47
4	14 - 22	1.39	0.79	1.40	80	40	101	4.04
5	15 - 9	1.27	0.76	1.27	76	30	100	3.00
6	17 – 27	1.60	0.82	1.54	79	36	96	3.46
7	18 – 16	1.49	0.87	1.33	77	27	89	2.40
8	24 – 32	1.52	0.90	1.49	88	28	98	2.74
9	18 – 15	1.45	0.86	1.48	88	43	102	4.38
10	Ri – 3 Bl	1.47	0.83	1.41	80	32	96	3.07
The clone average 1-9		1.30	0.74	1.25	81	36	96	3.46

Tabel 2

Phenological data in the trial field

Clone/Clone Elite	De-budding	Blossoming	The beginning of the ripening period	Full maturity	Leaf fall
Italian Riesling 3 Bl.	25.IV-5.V	10–25.VI	10.VIII–25.VIII	25.IX–05.X	30.X
Italian Riesling 18 - 15	25.IV-5.V	10–25.V	1.VIII–20.VIII	15.IX–25.IX	30.X

Table 3

Fertility and productivity in the trial field

Clone/Clone Elite	Fertility factors (%)	Fertility coefficient		Productivity index		The average weight of a grape (g)
		absolute	relative	absolute	relative	
Italian Riesling3 Bl.	61.2	1.50	0.86	1.38	0.79	92
Italian Riesling 18 - 15	62.6	1.47	0.88	1.43	0.85	97

Table 4

The production of grapes and the quality of the grape must

Clone/ Clone Elite	The number of grapes	The production of grapes		The quality of the must		
		kg/log	kg/ hectare	Sugar g/l	Sugar kg/ hectare	Acidity g/l H_2 SO_4
Italian Riesling 3 Bl.	35	3.26	13,584	186	2,527	6.2
Italian Riesling 18-15	37	3.59	14,960	192	2,872	5.9

Fig. 1 The studied Italian Riesling clone elite 18 – 15

Fig. 2 The clone Italian Riesling – 3 Bl. taken as a witness

Researches concerning the behavior of some white wine grape varieties in different pedoclimatic and technology conditions

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ABSTRACT

Vine culture is an activity which dates in Romania from ancient times, the grapes and wine being for centuries one of the most valuable natural resource of the country. In time, Romanian wines got and carried over a special fame because of their quality, which made our country, together with France, Spain, Italy, Germany or Portugal, one of the largest wine producers in Europe. In wine composition there are vitamins, such as: A, B1, B2, B3, B5, B6, B9, C, E, D and P, minerals, iron, sodium, calcium, potassium, phosphorus, magnesium, chlorine, silicon, manganese, arsenic and chromium. Because of this composition based on vitamins and minerals, grapes are an extremely valuable aliment. Doctor Arcadie Percek said: "a glass of wine can be identified with a miniature laboratory". Wine is an aliment and an energising factor, the white one has dietetic effects, it is good for digestion stimulation. Research undertaken on white wine varieties have assumed that white wine has the largest share in terms of wine consumption.

INTRODUCTION

The established objectives followed the behaviour in different pedoclimatic and technology conditions of some white and aromatic wine grape varieties, Fetească albă, Fetească regală, Riesling italian, Pinot gris and Muscat Ottonel. The studied varieties belonged to the vine plantations of the following culture areas: Miniş vineyard, Recaş vine culture area, Didactic Station Timişoara.

The researches started from the calculation of the foliar surface, with importance in obtaining grapes production, considering the quantity and quality. Between the value of the foliar surface and the one of the production there is a direct correlation, by knowing the fact that each vine variety is characterized by a certain biological potential, genetically determined and exposed to the impact of the ecological and technological culture factors (Drăgunescu, 2007, Mălăescu, 2011).

Wine quality is determined by the quality of the grapes, grape is the vector that connects the viticulture and wine (Dobrei, 2008).

MATERIALS AND METHODS

The studies were made upon white and aromatic wine grape varieties: Fetească albă, Fetească regală, Riesling italian, Pinot gris and Muscat Ottonel, chosen of the most spread varieties in the culture areas: Miniş vineyard, Recaş vine culture area and the Didactic Station Timişoara of our university. When choosing varieties we considered to ensure diversity in terms of production potential and quality of varieties, vine vigor, and biological characteristics during the ripening of grapes (4).

Vineyards, the varieties studied are found, have a length between 15 and 50 years, the planting distances in these production systems are 2 m between the rows and 1.2 m between the vines on the row. The pruning types are Guyot on trunk and Cazenave cordon.

The researches were done during the period 2009-2010, and there were done the calculation of the foliar surface per trunk and per hectare, the grape productions obtained per trunk and per hectare, the quality of the productions by analyzing the composition of must obtained at full maturation of grapes, determine the sugar and total acidity content of it.

RESULTS AND DISCUSSIONS

Following observations, measurements and calculations on the five varieties of white wine grape varieties in the three areas studied in different natural conditions, the foliar surface indicator values averaged ranged from 3,59 $m^{2/}$trunk for Pinot gris and 6,81 m^2/trunk for Fetească albă (table 1).

One can see that Pinot gris, variety of low vigor has remained low its foliar surface conforming to its biological potential and variety Fetească albă high vigor variety had higher foliar surface values .

The group of varieties with medium vigor there are intermediate foliar surface values for all varieties studied, Fetească regală, Italian Riesling and Muscat Ottonel, respectively 5,06 m^2/trunk, 4,42 m^2/trunk and 4,08 m^2/trunk.

High values of the foliar surface were registered in the high fertility areas, such as Timişoara, then Recaş, while low values of the foliar surface indicator were obtained for all the varieties in Miniş, where the pedological fertility is lower.

Based on these values, we find that, in terms of foliar surface in the three areas of culture, vigorous varieties have been recognized as superior value compared to the low varieties, concluding that the varieties are spaced according to their genetic potential correlated with soil fertility and the degree of favorability of the climate of the area and of the culture.

The average values of the obtained productions along the research cycle (tabelul 2) show very accurate statistic information of the productive features of the studied varieties and their inter-relation with the ecological factors of the culture area.

During the research (2009-2010) minimum values of the average production were obtained for Pinot gris, 5679.64 kg/ha, then Fetească albă, with 7623.78 kg/ha. High values were observed in case of Muscat Ottonel, with 9554.02 kg/ha average production, Riesling italian, with 9762.32 kg/ha average production, while Fetească regală variety had a maximum average production of 9928.9674 kg/ha (table 2).

These data show that the production value is correlated with variety's vigour, with the quality potential of grape production and with the wine-growing potential of the culture area.

The quality of production obtained from the studied varieties was expressed by the sugars content, total acidity and the rapport between them, which is the glucoacidimetric index. Considering the two studied years, the values obtained concerning the sugars content varies between 175.00 g/l for Fetească regală (the lowest value of the sugars content), then Riesling italian (180.55 g/l), and the highest values were obtained for Muscat Ottonel, with 186.03 g/l, Fetească albă, with 186.35 g/l and Pinot gris, with 186.57 g/l (table 3).

Considered as a high production white wine variety Fetească regală accumulated the lowest quantity of sugars (175.00 g/l), while Pinot gris, white grapes variety for quality wines is on the first place regarding the production, with the highest sugars quantity determined in full grapes maturation.

Considering the culture areas, the highest sugars contents were obtained in conditions of a low fertility, on slope lands, as it is Recaş area, while in Timişoara, in conditions of plain and fertile soil, these values were lower.

The rapport between the foliar surface and quantity production presented in table 4 show that the lowest values of the foliar surface needed for obtaining one kilogram of grapes were determined for the middle vigour varieties, Muscat Ottonel- 1.97 m^2/kg, Riesling italian – 2.07 m^2/kg and Fetească regală-2.12 m^2/kg, while the highest values of the foliar surface per grapes kilogram were determined for the quality variety Pinot gris – 2.63 m^2/kg and high vigour variety - Fetească albă (3.72 m^2/kg).

Statistically, Pinot gris has significant negative differences to the average value, when it is cultivated in Recaş and Miniş and distinct significant positive differences, when it is cultivated in Timişoara.

Fetească albă has statistically assured differences to the average value in all culture areas, as it follows: distinct significant negative in Recaş and significant positive in Miniş and Timişoara.

Fetească regală is statistically assured by significant negative differences in Recaş and significant positive in Miniş and Timişoara.

Italian Riesling has compared to the average value significant negative differences if cultivated in Recaş and significant positive differences in Timişoara, while in Miniş culture area the differences to the average value are not statistically assured.

Muscat Ottonel is statistically assured by significant negative differences in Recaş şi and significant positive differences in Miniş and Timişoara.

According to these data, we can conclude that the varieties behave according to their own vigour, but in close concordance with their quality potential and directly influenced by the culture conditions features.

In order to point out the different behavior of the studied grape varieties in different natural conditions, in figure 1 there are presented the values of the rapport between the foliar surface and quantity production obtained, as average values for each variety and culture area for the research cycle.

In conditions of a fertile soil as the one in the Didactic Station of our University, the foliar surface needed for obtaining one kilogram of grapes has superior values because of the increased useless growths registered in the conditions of such an ecotop, while in conditions of a lower fertility of soil, found in Recaş and Miniş culture areas, the foliar surface needed reduces as a result of the limited available nutrients, which won't allow useless growths.

The lowest foliar necessary for one kilogram of grapes is observed in Recaş, where the good correlation between the relief conditions, moderate fertility of soil and the technologic potential of the wine growing area, assures the highest photosintetic productivity.

Knowing the interactions between the variety, the quality potential and the culture conditions is very important in vine culture practice because they allow establishing the optimum value of the foliar surface and, according to this, to apply correctly the works and operations in the vegetative period according to the culture technologies.

Out of the studies made, we observe that the highest value of the rapport between the foliar surface and quality was obtained from Fetească albă, of 25.38 m^2/kg sugar, variety with high vigour, while the lowest value was obtained from Muscat Ottonel – middle vigour variety, of 13.41 m^2/kg sugar (table 5). Fetească regală, variety of high production and middle vigour, has a low necessary per sugar kilogram of 15.06 m^2/kg.

Considering the culture areas, the highest values of the rapport foliar surface/kg sugar are on fertile and plain soils (Timişoara), than the other areas with slope land and less fertile soils (Miniş şi Recaş). At Recaş, compared with Miniş, the higher values can be explained by the favorable pedoclimatic conditions, which harmonize with a performant technological level, in this way assuring an efficient value of the biological potential of the studied varieties.

CONCLUSIONS

Knowing the optimum value of the foliar surface necessary for obtaining one kilogram of grapes (respectively of one kilogram of sugar) is important because surpassing it is useless and can also diminish the production because of the self shading.

Considering the foliar surface, the varieties behave according to their genetical potential correlated with soil's fertility degree mainly and with the favorable climatic conditions degree of the culture area, so that in all of the three culture areas, Fetească albă, high vigor variety, registered superior values compared with the low vigor variety Pinot gris.

Pinot gris variety, with low vigor, has low productions, but of superior quality, and it registered medium values of the foliar surface for one kilogram of grapes, which assures the maintenance of the quality aspect of the production and the highest quantity of sugar determined in full maturity of grapes.

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TABLES AND FIGURES

Table 1

Average values of the foliar surface

No.	Variety	Vine culture area	Foliar surface	
			m^2/trunk	m^2/ha
1	Pinot gris	Recaş	3.70	15414.20
		Miniş	3.18	13247.88
		Timişoara	3.90	16247.40
		Average	3.59	14969.83
2	Fetească albă	Recaş	6.52	27162.32
		Miniş	6.25	26037.50
		Timişoara	7.66	31911.56
		Average	6.81	28370.46
3	Fetească regală	Recaş	5.15	21454.90
		Miniş	4.63	19288.58
		Timişoara	5.40	22496.40
		Average	5.06	21079.96
4	Riesling italian	Recaş	4.90	20413.40
		Miniş	4.42	18413.72
		Timişoara	5.22	21746.52
		Average	4.85	20191.21
5	Muscat Ottonel	Recaş	4.52	18830.32
		Miniş	4.08	16997.28
		Timişoara	4.95	20621.70
		Average	4.52	18816.43

Table 2

Grapes production, on culture areas and varieties –average values 2009-2010

No.	Variety	Wine-growing area	Grapes production	
			kg/trunk	kg/ha
1	Pinot gris	Recaş	1.60	6665.60
		Miniş	1.22	5082.52
		Timişoara	1.27	5290.82
		Average	1.36	5679.64
2	Fetească albă	Recaş	2.18	9081.88
		Miniş	1.55	6457.30
		Timişoara	1.76	7332.16
		Average	1.83	7623.78
3	Fetească regală	Recaş	3.29	13706.14
		Miniş	1.82	7582.12
		Timişoara	2.04	8498.64
		Average	2.38	9928.96
4	Riesling italian	Recaş	3.19	13289.54
		Miniş	1.81	7540.46
		Timişoara	2.03	8456.98
		Average	2.34	9762.32
5	Muscat Ottonel	Recaş	3.27	13622.82
		Miniş	1.68	6998.88
		Timişoara	1.93	8040.38
		Average	2.29	9554.02

Table 3

Production's quality of the studied varieties

Variety	Culture area	Grapes production (kg/trunk)	Obtained must (l/trunk)	Sugars (g/l)	Acidity (g/l H_2SO_4)	Glucoacidimetric index
Pinot gris	Recaş	1.60	1.30	195.1	4.05	48.17
	Miniş	1.22	0.95	183.4	4.15	44.19
	Timişoara	1.27	1.05	181.2	4.97	36.46
	Average	1.36	1.10	186.57	4.39	42.50
Fetească albă	Recaş	2.18	1.74	192.2	4.2	45.76
	Miniş	1.55	1.20	185.8	4.55	40.84
	Timişoara	1.76	1.40	181.05	5.05	35.85
	Average	1.83	1.44	186.35	4.6	40.51
Fetească regală	Recaş	3.29	2.65	179	5.32	33.65
	Miniş	1.82	1.46	175.5	5.5	31.91
	Timişoara	2.04	1.65	170.5	5.95	28.66
	Average	2.38	1.92	175	5.59	31.31
Riesling italian	Recaş	3.19	2.50	181.1	4.75	38.13
	Miniş	1.81	1.35	180.35	5.25	34.35
	Timişoara	2.03	1.60	180.2	5.3	34.00
	Average	2.34	1.81	180.55	5.1	35.40
Muscat Ottonel	Recaş	3.27	2.51	193	3.5	55.14
	Miniş	1.68	1.40	186.1	3.4	54.74
	Timişoara	1.93	1.53	179	3.2	55.94
	Average	2.29	1.81	186.03	3.37	55.26

Table 4

Rapport of the foliar surface – quantity production

Variety	Culture area	Production (kg/trunk)	Foliar surface, (m^2/trunk)	Foliar surface, (m^2/kg grapes)	Difference to the average value	Significance
Pinot gris	Recaş	1.60	3.70	2.31	-0.32	o
	Miniş	1.22	3.18	2.61	-0.02	o
	Timişoara	1.27	3.90	3.07	0.44	xx
	Average	1.36	3.59	2.63	-	-
Limit differences DL5%= 0,17 DL1%=0,40 DL0,15%=0,90						
Fetească albă	Recaş	2.18	6.52	2.99	-0.73	oo
	Miniş	1.55	6.25	4.03	0.31	x
	Timişoara	1.76	7.66	4.35	0.63	x
	Average	1.83	6.81	3.72	-	-
Limit differences DL5%=0,32 DL1%=0,65 DL0,1%= 1,30						
Fetească regală	Recaş	3.29	5.15	1.57	-0.55	o
	Miniş	1.82	4.63	2.54	0.42	x
	Timişoara	2.04	5.40	2.65	0.53	x
	Average	2.38	5.06	2.12	-	-
Limit differences DL5%=0,40 DL1%=0,74 DL0,1%=1,38						
Riesling italian	Recaş	3.19	4.90	1.54	-0.53	o
	Miniş	1.81	4.42	2.44	0.37	-
	Timişoara	2.03	5.22	2.57	0.50	x
	Average	2.34	4.85	2.07	-	-
Limit differences DL5%=0,45 DL1%=0,90 DL0,1%=1,55						
Muscat ottonel	Recaş	3.27	4.52	1.38	-0.59	o
	Miniş	1.68	4.08	2.43	0.46	x
	Timişoara	1.93	4.95	2.56	0.59	x
	Average	2.29	4.52	1.97	-	-
Limit differences DL5%=0.40 DL1%=0.85 DL0.1%=1.66						

Table 5

Rapport between the foliar surface and the quality production

Variety	Wine-growing area	Foliar surface, (m^2/ha)	Sugars, (Kg/ha)	Foliar surface/sugars, (m^2/kg)
Pinot gris	Recaş	15414.20	1056.62	14.59
	Miniş	13247.88	725.84	18.25
	Timişoara	16247.40	792.62	20.50
	Average	14969.83	854.98	17.51
Fetească albă	Recaş	27162.32	1393.23	19.50
	Miniş	26037.50	928.85	28.03
	Timişoara	31911.56	1055.96	30.22
	Average	28370.46	1117.92	25.38
Fetească regală	Recaş	21454.90	1976.14	10.86
	Miniş	19288.58	1067.45	18.07
	Timişoara	22496.40	1172.00	19.19
	Average	21079.96	1399.78	15.06
Riesling italian	Recaş	20413.40	1886.16	10.82
	Miniş	18413.72	1014.31	18.15
	Timişoara	21746.52	1201.14	18.10
	Average	20191.21	1361.43	14.83
Muscat Ottonel	Recaş	18830.32	2018.14	9.33
	Miniş	16997.28	1085.41	15.66
	Timişoara	20621.70	1140.94	18.07
	Average	18816.43	1402.75	13.41

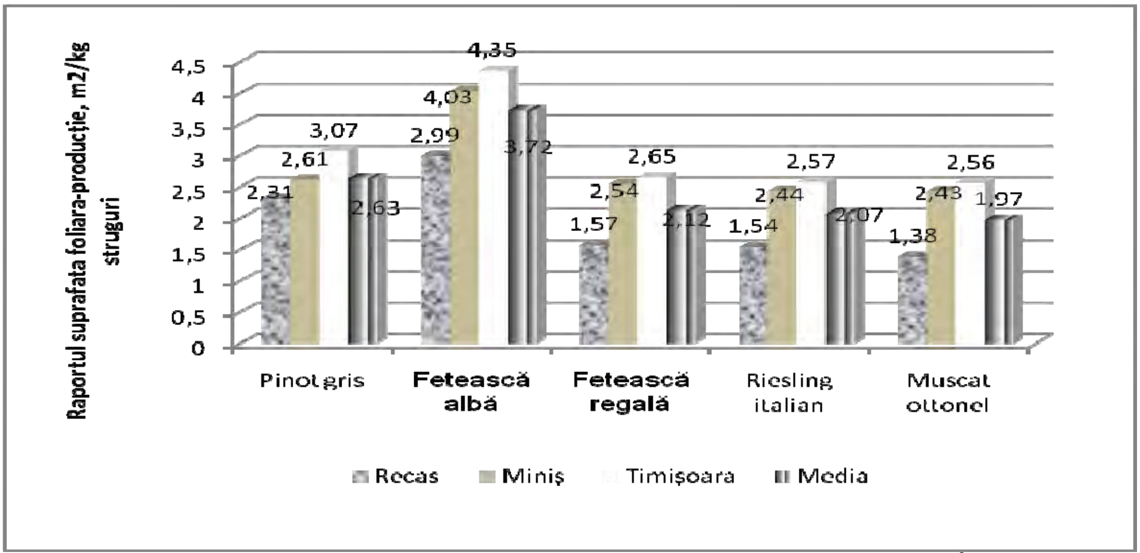

Fig. 1. Rapport between the foliar surface and production of the studied varieties, m^2/kg grapes

Researches regarding the deployment phases of vegetation, fertility and productivity of some wine grape varieties grown in the vineyard of the Didactic Station Timisoara

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Keywords: foliar surface, production, quantity, quality

ABSTRACT

Observations and measurements presented in this scientific paper were made in the vineyard of the Didactic Station Timisoara during the years 2009 and 2010. Researchers have mainly pursued completion phases of vegetation and fertility as well as productivity aspects of wine grape varieties: Pinot noir, Cabernet Sauvignon, Merlot, Burgundy, Italian Riesling and Muscat Ottonel. The above mentioned features are not always in a direct correlation but they influence decisively the production obtained. It is important to have quantitative and qualitative balanced production to obtain high-quality wines.From this point of view all the mentioned varieties had a good behavior, pointing out the large production of Burgundy varieties and Merlot and a high quality of Pinot Noir varieties and Cabernet Sauvignon. The amount of sugar accumulated in berries enables obtaining high quality wines to all varieties analysed. Deployment of the vegetation phases occurs differently from year to year depending on environmental conditions within the same variety, and the differences between varieties are determined mainly by their genetic characteristics. Productivity and fertility of varieties was estimated according to the percentage of fertile shoots, the number of inflorescences on the vine, the coefficients of fertility and productivity indices, Merlot variety being considered the most fertile and the productivity of varieties analysed ranged in specific values for wine grape varieties. Pedoclimatic conditions in the perimeter of Timisoara are favorable to growing quality vine varieties.

INTRODUCTION

The Banat region has long been recognized as being a very favorable area for cultivation of wine grape varieties. To obtain every year a qualitative and quantitative balanced production is important to know the aspects of the annual biological cycle deployment of grape varieties for wine, fertility, productivity and quality of production, all manifesting different characteristics from one area to another (Dobrei, 2009).

The phases of vegetation are hereditary nature, but their running is influenced by yearly specific environmental conditions and by each geographical area. Obtaining of higher quality and quantity production depends on good conditions deployment of all vegetation phases.

The fertility and the productivity represent specific traits which belong to the genetic variety, but they can be influenced by climatic conditions, soil and cultivation technology. In these circumstances it is very important to apply a differentiated technology from a variety to another, taking into account the specific vineyard so as to result an optimal qualitative and quantitative production (Dobrei, 2005).

MATERIALS AND METHODS

Researches were performed during 2009 and 2010 in a vineyard of the Didactic Station Timisoara and targeted varieties: Pinot Noir, Cabernet Sauvignon, Merlot, Burgundy, Italian Riesling and Muscat Ottonel; these wine grape are very famous worldwide.(Dobrei, 2008).

Planting distances between rows are 2,2 m and 1 m between vines on row, Cazenave being the used cutting system. For achieving the researches of each variety we used a total of 20 vines.

Observations and measurements were made on phases of vegetation, fertility shoots, foliar surface size and the quantity and quality of grape production.

The productivity and the fertility of varieties were estimated according to the percentage of fertile shoots, the number of inflorescences on the vine, the coefficients of fertility and productivity indices.

The foliar surface was recorded at the end of June, after phenophase of intensive growth of shoots.

The production on the vine was evaluated by effectively weighing the grapes reaching full maturity, and the average test result was multiplied by the number of vines per hectare, thus estimating the yield per hectare for each variety. The quality of production obtained was highlighted by analysing the sugar content and acidity of the must.

RESULTS AND DISCUSSIONS

Years 2009 and 2010 were similar in terms of climate, temperature and volume of rainfall which have not registered significant differences in Timisoara. As a consequence, deployment phases of vegetation from the annual biological cycle of the vine were done in these two years of research at similar calendar dates. Weeping vine was triggered in early April, at the earliest bud breaking Pinot Noir variety on 14.04 and at the latest Cabernet Sauvignon variety on 19.04. For all varieties studied blossoming occurred in the third decade of May, and in the first decade of August the grapes started ripening. The varieties Pinot Noir, Muscat Ottonel and Italian Riesling came first to full maturity, while Burgundy and Cabernet Sauvignon varieties were matured by 4-7 days later, on 24.09., 27.09 respectively (Table 1).

The average weight of a grape ranged between limits 95,10 g at Pinot Noir and 129,18 g to Burgundy. Fertility coefficients indicate differences of fertility among our varieties, such as varieties Pinot Noir and Muscat Ottonel have close values, they recorded the lowest fertility, while Merlot has presented the highest fertility of the varieties analysed. Relative productivity index shows a low productivity at the Pinot Noir varieties and Muscat Ottonel and a medium productivity from other varieties analysed, the values recorded being typical for wine grape varieties (Table 2).

The photosynthesis process is the basis for accumulation of organic substances in plants so that between the foliar surface and production obtained is a close connection. Achieving a balanced production of grapes depends on proper development and health of the vine foliar system. Foliar surface represents one trait variety but can be influenced by pedoclimatic conditions and technology of culture. Following determinations made over foliar surface is found that Cabernet Sauvignon varieties and Burgundy are the most vigorous, the average of the two years research exceeding 4 m^2/vine. The smallest production was recorded at the Pinot Noir (7499,25 kg/ha) while high productions were obtained at the Burgundy varieties (13498,65 kg/ha) and Merlot (12498,75 kg/ha). As regards the size of foliar surface necessary for obtaining a kilogram of grapes from the data analysis is found that Cabernet Sauvignon variety needs a large foliar surface (2,16 m^2/kg grapes) compared to the Merlot varieties and Burgundy, which although give high productions of grapes uses a smaller foliar area/kg grapes (Table 3).

We can confirm that for all examined varieties the recorded production was balanced quantitative and qualitative. Due to the applied culture technology, works and treatments done on time and to a good phytosanitary situation of the vineyard, the production obtained is characterised by a high quality, even if the ratio between sugar and acidity was not always balanced. Pinot Noir varieties and Cabernet Sauvignon accumulated more than 200 g/l sugar in berries so the alcohol potential of the must exceed 12^0 alcohol. The smallest quantity of sugar was accumulated by Italian Riesling variety (185 g/l sugar) however the alcohol potential of must ($10,88^0$alcohol) enables to obtain a wine of better-quality (Table 4).

CONCLUSIONS

During these two years of research was a recorded difference between the studied varieties as regards phases of vegetation deployment, which indicates that the genetic factor has a greater influence on deployment of the annual biological cycle than external factors. Triggering of vegetation phases manifests with small differences caused by pedoclimatic conditions of that year, within the same variety.

Maintaining the foliar system of vine in a good phytosanitary state is a mandatory condition for obtaining a quantitative and qualitative balanced production. The Cabernet Sauvignon varieties and Burgundy presents the highest foliar surface, being more vigorous.

The average weight of a grape ranged between the limits of 95.10 g to Pinot Noir and 129.18 g to Burgundy, but in all cases fell within the specific values of varieties.

Pinot Noir variety (7499.25 kg/ha) yielded the lowest quantity but the highest quality production, the amount of sugar accumulated in berries being 209 g/l.

For all analysed varieties the alcohol potential of must indicates the possibility of obtaining high quality wines.

Therefore, due to favorable pedoclimatic conditions, we conclude that in the perimeter of Timisoara, wine grape varieties for quality wines can successfully be cultivated.

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TABLES

Table 1

Deployment of vegetation phases (average 2009-2010)

Variety	Phases of vegetation				
	Weeping vine	Bud breaking	Blossoming	Started ripening	Full maturity
Pinot Noir	02.04.	14.04.	23.05.	04.08.	20.09.
Cabernet Sauvignon	02.04.	19.04.	27.05.	08.08.	27.09.
Merlot	02.04.	17.04.	25.05.	07.08.	22.09.
Burgund	01..04.	16.04.	25.05.	08.08.	24.09.
Riesling Italian	03.04.	16.04.	26.05.	06.08.	21.09.
Muscat Ottonel	03.04.	15.04.	26.05.	05.08.	21.09.

Table 2

Fertility and productivity of varieties (average 2009-2010)

Variety	Number of shoots			Fertility %	Relative fertility coefficient	Absolute fertility coefficient	The average weight of a grape (g)	Relative productivity index	Absolute productivity index
	Total	Sterile	Fertile						
Pinot Noir	25,08	9,06	16,02	63,87	0,70	1,05	95,10	66,57	99,85
Cabernet Sauvignon	23,54	3,58	19,96	84,79	1,09	1,30	114,7	125,02	149,11
Merlot	23,59	3,39	20,20	85,62	1,26	1,46	122,33	154,13	178,60
Burgund	24,22	3,64	20,58	84,97	1,12	1,30	129,18	144,68	167,93
Riesling Italian	22,75	6,33	16,42	72,17	1,01	1,23	107,12	108,19	131,75
Muscat Ottonel	23,85	8,25	15,60	65,40	0,67	1,02	101,88	68,25	103,91

Table 3

Foliar surface – productivity relationship (average 2009-2010)

Variety	Foliar surface		Production		Foliar surface(m^2)/kg of grapes
	m^2/vine	m^2/ha	Kg/vine	Kg/ha	
Pinot Noir	3,21	14589.45	1,65	7499.25	1,94
Cabernet Sauvignon	4,20	19089	1,94	8817.3	2,16
Merlot	3,48	15816.6	2,75	12498.75	1,26
Burgund	4,01	18225.45	2,97	13498.65	1,35
Riesling Italian	3,33	15134.85	2,10	9544.5	1,58
Muscat Ottonel	3,25	14771.25	1,77	8044.65	1,83

Table 4

Production quality (average 2009-2010)

Variety	Sugar (g/l)	Acidity (g/l H_2SO_4)	Glucose-acidimetric index	Alcohol potential of the must (^{0}alcool)
Pinot Noir	209	4,2	49,76	12,29
Cabernet Sauvignon	205	4,5	45,55	12,05
Merlot	200	4,6	43,47	11,76
Burgund	192	4,7	40,85	11,29
Riesling Italian	185	4,7	39,36	10,88
Muscat Ottonel	199	4,0	49,75	11,70

The agrobiological study of old grape varieties in vineyard Dragasani

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Keywords: shoot, bud burst, full bloom, varieties, descriptors.

ABSTRACT

The study was made in years 2010-2011 and followed the main properties of agrobiological old varieties in the Dragasani Vineyard. The study was made in order to save these old varieties, which are increasing uncommon in Dragasani Vineyard, because of different social or economic causes. The study was carried out in the private plantations located in the Dragasani Vineyard for the conservation of the old grape varieties *on farm*, *in situ* and *ex situ* in ampelographic collections. For an easier identification of these grape were used accredited organizations in this field descriptors, namely: O.I.V., U.P.O.V, I.B.P.G.R. as easy as possible to identify these varieties, aiming the promotion and the multiplication of these varieties and the recovery of old traditional assortment in Dragasani Vineyard. The study showed the existence extremely valuable genetic resources, of old traditional varieties.

INTRODUCTION

Over the years, the vine growers had created and promoted in practice valuable varieties among which many have an important place in the current assortment, such as 'Feteasca alba', 'Feteasca regala', 'Cramposie', 'Gordan', 'Braghina', 'Tamaioasa romaneasca', 'Coarna' and more. The assortment remains a dynamic factor in the evolution and the continuous improvement (Oprea and Moldovan, 2007).

The large number of grape varieties manifests polymorphisms in culture, the number of characters frequently used in the description of the grapes, their complexity and not considering the agrobiological, agrophytotechnics and technological characteristics of grape varieties had caused in practice a lot of confusions and errors in the grape variety recognition.

Therefore, the description of the varieties is necessary to establish a common language of a code description (Olteanu et. al., 2002).

Dragasani Vineyard is an old Dacian vineyard situated in the sunny slope on the right side of River Olt, on a 60 km lenght and 20 km wide. (Victoria Cotea and V. Cotea, 1995).

The traditional assortment of Dragasani Vineyard – old romanian vineyard, where legends have time to turn into reality were for centuries made from 'Braghina' (30 %), 'Cramposie' (30 %), 'Gordan' (30 %) and a few of 'Tamaioasa romaneasca' (Puşcă, 2006).

MATERIALS AND METHODS

The study was carried out in the Dragasani Vineyard, in private plantations and aimed the main agrobiological characters of the old grape varieties.

The varieties taken into study are part of traditional assortment of Dragasani Vineyard: 'Braghina','Cramposie','Gordan', 'Tamaioasa romaneasca', 'Feteasca alba', 'Feteasca regala', 'Coarna alba', 'Coarna neagra' and 'Coarna rosie'.

The study was carried out using O.I.V, U.P.O.V., I.B.P.G.R., descriptors for the agrobiological features of these varieties thru the phenological and agrobiological descriptors, the time periods of these stages and climatic conditions existing in Dragasani Vineyard, using data collected from I.N.M.H. Dragasani.

The phenological characters of these studied varieties were: bud burst, time of full bloom, time of beginning of berry ripening, time of full physiological maturity of the berry, time of beginning of wood maturity, autumn coloration of leaves and the agrobiological

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characters analyzed were: vigor of shoot growth, growth of lateral shoots, length and the diameter of internodes.

There were analyzed: time of bud burst – Stage C after Baggiolini (Baggiolini, 1952), time of full bloom when 50 % of flowers are open, time of beginning of berry ripening when 50 % of berries become elastic; time of full physiological maturity of the berry when the content in sugar reaches the maximum; time of beginning of wood maturity it was considered to be when basal internodes of 10 shoots begin to brown; the observation of autumn coloring shortly before leaf drop thru the examination of leaves from the middle third of several shoots; vigor of shoots growth thru observations during the full bloom and again after the leaf fall considering the average of 10 main shoots; growth of lateral shoots thru observations made before the summer pruning analyzing the number and the length of the lateral shoots longer than 2 cm placed in the middle third of 10 shoots. Also, were studied trough measurements the length and the diameter from 10 internodes from the middle third of the woody shoots placed close to the trunk, were recorded the maximum diameter of the median internodes area.

RESULTS AND DISCUSSIONS

Climatic conditions in 2010 in Vineyard Dragasani were normal, average temperature was 12^{o}C, maximum temperature recorded in August 36^{o}C and minimum January -15^{o}C. The real sunstroke was 2.300 hours on year, rainfall 570 mm and 77 % atmospheric humitity.

From the phenologic point of view of the varieties studied in the year 2010 were recorded the following data: bud burst (09-15 april); full bloom (24 may-08 june); beginning of berry ripening (27 july-13 august); full physiological maturity of the berry (12-24 September); the beginning of wood maturity (09-13.08 August) (Table 1).

After we analyze of the old grape varieties were revealed a series of data showed in table 2.

On 'Braghina' we have medium characters at bud burst, full bloom, beginning of berry ripening, beginning of wood maturity and the full physiological maturity of the berry is very late. The colour of the leaf is yellow reddish. Vigor of shoot growth and also growth of lateral shoots is medium, internodes length is short, about 9 cm and the internodes diameter is small, about 8 mm.

The 'Cramposie' grape variety has the following characters: bud burst, full bloom, beginning of berry ripening, full physiological maturity of the berry, beginning of wood maturity are medium and the vigor of shoot growth and the growth of lateral shoots are strong. The leaf colour is yellow. The internodes length is long, about 15 cm and internodes diameter is large (14 mm).

On 'Tamaioasa romaneasca' we observe the following characters: bud burst, full bloom, beginning of berry ripening, full physiological maturity of the berry, beginning of wood maturity are medium, the vigor of shoot growth is strong and the growth of lateral shoots is medium. The leaf colour is yellow-reddish. Internodes length and diameter are medium, about 12cm respectively 11mm.

'Gordan' variety has identical characters with those of 'Tamaioasa romaneasca': bud burst, full bloom, beginning of berry ripening, full physiological maturity of the berry, beginning of wood maturity are medium, the vigor of shoot growth is strong and the growth of lateral shoots is medium. The leaf colour is yellow-reddish. Internodes length and diameter are medium, about 12cm respectively 11mm.

We observe at 'Feteasca alba' and 'Feteasca regala' grape varieties identical characters: bud burst, full bloom, beginning of berry ripening, full physiological maturity of the berry are early, beginning of wood maturity is medium, the leaf colour is yellow, the vigor of shoot growth and the growth of lateral shoots are strong. The internodes length is medium, about 12 cm and the diameter is small, about 8 mm.

The 'Coarna' sortogrup presents identical characters, except the leaf colour which at 'Coarna rosie' is yellow-reddish and yellow at 'Coarna alba' and 'Coarna neagra'. The following characters are bud burst, full bloom, beginning of berry ripening, full physiological maturity of the berry, beginning of wood maturity are medium. The vigor of shoot growth is strong and growth of lateral shoots is medium. The internodes length is long, about 15 cm and internodes diameter is large, about 14 mm.

CONCLUSIONS

All the old analyzed varieties presents medium characters at bud burst, full bloom, beginning of berry ripening and beginning of wood maturity; the full physiological maturity of the berry is medium except 'Braghina' grape variety which is very late. The vigor of shoot growth and the growth of lateral shoots are medium and large. The leaf colour is mostly yellow. The length and diameter of internodes varies from one to another.

In Dragasani Vineyard exists grape varieties genetical resources to save the germplasm which must be conserved *on farm*, *in situ* and *ex situ*, in ampelographic collections, to restore the traditional assortment of vineyard.

This study must be continued to identify other old varieties of the traditional assortment and more.

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*** Code des caractères descriptifs de variétés et espéces de *Vitis,* 2009, 2–eme édition de la liste des descripteurs OIV.

TABLES

Table 1

Phenological data of the grape varieties studied

No. crt.	Variety	Bud burst	Full bloom	Beginning of berry ripening	Full maturity of the berry	Beginning of wood maturity
1.	'Braghina'	15.04	30.05-08.06	13.08	23.09	13.08
2.	'Cramposie'	14.04	28.05- 06.06	08.08	20.09	10.08
3.	Gordan	12.04	27.05-06.06	05.08	20.09	10.08
4.	'Tamaioasa romaneasca'	11.04	27.05-05.06	08.08	16.09	12.08
5.	'Feteasca alba'	13.04	25.05-03.06	04.08	12.09	09.08
6.	'Feteasca regala'	13.04	26.05-05.06	04.08	12.09	09.08
7.	'Coarna alba'	09.04	24.05-02.06	27.07	24.09	12.08
8.	'Coarna neagra'	09.04	24.05-02.06	01.08	24.09	12.08
9.	'Coarna rosie'	10.04	25.05-03.06	30.07	23.09	13.08

Table 2

Agrobiological and phenological descriptors of old grapes varieties

No. crt.	Variety	Character	Character expression	Notes	Codes OIV,UPOV IBPGR
1.	'Braghina'	- time of bud burst	- medium	5	301; 1; 7.1.1
		- time of full bloom	- medium	5	302; - ; 6.2.21
		- beginning of berry ripening	- medium	5	303; 31; 7.1.4
		- full maturity of the berry	- very late	9	304; - ; 7.1.10
		- beginning of wood maturity	- medium	5	305; - ; -
		- autumn coloration of leaves	- yellow-reddish	1/2	306; - ; -
		- vigor of shoot growth	- medium	5	351; - ; -
		- growth of lateral shoots	- medium	5	352; - ; 7.1.11
		- length of internodes	- short	3	353; - ; 7.1.12
		- diameter of internodes	- small	3	354 - ; -
2.	'Cramposie'	- time of bud burst	- medium	5	301; 1; 7.1.1
		- time of full bloom	- medium	5	302; - ; 6.2.21
		- beginning of berry ripening	- medium	5	303; 31; 7.1.4
		- full maturity of the berry	- medium	5	304; - ; 7.1.10
		- beginning of wood maturity	- medium	5	305; - ; -
		- autumn coloration of leaves	- yellow	1	306; - ; -
		- vigor of shoot growth	- strong	7	351; - ; -
		- growth of lateral shoots	- strong	7	352; - ; 7.1.11
		- length of internodes	- long	7	353; - ; 7.1.12
		- diameter of internodes	- large	7	354 - ; -
3.	'Gordan'	- time of bud burst	- medium	5	301; 1; 7.1.1
		- time of full bloom	- medium	5	302; - ; 6.2.21
		- beginning of berry ripening	- medium	5	303; 31; 7.1.4
		- full maturity of the berry	- medium	5	304; - ; 7.1.10
		- beginning of wood maturity	- medium	5	305; - ; -
		- autumn coloration of leaves	- yellow- reddish	1/2	306; - ; -
		- vigor of shoot growth	- strong	7	351; - ; -
		- growth of lateral shoots	- medium	5	352; - ; 7.1.11
		- length of internodes	- medium	5	353; - ; 7.1.12
		- diameter of internodes	- medium	5	354 - ; -
4.	'Tamaioasa romaneasca'	- time of bud burst	- medium	5	301; 1; 7.1.1
		- time of full bloom	- medium	5	302; - ; 6.2.21
		- beginning of berry ripening	- medium	5	303; 31; 7.1.4
		- full maturity of the berry	- medium	5	304; - ; 7.1.10
		- beginning of wood maturity	- medium	5	305; - ; -
		- autumn coloration of leaves	- yellow-reddish	1/2	306; - ; -
		- vigor of shoot growth	- strong	7	351; - ; -
		- growth of lateral shoots	- medium	5	352; - ; 7.1.11
		- length of internodes	- medium	5	353; - ; 7.1.12
		- diameter of internodes	- medium	5	354 - ; -
5.	'Feteasca alba'	- time of bud burst	- early	3	301; 1; 7.1.1
		- time of full bloom	- early	3	302; - ; 6.2.21
		- beginning of berry ripening	- early	3	303; 31; 7.1.4
		- full maturity of the berry	- early	3	304; - ; 7.1.10
		- beginning of wood maturity	- medium	5	305; - ; -
		- autumn coloration of leaves	- wellow	1	306; - ; -
		- vigor of shoot growth	- strong	7	351; - ; -
		- growth of lateral shoots	- strong	7	352; - ; 7.1.11
		- length of internodes	- medium	5	353; - ; 7.1.12
		- diameter of internodes	- small	3	354 - ; -
6.	'Feteasca regala'	- time of bud burst	- early	3	301; 1; 7.1.1
		- time of full bloom	- early	3	302; - ; 6.2.21
		- beginning of berry ripening	- early	3	303; 31; 7.1.4
		- full maturity of the berry	- early	3	304; - ; 7.1.10
		- beginning of wood maturity	- medium	5	305; - ; -
		- autumn coloration of leaves	- wellow	1	306; - ; -

		- vigor of shoot growth - growth of lateral shoots - length of internodes - diameter of internodes	- strong - strong - medium - small	7 7 5 3	351; - ; - 352; - ; 7.1.11 353; - ; 7.1.12 354 - ; -
7.	'Coarna alba'	- time of bud burst - time of full bloom - beginning of berry ripening - full maturity of the berry - beginning of wood maturity - autumn coloration of leaves - vigor of shoot growth - growth of lateral shoots - length of internodes - diameter of internodes	- medium - medium - medium - medium - medium - yellow - strong - medium - long - large	5 5 5 5 5 1 7 5 7 7	301; 1; 7.1.1 302; - ; 6.2.21 303; 31; 7.1.4 304; - ; 7.1.10 305; - ; - 306; - ; - 351; - ; - 352; - ; 7.1.11 353; - ; 7.1.12 354 - ; -
8.	'Coarna neagra'	- time of bud burst - time of full bloom - beginning of berry ripening - full maturity of the berry - beginning of wood maturity - autumn coloration of leaves - vigor of shoot growth - growth of lateral shoots - length of internodes - diameter of internodes	- medium - medium - medium - medium - medium - yellow - strong - medium - long - large	5 5 5 5 5 1 7 5 7 7	301; 1; 7.1.1 302; - ; 6.2.21 303; 31; 7.1.4 304; - ; 7.1.10 305; - ; - 306; - ; - 351; - ; - 352; - ; 7.1.11 353; - ; 7.1.12 354 - ; -
9.	'Coarna rosie'	- time of bud burst - time of full bloom - beginning of berry ripening - full maturity of the berry - beginning of wood maturity - autumn coloration of leaves - vigor of shoot growth - growth of lateral shoots - length of internodes - diameter of internodes	- medium - medium - medium - medium - medium - yellow-reddish - strong - medium - long - large	5 5 5 5 5 1/2 7 5 7 7	301; 1; 7.1.1 302; - ; 6.2.21 303; 31; 7.1.4 304; - ; 7.1.10 305; - ; - 306; - ; - 351; - ; - 352; - ; 7.1.11 353; - ; 7.1.12 354 - ; -

Comparative study of some table grape cultivars in view of the extension of varietal conveyer in Huşi vineyard

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Keywords: table grape varieties, Husi vineyard

ABSTRACT

The results of the research on 6 new varieties obtained in Romania (Azur, Tamina, Victoria, Napoca, Xenia) and in the Republic of Moldova (Moldova), as compared to the control varieties Muscat de Hamburg, Chasselas doré and Afuz Ali under the conditions at S.C. Vincon S.A., Recea farm, during the 3 years of experimental studies (2006-2008), have evinced valuable conclusions for the enlargement of table grape assortment in Husi vineyard and the improvement of production quality.

The obvious climate changes of the last years, regarding the high thermal resources and the shortfall of humidity, especially during the aging of the grapes, are allowing the cultivation expansion of the large berry table grapes varieties further north, compared to those foreseen 30 years ago. The interaction between variety, bud load when pruning and the cluster thinning has determined certain vegetation architectures, leading to a vegetation and yield balance as well as to a certain quality of it.

It is recommended, the culture expansion in the Huşi vineyard of the varieties Victoria and Xenia, due to their adequate behavior in the culture, the pleasant appearance of the grapes and the taste balance appreciated by the consumers. The pleasant appearance of the Moldova variety grapes, the good preservation capacity and the frost resistance recommends this variety for the expansion in the culture.

INTRODUCTION

In Romania, the culture of the table grape varieties has extended especially in the south of the country. The area occupied with table grape varieties has continuously grown after the Second World War, reaching 35,000 ha in 1979.

In the last two decades, the area for the table grape varieties has continuously decreased as a result of the shortcomings of the transition period, reaching 9384 ha in 2009. Moreover, the improvement of the transport conditions and of the cold preservation techniques, has allowed the table grapes to also reach remote consumers throughout the year, ensuring an accentuated globalization of this sector.

For the producer, the culture of the table grape varieties is a profitable activity. Using valuable varieties, well located on the field and correctly managed, the yields are much bigger compared to the varieties for wine.

The quality of the table grapes is assessed by other parameters then those for the wine grape varieties: the size of the grapes and the berries, the appearance, the uniformity, the color, the pulp consistency, the sugar content and acidity, the harmony between these. These parameters are less affected by the increase of the grape yield (Matei, 2002; Contoman, 2010).

The production costs are recovered in a shorter time for the table grapes than for the wine grapes; this is why the rotation of the financial means is faster.

The vine culture is a main source of income for an important part of the country population, and the table grape varieties are at the same time a means to increase the living standards; therefore it has to be encouraged in any way possible.

In the last 50 years, as a result of the research work carried out in our country, many new table grape varieties and valuable clones were homologated and introduced, appreciated not only locally but also internationally (Indreaş, Vişan, 2001; Ţârdea, Rotaru, 2003; Popa *et al.*, 2006; Nicolaescu *et al.*, 2007; Hajdu, 2007; Antonacci *et al.*, 2007; Rotaru *et al.*, 2008; Angellini R., 2010).

The „meridionalization" of the table grape varieties, much more sensitive to the helio-thermal resources, is no longer so important today, when the global warming is so obvious, allowing the culture limits of different varieties to be shifted toward the north.

This paper intends to study the possibility of enlarging the assortment of table grape varieties, for the Huşi Vineyard, with new valuable varieties, with characteristics appreciated by the modern consumer, trader and producer, with the recommendation of rational application of some technological measures (pruning, operations during the vegetation period), consistent to high quality.

MATERIALS AND METHODS

The experiences were organized under the conditions at S.C. Vincon S.A., Recea farm, during the 3 years of experimental studies (2006-2008).

The following new cultivars have been studied: Azur, Tamina, Victoria, Napoca, Xenia (obtained in Romania) and Moldova (from Republic of Moldova), as compared to the control varieties Muscat of Hamburg, Chasselas doré and Afuz Ali, grafed on the rootstock Kober 5 BB, planted at distances of 2.2/1.2 (meaning 3787 vines/ha).

The experiences comprised four variants:

-V_1- 10 buds/sq m, with cluster thinning (22);

-V_2- 10 buds/sq m, without cluster thinning;

-V_3- 15 buds/sq m, with cluster thinning (22);

-V_4- 15 buds/sq m, without cluster thinning.

There were studied three groups of varieties:

- Azur, Tamina, compared with Muscat of Hamburg as control;
- Victoria, Napoca, compared with Chasselas doré as control;
- Xenia, Moldova, compared with Afuz Ali as control.

The observations and determinations took into account the following: yield and quality of grape; average weight of a grape; average weight of 100 berries and the sugar contents (g/l) of the juice.

RESULTS AND DISCUSSIONS

The grape yield (table 1) is a very important parameter for the studied factors, the degree of variability manifestation being very high. If the Afuz Ali variety registered in 2007 a grape yield of 1.86 kg/vine, when the winter dangerous temperatures have exceeded the buds' resistance limit, on V_2 variant (10 buds/sq m, without cluster thinning), the Victoria variety reached in 2006 a maximum yield on V_3 variant (15 buds/m^2, with cluster thinning), 5 times greater (8.98 kg/vine). From the analysis of the variance regarding the action of the studied varieties on the grape yield, the greatest values compared to the witness have been recorded for Tamina variety (in 2006 and 2008), Azur variety (in 2007), Victoria and Napoca varieties (in all 3 years of the experiment). Regarding the influence of the bud load on harvesting and cluster thinning, the biggest yield plus values, compared to the witness, were ensured by the loads of 15 buds/sq m, with cluster thinning (V_3), in Azur, Tamina and Hamburg Muscat varieties, as well as Victoria, Napoca and Chasselas doré varieties, in year 2006.

The accumulation of sugar in the berries (figures 1-3) on ripeness of the grapes proved to be a parameter on which the studied varieties have an important influence. Therefore, as an average of the experiment years, the biggest sugar accumulations were recorded on varieties Hamburg Muscat (162.2 g/l) and Chasselas doré (157.8 g/l), these being followed by Xenia (156.6 g/l) and Azur (149.4 g/l). The lowest sugar accumulations were recorded for the varieties Afuz Ali (137.6 g/l), Tamina (141.1 g/l) and Napoca (141.1 g/l). The maximum sugar content was recorded on all studied varieties for V_1 variant (10 buds/sq m, with cluster thinning), and the minimum one for V_4, with maximum load and without cluster thinning, as well as for V_2 (10 buds/sq m, without cluster).

The average weight of the grape (table 2) for the new studied varieties was between 203 g (Azur), 238 g (Napoca), 240 g (Xenia), 337 g (Moldova), 371 g (Victoria) and 472 g (Tamina). Regarding the influence of the bud load when harvesting, and the cluster thinning, the differences between the variants were in the majority of the cases insignificant.

The average weight of 100 berries (table 3) is another parameter over which the variety has a generally significant influence. The biggest berries were recorded for the variety Tamina (with an average weight of a 100 berries of 639 g), followed by Victoria (599 g), Moldova (491 g) and Xenia (483 g). The influence of the bud load and cluster thinning was in the majority of the cases insignificant.

CONCLUSIONS

1. It is recommended the culture expansion in the Huşi vineyard of the varieties Victoria and Xenia, due to their adequate behavior in the culture, the pleasant appearance of the grapes and the taste balance appreciated by the consumers.

2. The pleasant appearance of the Moldova variety grapes, the good preservation capacity and the frost resistance recommends this variety for the expansion in the culture.

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TABLES AND FIGURES

Table 1

Grape yield (kg/vine) at table grape cultivars studied in Huşi viticultural center (2006-2008)

Cultivar	Variant	Yield (kg/vine)			
		2006	2007	2008	Average
Azur	V_1 -10 buds/sq m, with cluster thinning	5.32	3.85	4.15	4.44
	V_2 -10 buds/sq m, without cluster thinning	4.07	3.58	3.78	3.81
	V_3 -15 buds/sq m, with cluster thinning	7.12	4.08	5.18	5.46
	V_4 -15 buds/sq m, without cluster thinning	6.50	4.28	4.88	5.22
	Mean	**5.75**	**3.94**	**4.49**	**4.73**
Tamina	V_1 -10 buds/sq m, with cluster thinning	6.66	3.40	6.20	5.42
	V_2 -10 buds/sq m, without cluster thinning	5.35	3.25	5.98	4.86
	V_3 -15 buds/sq m, with cluster thinning	8.48	4.05	6.70	6.41
	V_4 -15 buds/sq m, without cluster thinning	8.47	3.82	6.40	6.23
	Mean	**7.24**	**3.63**	**6.32**	**5.73**
Muscat of Hamburg (Control)	V_1 -10 buds/sq m, with cluster thinning	5.08	3.28	4.30	4.22
	V_2 -10 buds/sq m, without cluster thinning	4.45	2.95	4.06	3.82
	V_3 -15 buds/sq m, with cluster thinning	6.35	3.03	4.48	4.62
	V_4 -15 buds/sq m, without cluster thinning	5.75	2.80	4.05	4.20
	Mean	**5.40**	**3.01**	**4.22**	**4.21**
Victoria	V_1 -10 buds/sq m, with cluster thinning	6.35	2.85	4.06	4.42
	V_2 -10 buds/sq m, without cluster thinning	5.61	2.46	3.51	3.86
	V_3 -15 buds/sq m, with cluster thinning	8.98	3.28	5.20	5.82
	V_4 -15 buds/sq m, without cluster thinning	8.94	2.87	5.05	5.62
	Mean	**7.47**	**2.86**	**4.45**	**4.93**
Napoca	V_1 -10 buds/sq m, with cluster thinning	5.84	3.22	4.80	4.62
	V_2 -10 buds/sq m, without cluster thinning	5.38	3.02	4.38	4.26
	V_3 -15 buds/sq m, with cluster thinning	7.39	2.95	5.38	5.24
	V_4 -15 buds/sq m, without cluster thinning	5.40	2.80	4.45	4.22
	Mean	**6.00**	**2.99**	**4.75**	**4.58**
Chasselas doré (Control)	V_1 -10 buds/sq m, with cluster thinning	3.37	2.47	3.52	3.12
	V_2 -10 buds/sq m, without cluster thinning	3.29	2.05	3.12	2.82
	V_3 -15 buds/sq m, with cluster thinning	4.77	2.31	3.84	3.64
	V_4 -15 buds/sq m, without cluster thinning	4.74	2.15	3.55	3.48
	Mean	**4.04**	**2.24**	**3.50**	**3.26**
Xenia	V_1 -10 buds/sq m, with cluster thinning	3.68	2.50	3.45	3.21
	V_2 -10 buds/sq m, without cluster thinning	3.79	2.42	3.30	3.17
	V_3 -15 buds/sq m, with cluster thinning	4.97	2.66	3.95	3.86
	V_4 -15 buds/sq m, without cluster thinning	4.78	2.48	3.84	3.70
	Mean	**4.30**	**2.51**	**3.63**	**3.48**
Moldova	V_1 -10 buds/sq m, with cluster thinning	5.15	3.88	4.95	4.66
	V_2 -10 buds/sq m, without cluster thinning	5.09	4.00	5.25	4.78
	V_3 -15 buds/sq m, with cluster thinning	5.93	4.75	5.76	5.48
	V_4 -15 buds/sq m, without cluster thinning	4.56	3.98	4.84	4.46
	Mean	**5.18**	**4.15**	**5.20**	**4.84**
Afuz Ali (Control)	V_1 -10 buds/sq m, with cluster thinning	6.31	2.55	5.00	4.62
	V_2 -10 buds/sq m, without cluster thinning	5.66	1.86	4.12	3.88
	V_3 -15 buds/sq m, with cluster thinning	6.78	2.68	5.18	4.88
	V_4 -15 buds/sq m, without cluster thinning	5.99	2.54	4.73	4.42
	Mean	**6.18**	**2.40**	**4.75**	**4.45**

Table 2

Average weight of the grape (g) of table grape cultivars studied in Huşi vineyard (2006-2008)

Cultivar	Variant	2006	2007	2008	Average
Azur	V_1 -10 buds/sq m, with cluster thinning	225	205	224	218
	V_2 -10 buds/sq m, without cluster thinning	193	214	193	200
	V_3 -15 buds/sq m, with cluster thinning	190	198	218	202
	V_4 -15 buds/sq m, without cluster thinning	209	188	182	193
	Mean	**204**	**201**	**204**	**203**
Tamina	V_1 -10 buds/sq m, with cluster thinning	490	461	474	475
	V_2 -10 buds/sq m, without cluster thinning	527	529	492	516
	V_3 -15 buds/sq m, with cluster thinning	462	482	505	483
	V_4 -15 buds/sq m, without cluster thinning	433	378	419	410
	Mean	**478**	**462**	**474**	**472**
Muscat of Hamburg (Control)	V_1 -10 buds/sq m, with cluster thinning	263	236	245	248
	V_2 -10 buds/sq m, without cluster thinning	271	280	247	266
	V_3 -15 buds/sq m, with cluster thinning	303	267	285	285
	V_4 -15 buds/sq m, without cluster thinning	219	247	251	239
	Mean	**264**	**257**	**257**	**259**
Victoria	V_1 -10 buds/sq m, with cluster thinning	414	371	394	393
	V_2 -10 buds/sq m, without cluster thinning	397	422	363	394
	V_3 -15 buds/sq m, with cluster thinning	348	380	400	376
	V_4 -15 buds/sq m, without cluster thinning	352	294	326	324
	Mean	**377**	**366**	**371**	**371**
Napoca	V_1 -10 buds/sq m, with cluster thinning	244	212	258	238
	V_2 -10 buds/sq m, without cluster thinning	251	251	203	235
	V_3 -15 buds/sq m, with cluster thinning	238	277	286	267
	V_4 -15 buds/sq m, without cluster thinning	227	196	216	213
	Mean	**240**	**234**	**240**	**238**
Chasselas doré (Control)	V_1 -10 buds/sq m, with cluster thinning	144	120	129	131
	V_2 -10 buds/sq m, without cluster thinning	119	125	98	114
	V_3 -15 buds/sq m, with cluster thinning	120	158	169	149
	V_4 -15 buds/sq m, without cluster thinning	143	103	111	119
	Mean	**131**	**126**	**126**	**128**
Xenia	V_1 -10 buds/sq m, with cluster thinning	252	212	232	232
	V_2 -10 buds/sq m, without cluster thinning	231	240	192	221
	V_3 -15 buds/sq m, with cluster thinning	276	271	305	284
	V_4 -15 buds/sq m, without cluster thinning	248	195	235	226
	Mean	**251**	**229**	**241**	**240**
Moldova	V_1 -10 buds/sq m, with cluster thinning	389	350	365	368
	V_2 -10 buds/sq m, without cluster thinning	287	331	285	301
	V_3 -15 buds/sq m, with cluster thinning	327	339	366	344
	V_4 -15 buds/sq m, without cluster thinning	362	320	329	337
	Mean	**341**	**335**	**336**	**337**
Afuz Ali (Control)	V_1 -10 buds/sq m, with cluster thinning	412	368	402	394
	V_2 -10 buds/sq m, without cluster thinning	319	330	302	317
	V_3 -15 buds/sq m, with cluster thinning	320	341	368	343
	V_4 -15 buds/sq m, without cluster thinning	350	312	310	324
	Mean	**350**	**337**	**345**	**344**

Table 3

Average weight of 100 berries (g) of table grape cultivars studied

Cultivar	Variant	2006	2007	2008	Average
Azur	V_1 -10 buds/sq m, with cluster thinning	363	311	355	343
	V_2 -10 buds/sq m, without cluster thinning	326	336	292	318
	V_3 -15 buds/sq m, with cluster thinning	338	340	375	351
	V_4 -15 buds/sq m, without cluster thinning	287	317	323	309
	Mean	**328**	**326**	**336**	**330**
Tamina	V_1 -10 buds/sq m, with cluster thinning	674	637	615	642
	V_2 -10 buds/sq m, without cluster thinning	630	659	595	628
	V_3 -15 buds/sq m, with cluster thinning	642	634	686	654
	V_4 -15 buds/sq m, without cluster thinning	651	603	612	622
	Mean	**649**	**633**	**627**	**636**
Muscat of Hamburg (Control)	V_1 -10 buds/sq m, with cluster thinning	336	306	291	311
	V_2 -10 buds/sq m, without cluster thinning	271	312	275	286
	V_3 -15 buds/sq m, with cluster thinning	310	325	340	325
	V_4 -15 buds/sq m, without cluster thinning	318	293	280	297
	Mean	**308**	**309**	**296**	**304**
Victoria	V_1 -10 buds/sq m, with cluster thinning	652	616	601	623
	V_2 -10 buds/sq m, without cluster thinning	566	603	571	580
	V_3 -15 buds/sq m, with cluster thinning	618	619	656	631
	V_4 -15 buds/sq m, without cluster thinning	595	552	548	565
	Mean	**607**	**597**	**594**	**599**
Napoca	V_1 -10 buds/sq m, with cluster thinning	388	347	399	378
	V_2 -10 buds/sq m, without cluster thinning	369	422	385	392
	V_3 -15 buds/sq m, with cluster thinning	376	375	407	386
	V_4 -15 buds/sq m, without cluster thinning	383	341	326	350
	Mean	**379**	**371**	**379**	**376**
Chasselas doré (Control)	V_1 -10 buds/sq m, with cluster thinning	238	199	205	214
	V_2 -10 buds/sq m, without cluster thinning	173	235	180	196
	V_3 -15 buds/sq m, with cluster thinning	211	234	254	233
	V_4 -15 buds/sq m, without cluster thinning	227	195	187	203
	Mean	**212**	**215**	**206**	**211**
Xenia	V_1 -10 buds/sq m, with cluster thinning	505	460	475	480
	V_2 -10 buds/sq m, without cluster thinning	453	498	465	472
	V_3 -15 buds/sq m, with cluster thinning	503	482	530	505
	V_4 -15 buds/sq m, without cluster thinning	497	473	464	478
	Mean	**489**	**478**	**483**	**483**
Moldova	V_1 -10 buds/sq m, with cluster thinning	526	488	480	498
	V_2 -10 buds/sq m, without cluster thinning	470	495	460	475
	V_3 -15 buds/sq m, with cluster thinning	507	504	552	521
	V_4 -15 buds/sq m, without cluster thinning	490	465	461	472
	Mean	**498**	**488**	**488**	**491**
Afuz Ali (Control)	V_1 -10 buds/sq m, with cluster thinning	576	530	526	544
	V_2 -10 buds/sq m, without cluster thinning	518	562	528	536
	V_3 -15 buds/sq m, with cluster thinning	568	549	605	574
	V_4 -15 buds/sq m, without cluster thinning	588	553	545	562
	Mean	**562**	**548**	**551**	**554**

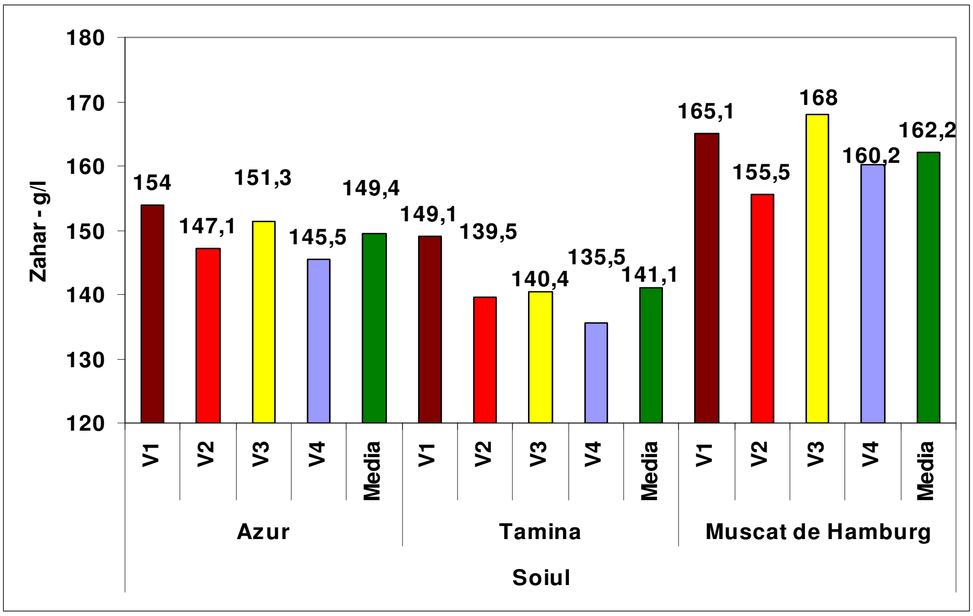

Fig. 1. Sugar content of musts from Azur, Tamina and Muscat of Hamburg studied in Huşi vineyard (2006-2008)

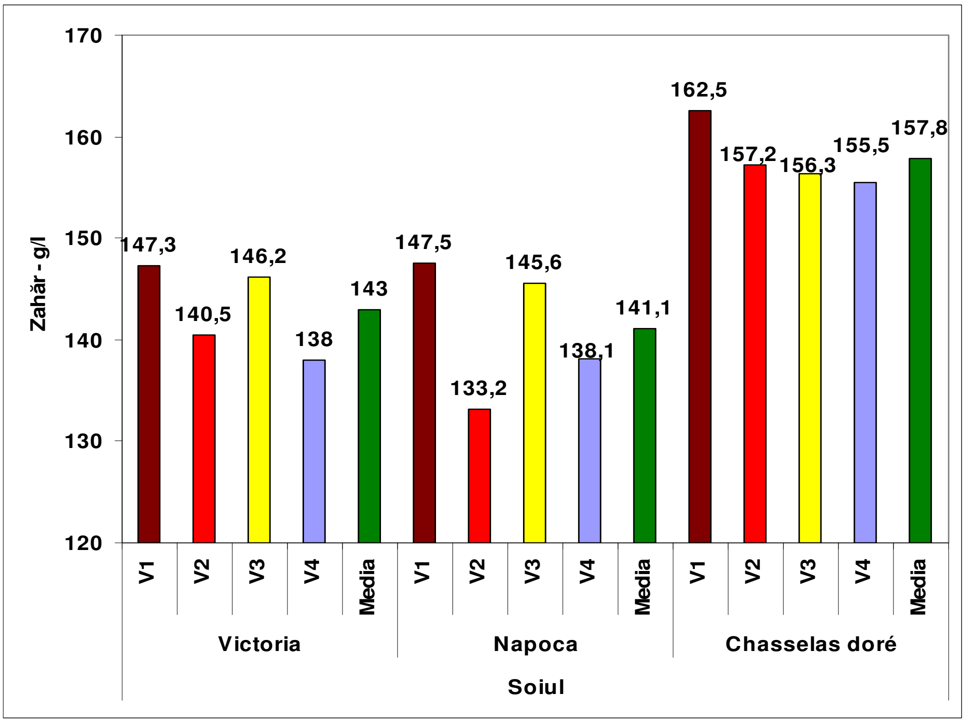

Fig. 2. Sugar content of musts from Victoria, Napoca and Chasselas doré studied in Huşi vineyard (2006-2008)

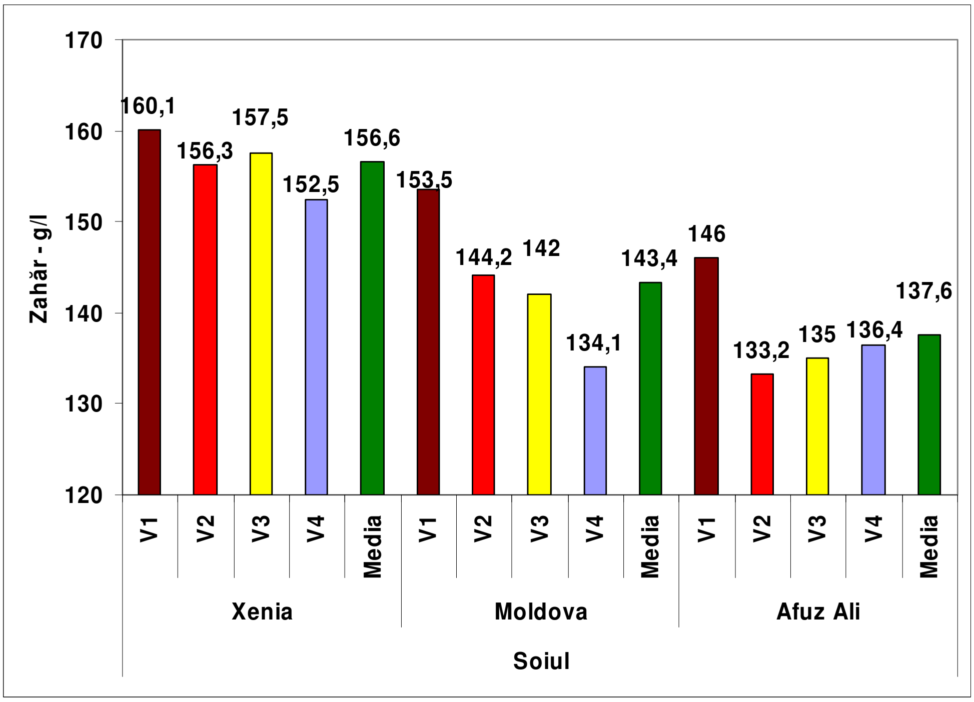

Fig. 3. Sugar content of musts from Xenia, Moldova and Afuz Ali studied in Huşi vineyard (2006-2008)

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Effects of conditioning treatment on chromatic structure of young red wines

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Keywords: conditioning, color intensity, tonality, pigments, flavil

ABSTRACT

Physical, physical-chemical, and physical mechanics treatments applied young red wines perform different actions on their chromatic structure depending on their mode of combination and order of intervention. Heat treatment increases the intensity of colors and color tone. Interventions with cold, bentonite and filtering cause significant reductions in intensity colors.

INTRODUCTION

Elevation authentic researches, over the past decade, conducted by the hygienists, nutritionists and renowned winemakers have clarified the exceptional importance about the role of wine phenols compounds in human health protection. Note that these constituents are able to introduce a valuable antioxidant factor in daily dietary, providing effective protection against cardiovascular disease and cancer (Ravanello 1997).

The protective effect of moderate wine consumption against cardiovascular diseases is given, especially, the polyphenols compounds in red wines young existing monomers. They are genuine collectors of free radicals, which explain their antioxidant action (Stoclet et al., 2004).

But for young red wines to be accepted by informed consumers must meet minimum organoleptic characteristics, designed to make them attractive. These can be obtained through a rigorous conditioning, involving treatment under the law (Rivas-Gonzalo et al., 2004, Ronald 2008, Muntean et al., 2009).

Experiments covered by this paper focused on how various treatments affect complex anthocyanins (red young wines, subject to conditions), knowing that the composition of phenolic monomer is and parties, whose role mentioned above.

MATERIALS AND METHODS

The research was conducted using a red wine of Merlot (from vineyard Sâmbureşti), about 45 days after the first decant.

Wine subject to conditioning treatments presented the following basic composition: 11.9 vol% alcohol, total acidity 6.25 g/l (tartaric acid), unreducing extract 27.4 g/l, anthocyanins 524 mg/l, the intensity of color 0.887, 0.72 color tone.

In the process of conditioning were involved physical factors (pasteurization 75^0 C 10 minute and refrigeration - 5^0 C during 10 days) physical and chemical factors (bentonite 75 g/hl, gelatin 10 g/hl, casein 10 g/hl and ovoclar 10 g/hl) and physical-mechanical factors (filtration plates K8).

Combinations and sequences of the three categories of factors will be presented with the results. Treatment effects were determined by spectrophotometric measurements, quantifying the extent of intensity and color tone and color modifications to components of the complex anthocyanins, compared with untreated sample (Control 1) and heat-treated wines (Control 2).

RESULTS AND DISCUSSION

Under the action of pasteurization followed by various treatments, the intensity and color tone suffer changes, more or less important, in order to increase and decrease of them (Table 1).

Pasteurization, acting as single factor (M2), coloring intensity increases by 10% and tone color with just over 4%. If after heat treatment acts such physico-chemical factors and physical-mechanical situation is changing, both in tone and intensity of staining (Fig.1). Therefore, narrow pore filtration plates attract intensity reduction compared to baseline, and plus canceling determined by pasteurization. It is interesting to note that the ratio of different types of pigments remains constant.

Of all the winemaking materials with physico-chemical action, bentonite produces the largest loss of color; they reach about 10% of untreated wine and 20% of the pasteurized. Materials such as protein (gelatin, ovoclarul, casein) did not produce changes in intensity compared with untreated wine. Moreover, in all cases remain significant parts of ups caused by heat treatment.

Filtration with low porosity plates attract drastic decrease of intensity colors, ranging from 9.5% (when filtering occurred after casein) and 33.8% (when the filter was as bentonite), figures reported in untreated wine.

Changing tone of another way in most cases increases, the higher ups where considerable losses dye intensity. There are situations when reductions occur both in tone and intensity (pasteurized and pasteurized + ovoclar + filter + filter + casein). Influences treatments (with refrigeration based interventions succeeded with natural mineral and protein material, and filtration) on the chromatic characteristics are quantified in Table 2.

Chilling as single factor driving produces minor strength reductions coloring (less than 4% compared to untreated control). All other treatments (with bentonite and protein material) involved decreases in intensity after chilling colors attract between 5.2% (casein) and 22.7% (ovoclar). Declines, however, are amplified by strong filtering, when applied after cold treatment and treatment of physical and chemical nature. In these cases the intensity values can go down to 72.8% compared with the control wine (100%).

In one situation the color tone presents lower values than untreated wine that is, when gelatin is applied after chilling. In all other variants that feature increases between 1.3 and 22.2%, given that treatments applied to affect a greater red-violet and red pigments, which is a real advantage in visual report.

Analysis of structural color elements is likely to lead to obtain the explanation on modifications to the intensity and color tone under the action of applied treatments (Tables 3 and 4).

It is illustrative that the heat treatment (pasteurization) staining intensity increases (aspect revealed in Table 1) due to increasing proportions of both yellow pigments and the red ones, while the blue component decreases by over 6%.

The dates from table 3 are also found that both the yellow component to component and red, plus (or partially) given the high temperature is found in few variants, the most obvious being that after pasteurization treatments were applied with gelatin and ovoclar.

Both the yellow and the red component suffer significant declines reaching up to 26.7% and 37.5% respectively when intervened with bentonite after pasteurization and filtration.

Considerable reductions in the two main types of pigments are taking place under the action ovoclar product and gelatin, followed by filtration.

In fact, in all cases, filtering is one that reduces substantially close chromatic components of colorants, the direct reflection of the intensity values and color tone (Fig. 1).

Blue component decreases in all cases, reaching approximately 48% - to Control 1 - the version where bentonite occurred after heating and filtering. The proportion of blue pigments decreases more, the color tone is improving.

Cations flavil (following relations are established between the three categories of pigments) increase when casein intervention (after pasteurization), which is, stills an element of potentiation quality color.

Chilling the singular factor does not change the proportions of yellow and orange pigments, but causes reduction of about 5% and 9% red component from the blue.

Filtering after cold treatment draw but significant reductions in all components of the dye complex (16.3% of yellow pigments, red pigments and 27.5% from 45% to blue pigments.

On the acting cold treatments, such as mineral and organic materials and filtration deletions occur in all types of pigments.

Overall losses of 13.7% for yellow component, 20.7% and 34.0% in the red component of the blue component.

CONCLUSIONS

The red wines of the early conditioning, heat treatments act differently. Heat causes increased of color intensity and reductions in this parameter draws chilling, but insignificant.

Bentonite and filtering applied by heat and cold treatment cause significant loss of color, tone value increase significantly instead.

Oenological materials, compounded by heat treatments, gelatin and attract ovoclar the decrease between 20 and 25% of the intensity of colors.

Submitted to elimination blue pigments, but in smaller proportions of the yellow, orange and red on all treatments applied leading to improved organoleptic obvious, including the color out in clear relief the visual report.

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TABLES AND FIGURE

Table 1

Effects of heat treatments combined with physical-chemical and filtering on the intensity and color tone wines

VARIANTS	Color intensity (I)		Color tone (T)	
	Abs.	%	Abs.	%
Untreated wine (M_1)	0.887	100	0.72	100
Pasteurization (M_2)	0.978	110.2	0.75	104.1
Pasteurization + Filtration	0.871	98.2	0.72	100
Pasteurization + Bentonite	0.797	89.9	0.83	115.2
Pasteurization + Bentonite + Filtration	0.588	66.2	0.87	120.8
Pasteurization + Gelatin	0.912	102.8	0.77	106.9
Pasteurization + Gelatin + Filtration	0.710	80.0	0.76	105.5
Pasteurization + Ovoclar	0.973	109.6	0.76	105.5
Pasteurization + Ooclar + Filtration	0.665	75.0	0.71	98.6
Pasteurization + Casein	0.917	103.4	0.63	87.0
Pasteurization + Casein + Filtration	0.803	90.5	0.64	88.8

I = $D_0$420 nm + $D_0$520 nm + D_0 620 nm T = $D_0$420 nm/$D_0$520 nm

Table 2

The effects of chilling treatments followed by physical-chemical and filtration on the intensity and color tone wines

VARIANTS	I		T	
	abs.	%	abs.	%
Untreated wine (M_1)	0.887	100.0	0.72	100
Chilling treatment (M_2)	0.858	96.7	0.75	104.1
Chilling treatment + Filtration	0.660	74.4	0.83	115.2
Chilling treatment + Bentonite	0.724	81.6	0.81	112.5
Chilling treatment + Bentonite + Filtration	0.658	74.2	0.88	122.2
Chilling treatment + Gelatin	0.779	87.8	0.68	94.4
Chilling treatment + Gelatin + Filtration	0.703	79.3	0.79	109.7
Chilling treatment + Ovoclar	0.686	77.3	0.77	106.9
Chilling treatment + Ovoclar + Filtration	0.675	76.1	0.73	101.3
Chilling treatment + Casein	0.841	94.8	0.76	105.5
Chilling treatment + Casein + Filtration	0.646	72.8	0.83	115.5

I = $D_0$420 nm + $D_0$520 nm T = $D_0$420nm/$D_0$520 nm

Table 3

Effects of heat treatments combined with physical-chemical and filtering on the chromatic characterstics on red wines

VARIANTS	$D_0$420 nm Yellow and orange pigments		$D_0$520 nm Red pigments		$D_0$620 nm Blue pigments		dA % Flavil cations
	Abs.	%	Abs.	%	Abs	%	
Untreated wine (M_1)	0.325	100	0.451	100	0.111	100	51.66
Pasteurization (M_2)	0.377	116.0	0.497	110.2	0.104	93.69	51.61
Pasteurization + Filtration	0.326	100.3	0.448	99.3	0.097	87.38	52.79
Pasteurization + Bentonite	0.323	99.4	0.389	86.2	0.085	76.57	47.56
Pasteurization + Bentonite + Filtration	0.248	73.3	0.282	62.5	0.058	52.25	45.74
Pasteurization + Gelatin	0.355	109.2	0.459	101.7	0.098	88.28	50.65
Pasteurization + Gelatin + Filtration	0.276	84.9	0.363	80.5	0.071	63.96	52.20
Pasteurization + Ovoclar	0.377	116.0	0.491	108.8	0.105	94.59	50.92
Pasteurization + Ooclar + Filtration	0.249	76.6	0.346	76.7	0.070	63.06	53.90
Pasteurization + Casein	0.313	96.3	0.496	109.9	0.108	97.29	57.56
Pasteurization + Casein + Filtration	0.282	86.7	0.436	96.6	0.085	76.57	57.91

dA % = [$D_0$520 - ($D_0$420 + $D_0$620/2)] x (1/$D_0$520 x 100)

Table 4

The effects of chilling treatments followed by physical-chemical and filtration on chromatic characteristics of red wines

VARIANTS	D_o420 nm Yellow and orange pigments		D_0520 nm Red pigments		D_0620 nm Blue pigments	
	Abs.	%	Abs.	%	Abs	%
Untreated wine (M_1)	0.325	100	0.451	100	0.111	100
Chilling treatment (M_2)	0.325	100	0.430	95.3	0.101	90.9
Chilling treatment + Filtration	0.272	83.7	0.327	72.5	0.061	54.95
Chilling treatment + Bentonite	0.288	88.6	0.355	78.7	0.081	72.97
Chilling treatment + Bentonite + Filtration	0.275	87.6	0.312	69.2	0.069	62.16
Chilling treatment + Gelatin	0.288	88.6	0.418	92.6	0.073	65.76
Chilling treatment + Gelatin + Filtration	0.282	86.7	0.355	78.7	0.066	59.45
Chilling treatment + Ovoclar	0.256	78.7	0.349	77.4	0.070	63.06
Chilling treatment + Ovoclar + Filtration	0.271	83.4	0.348	77.2	0.067	60.36
Chilling treatment + Casein	0.312	96.0	0.408	90.4	0.098	88.2
Chilling treatment + Casein + Filtration	0.265	81.5	0.318	70.5	0.063	56.75

dA % = $[D_0520 - (D_0420 + D_0620/2)] \times (1/D_0520 \times 100)$

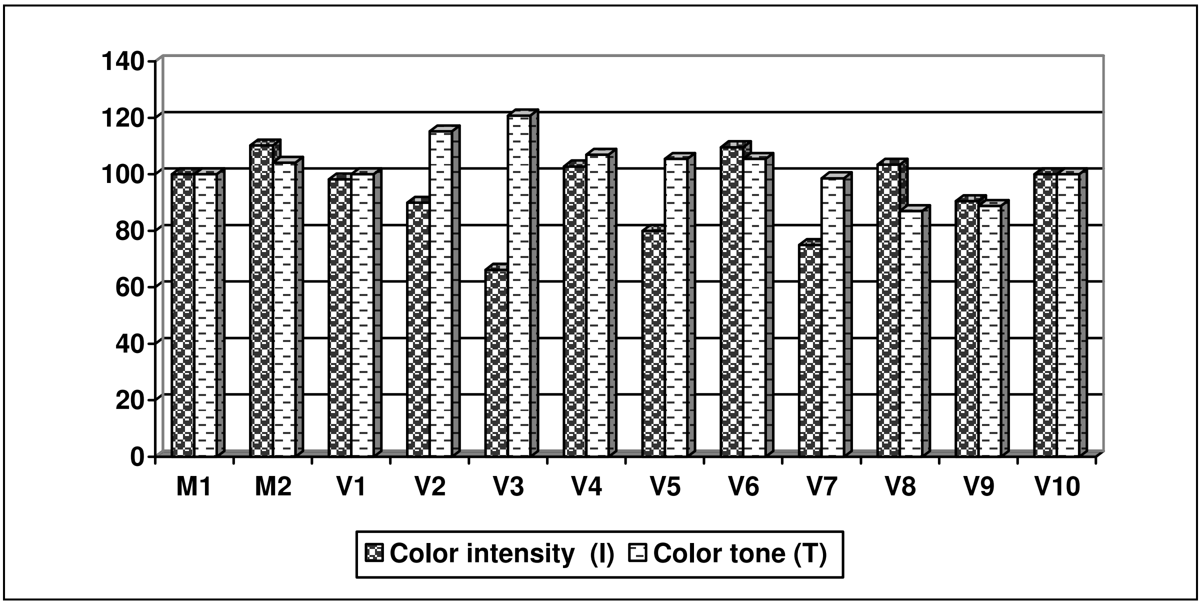

Fig. 1 Effects of heat treatments combined with physical-chemical and filtering on the intensity and color tone wines

Restrictions, precautions and trends in using the herbicides in viticulture

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ABSTRACT

Herbicides technique appeared in viticulture in the 1950-1960 periods, at the same time with the paraquat and the aminotriazol like foliar herbicides and the diuron and the simazine like preemergency herbicides to settle the matter of the weeds. Today in many U.E. regions, in special in France, the herbicides are concerned like negative in connection with environment. Even if using the herbicides we have a very good weeds control, reduced soil erosion, have a good selectivity for grapevine, the grapes and wines without residues, the detection of the superior limit 0,1 µg/L in the superficial and underground waters is necessary to use theses with restrictions and cautious. The herbicides based on Simazin and Terbutylazin were forbidden, the doze of use of Diuron was reduced at 1500 g/ha/year and do not use as single, the doze of Glyphosate and Sulphosate was reduced at 2200 g/ha/an. To avoid using the herbicides for return zones, for vegetation fosses, for drains are environmental favorable measures.

Use the Terbutylazin associated in different combinations like with Isoxaflutol and S-metalaclor for weeds control on the vine row, and natural grasses on the rows interval were experimented in vineyard Stefanesti in the 2008-2010 period.

INTRODUCTION

World and European evolutions regarding herbicides used, determine us to bend more to their influence about the environment.

Weeds control by herbicides has an impact on the environment and so on has accreditation the idea that the herbicides do not make good house with the environment. This is the principal point that competes to have reserves with weeds chemical control. Effect is that some of the herbicides applied direct on the soil or on the vegetation, is trained including with soil particles in superficial and underground waters.

Even for the molecules with interesting environmental characteristics (strong retained in soil, slow solubility, weak persistence, low aquatic toxicity, low dose application), zero risk do not exist, more, can limited the problem or to declare it appearance in time, for all that, it is integrated at weed chemical control.

All herbicides are found in waters. After the detection frequency of the portability superior norm, preemergency herbicides are found in underground waters and also in superficial, and the postemergent herbicides are found in superficial waters at the content over 0,1 µg/liter.

The Average frequency detection of the superior drinkable norm analyzed by DRAF _ SRPV France in 18 basin with vine sides (700 analyses), where Asb represents the underground waters and Asp represents the superficial waters. (fig.1)

In figure 1 remark that all herbicides found in waters, quantities more important in underground waters. From preemergent herbicides, Terbutylasin and their metabolites are very frequency, while from postemergent herbicides, Glyphosate and their metabolites are very frequency.

Recently studies made to compare technical itinerary named „conventional" with „integrated" itinerary, do not allow us to dissociate the herbicides effect from the effect of another plant protection products like the fungicides or insecticides, or the other practices effect like, fertilization practice or amendment.

In viticulture were made more research about weeds control. In France: Cordeau, Galles, Demarchi, Dupuch, Pradier, Tournayre, Casanova, Gatbay, Marie de Lajamme, Larelle, David, Maigrot, Mensan, Marcone, Wolff. In Italy: Bovio, Morando, Eynard. In

Greece: Vizantinopoulus, Daris. In Hongry: Varddi, Mikulas, Botoş Balo, Polos. And odhers in all over the world.

In Roumania: Alexandri, Văleanu, Bernaz, Şarpe, Săndulescu, Condei, Popa, Mihalca, Voiculescu.

In Stefanesti Arges: 1970-1980, Săndulescu, Şarpe; 1980-1992, Săndulescu, Rădulescu; 2005-2010, Rădulescu, Sarpe.

In viticulture the researches started with efficacy and selectivity studies of triasines herbicides (Atrasin and Simasin) applied preemergent and continued with postemegency herbicides, totals based on paraquat and glyphosat and selective based different active ingredients. Little research was focused on the impact of the environment.

In Romania, monocotile and dicotile weeds control, in viticulture, entered into a real impasse with the prohibition on the use of products based on "Simazine". Replacing simazine with other active ingredients based on Isoxaflutol and S-metolaclor in combination with Terbutylasin, combinations used successfully in maize, gave good results in wine-growing. These combinations were experimented at NRDIBH Stefanesti-Arges in 2008-2010 periods.

MATERIALS AND METHODS

As material was used a vine plantation over 10 years old with Chardonay grafted by BerlandierixRiparia Kobber 5 BB, planted 2,2/1,2 m distance, place to a side with 8-10 degrees, arranged by uniformization in platforms of 80-100 m and with complex of soils as Eutricambosol, Regosol and Preluvosol in conformity with RTSS/2003 and WRB.

The herbicides used:

1. Merlin Duo, concentrated suspension with 37,5 g/l Isoxaflutol and 375 g/l Terbutylasin, with root absorption and inhibitor of clorophyl and photosyntese;

2. Gardoprim Gold Plus 500 S.C., concentrated suspension with 312,5 g/l S-metolaclor and 187,5 g/l Terbutylasin, absorption by roots and leaves.

Experimental scheme include 6 variants:

V1- Control I, plowing and weeding
V2- Control II, no tillage, no herbicides
V3- Merlin Duo - 3 l/ha
V4- Merlin Duo - 6 l/ha
V5- Gardoprim Plus Gold - 5 l/ha
V6- Gardoprim Plus Gold - 10 l/ha.

Research method: randomized blocks in 4 repetitions.

The observations and determinations were related to the vine selectivity, efficacy on weeds and the influence on production.

The spectrum of weeds from the experimental plantation:

Annual: Perennial:

- *Setaria viridis Agropyron repens*
- *Echinocloa crus-galli Cynodon dactylon*
- *Digitaria sanguinalis Sorghum halepense*
- *Veronica sp. Convolvulus arvensis*
- *Chenopodium album Cirsum arvense*
- *Amarantus retroflexus Tripholium pratense*
- *Daucus carota*
- *Xanthium strumarium* Bushes:
- *Vicia vilosa Rosa rugosa*
- *Sonchus arvense Clematitis vitalba*
- *Matricaria chamomila*

- *Atriplex viridis*
- *Erigeron canadensis*

RESULTS AND DISCUSSIONS

1. The selectivity of Merlin Duo and Gardoprim Gold Plus 500 SC herbicides on vine (Table 1).

The observations regarding the selectivity of Merlin Duo and Gardoprim Gold Plus herbicides were performed at 30, 60 and 90 days after application. In all variants, both at low doses and double doses were not found phytotoxicity symptoms: wrinkled or burned leaves, reductions in growth of grapevines. The selectivity was appreciated by EWRS notes. In all variants the note obtained was 1, without symptoms.

2. The efficacy of Merlin Duo and Gardoprim Plus Gold 500 SC herbicides on monocotyledonous and dicotyledonous annual weeds in wine growing (table 2).

The efficacy was determinate by visual observations at 30, 60 si 90 days. Because the wine is a perennial plant with 180 ± 10 days vegetation period, is necessary that in harvest period, September or October, the land must be clear of weeds, the reason to introduce a observation at 150 days.

The Merlin Duo product, 3 and 6 l/ha doses, had a very good efficacy of 100 %, especially in the third year of application.

The Gardoprin Plus Gold 500 SC product had a good efficacy, of 90% at 5 l/ha dose and 100% at 10 l/ha dose. The species *Xanthium*, *Sinapis* and *Daucus* were presents. The important problem is the *Xanthium strumarium* during the harvest.

In vine plantation, another problem created as a result the elimination of monocotile and dicotile annual weeds was appearance of perennial weeds, especially *Cynodon dactylon* and *Sorghum halepense*, what attract in completion of weeds control scheme, with total or selective systemic foliar herbicides.

Analyzing grapes production of the unit area (ha), in 2008-2010 period, in opposite by V1- Control I, with plowing and weeding, the herbicides had a positive influence. Merlin Duo product increase the production with 7% at the dose of 3 l/h and with 10 % at the dose 6 l/ha. Gardoprim Plus Gold 500 SC increase the production with 4% at dose of 5 l/ha and with 7% at dose of 10 l/ha. In opposite with V2- untreated control, the production was increased by 70-80%, situation which demonstrate again the necessity of weeds control by herbicides, even limiting the use only by rows. In this case, using weeds control by plowing and weeding, the production was increase with 63%. The weeds presence in vine plantations prevent correct application of phytosanitare treatments and decreases the effectiveness of treatment products by maintain favorable conditions of diseases and pests development.

We can choose the herbicides according to their impact on the environment? Behavior active ingredients of herbicides on the environment are partial conditioned of the own characteristics of each molecule: the retention in soil, solubility, toxicity on different microorganisms, persistence. ITV France in collaboration with CIVC, INRA and l'ARRA, estimate a risk index for air and water in function of some characteristics of molecules, plot conditions and some conditions of use. But, do not taken into account the punctually pollution risk, all cultural practices carried out on the basin slope or rain nature and the time happened after application. This because did not give a complete answer at the question if we can choose the herbicides by environmental criteria. However it may be an excellent index to cultured practices management sensibility.

How we put in work chemical weeds control? The strategies which agree technical aspects, settlement evolutions and environmental preoccupations, were proposed many alternatives to classic solution for application a preemergent herbicide at the beginning of season. These alternatives, which consisted in reduced doses, at weeds partial control only by row, are very favorable for environment. By this evolution to limiting, want interdiction of some products, and make possible to pass on obligation to respect regular measures.

Chemical weed control and the evolution of regulars for environmental reasons.

Degradation of quality water in many wine-growing regions leaded to interdictions and restrictions of use to many herbicides specialties like following:

- withdrawal simazin homologation with stop commercialization on 30/03/2003;
- dose reduction of diuron herbicide used at 1500 g/ha/year and withdraw the homologations for commercial products only on diuron;
- withdrawal Terbutylasin homologation with stop commercialization on 31/12/2003, and use on 30/06/2004.
- reduction of used dose of glyphosate and sulphosate at 2200 g/ha/year.

Preemergent weeds chemical control as only one application. To try to intervene how later is possible give evidence of a good tehnical possesion. In some vineyards the applications are classic after buds open in April-May, even in may better then April in opposition with other vineyards where applications are made before of buds open, in March. To have the clean plots in September, with a persistence of 4-5 to 6 months in application after buds open, the dose of application is necessary less, this is a positive sing for environment. The persistence of application is wanted not pass over September, had plots with weeds infestation during the autumn and winter. In this case, the application of preemergent herbicides in the next spring is oblige to associate a postemergent herbicide to destroy the already appeared plants (perennials and with rosette) in the treatment moment. In this situation, an important covering with weeds, risk to train the foliar herbicides by erosion is much reduced.

In matter of preemergent and postemergent herbicides mixtures, must be in accordance with present regulars. The last active substances came into market, flumioxazine and flazasulfuron, for the reasons which keep less of vine selectivity, require a very big technical rigor when their application make after buds open. For these substances do not exist until now a risk clear diagnosed regarding their transfer into environment by diffuse pollution, but their utilization must not be abusive. At the same time, must avoid herbicides application on return zones, buffer zones between plots, vegetable fosses, the way access or the drains for rains collect.

Active substances like Diuron, Oryzalin, Isoxaben present the principal risk to transfer into environment by diffuse pollution. For Oxifluorfen and their combinations do not enough data but, for active substances used in preemergency, choose is in function of the principal risk, to train on plots. Alternation of active substances every year is necessary to avoid the creation hardy forms and to limit the risk of massif transfers in waters.

Foliar weeds control or NGW (natural grass withered) is a stage to pass to a natural grass withered. It is a technical weeds control by foliar herbicides in one application, which is develop from environmental reasons. Aesthetical aspect of the vine plantation with some grasses is with certainty more tolerable then a nude field without only one blade of grass and also an herbicide applied on a dense rug of grasses it is less susceptible to train by stream. In addition, this is an alternative to integral preemergent chemical control of weeds on the sides where return to plugging and weeding is too difficult to take, so like a temporary measure to fight against erosion and wash nitrates in winter. In fact, to see a burnt carpet of grasses by foliar herbicide, if is not aesthetic, is preferable and appreciated the situations when the herbicides are find again in water. The impact on the fauna and microflora of soil are much reduced than preemergent chemical weeds control and can be considered an intermediary stage between integral preemergent weeds control and natural grass withered.

CONCLUSIONS

1. The Merlin Duo and Gardoprim Plus Dold 500 S.C. herbicides are selective for vine.
2. The Merlin Duo and Gardoprim Plus Gold 500 S.C. herbicides have similar efficacy in weeds control like the herbicides based on Simazin.
3. The Merlin Duo and Gardoprim Plus Gold 500 S.C. herbicides have a positive influence, increase by 4-10% of grapes production.
4. The scheme to control annual monocotyledonous and dicotyledonous weeds based on Merlin Duo and Gardoprim Plus Gold 500 S.C. is necessary to include the foliar herbicide to control perennial weeds.
5. The type of herbicid, the moment of application must choose with environmental respect.

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TABLES AND FIGURE

Table 1

The influence of application treatments on selectivity of wine growing – Chardonay variety, Stefanesti-Arges, 2008-2010

Variant	Treatment, herbicide	Dose l/ha	Time of application	EWRS selectivity after treatment		
				30 days	60 days	90 days
V_1	Control I, ploughing and weeding	-	At rest and vegetation	1	1	1
V_2	Martor II, No tillage or herbicides	-	-	1	1	1
V_3	Merlin Duo	3	preemergent	1	1	1
V_4	Merlin Duo	6	preemergent	1	1	1
V_5	Gardoprim Plus Gold	5	preemergent	1	1	1
V_6	Gardoprim Plus Gold	10	preemergent	1	1	1

Table 2

The efficacy of preemergent herbicides on weeds control in Stefanesti-Arges vineyard, 2008-2010

Variant	Treatment, herbicide	Dose l/ha	Time of application	Efficacy after treatment (%)			
				30 days	60 days	90 days	150 days
V_1	Control I, Plouwing & weding	-	In the rest & vegetation	90	85	80	60
V_2	Control II, no tillage, no herb.	-	-	0	0	0	0
V_3	Merlin Duo	3	preemergent	100	100	100	100
V_4	Merlin Duo	6	preemergent	100	100	100	100
V_5	Gardoprim Plus Gold	5	preemergent	100	98	95	90
V_6	Gardoprim Plus Gold	10	preemergent	100	100	100	100

Table 3

The influence of herbicides on grapes production of Chardonay variety in Stefanesti-Arges vinyard, 2008-2010

Variant	Treatament, herbicid	Dose l/ha	Time of application	Grapes production (kg/ha)				
				2010		2008-2010		
				kg/ha	%	kg/ha	%	
V_1	Control I, Plouwing & weding	-	In the rest & vegetation	4270	100	6440	100	163
V_2	Control II, no tillage, no herb	-	-	1630	39	3953	61	100
V_3	Merlin Duo	3	preemergent	5340	125	6873	107	174
V_4	Merlin Duo	6	preemergent	5650	132	7100	110	180
V_5	Gardoprim Plus Gold	5	preemergent	4780	112	6680	104	169
V_6	Gardoprim Plus Gold	10	preemergent	5220	122	6877	107	174

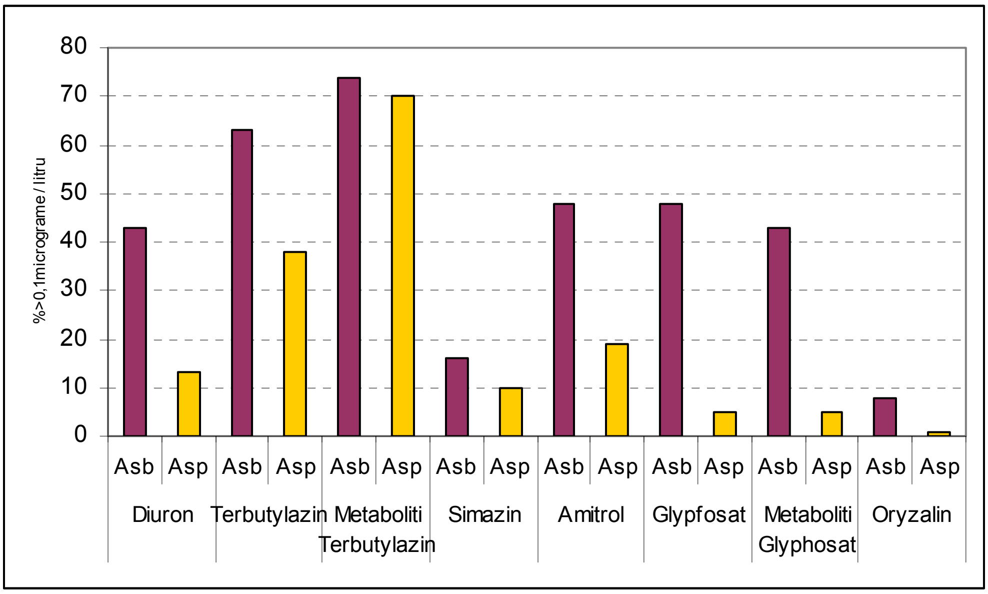

Fig.1 The Average frequency detection of the superior drinkable norm (Kuntzmann Ph. et. al., 2005)

Merlot 7Vl and Cabernet Sauvignon 30Vl, clonal selection for red wine designation of origin

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Keywords: traditional varieties, elite, approval, bifactorial experience, interaction, appreciation organoleptic

ABSTRACT

At Research-Development Institute for Viticulture and Winemaking, Valea Călugărească, continues to happen in clonal selection was made of varieties that produce wines with controlled appellation of origin including Merlot and Cabernet Sauvignon. To the best of both varieties elite files have been prepared for approval in 2011 under the name of Merlot 7Vl and Cabernet Sauvignon 30Vl. The study of clonal forms in the present study was conducted between 2007-2009. The first clone, Merlot 7Vl, boasts a higher grape production by 17% from the average clone approved in a previous year, Merlot 8Vl, increase the quantity being 8.66 t/ha to 10.20 t/ha. A second clone approved Cabernet Sauvignon30Vl, is distinguished by a higher grape production by 19% to clone approved earlier, Cabernet Sauvignon 33Vl increase the quantity being 7.07 t/ha to 8.40 t/ha. Grape quality is slightly superior clones of control who were approved in previous years. Sugar content of grapes was 206 g/l for Merlot 7Vl at 204 g/l compared with Merlot 8Vl control. Cabernet Sauvignon 30Vl clone had 208g/l compared with compared with control sugar Cabernet Sauvignon 33Vl which 201 g/l. Other technological features are very similar to the new clones compared with respective controls. The content of anthocyanins in wine was Merlot 7Vl of 274.75 mg/l compared with control which was 264.25 mg/l. Anthocyanin content was the Cabernet 30Vl, 603.75 mg/l compared with control which was 565 mg/l. Organoleptic assessment was the wine tasting Merlot 7Vl clone 18.3 compared with 18.0 for the control Merlot 8Vl; Cabernet Sauvignon 30Vl the note was of 18.8 compared with 18.3 control Cabernet Sauvignon33Vl.

INTRODUCTION

Research and Research-Development Institute for Viticulture and Winemaking continue to happen where the two clones were created recently approved, the work focused in improving the product range by creating new wine selections valuable. It was aimed at increasing competitiveness in the market economy, adapting to the various clones environmental conditions continue to happen in wine center and other centers with similar ecological conditions and ensuring the highest quality output for domestic consumption and export.

The two clones belonging to the group recently performed traditional varieties Dealu Mare vineyard, and that the selection work is ongoing.

Clonal selection was a study some time in our country who occupy many researchers as Gorodea et al. (1983), Schoffling and Deroo, (1991), Petrescu şi Stoian (1994), Petrescu et al. (2007), Stoian et al. (2005, 2006), Indreaş (1992), and many others.

MATERIALS AND METHODS

Technological characterization of the grapes was made from grapes harvested production and quality (sugar content g/l acid equivalent g/l H_2SO_4 and anthocyanins mg/kg) and weight of a grape and 100 grains. In terms of production of grapes per hectare research calculated the statistical calculation used two-way experiences, each with three repetitions each of 12 logs. The methodology was performed after manual "field experience" of Săulescu (1967). Insurance the statistical and mathematical significance of differences was performed by comparison with control. Variants of each variety were composed of an clonal elite (Cabernet Sauvignon 81/18 and Merlot 9), approved last clone in a previous year as a controls (Cabernet Sauvignon 33Vl and Merlot 8Vl) and the new clones homologated in year 2011, Merlot 7Vl and Cabernet Sauvignon 30Vl. Tests on raw material quality were related to sugar and anthocyanin content of grapes.

Analysis of wine define utmost quality and elite clones studied were related to alcohol content, total acidity and volatile, total extract, ash, polyphenols, anthocyanins, the intensity of the dye, tint, organic acids and tannin. Analyses conducted by his or Macici (1997, 2008), Giosanu et al. (1982), Stoian (2001) and by Usseglio-Tomasset (1988). Acids in wine were determined ioncromatograf device. The final assessment was performed by giving the wine taste notes.

RESULTS AND DISCUSSIONS

Morphological aspects. The two clones have recently approved a leaf five lobes of the leaves and relatively small. Merlot 7Vl has more embossed leaf (fig.1) than Cabernet Sauvignon 30Vl (fig. 2). The latter has all the lateral sinuses closed 7Vl Merlot clone compared to the lower lateral sinuses are open.

Production of grapes per hectare. As the average of the three years of study (2007-2009), Merlot 7Vl achieved 10.2 t/ha compared with control Merlot 8Vl which was 8.66 t/ha (table 1). Increase production if Merlot 7Vl clone has 17%, compared with control.

In these years, has Cabernet Sauvignon 30Vl 8.40 t/ha compared with control Cabernet Sauvignon 33Vl which was 7.07 t/ha (table 2). Increase production if clone Cabernet Sauvignon 30Vl has 19%, compared with control. Bifactorial variance type A factor considered elite/clone, factor B, the year of study and the factor R, repetitions. Analysis of variance forms of Merlot and Cabernet Sauvignon set the f factor is 1% of the value to 8.65 and the amount of interaction BxA 18. The same factor f is taken for 5% E value to 4.46 and 6.94 to BxA interaction (tables 3 and 4).

If variants of Merlot, the significance of differences at 5%, 1% and 0.1% had the following error values: 0.43, 0.72 and 1.35. The significance of differences applied variants is as follows (table 3):

- the influence of elite/clone (A), option 3, depending on the error, 7Vl Merlot is very significant (***), exceeding the 17.78%. Other variants have acquired meanings;
- the influence of (B), depending on the error, the variations do not have meanings.

B significance of differences for error 5%, 1% and 0.1% respectively have the following values: 0.66, 0.96 and 1.44 (table 3). They are as follows:

- The combined influence of (AxB), depending on the error b-year variants, variant t3a1 (Merlot 7Vl/2007) is distinctly significant (**), and t3a2 variants (Merlot 7Vl/2008) and t3a3 (Merlot 7Vl/2009) is very significant (***). They are superior to control witness with 12.01% -22.4%. Other variants have gained significance.
- The combined influence (BxA), depending on the error b, years-variants, variant a1t3 (Merlot 7Vl/2007) is significantly distinct (**): versions a2t3 (Merlot 7Vl/2008) and a3t3 (7Vl/2009 Merlot) is very significant (***). They are superior to control with 18.94% -22.4%. Other variants have gained significance.

At the variants of Cabernet Sauvignon, significance differences for the error to 5%, 1% and 0.1% has the following values: 0.62, 1.03 and 1.93 (table 4).

Applied variants, the significance of differences are as follows:

- The influence of elite/clone (A), depending on the error, version 3, Cabernet Sauvignon is distinct 30Vl significant (*), exceeding 18.82% witnesses. Other variants have gained significance.
- The influence of (B), depending on the error, the variations do not have meanings. The significance of differences for the error b 5%, 1% and 0.1% respectively have the following values: 0.35, 0.50 and 0.75 (table 4). Therefore:
- The combined influence of (AxB)-year options, depending on the error b, t1a1 version (Cabernet Sauvignon 81/18) was significantly distinct negative. T3a1 variants (Cabernet Sauvignon 30Vl/2007) t3a2 (Cabernet Sauvignon 30Vl/2008) and t3a3 (Cabernet Sauvignon

30Vl/2009) are very significant. Other variants have acquired meanings;
- The combined influence (BxA), year-variants, depending on the error b, a1t11 version (Cabernet Sauvignon 81/18) was significantly distinct negative. A1t3 variants (Cabernet Sauvignon 30Vl/2007) a2t3 (Cabernet Sauvignon 30Vl/2008) and a3t3 (Cabernet Sauvignon 30Vl/2009) are very significant. Other variants have gained significance.

Qualitative aspects of the grapes. Clones are distinguished by their quality Merlot 7Vl and Cabernet Sauvignon 30Vl who have accumulated 206 g/l respectively sugar and 208 g/l, compared with those controls who have accumulated 204 g/l respectively 201 g/l (table 5). The anthocyanins contained in the Merlot 7Vl and Cabernet Sauvignon 30Vl gained 389.39 mg/kg. respectively 691.90 mg/kg compared with those control who had 302.81 mg/kg respectively 602.83 mg/kg. Acid content has values close to those of the control.

Quantitative aspects of grapes. Merlot 7Vl grapes from weight was 130 g and the Cabernet Sauvignon 30Vl, 110 g, compared with controls who had 132 g and 115 g. The weight of 100 grains was 166 g at Merlot 7Vl and Cabernet Sauvignon 30Vl, 144 g compared with controls who had 170 g and 146 g (table 5).

Qualitative aspects of wine.

The variants of Merlot. In terms of alcohol content are small differences between the versions: from 11.60 vol% Merlot 9 to 11.90 vol% for Merlot 7Vl (table 6). Total acidity is the same for all variants, 5.56 g/l (H_2SO_4). Merlot 7Vl total extract was 24.32 g/l compared with control Merlot 8Vl which was 23.42 g/l. Nonreducing extrait from Merlot 7Vl was 20.46 g/l compared with control Merlot 8Vl which was 19.58 g/l.

Total polyphenol content (index IF) had a value 52 for Merlot 7Vl, Merlot 8Vl compared with that value was 50 (table 7). Anthocyanin content is higher in Merlot 7Vl it with 274.75 mg/l, compared with control Merlot 8Vl which was 264.25 mg/l (fig.3). Staining intensity is also superior 7Vl Merlot, this being before the 8459, Merlot 8Vl was 8036. Tinge was the Merlot 7Vl 0688, compared with the 0702 at Merlot 8Vl.

In the content of organic acids are small differences between the variants (table 8).

Tannin content is higher in Merlot 7Vl value being 2.24 g/l compared with Merlot 8Vl which was 1.92 g/l.

Note to taste the Merlot 7Vl was 18.3 g/l compared with Merlot 8Vl which was 18 (table 8).

The variants of Cabernet Sauvignon. In terms of alcohol content are somewhat larger differences between the versions: from 11.69 vol% of Cabernet Sauvignon 33Vl up to 12.08 vol% for Cabernet Sauvignon 30Vl (table 6). Total acidity was lowest in Cabernet Sauvignon 30Vl, 5.46 g/l (H_2SO_4) and the highest was of Cabernet Sauvignon 81/18 5.71 g/l (H_2SO_4). Cabernet Sauvignon 30Vl total extract was 26.28 g/l compared with control Cabernet Sauvignon 33Vl which was 21.75 g/l. Nonreducing extrait from Cabernet Sauvignon 30Vl was 23.72 g/l compared with control Cabernet Sauvignon 33Vl which was 19.45 g/l.

Total polyphenol content (index IF) had a value 64 at Cabernet Sauvignon 30Vl, Cabernet Sauvignon 33Vl compared with that value was 62 (table 7). Anthocyanin content is higher in Cabernet Sauvignon 30Vl it with 603.75 mg./l, compared with Cabernet Sauvignon 33Vl, was 565 mg/l (figure 3). Staining intensity was the Cabernet Sauvignon 30Vl, 12.653, compared with 12.532 in Cabernet Sauvignon 33Vl. Tinge was the 0740 Cabernet Sauvignon 30Vl, compared with the 0887 Cabernet Sauvignon 33Vl.

In the organic acid content are small differences between the variants (table 8). Tannin content is higher in Cabernet Sauvignon 30Vl value being 2.643 g/l compared to Cabernet Sauvignon 33Vl which was 2.580 g/l.

Note to taste was 18.8 g/l compared to Cabernet Sauvignon 30Vl and Cabernet Sauvignon 33Vl which was 18.3 (table 8).

CONCLUSIONS

Analysis of variance applied to the production of grapes per hectare per hectare calculated proved to be larger or smaller differences between the versions.

The variants of Merlot.

1. After production per hectare, exceeding witness Merlot 7Vl and Merlot 8Vl with 17.78% yield increase is very significant.
2. Influence of years is insignificant.
3. Influence of combined-year options, the option is distinctly significant (**)Merlot 7Vl/2007 and Merlot 7Vl/2009, 7Vl/2008 and Merlot are very significant (***). They are superior to witness with 12.01% -22.4%
4. Note the tasting was 18.3 g/l at Merlot 7Vl and the Merlot 8Vl was 18.

The variants of Cabernet Sauvignon

5. After production per hectare, clone Cabernet Sauvignon 30Vl with Cabernet Sauvignon clone 33Vl exceed witness with 18.8% yield increase was significantly distinct (**).
6. Influence of years is insignificant.
7. Influence of combined-year options, Cabernet Sauvignon 81/18 is negative distinctly significant (00) variants Cabernet Sauvignon 30Vl/2007, Cabernet Sauvignon 30Vl/2008 and Cabernet Sauvignon 30Vl/2009 are very significant (***). They are superior to witness 13.3% -24.75%.
8. Note the tasting was 18.8 clone Cabernet Sauvignon 30Vl, compared with Cabernet Sauvignon 33Vl. 18.3.

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TABLES AND FIGURES

Table 1

Annual production of grapes, t/ha at Merlot

No. of var	Clones/ elites	Years of study and grape product 2007	2008	2009	Average of years
1	Merlot 9	8.10	8.30	8.80	8.40
2	Merlot 8Vl, control	8.50	8.67	8.80	8.66
3	Merlot 7Vl	9.70	10.30	10.60	10.20
Average the Merlot variants		8.77	9.09	9.40	9.09

Table 2

Annual production of grapes, t/ha at Cabernet Sauvignon

No. of var	Clones/ elites	Years of study and grape product 2007	2008	2009	Average of years
1	Cabernet Sauvignon 81/18	6.45	6.80	7.05	6.77
2	Cabernet Sauvignon 33Vl, control	6.88	7.02	7.30	7.07
3	Cabernet Sauvignon 30Vl	8.01	8.38	8.82	8.40
Average the Cabernet Sauvignon variants		7.11	7.40	7.72	7.41

Table 3

Analysis of variance on obtained from Merlot grape production

Case	SP	GL	s^2	F test P = 1% to E	F test P = 1% to de BxA	F test P = 5% to E	F test P = 5% to BxA
Total	24.54	26.00	0.94				
Blocks	0.10	2	0.05				
Blocks x years	1.82	4	0.46	8.65	18	4.46	6.94
Variants	17.07	2	8.54				
Error (a)	0.44	4	0.11				
Variants x years	0.37	4	0.09				
Eroarea (b)	2.93	8	0.37				

t, test		**5%**	**1%**	**0.1%**	Height limit		**5%**	**1%**	**0.1%**
Error	a	2.78	4.6	8.61	Error	a	0.43	0.72	1.35
Error	b	2.31	3.36	5.04	Error	b	0.66	0.96	1.44

F test calculated from error a	8.54:0.11 = 77.64
F test calculated from error b	0.09:0.37 = 0.243
F calculated to test the interaction BxA	8.54:0.09 = 94.80
$\overline{Sd}$ error to error a differences	$\sqrt{(2x0.11):(3x3)}$ = 0.156
$\overline{Sd}$ error to error b differences	$\sqrt{(2x0.37):(3x3)}$ = 0.287

		Average	D +/-	The signific. of D	%
Error a function					
Influence clone/elite (A)			0.43	0.72	1.35
Merlot 9		8.40	-0.26		97.00
Merlot 8Vl,		8.66	0.00		99.95
Merlot 7Vl		10.20	1.54	***	117.78
Merlot 8Vl, control		8.66			
Error a function					
Influence of years (B)			0.43	0.72	1.35
a1	2007	8.77	-0.32		96.44
a2	2008	9.09	0.00		99.99
a3	2009	9.40	0.31		103.41
Average years, control		9.09			

Error b function					
Combined influence of (AxB)			0.66	0.96	1.44
t1a1	Merlot 9/2007	8.10	-0.56		93.53
t1a2	Merlot 9/2008	8.30	-0.36		95.84
t1a3	Merlot 9/2009	8.80	0.14		101.62
t2a1	Merlot 8Vl/2007	8.50	-0.16		98.15
t2a2	Merlot 8Vl/2008	8.67	0.01		100.08
t2a3	Merlot 8Vl/2009	8.80	0.14		101.62
t3a1	Merlot 9Vl/2007	9.70	1.04	**	112.01
t3a2	Merlot 9Vl/2008	10.30	1.64	***	118.94
t3a3	Merlot 9Vl/2009	10.60	1.94	***	122.40
Merlot 8Vl, control		8.66			
Combined influence of (B x A)		**Error b function**	0.66	0.96	1.44
a1t1	Merlot 9/2007	8.10	-0.56		93.53
a1t2	Merlot 8Vl/2007	8.50	-0.16		98.15
a1t3	Merlot 7Vl/2007	9.70	1.04	**	112.01
a2t1	Merlot 9/2008	8.30	-0.36		95.84
a2t2	Merlot 8Vl/2008	8.67	0.01		100.08
a2t3	Merlot 7Vl/2008	10.30	1.64	***	118.94
a3t1	Merlot 9/2009	8.80	0.14		101.62
a3t2	Merlot 8Vl/2009	8.80	0.14		101.62
a3t3	Merlot 7Vl/2009	10.60	1.94	***	122.40
Merlot 8Vl, control		8.66			

Table 4

Analysis of variance aspra obtained from Cabernet Sauvignon grape production

Case	S P	G L	s^2	F test P = 1%		F test P = 5%	
				to E	to de BxA	to E	to de BxA
Total	18.52	26.00	0.71				
Blocks	0.03	2	0.02				
Blocks x years	1.30	4	0.32	8.65	18	4.46	6.94
Variants	13.67	2	6.83				
Error (a)	0.91	4	0.23				
Variants x years	0.13	4	0.03				
Error (b)	0.81	8	0.10				

t, test		**5%**	**1%**	**0.1%**	Height limit		**5%**	**1%**	**0.1%**
Error	a	2.78	4.6	8.61	Error	a	0.62	1.03	1.93
Error	b	2.31	3.36	5.04	Error	b	0.35	0.50	0.75

F test calculated from error a	6.83:0.23 = 29.7
F test calculated from error b	0.03:0.10 = 0.30
F calculated to test the interaction BxA	6.83:0.03 = 227.6
$\overline{Sd}$ error to error a differences	$\sqrt{(2x0.23):(3x3)} = 0.226$
$\overline{Sd}$ error to error b differences	$\sqrt{(2x0.10):(3x3)} = 0.149$

		Average	**D +/-**	The sign. of D	**%**
Error a function					
Influence clone/elite (A)			**0.62**	**1.03**	**1.93**
t1	Cabernet Sauvignon 81/18	6.77	-0.30		95.71
t2	Cabernet Sauvignon 33Vl	7.07	0.00		99.95
t3	Cabernet Sauvignon 30Vl	8.40	1.33	**	118.82
Cabernet Sauvignon 33Vl, control		7.07			

Error a function					
Influence year (B)			**0.62**	**1.03**	**1.93**
a1	2007	7.11	-0.30		96.00
a2	2008	7.40	-0.01		99.87
a3	2009	7.72	0.31		104.23
Average years, control		7.41			
Combined influence of (AxB)		**Err b func**	**0.35**	**0.50**	**0.75**
t1a1	Cabernet Sauv. 81/18-2007	6.45	-0.62	00	91.23
t1a2	Cabernet Sauv. 81/18-2008	6.80	-0.27		96.18
t1a3	Cabernet Sauv. 81/18-2009	7.05	-0.02		99.72
t2a1	Cabernet Sauv. 33Vl.-2007	6.88	-0.19		97.31
t2a2	Cabernet Sauv. 33Vl.-2008	7.02	-0.05		99.29
t2a3	Cabernet Sauv. 33Vl.-2009	7.30	0.23		103.25
t3a1	Cabernet Sauv. 30Vl-2007	8.01	0.94	***	113.30
t3a2	Cabernet Sauv. 30Vl-2008	8.38	1.31	***	118.53
t3a3	Cabernet Sauv. 30Vl-2009	8.82	1.75	***	124.75
Cabernet Sauvignon 33Vl, control		7.07			
Combined influence of (B x A)		**Err b func**	**0.35**	**0.50**	**0.75**
a1t1	Cabernet Sauv. 81/18-2007	6.45	-0.62	oo	91.23
a1t2	Cabernet Sauv. 33Vl.-2007	6.88	-0.19		97.31
a1t3	Cabernet Sauv. 30Vl-2007	8.01	0.94	***	113.30
a2t1	Cabernet Sauv. 81/18-2008	6.80	-0.27		96.18
a2t2	Cabernet Sauv. 33Vl.-2008	7.02	-0.05		99.29
a2t3	Cabernet Sauv. 30Vl-2008	8.38	1.31	***	118.53
a3t1	Cabernet Sauv. 81/18-2009	7.05	-0.02		99.72
a3t2	Cabernet Sauv. 33Vl.-2009	7.30	0.23		103.25
a3t3	Cabernet Sauv. 30Vl-2009	8.82	1.75	***	124.75
Cabernet Sauvignon 33Vl, control		7.07			

Table 5

Technological characteristics of grapes (average data 2007-2009)

No of var	Clone/elite	Grapes output t/ha	Sugar content (g/l)	Acidity must (g/l H_2SO_4)	pH	Anthocyanins (mg/kg)	Weight of a grape (g)	Weight of 100 berries (g)
1	Merlot 9	8.40	201	3.66	3.52	325.50	127	159
2	Merlot 8Vl, control	8.66	204	3.76	3.59	302.81	132	170
3	**Merlot 7Vl**	**10.20**	**206**	**3.95**	**3.56**	**389.39**	**130**	**166**
4	CS 81/18	6.77	204	3.81	3.15	630.33	108	150
5	CS 33Vl, control	7.07	201	3.90	3.16	602.83	115	146
6	**CS 30Vl**	**8.40**	**208**	**4.29**	**3.21**	**691.90**	**110**	**144**

Table 6

Physico-chemical characteristics of wine 1 (average data 2007-2009)

No of var	Clone/ elite	Alcohol %	pH	Acidity total (g/l H_2SO_4)	Volatile acidity (g/l CH_3COOH)	Sugar remainder (g/l)	Total extract (g/l)	Nonreducing extract (g/l)	Ash (g/l)
1	Merlot 9	11.60	3.52	5.56	0.48	3.54	22.48	18.94	2.49
2	Merlot 8Vl	11.75	3.25	5.66	0.45	3.84	23.42	19.58	2.44
3	**Merlot 7Vl**	**11.90**	**3.49**	**5.66**	**0.43**	**3.86**	**24.32**	**20.46**	**2.57**
4	CS81/18	11.88	3.35	5.71	0.30	2.41	24.75	22.34	2.87
5	CS 33Vl	11.69	3.45	5.51	0.30	2.30	21.75	19.45	2.25
6	**CS 30Vl**	**12.08**	**3.48**	**5.46**	**0.39**	**2.56**	**26.28**	**23.72**	**2.72**

Table 7

Physico-chemical characteristics of wine 2 (average data 2007-2009)

No of var	Clone/ elite	Polyphenols (IF)	Antho cyanins (mg/l)	Reaction with vanillin (mg/l)	Colour intensity	Tempt	Optic. densit 420 %	Optic. densit 520 %	Optic. densit 620 %
1	Merlot 9	49	253.18	1.66	7.853	0.707	27.555	38.925	12.049
2	Merlot 8Vl	50	264.25	1.67	8.036	0.702	28.246	40.232	11.88
3	**Merlot 7Vl**	**52**	**274.75**	**1.68**	**8.459**	**0.688**	**29.762**	**43.228**	**11.60**
4	CS 81/18	46	578.31	0.70	11.817	0.834	47.750	57.220	13.20
5	CS 33Vl	62	565.00	0.64	12.532	0.887	53.545	60.330	11.45
6	**CS 30Vl**	**64.0**	**603.75**	**0.61**	**12.653**	**0.740**	**48.220**	**65.115**	**13.20**

Table 8

Physico-chemical characteristics of wine 3 (average data 2007-2009)

No of var	Clone/ elite	Organic acids in wine (mg/l)							Tannin (g/l)	Note to taste
		tartric	malic	succi-nic	citric	galac-turonic	ace-tic	fos-foric		
1	Merlot 9	2.145	998	1012	195	530	290	360	2.20	17.9
2	Merlot 8Vl	2.344	1002	1035	192	510	320	390	1.92	18.0
3	**Merlot 7Vl**	**2.465**	**1015**	**1020**	**188**	**520**	**310**	**380**	**2.24**	**18.3**
4	CS 81/18	2462	1115	1049	196	569	318	485	2.540	18.4
5	CS 33Vl	2453	1125	1050	192	570	320	480	2.580	18.3
6	**CS 30Vl**	**2296**	**1098**	**1005**	**192**	**511**	**281**	**766**	**2.643**	**18.8**

Fig. 1. Merlot 7Vl

Fig. 2. Cabernet Sauvignon 30Vl

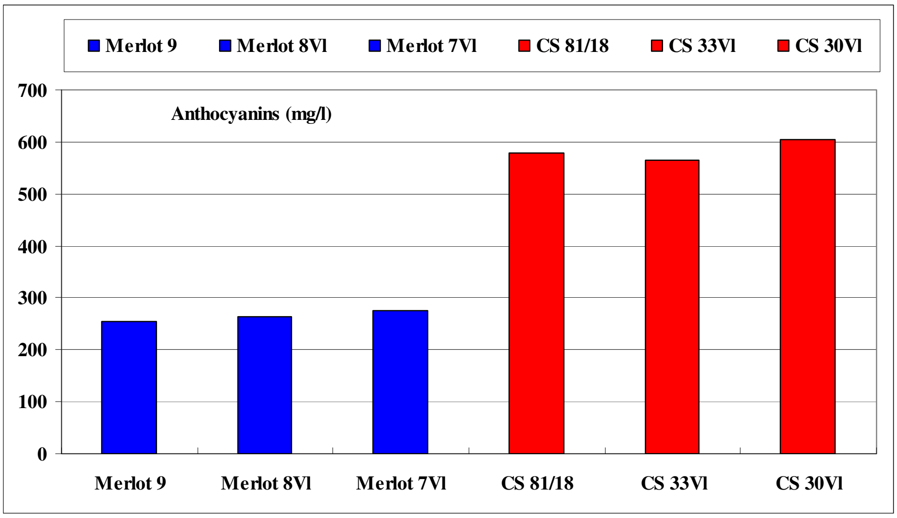

Fig.3 – Graph anthocyanins content in wines of Merlot and Cabernet Sauvignon variants

Results of clonal selection of Cabernet Franc

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Keywords: elite, approval, bifactorial experience, interaction, noted to taste

ABSTRACT

Cabernet franc is a grape variety for red wines complement the recommended designation of origin where the Dealu Mare vineyard with Cabernet Sauvignon grown. The year 2011 has been completed clonal selection of the variety is approved by the Research and Development Institute for Viticulture and Winemaking continue to happen in two clones of it: Cabernet Franc 43Vl and Cabernet Franc 81Vl. The study of clonal forms in the present study was conducted between 2007-2009. As the average three-year study, two clones of Cabernet Franc, CF and CF 81Vl 43Vl achieved 8.02 t/ha respectively 8.15 t/ha, compared with the average experience that was 7.55 t/ha. The increase in production compared with the average experience for 43Vl CF clone is 6.2%, but compared to the elite homologated CF 5/7 is 18.5%. If CF clone 81Vl increased production compared with the average experience of 8% compared with the elite but homologated CF 5/7 is 20.4%.

It is distinguished by its capacity CF 43Vl clone which has accumulated 225 g/l sugar, compared with the average experience with 215 g/l sugar. In the anthocyanins contained in grape CF 81Vl was 569 mg/kg. compared with the average experience of 551.11 mg/kg. Acid content is highest in the elite CF 5/7, 3.60 g/l (H_2SO_4), compared with an average of 3.48 g/l (H2SO4). In terms of alcohol content are differences between the versions: from 12.2 vol% of CF 5/7 up to 13.1 vol % for CF 81Vl. The content of anthocyanins in wine was superior to the Cabernet Franc 81Vl it with 556 mg/l, while the Cabernet Franc 43Vl was 498 mg/l, which was compared with the average 499 mg/l. The highest intensity of staining had the 6886 Cabernet Franc and Cabernet Franc 81Vl 43Vl was 5984, compared to an average of 6.4373. Optical density in the red spectrum, which most interest was the highest value of Cabernet Franc 81Vl 32.45% and Cabernet Franc 43Vl was 27.65%, compared to an average of 29.47%. Noted to taste of Cabernet Franc 43Vl was 18.5, followed by Cabernet Franc 81Vl with 18.4 g/l compared with the average which was 18.2.

INTRODUCTION

As is known, the Bordeaux range is composed of 60% Cabernet Sauvignon, Merlot, Cabernet Franc 30% and 10% and was designed such that fame does not diminish anything from the first variety. They are grown in France in the Bordeaux region in northeastern Italy and California. Cabernet Sauvignon is known in France by the year 1650 and its genitors x Sauvignon Cabernet Franc, after University of California Davis. Origin but Cabernet Franc, Cabernet Sauvignon course occurred previously remained unknown for so long and was probably selected in the forest. Although a remarkable quality, Cabernet Franc, has remained little known only from one reason: its grape yields per unit area are lower than those of Cabernet Sauvignon. Alleweldt (1987) presents Cabernet Franc with black beans. Cabernet Franc, vinified separately with seamless evolution to the glass of wine gives an aroma of dried air and gives him a scholar. Balanced taste sensations are conducted under the auspices of sweet and refreshing, a high alcohol level.

Research and Development Institute for Viticulture and Winemaking continue to happen where they were recently approved two clones of Cabernet Franc, activity focused in improving the product range by creating new wine selections valuable. It was aimed at increasing competitiveness in the market economy, adapting to the various clones environmental conditions Dealu Mare vineyard and other vineyards with similar environmental conditions, known for quality wines. It was intended to ensure a higher quality of production for both domestic consumption and export.

Clonal selection was a study some time in our country who occupy many scholars as Popescu et al. (1977, 1978), Calistru Gh. et al. (1980), Divoiu M. et al. (2007) and others.

MATERIALS AND METHODS

Technological characterization of the grapes was made from grapes calculated per hectare production and quality (sugar content g/l acid equivalent g/l H_2SO_4 and anthocyanins mg/kg) and weight of a grape and berry 100. In terms of production of grapes per hectare research has used statistical method of calculating the two-way experiences with three repetitions, each of 12 logs each. The methodology was performed after manual "field experience" of Săulescu (1967). Providing statistical and mathematical significance of differences was performed by comparison with the control, media experience. Our variety variants were composed of an unapproved elite homologated, Cabernet Franc 5/7, one clone imported from France, Cabernet Franc 348S1 and two elite clones of perspective which clones were recorded as Cabernet Franc 43Vl and Cabernet Franc 81Vl.

Biological and technological study of Cabernet Franc was based on the following topics of research were conducted at the Research Institute for Viticulture and Winemaking Development will continue to happen:
- Improve range for wine grapes (1998);
- Improved variety of biological value by applying the selection intraclonale (1998);
- Study of the oenological potential of varieties and growing areas are for improving zoning works in wine production (1998).

Wine analysis define utmost quality clones studied were related to alcohol content, total and volatile acidity, total extract, ash, polyphenols, anthocyanins, staining intensity, hue, organic acids and tannin. These or made after the following works:
- Primary Line winemaking technology to develop high quality red wines (Giosanu et al. 1982);
- Production technology of wine from vineyard Dealu Mare wine center will continue to happen (Popescu 1998).

Finally organoleptic assessment was conducted by providing wine notes.

The paper also took account of the European Community Council Regulation no. 1493-1417 May 1999 on the market in wine. It provides for a common agricultural policy for quality. This gives manufacturers the opportunity to exploit emerging markets. Wines to be designated by a geographical indication as a useful component of quality-oriented policies to better align supply on demand regardless of the type of wine produced. These relationships necessary prerequisite of scientific substantiation of work aimed at directing agro growth process in order to ensure high yields, and a constant high quality. Implementation of a quality policy in wine can only contribute to improving the conditions of sale and market expansion.

RESULTS AND DISCUSSIONS

In both clones of Cabernet Franc leaf has five lobes and is covered by a pentagonal shape. The compactness of the grape is medium (figures 1 and 2).

Production of grapes per hectare. As the average three-year study, two clones of Cabernet Franc, CF and CF 81Vl 43Vl achieved 8.02 t/ha respectively 8.15 t/ha, compared with the average experience that was 7.55 t/ha (table 1 and fig. 3). The increase in production compared with the average experience for CF 43Vl clone is 6.2%, but compared to the elite homologated CF 5/7 is 18.5%. If CF clone 81Vl increased production compared with the average experience of 8% compared with the unapproved elite homologated CF 5/7 is 20.4%.

Bifactorial variance type A factor considered elite/clone, factor B, the year of study and the factor R, repetitions. Analysis of variance from the established forms of Cabernet Franc 1% f factor of 4.77 is the value BxA interaction and to the value 7.01. The same factor f is taken for 5% E value to 3.01 and 3.84 to BxA interaction (table 2). Therefore, if variations of Cabernet Franc, significance differences for the error to 5%, 1% and 0.1% has the following values: 0.42, 0.62 and 0.93 (table 2).

Applied variants, the significance of differences is as follows:

- The influence of elite/clone (A), depending on the error, variant t1, Cabernet Franc 5/7 is distinctly significant negative (0 0). Variations t3, and t4, CF43Vl, CF 81Vl are positively significant. t2 variant, Cabernet Franc 348S1 received no significance.
- The influence of year (B), variant a1, 2007 is significantly negative while the A3 variant, 2009 is distinctly significant. Witness for all cases was the same, the average per hectare of experience.

B Significance of differences for error 5%, 1% and 0.1% respectively has the following values: 0.40, 0.55 and 0.75 (table 2).

Therefore:

– The combined influence (BxA), year-variants, depending on the error b, variants and t1a2 t1a1 (CF 5/7 in 2007 and 2008) and t2a1, t2a2 (CF 348S1 in 2007 and 2008) are very significant negative; t2a3 variants (CF 348S1/2009) t3a3 (CF 43Vl/2009) and t4a3 (CF 81Vl/2009 are very significant. t4a2 version, CF 81Vl/2008 is significantly positive. Other variants have gained significance.

– The combined influence of (AxB)-year options, depending on the error b, a1t1 variants, a2t1 (CF 5/7 in 2007 and 2008) and a1t2, a2t2 (CF 348S1 in the years 2008 and 2007) are very significant negative variants a3t2 (CF 348S1/2009) a3t3 (CF 43Vl/2009) and a3t4 (CF 81Vl/2009 are very significant. a2t4 version, CF 81Vl/2008 is significantly positive. Other variants have gained significance.

Qualitative aspects of the grapes. It is distinguished by its capacity CF 43Vl clone which has accumulated 225 g/l sugar, compared with the average experience with 215 g/l sugar (table 3). Acid content is highest in the elite CF 5/7, 3.60 g/l (H_2SO_4), compared with an average of 3.48 g/l (H_2SO_4).

The anthocyanins contained in the CF 81Vl had 569 mg/kg. and CF 43Vl. was 555.12 compared with the average experience with 551.11 mg/kg.

Quantitative aspects of grapes. Weight of elite grapes from CF 5/7 was 138 g and the average experience was 128 g. weight to CF 43Vl grapes was 130 g and the CF 81Vl was 125 g. The weight of 100 grains of CF 43Vl had 154 g and the CF 81Vl was 136 g, compared with an average of 144 g (table 3).

Qualitative aspects of wine.

In terms of alcohol content are differences between the versions: from 12.2 vol% of CF 5/7 by CF 81Vl by 13.1 vol% (table 4). CF 81Vl total extract was 26.50 g/l, the highest compared with the average of experience was 25.25 g/l. CF 5/7 nereducător extract from was 22.95 g/l compared with the average experience which was 22.15 g/l, (table 4).

The content of organic acids have the highest values in tartric acid 3347 mg/l, malic acid followed by 1187 mg/l as average data. In last place with average of acetic acid 277 mg/l, (table 5).

Total polyphenol content (index IF) had a value 62 for Cabernet Franc 81Vl and 46 for Cabernet Franc 43Vl, compared with the average value was 54 (table 6).

Total polyphenol content (index IF) has value 81Vl 62 Cabernet Franc and 46 at Cabernet Franc 43Vl compared with the average value was 54 (table 6).

Anthocyanin content was higher in Cabernet Franc 81Vl it with 556 mg/l, while the Cabernet Franc 43Vl was 498 mg/l, which was compared with the average of 499 mg/l (table 6 and fig.4).

Reaction with vanillin was 1544 mg/l and 2165 Cabernet Franc 43Vl mg/l compared with the average Cabernet Franc 81Vl which was 1834 mg/l.

Tannin content was from 2.046 mg/l for Cabernet Franc 43Vl up to 2393 mg/l for Cabernet Franc 81Vl than the average of 2145 mg/l.

The highest intensity of staining had 6886 for Cabernet Franc 81Vl and Cabernet Franc 43Vl was 5984, compared to an average of 6.4373 (table 7).

Tinge of the Cabernet Franc Cabernet Franc 43Vl value was 0.817 at Cabernet Franc 81Vl, 0789 was compared with the average was 0.815.

Optical density in the red spectrum, which most interest was the highest value of 32.45% Cabernet Franc 81Vl and Cabernet Franc 43Vl was 27.65%, compared to an average of 29.47% (table 7).

Note the largest tasting of Cabernet Franc 43Vl was 18.5, followed by Cabernet Franc 81Vl with 18.4 g/l compared with the average which was 18.2 (table 8).

CONCLUSIONS

Analysis of variance applied to the production of grapes per hectare per hectare calculated showed that there are differences between the versions.

1. After the production of grapes/ha ha, the two clones of Cabernet Franc, CF and CF 81Vl 43Vl achieved 8.02 t/ha respectively 8.15 t/ha, compared with the average experience that was 7.55 t/ha. The increase in production compared with the average experience for 43Vl CF clone is 6.2%, but compared to the elite homologated CF 5/7 is 18.5%. If CF clone 81Vl increased production compared with the average experience of 8% compared with the elite but homologated CF 5/7 is 20.4%. The influence of the elite/clone (A), depending on the error, Cabernet Franc 5/7 is distinctly significant negative (0 0). CF 81Vl and CF 43Vl variants are significantly positive. Variant Cabernet Franc 348S1 received no significance.

2. The influence of the year, according to the error, grape production in 2007 is significantly negative while the 2009 version is distinctly significant.

3. Influence of combined-year variations, depending on the error b, CF 5/7 variations in 2007 and 2008 and the years 2008 CF 348S1 and 2007 are very significant negative variants 348S1/2009 CF, and CF 81Vl/2009 are CF 43Vl/2009 very significant. CF 81Vl/2008 significant positive variant.

4. Anthocyanin content of wine was superior to the Cabernet Franc 81Vl it with 556 mg/l, while the Cabernet Franc 43Vl was 498 mg/l, compared with an average of 499 mg/l.

5. Optical density in the red spectrum, which most interest was the highest value of 32.45% Cabernet Franc 81Vl and Cabernet Franc 43Vl was 27.65%, compared to an average of 29.47%.

6. Note the largest tasting of Cabernet Franc 43Vl was 18.5, followed by Cabernet Franc 81Vl with 18.4 g/l compared with the average was 18.2.

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TABLES AND FIGURES

Table 1

Annual production of grapes, t/ha at Cabernet Franc

No. of var	Clones/ elites	Years of study and grape product			Average of years
		2007	2008	2009	
1	Cabernet Franc 5/7	6.35	6.58	7.38	6.77
2	Cabernet Franc 348S1	6.72	6.69	8.40	7.27
3	Cabernet Franc 43Vl	7.61	7.90	8.55	8.02
4	Cabernet Franc 81Vl	7.75	7.98	8.72	8.15
	Average of variants	**7.11**	**7.29**	**8.27**	**7.55**

Table 2

Analysis of variance on obtained from Cabernet Franc grape production

Cause	S P	G L	s^2	F test P = 1%		F test P = 5%	
				to E	to de BxA	to E	to de BxA
Total	28.95	44.00	0.66				
Blocks	0.14	2	0.07				
Blocks x years	0.88	4	0.22				
Variants	11.41	4	2.853	4.77	7.01	3.01	3.84
Error (a)	**1.21**	**8**	**0.151**				
Variants x years	1.16	8	0.145	0.92			
Eroarea (b)	**2.54**	**16**	**0.158**				

F test calculated from error a	2.853:0.151 = 18.894
F test calculated from error b	0.145:0.58 = 0.917
F calculated to test the interaction BxA	2.853:0.145 = 19.676
$\overline{\text{Sd}}$ error to error a differences	$\sqrt{(2x0.151):(3x3)}$ = 0.183
$\overline{\text{Sd}}$ error to error b differences	$\sqrt{(2x0.158):(3x3)}$ = 0.187

t, test		**5%**	**1%**	**0.1%**	**Height limit**		**5%**	**1%**	**0.1%**
Error	a	2.31	3.36	5.04	Error	a	0.42	0.62	0.93
Error	b	2.12	2.92	4.02	Error	b	0.40	0.55	0.75

		Average	**D +/-**	**The signific. of D**	**%**
		Error a function			
Influence clone/elite (A)			**0.42**	**0.62**	**0.93**
t1	Cabernet Franc 5/7	6.77	-0.78	oo	89.67
t2	Cabernet Franc 348S1	7.27	-0.28		96.29
t3	Cabernet Franc 43Vl	8.02	0.47	*	106.23

t4	Cabernet Franc 81Vl	8.15	0.60	*	107.95
Average, control		**7.55**	**0.00**		**100.00**
Error a function					
Influence of years (B)			**0.42**	**0.62**	**0.93**
a1	2007	7.11	-0.44	o	94.14
a2	2008	7.29	-0.26		96.53
a3	2009	8.27	0.71	**	109.45
Average, control		**7.55**	**0.00**		**100.00**
Error b function					
Combined influence of (B x A)			**0.40**	**0.55**	**0.75**
t1a1	CF 5/7-2007	6.35	-1.20	ooo	84.07
t1a2	CF 5/7-2008	6.58	-0.97	ooo	87.12
t1a3	CF 5/7-2009	7.38	-0.17		97.71
t2a1	CF 348S1/2007	6.72	-0.83	ooo	88.97
t2a2	CF 348S1/2008	6.69	-0.86	ooo	88.58
t2a3	CF 348S1/2009	8.40	0.85	***	111.22
t3a1	CF 43Vl/2007	7.61	0.06		100.76
t3a2	CF 43Vl/2008	7.90	0.35		104.60
t3a3	CF 43Vl/2009	8.55	1.00	***	113.20
t4a1	CF 81Vl/2007	7.75	0.20		102.61
t4a2	CF 81Vl/2008	7.98	0.43	*	105.65
t4a3	CF 81Vl/2009	8.72	1.17	***	115.45
Average, control		**7.55**	**0.00**		**100.00**
Combined influence of (A x B)	**Error b function**				
			0.40	**0.55**	**0.75**
a1t1	CF 5/7-2007	6.35	-1.20	ooo	84.07
a1t2	CF 348S1/2007	6.72	-0.83	ooo	88.97
a1t3	CF 43Vl/2007	7.61	0.06		100.76
a1t4	Cf 81Vl/2007	7.75	0.20		102.61
a2t1	CF 5/7-2008	6.58	-0.97	ooo	87.12
a2t2	CF 348S1/2008	6.69	-0.86	ooo	88.58
a2t3	CF 43Vl/2008	7.90	0.35		104.60
a2t4	Cf 81Vl/2008	7.98	0.43	*	105.65
a3t1	CF 5/7-2009	7.38	-0.17		97.71
a3t2	CF 348S1/2009	8.40	0.85	***	111.22
a3t3	CF 43Vl/2009	8.55	1.00	***	113.20
a3t4	Cf 81Vl/2009	8.72	1.17	***	115.45
Average, control		**7.55**	**0.00**		**100.00**

Table 3

Technological characteristics of grapes (average, 2007-2009, Valea Călugărească)

No of var	**Clone/elite**	**Grapes output t/ha**	**Sugar content (g/l)**	**Acidity must (g/l H_2SO_4)**	**Anthocyanin (mg/kg)**	**Weight of a grape (g)**	**Weight of 100 berries (g)**
1	CF 5/7	6.77	210	3.60	545.30	138	140
2	CF 348S1	7.27	213	3.55	535.00	120	145
3	CF 43Vl	8.02	225	3.43	555.12	130	154
4	CF 81Vl	8.15	211	3.33	569.00	125	136
Average, control		**7.55**	**215**	**3.48**	**551.11**	**128**	**144**

Table 4

Physico-chemical characteristics of wine (average, 2007-2009) Valea Călugarească

No of var	Clone/ elite	Alcohol %	pH	Acidity total (g/l H_2SO_4)	Volatile acidity (g/l CH_3COOH)	Sugar remainder (g/l)	Total extract (g/l)	Nonreducing extract (g/l)	Ash (g/l)
1	C F 5/7	12.2	3.58	4.88	0.35	2.60	25.55	22.95	2.68
2	CF 348S1	12.3	3.47	4.75	0.42	3.90	24.80	20.90	2.60
3	CF43Vl	13.1	3.67	5.15	0.39	2.30	24.16	21.86	2.53
4	C F81Vl	12.2	3.76	5.13	0.25	3.60	26.50	22.90	2.77
Average		**12.5**	**3.62**	**4.98**	**0.35**	**3.1**	**25.25**	**22.15**	**2.65**

Table 5

Organic acids in wine (average, 2007-2009) Valea Călugarească,

No. of var	Clone/ elite	Organic acids in wine (mg/l)							
		tartric	malic	succinic	citric	galacturonic	lactic	acetic	fosforic
1	CF 5/7	3368	1045	930	280	630	303	287	560
2	CF 348S1	3320	1322	910	309	625	440	252	590
3	CF43 Vl	3394	1034	927	294	628	302	297	550
4	CF 81Vl	3306	1347	910	329	659	448	272	630
5	**Average**	**3347**	**1187**	**919**	**303**	**636**	**373**	**277**	**583**

Table 6

Polyphenolic composition analysis (average, 2007-2009)Valea Călugarească,

No var	Clone/ elite	Total polyphenols (IF)	Anthocyanins mg/l	Reaction with vanillin, (mg/l)	Tannin
1	Cabernet Franc 5/7	49	468	1620	2.055
2	Cabernet Franc 348S1	57	476	2005	2.084
3	Cabernet Franc 43Vl	46	498	1544	2.046
4	Cabernet Franc 81Vl	62	556	2165	2.393
	Average, control	**54**	**499**	**1834**	**2.145**

Table 7

Color analysis (average, 2007-2009) Valea Călugarească

No var	Clone/ elite	Colour intensity	Tempt	Optical density (%)		
				420	520	620
1	Cabernet Franc 5/7	6.672	0.775	24.22	31.25	11.25
2	Cabernet Franc 348S1	6.207	0.880	23.35	26.52	12.20
3	Cabernet Franc 43Vl	5.984	0.817	22.59	27.65	9.60
4	Cabernet Franc 81Vl	6.886	0.789	25.61	32.45	10.80
	Average, control	**6.4373**	**0.815**	**23.94**	**29.468**	**10.962**

Table 8

Findings organoleptic wine (average, 2007-2009) Valea Cãlugãreascã

No of var	Clone/elite	Colour (0-2)	Appearance, clearness (0-2)	Flavour bouquet (0-4)	Taste (0-12)	Note to harddegus (0-20)
1	Cabernet Franc 5/7	2	2	3.0	10.8	17.8
2	Cabernet Franc 348S1	2	2	3.1	10.9	18.0
3	Cabernet Franc 43Vl	2	2	3.3	11.2	18.5
4	Cabernet Franc 81Vl	2	2	3.3	11.1	18.4
	Average, control	**2**	**2**	**3.2**	**11.0**	**18.2**

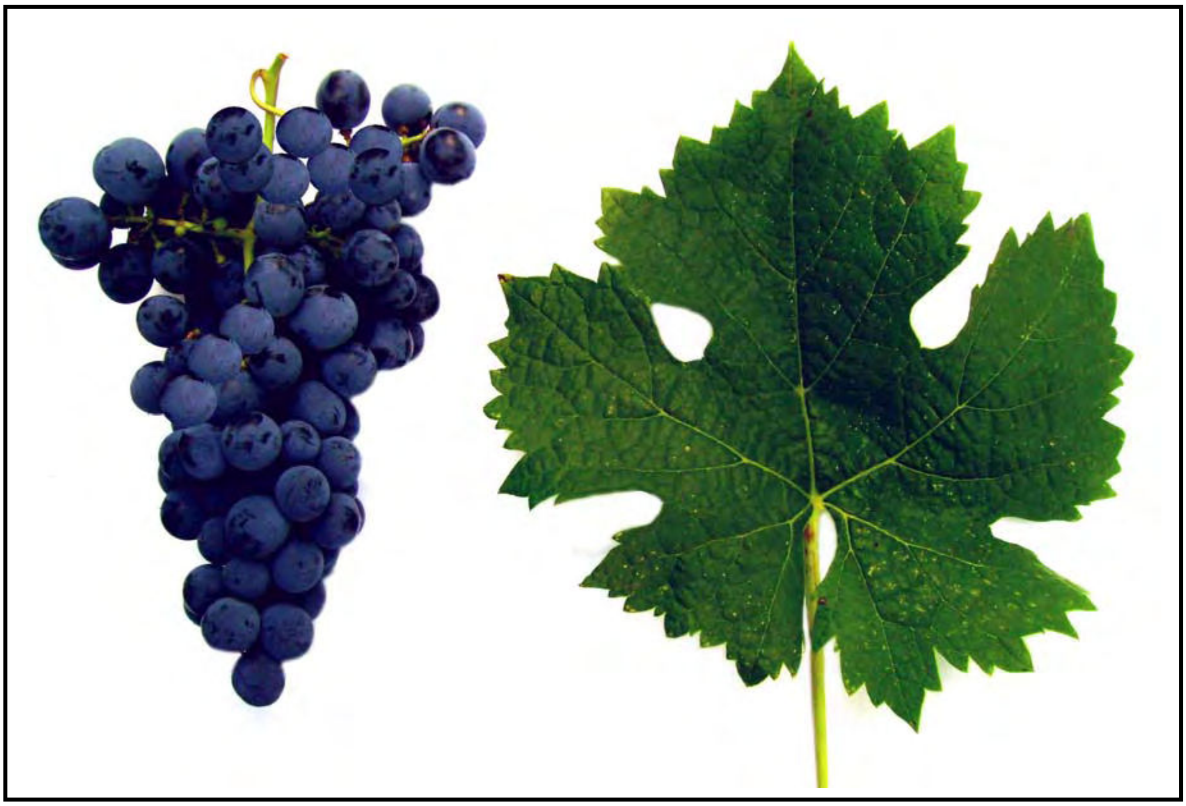

Fig. 1. Cabernet Franc 43Vl

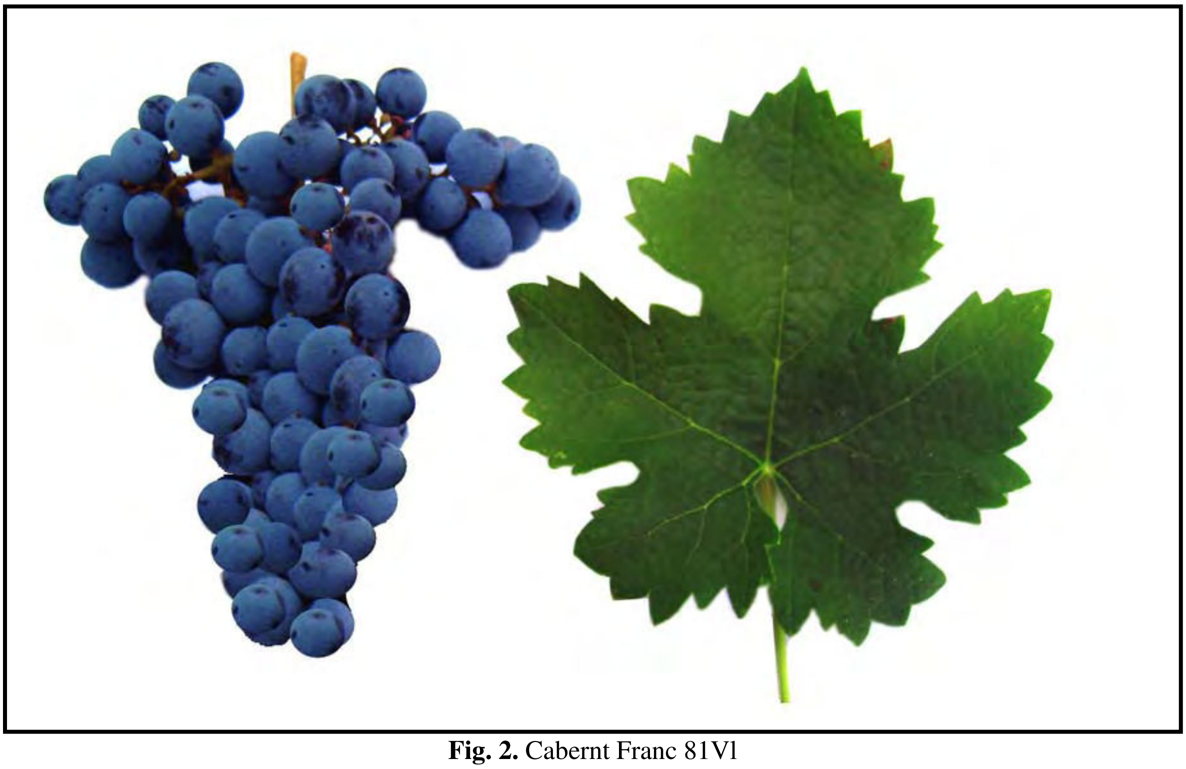

Fig. 2. Cabernt Franc 81Vl

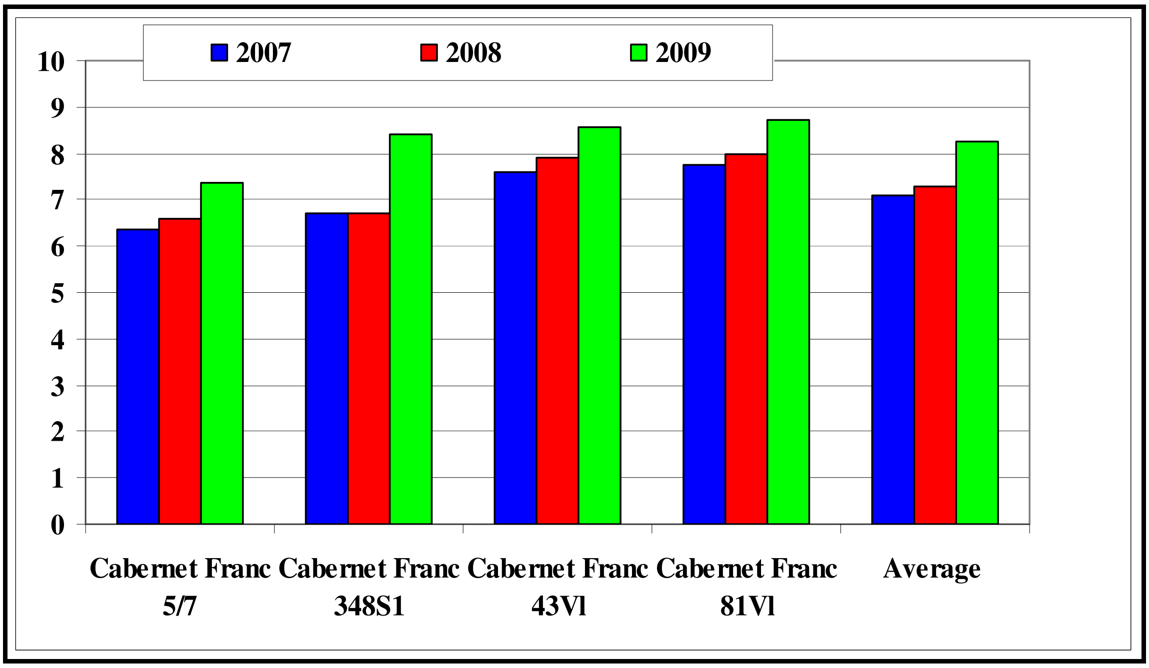

Fig.3 – Graph the production of grapes per year in t/ha of Cabernet Franc variants

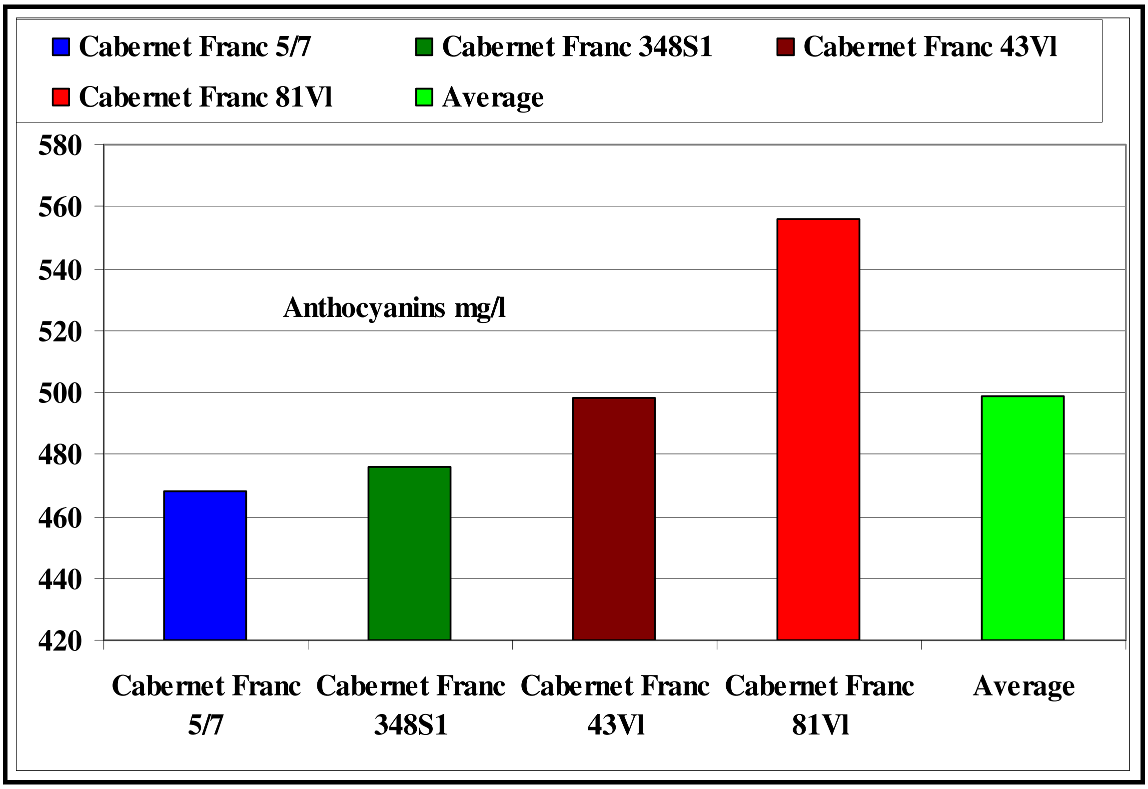

Fig.4 – Graph anthocyanins content in wines mg/l of Cabernet Franc variants

Selection of vine clones to produce certified planting material

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Keywords: serotypes, approval, quarantine diseases, viral diseases, starting material G0

ABSTRACT

It was continued research of the 4 clones recently approved (7Vl Merlot, Cabernet Sauvignon 30Vl, Cabernet Franc and Cabernet Franc 43Vl 81Vl) certificate to obtain biological material was performed between 2007 and 2009. Clones were tested for fan-leaf virus vine + Arabis mosaic virus (GFLV + ArMV), vine leafroll associated virus serotypes 1 3 (GLRaV-1 +3), Fleck vine virus (GFkV) and virus vine a (GVA) by double antibody sandwich - enzyme-linked immunosorbent assay (DAS-ELISA) (Clark and Adams, 1977) using commercial kits purchased from BIOREBA, Switzerland. As some corresponding ELISA values of biological material samples of Cabernet Sauvignon clone 30 Vl, indicated the presence of virus GFkV Fleck, was moved to devirozation by in vitro chemotherapy. Regular checks concerning the assessment of the ribavirin effect on virus elimination Fleck to clone Cabernet Sauvignon 30 Vl, allowed the choice of healthy plants that were initially propagating material G0. Plants were promoted the next steps leading to the production of certified planting material.

Parallel to the work done at fitotron continued observations in the field test which confirmed clones for approval on 18.02.11. Thus, 7Vl Merlot clone has the highest production of grapes per hectare, 10.20 tons and has a production clone Cabernet Franc 43Vl lowest, 8.02 t 8.69 compared to their average clone t. CF 43Vl gained 225 g/l sugar, (most) compared to the average experience with 213 g/l sugar. In the anthocyanins contained in grape clone of Cabernet Sauvignon 30Vl was 691.90 mg/kg, the highest value and Merlot 7Vl had the lowest value of 389.39 compared to the average experience with 551.35 mg/kg. In the alcohol content, the lowest value has a 11.9 vol% Merlot 7Vl and Cabernet Franc 43Vl had 13.1% alcohol volume than the average of 12.32 vol%.

Anthocyanin content of wine was Cabernet Sauvignon 30Vl of 604 mg/l, the largest and the Merlot 7Vl was 275 mg/l, the lowest compared with the media was 483 mg/l. Note the greatest tasting Cabernet Sauvignon was 30Vl of 18.8 and the lowest was 18.3 Merlot 7Vl than the average which was 18.5.

INTRODUCTION

Research methodology and evaluation of clones complied with EU Council Directive nr.68/193, amended by Directive 2002/11 EC in September 2002 which applies to the marketing material for the vegetative propagation of the vine. In this respect in our country it applies the law 266/2002, republished in 2011 on the production, control and certification of planting material and the Order of the Ministry of Agriculture Forestry and Rural Development 1267/2005 which provides rules and technical standards on the production, control, quality certification and marketing of planting.

Nr.1467/94 European Community Council Directive of June 20 1994 aims to coordinate the conservation; characterization and utilization of genetic resources in agriculture with particular clones are better adapted to local environmental conditions. For the genus Vitis EC draft "Genres CT 96 no. 81, the European network for grapevine genetic resources Conservation and characterization, "which has as main objective to establish a database of genus Vitis for each country.

The conditions imposed by Law 266/2002 republished in 2011 and the Order 1267/2005 (Annex 7), to expand the production of new clonal varieties and creations, stated the following conditions mandatory: the purity and authenticity of the 100 % and plant health (quarantine diseases and virus diseases) should be checked periodically (depending on the biological category), the authorized institutions.

As known, the Bordeaux wine range consists of 60% Cabernet Sauvignon, Merlot, Cabernet Franc 30% and 10% and was designed such that it does not diminish anything from the fame of the first kind. These varieties are grown in France in the Bordeaux region in northeastern Italy and California, but in our few vineyards. Of these genotypes, Valea Cãlugãreascã approved recently 7VIMerlot, Cabernet Sauvignon 30Vl, Cabernet Franc and Cabernet Franc 43Vl 81Vl.

Research and Development Institute for Viticulture and Winemaking Valea Calugareasca sought to increase competitiveness in the market economy, adapting to the various clones' environmental conditions such Dealu Mare vineyard and other vineyards with similar environmental conditions, known for quality wines. He pursued so as to ensure a higher quality of production for domestic consumption and export.

Production of certified planting material which recently began to be produced in our study was that there were busier Oprea şi Indreaş (2000), Guţă et al.(2008).

MATERIALS AND METHODS

There have been positive maintenance of biological material composed of the four clones listed in order to obtain propagating material initially G0: Merlot 7Vl (nr.1062/18.02.11 approval certificate), Cabernet Sauvignon 30Vl (certificate of approval nr.1063/02/18/11), Cabernet Franc 43Vl (nr.1064/18.02.11 approval certificate) and Cabernet Franc 81Vl (nr.1065/18.02.11 approval certificate). Therefore, these clones were recorded in the Official Catalogue of Varieties of crops in Romania in 2011. If the above maintenance clones were carried out in the fields of improvement and were selected for laboratory testing and then two hubs.

Following assessment of their health by ELISA was selected for breeding a single completely healthy block that was elected to form the material initially G0, in consultation with the breeder. This corresponded to the authenticity; description ampelographic previously carried out by the breeder and at least visually was free of symptoms of harmful organisms.

To comply with traceability in the process of breeding, were taken the following steps:

a) were tested for viruses listed in Annex 5 and other viruses listed in plant quarantine legislation. After testing if found to be free of harmful organisms have been kept in storage at the National Institute of Research and Development of Biotechnology in Horticulture, Ştefăneşti-Arges. Here were taken all the measures to prevent infections with different pests and provide the initial material of the breeder or breeder generation G0, for beginning the process of propagation.

b) it was made up the stock core multiplied by vegetative plants, G1 generation, the plant selected by the breeder that the test was found to be free of harmful organisms listed in Annex 5 (Order 1267/2002) and were insulating core placed in the greenhouse where they have taken all measures to prevent infections each year checking the netipice plants.

c) in two cases and only in some logs was found infection with pests. Those logs were subject of devirozation by thermotherapy and multiplication in vitro. Then it followed the retesting and re-check of authenticity. Plants after retesting were found free of viruses and other viruses similar bodies were reassessed for the presence of other harmful organisms listed in Annex. 5 and then were transferred to conservation;

d) propagating material originally produced in G1 by classical methods or other methods of propagating from the roots, in total isolation and preventing infestation of pests, will be original material, the generation of G2, which is financing the establishment of plantations basic mother. It is composed of young vine plants rooted not grafted category certificate, schedule production of certified propagation material provided in Annex No. 10 (Order 1267/2002).

Clones were tested for fan-leaf virus vine + Arabis mosaic virus (GFLV + ArMV), vine leafroll associated virus serotypes 1 3 (GLRaV-1 +3), Fleck vine virus (GFkV) and virus vineyard A (GVA). Testing was done by double-antibody sandwich enzyme-linked, immunosorbent assay DAS-ELISA (Clark and Adams, 1977) using commercial kits purchased from BIOREBA, Switzerland.

Technological characterization of grapes was carried out in the field test began with the production of grapes per hectare calculated and quality (sugar content g/l acid equivalent g/L H_2SO_4, anthocyanins, mg/kg), the weight of grapes and 100 grains.

Analysis of wine define utmost quality clones studied were related to alcohol content, total acidity and volatile remaining sugar, extract all, extract and non reducer anthocyanins (mg/l). Analysis took into account his "Determinants of quality wines" written by Macici M. (2000) and Macici M. (2008) with Muntenia and Oltenia wines work. Dealu Mare.

The final assessment was performed by giving marks to the wine taste.

Technological characterization of varieties of plantation records was made after scientific research Valea Calugareasca ICDVV recommended for the following topics:

- Improving product range for wine grapes (1998).
- Study of the oenological potential of varieties and growing areas are in the works to improve the zoning of wine production (1998).

Among the authors who have studied the varieties Merlot, Cabernet Sauvignon and Cabernet Franc are many authors among which the Oprea şi Indreaş (2000), Popescu et al. (1978).

RESULTS AND DISCUSSIONS

Recently approved and those clones were tested for fan-leaf virus vine + Arabis mosaic virus (GFLV + ArMV), vine leafroll associated virus serotypes 1 3 (GLRaV-1 +3), Fleck vine virus (GFkV) and vine virus a (GVA) by double antibody sandwich - enzyme-linked immunosorbent assay DAS-ELISA (Clark and Adams, 1977) using commercial kits purchased from BIOREBA, Switzerland.

As some corresponding ELISA values of biological material samples of Cabernet Sauvignon clone 30 Vl, indicated the presence of virus GFkV Fleck (table 1) was switched to chemotherapy in vitro devirozarea (Guţã et al., 2008) to obtain material Initially G0 multiplication.

Plants regenerated in vitro on medium with ribavirin were acclimatized to their prosecution in terms of possible recurrence of infection GFkV the next two years. Periodic checks on the assessment of the effect of ribavirin on virus elimination Fleck to clone Cabernet Sauvignon 30Vl, allowed the choice of healthy plants that were initially propagating material G0. Clones were promoted to the next steps to produce certified planting material (fig.1-4).

In greenhouse Depositary new clones belonging to the biological material is approved during the assessment of the main characters in order to assess stability ampelographic morphophysiological propagating material G0 Originally produced by biotechnological methods and maintained under controlled conditions in the plantations compared with the breeder material (fig.1-4).

The production of grapes per hectare. Study of the four clones mentioned above was conducted in field test (fig. 5-8), plot where they were proposed for approval. As the average of the three-year study (2007-2009), Merlot clone 7 Vl recorded the highest yield of grapes per hectare (10.20 tons), while clone Cabernet Franc 43Vl with a yield of 8.02 t/ha was estimated less productive than their average 8.69 tons (tables 2, 3 and fig.9). A significant increase in production from the average experience of 17.4%, was recorded for 7Vl Merlot clone.

Qualitative aspects of the grapes.

CF clone 43Vl quality grapes, evidenced by the accumulation capacity of 225g sugar/l, compared with average experience with 213 g/l sugar (table 3).

High acid content of 4.29 g/l (H_2SO_4) was the Cabernet Sauvignon clone 30Vl than the average experiment 3.75 g/l (H_2SO_4). The lowest value of 3.33 must acidity g/l (H_2SO_4), had a clone Cabernet Franc 81Vl.

In terms of anthocyanin content in grapes Cabernet Sauvignon clone 30Vl were recorded valoariea maximum 691.90 mg/kg, while the Merlot clone 7 Vl only 389.39 mg/kg, compared with average experience with 551.35 mg/kg (table 3).

Quantitative aspects of the grapes.

Merlot grape clones weight to 43Vl 7Vl and Cabernet Franc was 130 g and 110 g 30Vl Cabernet Sauvignon, while the average value of the experience was 124 g. The highest weight of 100 grains was recorded in Merlot 7Vl (166 g) and the lowest value, 136 g was the Cabernet Franc 81Vl compared to the average experience of 150 g (table 3).

Qualitative aspects of wine.

In terms of alcohol content differences were found between clones, as follows: from 11.9 vol% to 13.1% Merlot 7Vl to the Cabernet Franc 43Vl, compared with an average of 12.32 g/l (table 4).

Total extract of 26.5 g/l recorded Cabernet Franc 81Vl, was the highest, and the Cabernet Franc 43Vl has value 24.2 g/l, compared with average experience (25.3 g/l).

Nonreducing extract(g/l) the value 23.72 g/l of Cabernet Sauvignon 30Vl was highest, while the Merlot 7Vl was the lowest of 20.46 g/l compared to the average experience of 22.24 g/l (table 4).

Anthocyanin content showed higher values in Cabernet Savignon 30Vl (604 mg/l) and the Merlot 7Vl was 275 mg/l, the lowest compared with the media was 483 mg/l (table 4 and fig. 10).

Depending on the note to clone Cabernet Sauvignon 30Vl tasting by 18.8 deck stood first while Merlot 7Vl was only 18.3 points than the average which was 18.5 (table 4).

CONCLUSIONS

In the coming years, creating nuclei of biological material of high genetic value wine, free of viruses, will provide a secure and competitive supply of potential internal and external customers. This offer will be the first source storage propagating material of the original categories, basic and certified as a guarantee of future genetic quality and health of vine plantations on farms own research stations and on farms production.

1. As a result, positive health selection as the first stage of selection for healthy vine multiplication of biological material is insufficient and must be supplemented by laboratory tests as the expression of symptoms of viral diseases is favored by several factors, such as susceptibility of the variety, plant age, conditions environment, the association of different viral agents.

2. Periodic checks on the assessment of the effect of ribavirin on virus elimination Fleck to clone Cabernet Sauvignon 30 Vl, allowed the choice of healthy plants that were initially propagating material G0.

3. As the average of the three-year study (2007-2010), the clone has the highest 7Vl Merlot grape production per hectare, 10.20 tons and Cabernet Franc 43Vl clone has the lowest production, 8.02 tons, compared with their average 8.69 t. The increase in production compared to the average experience for 7Vl Merlot clone is 17.4%.

4. Alcohol content of wine was from 11.9 vol% for up to 13.1% Merlot 7Vl, Cabernet Franc 43Vl, compared with an average of 12.32 g/l.

5. Anthocyanin content of wines had the highest value in Cabernet Savignon 30Vl of 604 mg/l, while the Merlot 7Vl was 275 mg/l, the lowest compared with the media was 483 mg/l.

6. Note the greatest tasting Cabernet Savignon was 30Vl of 18.8, followed by Cabernet Franc 43Vl by 18.5 g/l compared to the average which was 18.5.

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TABLES AND FIGURES

Table 1

ELISA results for detection of viruses in the clones studied

Test	Virus testing	Result analysis
Merlot 7 Vl (log 1)	GFLV+ArMV	negative
	GLRaV 1+3	negative
	GFkV	negative
	GVA	negative
Merlot 7Vl (log 2)	GFLV+ArMV	negative
	GLRaV 1+3	negative
	GFkV	**positive**
	GVA	negative
Cabernet Sauvignon 30 Vl (log 1)	GFLV+ArMV	negative
	GLRaV 1+3	negative
	GFkV	**positive**
	GVA	negative
Cabernet Sauvignon 30 Vl (log 2)	GFLV+ArMV	negative
	GLRaV 1+3	negative
	GFkV	**positive**
	GVA	negative
Cabernet franc 43 Vl (log 1)	GFLV+ArMV	negative
	GLRaV 1+3	negative
	GFkV	negative
	GVA	negative
Cabernet franc 43 Vl (log 2)	GFLV+ArMV	negative
	GLRaV 1+3	negative
	GFkV	**positive**
	GVA	negativ
Cabernet franc 81 Vl (log 1)	GFLV+ArMV	negativ
	GLRaV 1+3	negativ
	GFkV	negativ
	GVA	negativ
Cabernet franc 81 Vl (log 2)	GFLV+ArMV	negativ
	GLRaV 1+3	negativ
	GFkV	negativ
	GVA	negativ

Table 2

Annual production of grapes, t/ha at the clones studied (Valea Călugarească, 2007-2009)

No. var	Years / Clones studied	2007	2008	2009	Average of years
1	Merlot 7Vl	9.70	10.30	10.60	10.20
2	Cabernet Sauvignon 30Vl	8.01	8.38	8.82	8.40
3	Cabernet Franc 43Vl	7.61	7.90	8.55	8.02
4	Cabernet Franc 81Vl	7.75	7.98	8.72	8.15
	Average	8.27	8.64	9.17	8.69

Table 3

Technological characteristics of grapes (average data 2007-2009, Valea Călugãrească)

Nr. of var	Clones studied	Grapes output t/ha	Sugar content (g/l)	Acidity must (g/l H_2SO_4)	Anthocyanins (mg/kg)	Weight of a grape (g)	Weight of 100 berries (g)
1	Merlot 7Vl	10.20	206	3.95	389.39	130	166
2	CS 30Vl	8.40	208	4.29	691.90	110	144
3	CF 43Vl	8.02	225	3.43	555.12	130	154
4	CF 81Vl	8.15	211	3.33	569.00	125	136
	Average	8.69	213	3.75	551.35	124	150

Table 4

Physico-chemical characteristics of wine (average Valea Călugarească, data 2007-2009)

No	Clones studied	Alcohol %	Acidity total (g/l H_2SO_4)	Volatile acidity (g/l CH_3COOH)	Sugar remainder (g/l)	Total extract (g/l)	Non-redu-cing extract (g/l)	Anthocyanins mg/l	Note to harddegus (0-20)
1	Merlot 7Vl	11.90	5.66	0.43	3.86	24.3	20.46	275	18.3
2	Cab.S 30Vl	12.08	5.46	0.39	2.56	26.3	23.72	604	18.8
3	Cab.F 43Vl	13.1	5.15	0.39	2.30	24.2	21.86	498	18.5
4	Cab.F 81Vl	12.2	5.13	0.25	3.60	26.5	22.90	556	18.4
	Average	12.32	5.35	0.37	3.08	25.3	22.24	483	18.5

Fig.1 – Merlot 7Vl at G0

Fig.2 – Cab. S.30Vl at G0


Fig.3 – Cabernet Franc 43Vl at G0


Fig.4 – Cabernet Franc 81Vl at G0


Fig. 5 - Merlot 7Vl


Fig. 6 - Cabernet Sauvignon 30Vl

Fig. 7 - Cabernet Franc 43Vl

Fig. 8 - Cabernet Franc 81Vl

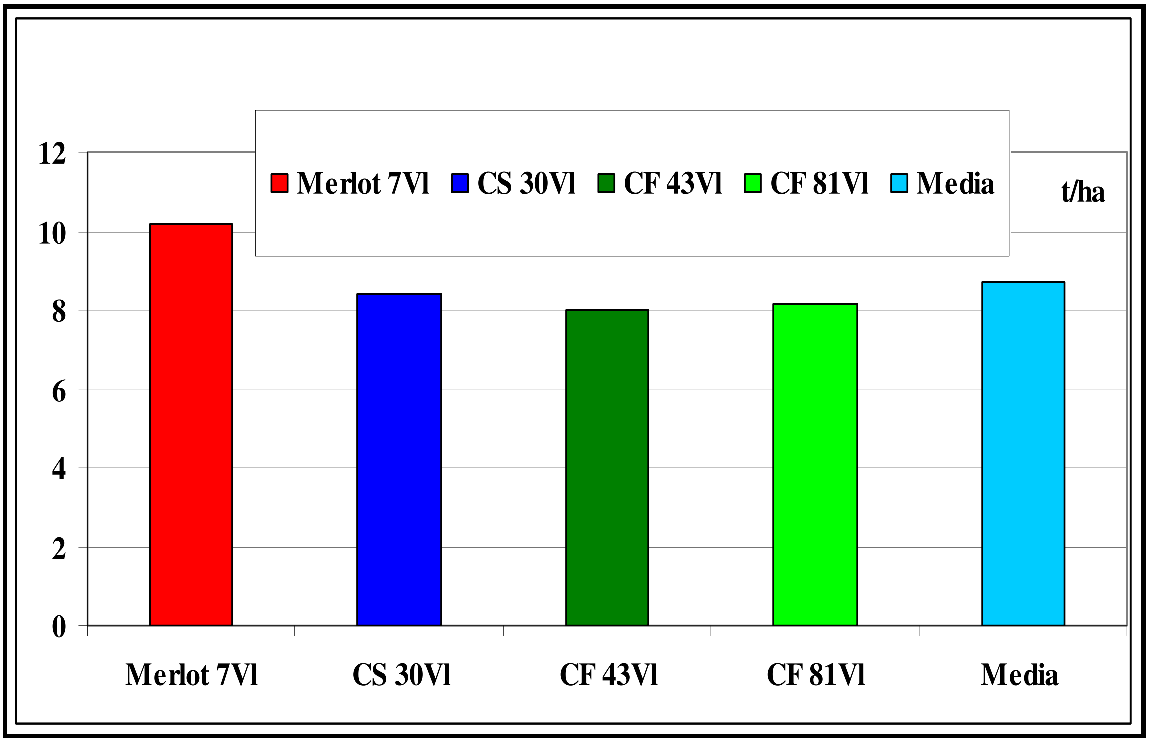

Fig. 9 – Graph the production of grapes per year in t/ha of variants

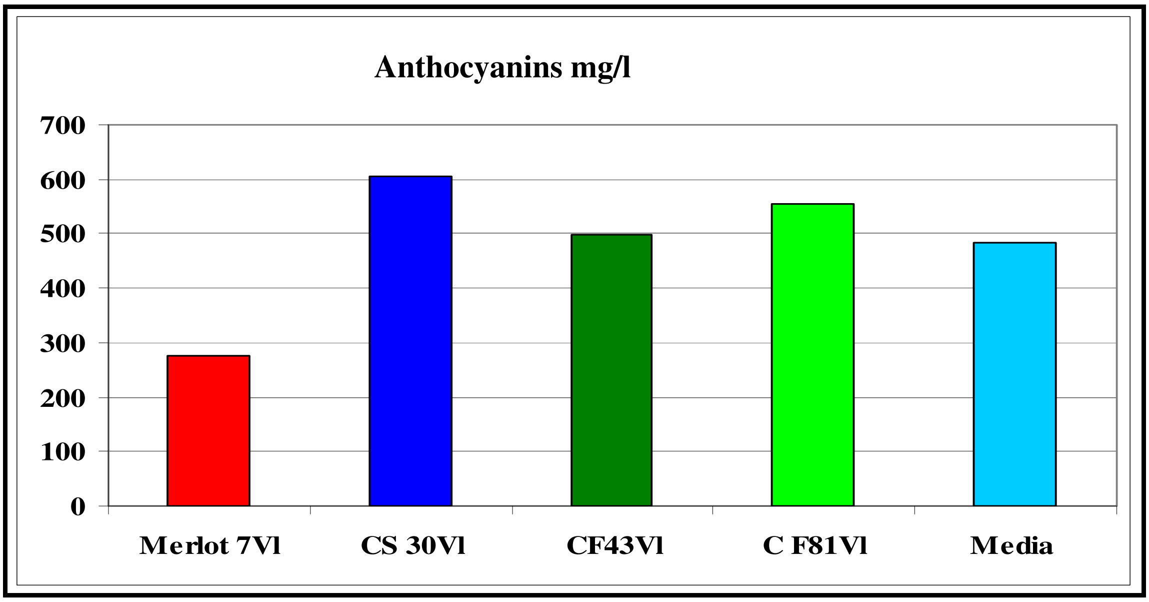

Fig. 10– Graph anthocyanins content in wines mg/l of variants

The combined effect of maceration and pectolytic enzyme preparations on extraction of terpenes compounds by flavour grapes

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Key words: flavored grapes, maceration, enzymatic preparation, volatile terpenes, bound terpenes

ABSTRACT

The results obtain shows that using in a different variant of maceration can be a notable difference between them concerning wines chemical composition parameter, but mostly in concerning terpenes complex parameters and the proportions. The researches some enzymatic preparation using during the maceration process in flavour wine technology have a positive effect on wine volatile terpenes content, result an product with better aromatic potential.

INTRODUCTION

The flavored wines which are obtained from the varieties of grapes that have the capacity to biosynthesize and to accumulate the flavor substances (linalool, geraniol, α terpenol) in the superficial or profound stratum of the peel, reclaim an elaborate technology, specific to increasing their flavored potential (Stoica, 2003).

Monoterpenes found in grapes as free - as odorant and combined non-volatile, odorless linked to one molecule of glucose, itself linked to arabinose, rhamnose or apioză, combined fraction is preponderant compared to the free (Dagan, 2006, Fretz et al., 2005).

Further, the flavored wines technology refers at two fundamental objectives: the extraction of primary flavors from the grapes and the favorisation of the formation of the secondary flavors in fermentation.

Therefore, the prefermentative phase is crucial in obtaining flavored wines. In the course of time, it realized many researches regarding this aspect and the conclusion was that using the enzymatic preparation has positive consequences in increasing the flavored potential of wines through the liberation of terpenes from the bounded compounds (Bertrand, 1996; Wirth et al., 2001, Stoica et al., 2008,)

Terpenes flavors are those, which dominate in grapes and the terpens monohydric alcohols are the most important, from an olfactory point of view. Yet, any of those volatile compounds, considered as individual, cannot provide a typical flavor of "muscat" kind, while their general mixture lead to a flavored, typical note of wines.

MATERIALS AND METHODS

It used, as raw material, the grapes of Tămâioasă românească variety, from Drăgăşani vineyard. The grapes were harvested in an absolute ripeness, which leaded to the required parameters, necessary for obtaining flavored wines VDOCC. The enzymatic preparation, which was used, is Vinozym G 2.5 g/hl. The preparation was used in two variants of maceration: classical and cold maceration.

The grape has fallowing quality parameters: sugar 220 g/L, acidity 5.85 g/L tartaric acid, volatile terpenes 3080 g/kg berry, bound terpenes 9410 g/kg berry. It was applied a sugar correction of must with 25 g/L.

The experimental variants are:

V_1 = Control (white vinification)
V_2 = Classic maceration 24 h
V_3 = Classic maceration 24 h + enzymatic preparation
V_4 = Classic maceration 48 h
V_5 = Classic maceration 48 h + enzymatic preparation
V_6 = Cold maceration 24 h

V_7 = Cold maceration 24 h + enzymatic preparation
V_8 = Frozen grapes (2^0C) + classic maceration 24 h
The suspend of fermentation was made with SO_2 (150 mg/L) and refrigeration at the 11. 5 - 12 vol. % alcohol.

To pursue joint influence of selected yeasts, enzymes and length of maceration on the merits of aromatic wines Tămâioasă românească installed the next set of experimental variants:

V_1 = White vinification L.I. + SO_2 - Control
V_2 = White vinification L.S.A. + SO_2Classic maceration 24 h
V_3 = LI+SO_2Classic maceration 24 h
V_4 = LI+SO_2Classic maceration 36 h
V_5 = LI+SO_2Classic maceration 48 h
V_6 = LSA+SO_2Classic maceration 24 h
V_7 = LSA+SO_2Classic maceration 36 h
V_8 = LSA+SO_2Classic maceration 48 h
V_9 = LI+SO_2Classic maceration 24 h + pectolytic enzyme
V_{10} = LI+SO_2Classic maceration 36 h + pectolytic enzyme
V_{11} = LI+SO_2Classic maceration 48 h + pectolytic enzyme
V_{12} = LSA+SO_2Classic maceration 24 h + pectolytic enzyme
V_{13} = LSA+SO_2Classic maceration 36 h + pectolytic enzyme
V_{14} = LSA+SO_2Classic maceration 48 h + pectolytic enzyme

Experimental condition: Grapes - Tămâioasă românească: Glucids at vinification 230 g/L; Acidity at vinification 4.36 g/l H_2SO_4 ; TVL 6326 g/kg berry, TLP 9114 g/kg berry, SO_2 – 60mg/L; L.S.A. 6mil/ml; Enzymes LALLZYME – 2.5 g/hl; Temperature of maceration 22-23 ^0C

Analyses for identification and determination of terpenes compounds were performed using gas chromatography and immiscible solvent extraction, most used for concentration and purification of volatile compounds. Both methods are recommended and supported by national and international profile.

RESULTS AND DISCUSSIONS

The values of the principal composition constituents of Tămâioasă românească wines are write in table 1.

Harvesting at the moment established on bases maturation process, the grapes has fermented glucose content able to obtain fermentation on the important alcohol proportion.

By suspend of the alcoholic fermentation it was able to obtain values 12 vol % and a residual sugar content by 30 g/L.

The glycerol registered adequate values of alcoholic degree oscillating between 8.06 g/L (V_1) and 11.5 g/L (V_5).

Reduced extract was in concordance with the maceration type, with following values: 25.4 g/L (V_1 - without maceration) and 28.68 g/L (V_3), 29.22 g/L (V_5), 27.83 g/L (V_7) and 31.25 g/L (V_8).

Volatile terpenes registered values which oscillating between 2000 µg/L (V_1) (control) and 3000 µg/L (V_7) with could maceration 24 h and enzymatic preparation (Vinozym G 2.5 g/hl).

It was noticed that in classic maceration variant - 24 h and 48 h - volatile and bound aromatic profile is better represented than control variant (V_1). In the same, in variants with enzymatic preparations the values of the volatile terpenes are increase comparative variants with out enzymes.

It was noticed could maceration variant 24 h recording the most important growing. which can be evident at could maceration variant with Vinozym G.

In table no. 2 it was presented the measure of the terpenes substances of the Tămâioasă românească wines.

In all the variants can be observed an important content of the linalool, closer by the α-terpineol. The remarkable variants are that could maceration and in specially V_7, which it was macerated with Vinozym G. It's making evident the variants V_3 and V_5 too, which have the different duration of the maceration 24 h and 48 h, both with pectolityc enzymes.

Under the acids influence in the must, the biggest quantity of the linalool, geraniol and nerol cyclisated and transformed itself in α terpineol, which is apparently the most stabile free alcohol (fig.1).

Regarding the sum of the major monoterpenic alcohols, a value which give the "muscat" tipicity to the wine's flavor, can be seen that the unmarked, control variant has a lower content, comparing to the macerated ones. At all macerated variants (with or without enzymes) the L+N+G parameter has approximately 1000 μg/L the wine present a typical flavor. It can be noticed, in specially V_4 variant. In exchange, V_1 and V_7 variants do not fit in the optimal value, because of their flavors, to little noticed (V_1) and much strong, atypical (V_7).

The dates from Table 3 show the combined influence of yeast, the length of maceration and pectolytic enzymes on the aromatic potential of Tămâiosă românească wines.

Overall the experiment shows that fermentation-maceration process, regardless of yeasts involved in the metabolism of carbohydrates category determines enrichment of must-wine with flavors through a better extraction of terpens compounds present in the composition of grape husks from mixture resulting after pressing.

In general aromatic substance increases as it extends the maceration. On two types of yeasts that single factor, but also with pectolytic enzymes, the results are clearly superior to versions, which were additionally activated selected yeasts. The use of selected yeasts and enzymes pectolytic, the proportions of free terpenes extracted is between 75.82% (24 hours of maceration) and 89.20% (to 48 hours of maceration) and bound terpenes are extracted in proportions ranging from 63.60% (pentru24 hours of maceration) and almost 65% (for 48 hours of maceration).

Carefully assessing the results it is clear contribution of pectolytic enzymes to the enrichment aromatic fund for both yeasts type.

The fermentation with indigenous yeasts (LI), depending on the length of maceration pectolytic enzymes causes the enrichment fund aromatic (TVL + TLP) with 39.0% the length of maceration for 24 hours and 44.5% the length of maceration of 36 hours. Where use of selected yeasts contribution of pectolytic enzymes are 39.64% in the maceration period of 24 hours and 36.5% the length of maceration for 36 hours.

It is clear that the ratio of extraction is higher flavors within 24 hours of maceration. This is due to rapid fermentation start the action of the large number of viable yeasts in the initial population and training properly addition of alcohol, key factor in the process of extracting flavor type terpenes.

CONCLUSIONS

Tămâioasă românească from Drăgăşani variety give flavor wines by high quality using a special technology. For using enzymatic preparation make facile the extraction of terpenes from grapes berry's peel with the intensification of the polygalacturonase activities. They catalyze hydrolyses of pectin from the structure of cellular membrans.

Time and temperature of the maceration develop the enzymatic action, which determined a quiqly hydrolyses for the pectin and protein substances from peels.

The enzymatic preparation used in flavored wine technology lead to the hydrolysis of the forerunners of the flavors (and their release in the product). Their activity establishes a certain releasing effect for a supplementary quantity of flavors, which in other situation would remain in a glucosidal form leading to the increase of the free terpens content of the product.

Therefore, Tămâioasă românească variety of wines, obtained în Drăgaşani vineyard, can be noticed by the delicacy of their flavor with rose, honeycomb, acacia flower and linolen tree nuances.

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TABLES AND FIGURE

Table 1

The values of chemical composition content at wines Tămâioasă românească

Variants	Alcohol vol.%	Total acidity g/L H_2SO_4	Ph	Glycerol g/L	Residual sugar g/L	Reduced extract g/L	TVL µg/L	TLP µg/L
V_1	12.0	4.21	3.1	8.06	30	25.40	2000	1560
V_2	11.9	4.40	3.5	9.86	33	26.16	2100	1865
V_3	12.2	4.32	3.7	11.04	28	28.68	2420	2850
V_4	11.9	4.40	3.7	9.86	33	26.52	2080	1600
V_5	12.0	4.40	3.7	11.5	31	29.22	2280	3100
V_6	12.1	4.52	3.6	8.36	28	25.95	2600	2300
V_7	12.0	4.48	3.5	10.5	30	27.83	3000	2980
V_8	12.0	4.30	3.2	13.34	30	31.25	2280	2450

TVL= volatile terpenes. µg/L; TLP= bound terpenes. µg/L

Table 2

The terpens substances dosing in wines of Tămâioasă românească

Variants	Linalool µg/L	α-terpineol µg/L	Nerol µg/L	Geraniol µg/L	Other volat. subst.µg/L	L+N+G µg/L
V_1	633	635	51	196	843	880
V_2	719	486	110	227	558	1056
V_3	987	671	121	397	244	1505
V_4	739	496	100	257	498	1096
V_5	842	334	107	426	571	1375
V_6	1049	647	84	369	451	1502
V_7	1316	692	154	507	331	1977
V_8	749	647	110	289	485	1148

Table 3

Conjugated influence of selected yeasts enzymes and length of maceration on the aromatic potential of Tămâioasă românească wines

Variants	Length of mace-ration. hour	Total arome in wine µg/l	TVL µg/l	TLP µg/l	TVL extracts %	TLP extracts %	Increase of flavors± compared to the control	
							TVL %	TLP %
V_1	-	6205	2325	3880	36.75	42.57	-	-
V_2	-	6235	2350	3885	37.14	42.62	1.07	0.12
V_3	24	6960	2910	4050	46.00	44.43	25.16	4.38
V_4	36	7310	3060	4250	48.37	46.63	31.61	9.53
V_5	48	7828	3260	4568	51.53	50.12	40.21	17.73
V_6	24	7476	3216	4260	50.83	46.74	38.32	9.79
V_7	36	7935	3360	4575	53.11	50.19	44.51	17.91
V_8	48	8495	3670	4225	58.01	52.94	57.84	24.55
V_9	24	9676	3951	5725	62.45	51.84	69.93	47.55
V_{10}	36	10567	4157	6410	65.71	59.35	78.56	65.20
V_{11}	48	10510	4162	6348	65.79	58.67	79.01	63.60
V_{12}	24	10436	4088	6348	64.62	69.65	75.82	63.60
V_{13}	36	10830	4450	6380	70.34	70.00	91.39	64.43
V_{14}	48	10800	4399	6401	69.54	70.23	89.20	69.94

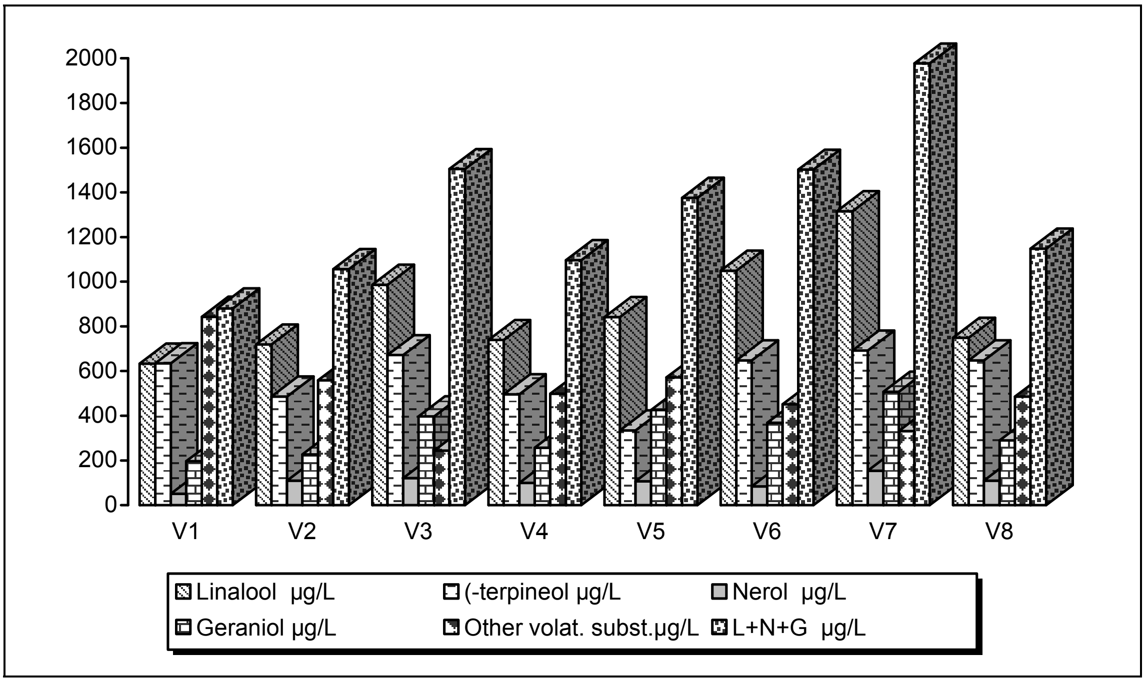

Fig.1. The terpens compounds Tămâioasă românească wines

Comparative analysis of the main elements which define viticultural "terroir" and their influenece on the Dornfelder variety

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Keywords*:* vineyard, climatical index, grape varietes, favorability

ABSTRACT

Terroir is an unique word, which can't be translated in any language, but basically, the notion of terroir includes all natural elements that can't be significantly influenced by man. In the last decade, has become a word "fashionable", often, the distinctive character and quality of wines, are described with reference only to the qualities of the natural environment where are cultivated grape varieties. The concept of terroir has to be, however understood, like a relationship of interdependence between the natural environment, vineyard and variety. This paper represents a synthesis in which was tried, through a comparative study, to highlight the behavior of the variety of German origin Dornfelder, in two areas very different in terms of ecopedoclimatic conditions – the experimental field of the ampelographic collection of the University of Agronomical Sciences and Veterinary Medicine, Bucharest and Rheinhessen, Ingelheim am Rhein, Germany. The study conducted by analyzing the main elements that define the terroir of these two areas, we can say that the variety Dornfelder suits best the natural environment of the two growing areas, apparently very different in terms of terroir conditions.

INTRODUCTION

Starting from the consideration that each area of cultivation of the vineyard has its specific and unique, which is reflected in his wines, more or less consistent from year to year, and, to some extent, no matter of growers and winemakers interventions, there was a greater concern in evaluating the favorability of a viticulture area in terms of producing authentic wines and "custom", concern which has been embodied in the growing practice of introducing the concept of "terroir". Basically, the French word "terroir" is used to describe the natural environment of any wine region. It is a combination of soil, terrain and every aspect of climate, which includes precipitation, wind speed, sunshine duration, maximum and minimum average temperature. Terroir influence and manages to print a "character" on the quality of grapes grown. In other words, "in the plant kingdom only vineyard manages to reveal the true flavor of the earth" (Rigaux, 2006).

MATERIALS AND METHODS

To analyze the elements that define the specificity of a complex behavior and its influence on the variety Dornfelder, the research was conducted during 2007/2009, in two units of the terroir - the experimental field of the Ampelographic Collection from U.S.A.M.V Bucharest, and Rheinhessen, Ingelheim am Rhein, Germany. The general data regarding the ecopedoclimatic conditions in which they conducted the research were recorded at weather station Baneasa and the Research Center DLR - RNH Oppeinheim, Rheinhessen. According to the objectives were carried out observations and measurements in the following directions: on the main climatic factors and synthetic indicators, on the quality and profile of wine depending on the existing soil, regarding the qualities of the variety (sugars content and acidity). The variety Dornfelder is the most well known variety for German red wine and on the global market was and still is a huge success. Dornferlder was obtained by August Herold in 1955 in Weinsberg, in his genealogy is a cross between two varieties of two major German red grapes, Helfensteiner x Heroldrebe. Fortunately, it has inherited more of the positive attributes and very little of the negative. He began to be cultivated in 1979, quickly becoming quite popular in Germany, because it gives good results in terms of the wine conditions, traditionally, were seen as more appropriate for white wine production. In Romania, the variety Dornfelder began to be cultivated only in 2003, in the experimental field of the Ampelographic Collection of U.S.A.M.V, Bucharest and small areas in Mehedinti, Vânju Mare.

RESULTS AND DISCUSSIONS

The two wine areas were analyzed in parallel, by detailing the elements that define their natural environment, being done a detailed analysis of elements related to geographical location, geology, soil, climate, precipitation, quality and profile of the wine obtained, etc., in Tables 1 and 2, highlighting also the specific climatic conditions of the two wine years analyzed, which showed a range of features and whose effect was reflected both in the development of vegetative cycle, but especially in the level and quality of harvest grapes.

The evaluation of favorability of the two areas are assessed based on ecoclimatic indices and it can be seen a small water resources for the experimental field USAMV, Bucharest that registers values of the coefficient between 0.65 to 0.80 and the Rheinhessen region, has moderate water resources, with values between 0.8 to 0.9. Bioclimatic index values, recorded during the studio, have high values of 10.16 to 12.4 (positive cultivation of quality red varieties).The values for the index of the oenoclimatic values (IAOe), indicating a high degree of favorability – 5092 - 5266 (Bucharest) and the Rheinhessen area values are between 4266 - 4466, representing an area in the middle favorability for obtaining red wines.

In conclusion, there is some similarity between the years 2007 in Bucharest and Rheinhessen, but further to the north, Germany has benefited from lower temperatures and higher precipitation, which was in favor of the vineyard this year. But 2008 was better in Bucharest than in the Rheinhessen, higher temperatures led to higher sugar accumulation, therefore, and alcoholic wines with higher potential in the south of the country.

Having these observations, it was analyzed the agro biological behavior and technological (phenological spectrum, sugars, acidity) of the variety Dornfelder during the two-year study analyzed (2006-2008), noticing that the budding began in the first decade of April in the Rheinhessen region and in the second decade of April for Bucharest in 2007.

The year 2008, recorded low temperatures in April in Rheinhessen, the budding started later in the third decade of and in the south of the country in the first decade of the month. Booming: It started in the last decade of May, 2007 in both regions.

The year 2008, with a later onset of budding in the Rheinhessen region, Booming occurred only in the first decade of June and in the south of the country in the last decade of May. Regarding full maturity, following measurements phenophase analyzed after the determinations realized in the laboratory (the evolution of accumulation of sugars, acidity) we see that it is recorded in the second decade of September, the variety Dornfelder pointing out fully installed by early maturity (the 5th époque of maturity). To determine the qualitative potential of variety Dornfelder in the two areas was analyzed the production in terms of quantity and accumulation of sugars, acidity of the stum, and we see that variety Dornfelder accumulated large amounts of sugars in the south of the country (at a production 3.6 kg/vine) compared with Rheinhessen (at a production of 3.2 kg/vine). The year 2007 (due to high temperatures in particular in July and August) was most favorable in obtaining large amounts of sugars. There were obtained wines with an alcoholic between 11 v‰$_0$ - 12 v‰$_0$, figure 1.

Acidity content is particularly important to obtain high quality finished products, there are minimal differences within the same terroir units and variations between the two areas, but the variations are smaller than variations acid sugars accumulated figure 2. Germany is among the northernmost regions of vine growing and winemaking, recorded higher values of acidity, from 6.5 to 6.7 between g/l, while in Bucharest acidity ranged from 5.9 to 5.8 g/l.

CONCLUSIONS

The key for finding the most suitable terroir for a certain variety, on one hand, is represented by the soil, through the genetic potential and on the other hand, the contribution of soil geology, climate, temperature, precipitation, relative humidity, wind, topography, and human elements who plays a role in the territorial distribution of varieties and thus typical for the products obtained.

In general, both areas fall into the middle favorability classes aimed at achieving quality red wines, but the results obtained during testing, it can be said that the area south of the country offer greater opportunities for obtaining culture compared with red wine Rheinhessen region.

Large accumulations of sugar registered Dornfelder by in our country encourages to obtain wines with higher alcoholic content with a 1-2‰ alcohol vol. than in Rheinhessen.In the Nordic region Rheinhessen, recorded value of acidity are higher than in the south of our country.

ACKNOWLEDGEMENTS

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TABLES AND FIGURES

Table 1

Analysis of the ecopedoclimatic and meteorological factors during experimentation in relation to variety Dornfelder

Experimental field in the Ampelographic Collection of the U.S.A.M.V. Bucharest	**Rheinhessen, Ingelheim am Rhein, Germania**
Geographic location	
Bucharest is located in the south of the country, Vlasiei Plain	Ingelheim am Rhein is located in the north of the Rheinhessen wine region, west of the city of Mainz.
Climate	
Bucharest climate is moderately continental, with an average annual temperature of 10-11°C; influences explain the presence of western and southern autumns long and warm, mild winter of days of spring or early. Generally winters are cold with heavy snow, blizzards often accompanied. Summer is very hot in july average temperature is 23 ° C, sometimes even reaching 35- 40°C, the coldest month, january of – 24^{0}C.	Rheinhessen enjoys a protected environment, the area with the warmest and driest climate in Germany. In general, there is low rainfall, hot summers and mild winters. The average annual temperature is 10 ° C. Temperatures during the growing season (approximately 180 days) are on average 17 ° C. The hottest months are july and august recorded the average temperature of 18-20ºC and the coldest month is january, with average temperatures of 1°C.
Soil properties	
- reddish brown-soil from forest, with predominance of loess-clay deposits - humus-content is 3.62% at the surface and decreases in depth while maintaining the in - depth value of 1%. - the percentage of clay is 3 - 40% (medium fine texture) in the upper horizon; - soil well supplied with potassium, has a medium to good permeability, which allows a good storage of water from rainfall and irrigation. - deep soil with deep groundwater.	- loess can be considered the mother rock typical for Rheinhessen. - in northern regions meet the transition from sand and loess areas are designated as loess-sandy texture. - mixtures of loess have improved considerably the quality of this soil compared with sandy soils. - the presence of sand makes it better aerated, and it heats better than pure loess soils; the soil is easily penetrated, highly calcareous and provide necessary nutrients for the vineyard.
Quality and profile of the wine obtained	
- dark soil warms up faster and retains heat, which reduces the acidity of the grapes in May. The grapes ripen early and remain healthy. Red wines have an aging potential of "normal".	- high water retention capacity allows a good accumulation in the skin grain flavors, especially red varieties. The high content of lime provides wines with mineral character, rich mining. Soil depth offers a good supply of nutrients and a stable acidity. In short: good soil, favorable for obtaining wines red and white, with great longevity.

Table 2

Analysis of the main meteorological factors during experimentation

Climatic elements	2007 RH	2008 RH	2007 Bucharest	2008 Bucharest
The average annual temperature (℃)	11.8	11.3	12.1	11.5
The average temperature in the vegetation period (April to September)	17.2	16.6	19.2	18.0
The average temperature of the hottest month (July) ℃	19.3	20.3	26.2	24.1
Growing season length (days)	207	194	199	207
Active thermal balance (Σ°ta)	3162.4	3060,6	3816	3709
The hours of real sunburn (Σ ir)	1335	1239	1604	1694
The annual precipitation amount (mm)	474.4	467.8	530.0	408.3
The amount of rainfall during the growing season (mm)	284.6	283.9	248	298.5
Hydrothermal coefficient (CH)	0.8	0.9	0.65	0.80
Wine bioclimatic index (Ibcv)	7.1	6.8	12.4	10.16
Oenoclimatic ability index (IAOe)	4463	4266	5266	5092

Table 3

Overview of the development of the phenological spectrum for the variety Dornfelder studied in the ecopedoclimatic conditions of the Bucharest and Rheinhessen area

Experimental version	Phenological observations *(2006-2008)*							
	Budding		Blooming		At colour appearance		Harvest	
	2007	2008	2007	2008	2007	2008	2007	2008
Bucharest	15.04	09.04	28.05	25.05	17.07	22.07	23.09	22.09
Rheinhessen	07.04	20.04	26.05	06.06	14.07	26.07	23.09	28.09

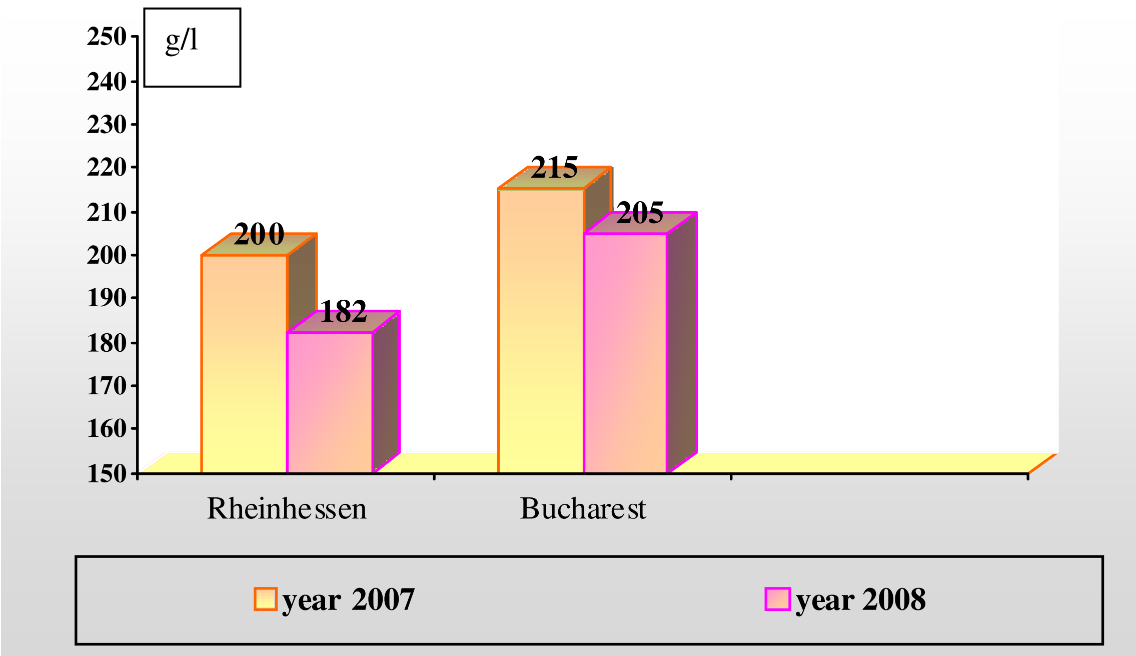

Fig.1. Variation in sugars content (g/l) during experimentation variety Dornfelder

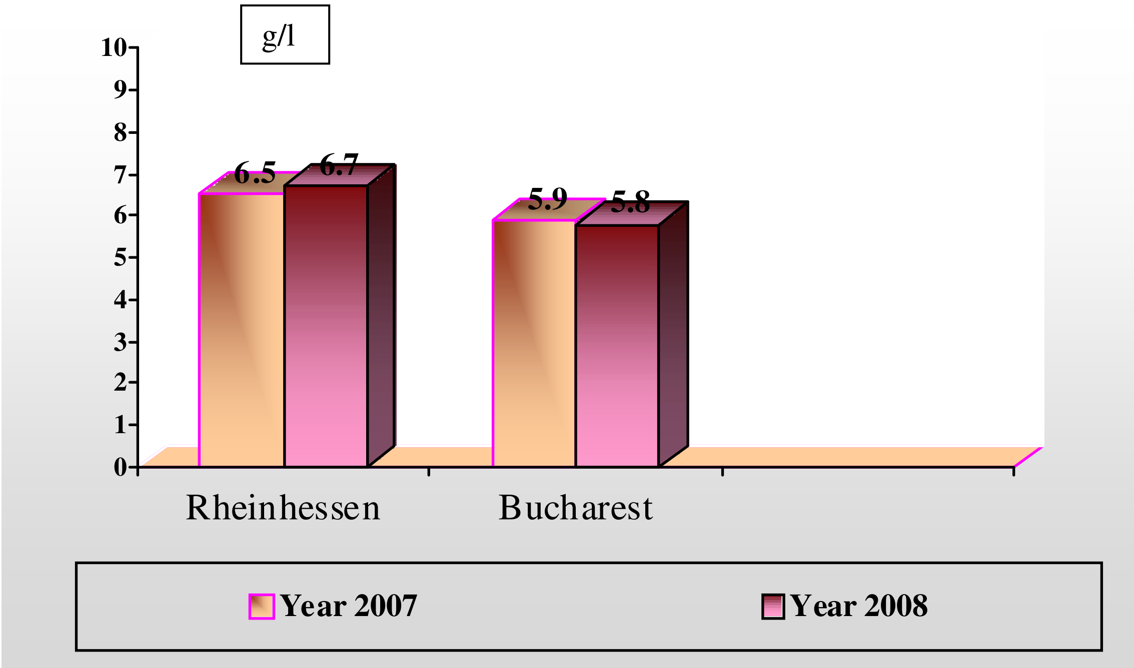

Fig.2. Change in acidity content (g/l) during experimentation variety Dornfelder

Research on the dynamics of *Empoasca Vitis* species in vineyards located in central Transylvania

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Keywords: *Empoasca vitis*, green cicada, the dynamics of the population

ABSTRACT

Species Empoasca vitis (Green Cicada vines) is reported more and more in vineyards located in central Transylvania. For a long time, the damage caused by this pest has been confused with other phenomena: burning, dryness, nutritional deficiencies, mites, etc. The presence and spread of the pest was monitored in demonstration plots located in the vineyard of Tarnave (Blaj and Aiud). The observations and determinations of the number of insects (larvae) found an average number of 2-4 larvae/leaf in the control plots.

INTRODUCTION

Green Cicada vines, *Empoasca vitis* (Goethe 1875*)* (Homoptera: Cicadellidae) was signalled in the past few years in all the vineyards in the centre of Transylvania, and nowadays it is extending. The species can be encountered on herbaceous, woody plants, but the main host is the vine.

The damage can be caused by the adults, larvae and nymphs. The insect stings the main veins of the leaves and the petiole, causing, through the nutrition surface and the incisions of the insects egg laying organ, physiological, morphological and other disturbances. Through the mechanical and chemical action of the saliva, the normal circulation of the sap is affected, causing the appearance of the characteristic symptoms. Depending on the amplitude of the attack, it can have serious negative effects on the quality and quantity of the production of grapes.

The present paper has and interprets data regarding the dynamics of the population of the pests, under the circumstances of the year 2009, in four representative plots for the studied vineyard.

The climate conditions with warm and dry weather in the summer/autumn of 2009 favoured the development of the population of this thermophilic species. Generally, the intervention threshold was rarely achieved. High densities were signalled at the end of the vegetation period, the symptoms of the attack, such as the landing of the internerve areas and of the leave rims with a negative influence on the growth of grapes, have been widely spread.

MATERIALS AND METHODS

The experiences were placed in the vineyards in the following towns and villages: Blaj, Craciunel, Sona and Jidvei, in plots tilled with Feteasca Regala, Italian Riesling, Muscat Ottonel, Pink Traminer and Sauvignon.

Monitoring the green cicada population was done by placing yellow adhesive traps.

There were 4 traps installed per hectare, as it follows:

- the first trap was installed at the edge of the plot, but not near the sources of dust (in order to avoid the clogging of the slabs)
- the next three traps were installed at an approximate distance of 50 metres between them, diagonally as much as possible.

The adhesive traps were weekly changed starting with May until September.

In order to monitor the juvenile forms (larvae and nymphs) in each experimental plot, 25 leaves/week were analysed, gathered from the area near the yellow traps.

The data regarding the number of individuals/leaf were analysed related to the tilled kind and the microclimatic circumstances specific for each experimental plot.

RESULTS AND DISCUSSIONS

A balance sheet of the obtained results regarding the dynamics of the *Empoasca vitis* species allowed an exact correlation between the thermal regime registered during the vegetation period and the evolution of the species.

The spring 2009 (March-May) was characterised by warmer weather than usually, with an average monthly thermal regime of the air with temperatures between 4.4 – 16.3 ^{0}C. The absolute maximum temperature in the air was of 30.2^{0}C/19.05.2009. Under these circumstances, the adults migrated towards the vine (the main host), starting with the phenostage of 2-3 leaflets, installed on the inferior side of the leaves.

The first evaluation was done around 15.05.09. In the first four weeks of vegetation, the density was low, with 6 individuals/trap/week at the end of June. Later, in the last decade of July, the capture rate increased significantly due to the appearance of the adults of the first generation. High densities were signalled at the end of the vegetation period, starting with the last decade of July, due to the appearance of the adults of the second generation. The highest temperatures were registered in the Jidvei ans Sona plantations with capturing rates of up to 13-16 adults/trap/week. In figure 1, there are data regarding the dynamics of the *Empoasca vitis* species according to the capturing rate of adults.

In the vineyards of Blaj, the number of adults/trap/week was significantly lower, the maximum level being of 6 individuals/trap/week at the end of the vegetation period. The late attacks produced obvious colourless areas on the mature leaves, delimited by ribs which eventually evolved in burns.

In correlation with the rate of captures/trap/week, the data regarding the number of individuals (larvae, nymphs)/leaf and the tolerance of the types related to the level of the attack were analysed. In table no. 1 there are the results regarding the density of the *Empoasca vitis* population/leaf.

In all the monitored plots, the high density in the first generation was a lot lower than the one of the second generation. On the leaves, the larvae of the first generation were signalled around the blossoming phenostage. The 5 larva studies developed during 3-4 weeks. The average density of the larvae was low until July 25. At the end of July, the larva density started to increase, due to the development of the second generation, which normally appears in July until the end of August. The decision of the intervention is motivated by the presence of 25 larvae/25 analysed leaves. On the contrary, the treatment is not justified.

The results regarding the influence of the kind on the level of the population are presented in Fig. No.2. In the plots tilled with the Sauvignon and Pink Traminer kinds, a higher level of the *Empoasca vitis* population was registered, compared to the plots tilled with the Feteasca regala and Italian Riesling types. These findings could be used for the entire administration of the pests, considering the identification of the studied plots, of some important useful species that can maintain the development of the *Empoasca vitis* pests. *Anagrus atomus*: A hymenopterus from the Mymaridae family, *Stethynium triclavatum* from the Miridae family that damages the eggs, *Aphelapus atratus* Drynidae fam. That damages the larvas, *Chlarus Sp*. Pipunculidae Fam. that damages the larvae and the adults.

CONCLUSIONS

- The green cicada, *Empoasca vitis* (Vitis Empoasca, Goethe 1875) was signalled in all the vineyards in the centre of Transylvania, at present the attack being in the expansion stage.
- The weather conditions with warm and dry weather in the summer/autumn of 2009 favoured the development of the population of the pests.

- In the vineyards in the centre of Transylvania the species develop two generations a year.
- The most damaging attacks were caused by the second generation of larvae, signalled between July – the end of August.
- In the case of the Sauvignon and Pink Traminer varieties, a higher level of *Empoasca vitis* population was registered with the plots tilled with the Feteasca regala and the Italian Riesling types.

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TABLE AND FIGURES

Table 1

The density of the Empoasca vitis (nymphs) population on the leaf in the year 2009

The location	The type	The day/the month when the observations were made								
		02.06	09.06	16.06	26.06	02.07	10.07	17.07	25.07	14.08
Blaj	Fetească regală	0.3	0.3	0.9	1.0	1.5	1.6	2.0	2.2	2.7
	Italian Riesling	0.9	0.8	1.0	1.1	1.9	2.0	2.1	2.4	2.5
Craciunel	Feteasca regala	0.2	0.6	0.7	0.9	1.4	1.4	1.6	2.0	2.4
	Muscat Ottonel	0.3	0.5	0.7	0.8	1.7	1.9	1.9	2.2	2.8
Sona	Feteasca regala	0.6	0.6	0.8	1.3	1.3	1.4	1.4	1.8	2.5
	Muscat Ottonel	0.5	0.7	0.9	1.2	1.8	1.6	1.9	2.4	2.7
Jidvei	Italian Riesling	0.4	0.6	0.6	0.9	1.2	1.3	1.7	1.7	2.3
	Feteasca regala	0.8	0.7	0.8	1.4	1.9	2.0	2.2	2.4	2.8

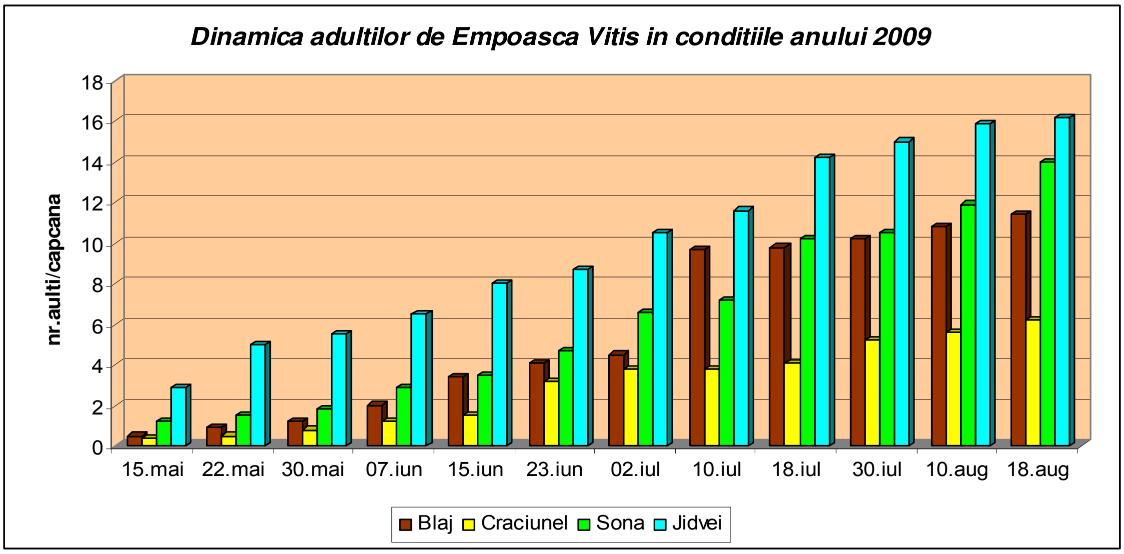

Fig. 1. The dynamics of the Empoasca vitis species, the number of adults/trap/week in the experimental plots from Blaj, Craciunel, Jidvei and Sona, in the year 2009

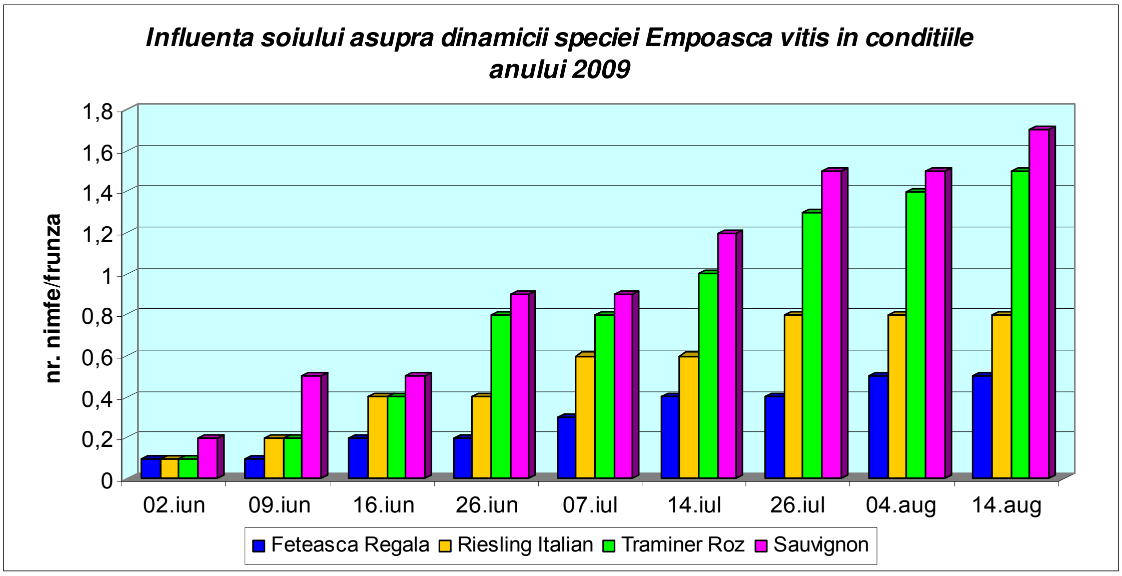

Fig. 2. The influence of the grape kind on the dynamics of the Empoasca vitis species in the year 2009 to mean of Blaj, Craciunel, Jidvei and Sona

Fig. 3. The larva of the Empoasca vitis pests

Fig. 4. The symptoms of the attack on the leaves

Fig. 5. The adult Empoasca vitis

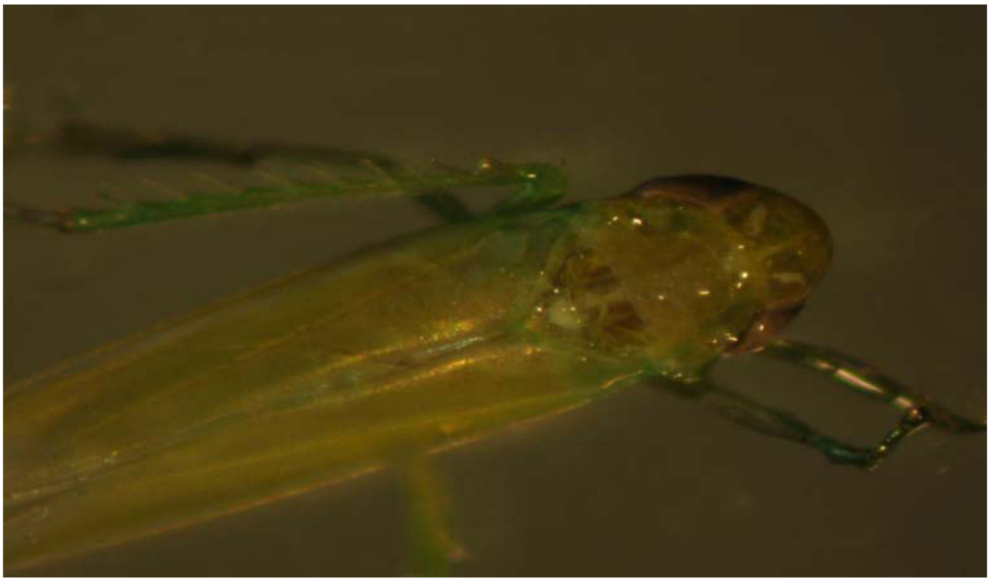

Fig. 6. The adult Empoasca vitis

The incidence of the attack of *Agrobacterium tumefaciens* on the maturation of the drafting canes for some varieties of *Vitis vinifera L.*

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Keywords: *Agrobacterium sp.*, grapevine, maturation, insoluble and soluble carbohydrates

ABSTRACT

Agrobacterium tumefaciens **is a bacterium that causes serious losses to many species of plants, including the grape vine. The tumors caused by this bacterium damage the plants in the plantations producing graft/rootstock cuttings and, therefore, are required periodic inspections to identify and eliminate the infected ones (by burning). The purpose of this study was to estimate the incidence of the *Agrobacterium tumefaciens* attack on the degree of maturation of the graft strings of some *vinifera* genotypes. The biochemical findings regarding the water, soluble carbohydrates and starch content in the wood led to the conclusion that the wood maturation was poor in the infected plants, with direct influence on the tolerance of these varieties to negative temperatures during the dormancy and thus, on the quality of the material used for propagation.**

INTRODUCTION

The maturation of bearing elements of the grape vine (wood maturation) is a physiological process influenced by several factors, of which, the most important are: the air temperature in the growing season, pedological humidity, light, soil nutritional status and physical-chemical soil characteristics, the hereditary features of the variety, the specific diseases and pests of the grape vines (Alleweldt, 1967).

The assessment of the degree of wood maturation is made by determining the water content in the shoots, which varies in specific limits depending on the variety and the ratio marrow/wood, the wood tissue content of carbohydrates (soluble carbohydrates and poly-carbohydrates) or of free amino acids (especially, proline). It should be noted that the wood is generally more resistant to frost compared to the buds and, therefore, the first symptoms of the negative temperature effect is manifested in the bud.

Crown gall caused by *Agrobacterium tumefaciens* or by *Agrobacterium vitis* is a very dangerous disease for the grape vine, leading to growth delays, reducing the amount of sap, dwarfism, reduced trunk diameter, necrosis of the attacked organs, but rarely of the whole plant (Popescu and Păduraru, 1974).

The production of planting material plays an important role in the spread of crown gall. In mother plantations for producing scion and rootstock strings may occur diseased plants without visible symptoms from which the material for multiplication is collected. The bacteria living in the vine cuttings, survive during the process of grafting and until planting grafted vines to the permanently place and can infect soil. Galls on roots, trunks and cordons can disrupt the plant's vascular tissues, and severe infections or plant death may result (Vizitiu and Dejeu, 2011).

The purpose of this study was to investigate the impact of the bacterial cancer on the wood maturation in the annual vine chords, for some *vinifera* genotypes.

MATERIALS AND METHODS

The study was conducted on four varieties of grape vine grown on their roots:

Chasselas Bordeaux, Cetatuia, Coarna neagra selectionata and Somesan. The wood samples were taken from three plants/genotype for two experimental variants:

V1 - control plants (healthy);

V2 - infected plants;

The material, consisting of annual plant parts, was harvested at the end of the dormancy. The entire cuttings were segmented into pieces of 8-12 cm, and these in turn, were brought to the length of 0.5 cm. Samples were taken from this material in three repeated times for each experimental variant and they were processed for a physical-chemical analysis, which consisted in determining the content of: free and total water, soluble carbohydrates and starch.

Thus, the method of finding out the water and carbohydrates content in the plant material was used in order to check the maturation of the graft and rootstock cuttings, as they are intended as a vine planting material, according to the Romanian STAS 220/10-85.

Finding out the water content in the wood material involved two working steps:

- drying the material at 40° C, until a constant mass is reached and determining the free water content;

- drying the material at 105° C, until a constant mass is reached and determining the total water content.

The dosage of the soluble carbohydrates and starch in the wood was done by the colorimetric method with the chemically reactive anthrone. The chemical analysis consisted of:

- the extraction of soluble carbohydrates with 80% ethanol, centrifuging the extract, the anthrone color reaction and the color measurement of samples at λ - 620 nm;
- the starch hydrolysis from the porridge left after the extraction of the soluble carbohydrates using 52% perchloric acid, centrifuging the extract, the anthrone color reaction and color measurement of samples at λ - 620 nm.

RESULTS AND DISCUSSIONS

As it is known, the degree of the wood maturation in the grape vine chords largely influences the plant resistance at negative temperatures during the winter dormancy.

The good wood maturation corresponds to the period in which the total carbohydrates reach a maximum level and generally and it generally coincides with the grape vine deep vegetative dormancy. During this period (which lasts for several months) the intensity of breathing is very low as the consumption of carbohydrates is low. Starting in mid-October, the starch enzymatic hydrolysis increases, thus leading to the increase of soluble carbohydrate content, and increase hardiness to a lower freezing temperature. During December and January, the soluble carbohydrate content reaches a maximum (10-12% DM), a period characterized, in fact, by the lowest temperatures. In February-March, the carbohydrate concentration decreases, as a result of their participation both in the breathing process (which is intensified in this period) and in the vegetative growth. The carbohydrates are extremely important substances for all the living organisms and the main energetic substances for the plants.

The analysis of the histograms represented in Fig. 1 and Fig. 3 shows that, the free and total water content is higher in the plants infected by *Agrobacterium tumefaciens* than in the control plants (healthy). Both the percentage of the free water content and of the total water content record values above 50% in the cuttings (budwoods) taken from the vine stocks with tumors caused by the bacterium, while in the control plant, these indicators have fluctuated around 45%. But, the chemically bound water content in the wood tissue of the chords taken from the plants infected by *Agrobacterium tumefaciens* is reduced compared to that found in the control plant variant, with recorded averages of 2.5% (compared to almost 3.5% - healthy control plant) - Figure 2. It is obviously that, there were no significant differences, in terms of this indicator, among the genotypes submitted to this experiment.

At the end of the dormancy, the soluble carbohydrate content of the wood which came from the healthy plants ranged from 5.84% (Chasselas of Bordeaux cv.) to 9.68% (Coarna neagra selectionata cv.). The concentration of soluble carbohydrates decreased in this period as a result of their participation both in the breathing process (which is intensified in this period) and in the vegetative plant growth at the end of the winter rest. The values found in the infected plants ranged from 3.89% (Chasselas of Bordeaux variety) to 5.49% (Coarna neagra selectionata variety), hence significantly lower values (Figure 4).

The accumulation of the reserve substances in the wood tissue of the chords is particularly important. The starch accumulation occurs in the chords and shoots in autumn, after harvesting the grapes. It is stored in the amiloplasts from the woody tissues, medullary and Liberian parenchyma, under the form of small grains with a diameter of 8 mm (Buttrose, 1966). The same difference, as for the percentage of the soluble carbohydrate content, is observed in the starch content of the wood tissue in the tested varieties, namely, significantly lower values of this indicator in the group of the plants infected by *Agrobacterium tumefaciens* (Figure 5).

The total carbohydrate content (Figure 6) follows the same downward curve for the infected plants while for the healthy ones it stays in the normal, specific values for this period and for each variety (11.74% - Chasselas of Bordeaux variety - and 15,48% - Coarnă neagră selectionata variety).

CONCLUSIONS

1. The crown gall has affected the maturation degree of the woody tissues in the experimented vine varieties.
2. The soluble carbohydrates and starch accumulation was impaired in the group of plants infected by *Agrobacterium tumefaciens*, as evidenced by the low values of these biochemical indicators of the degree of maturation of the wood.
3. The chemically bound water in the wood tissue showed low values in the plants with tumors caused by *Agrobacterium tumefaciens* as compared to those obtained for the healthy control plants, which shows a weaker wood maturation.
4. The free and total water content was significantly higher in the infected varieties compared to the healthy control plants.
5. In these conditions, are required a periodic inspections in the plantations producing graft chords and generally in all the vineyards to detect and remove the diseased plants (by burning) and thus to reduce the spread of the bacteria.

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FIGURES

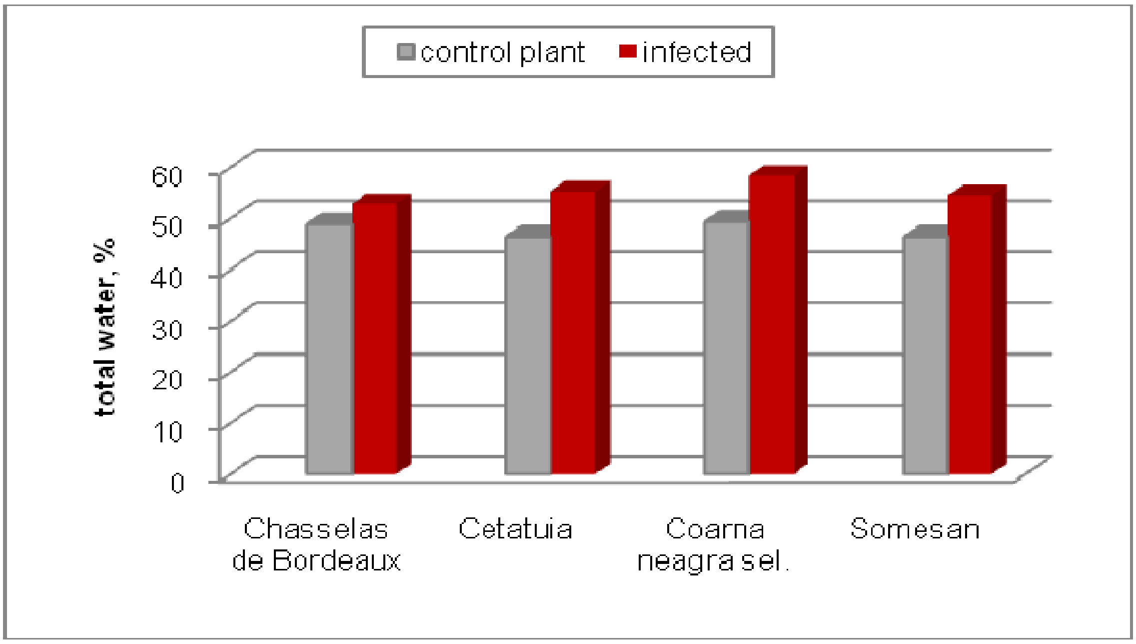

Fig. 1. Evaluation of total water content in the wood material

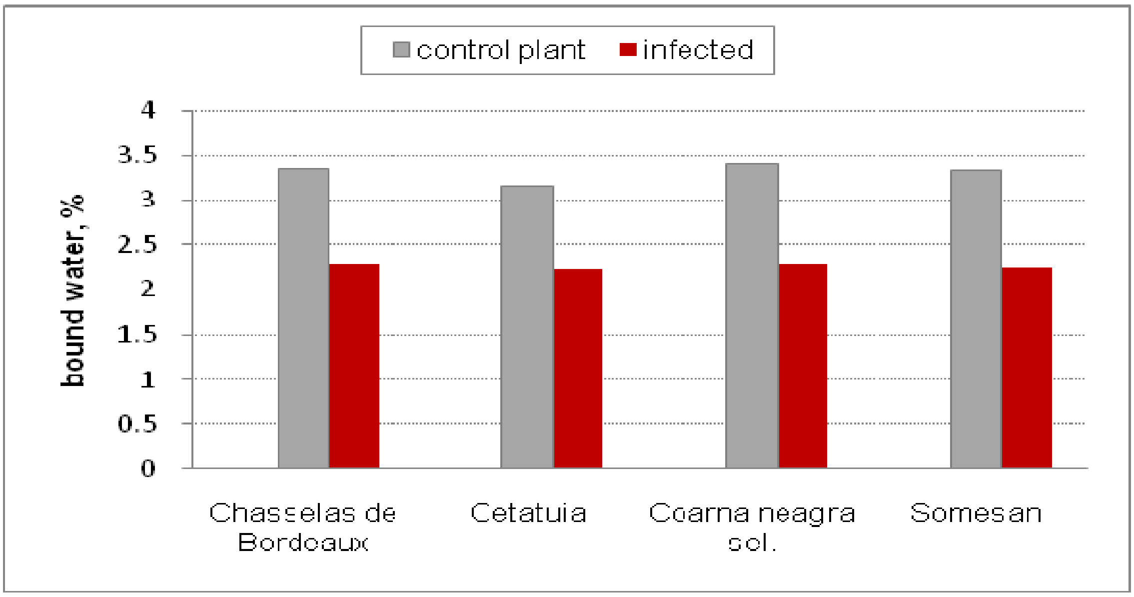

Fig. 2. Evaluation of the bound water content in the wood material

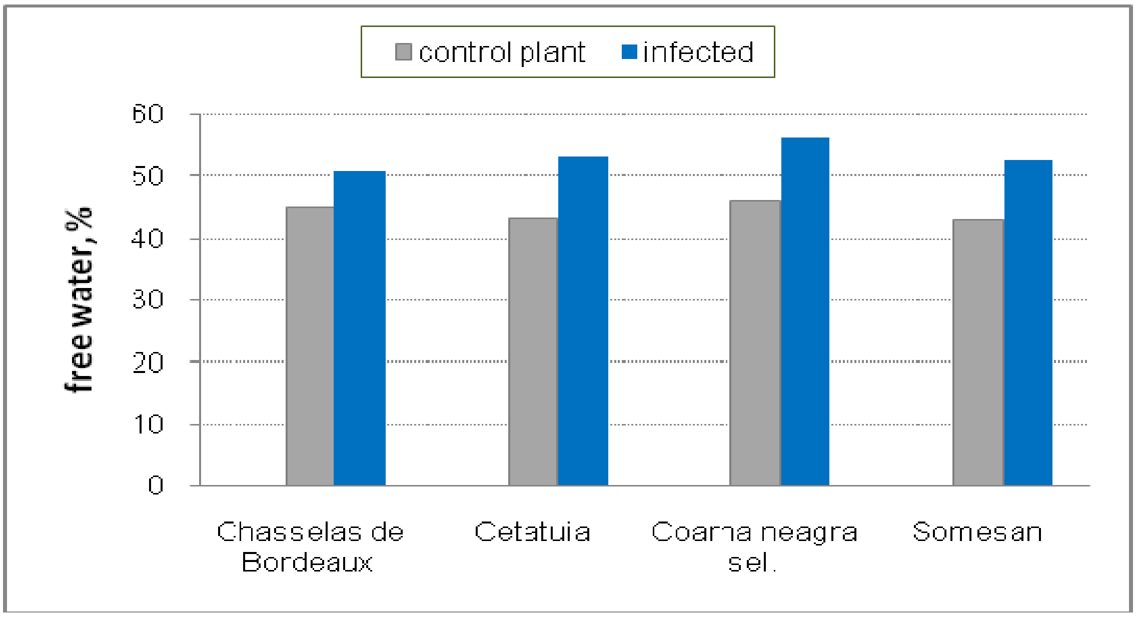

Fig. 3. Evaluation of free water content in the wood material

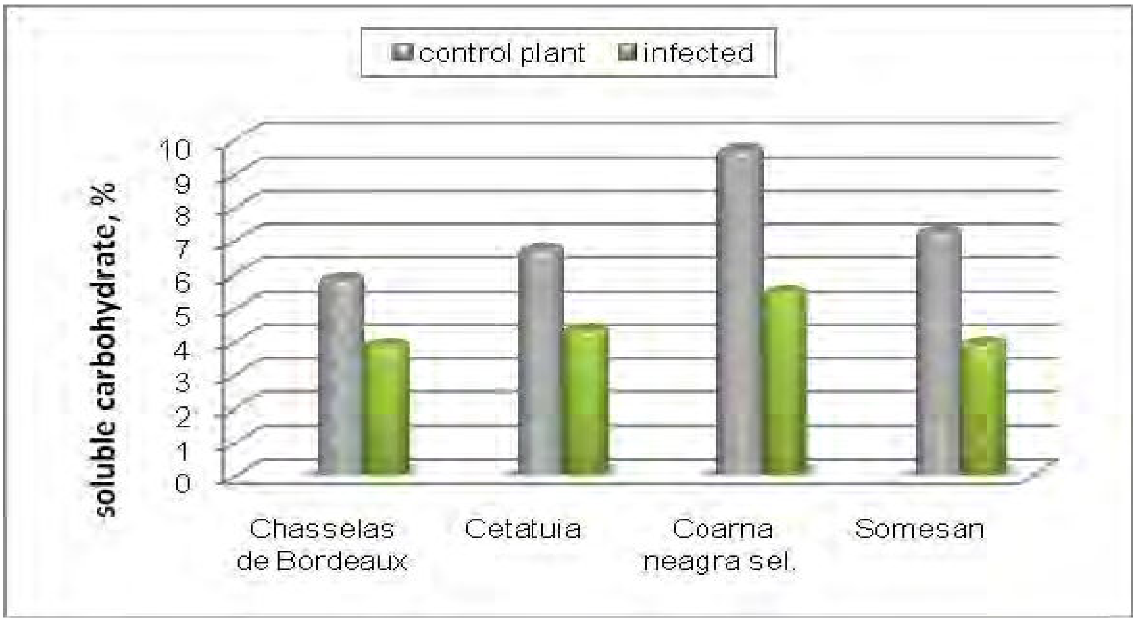

Fig. 4. Soluble carbohydrate reserves in the grape vine chords at the end of dormancy

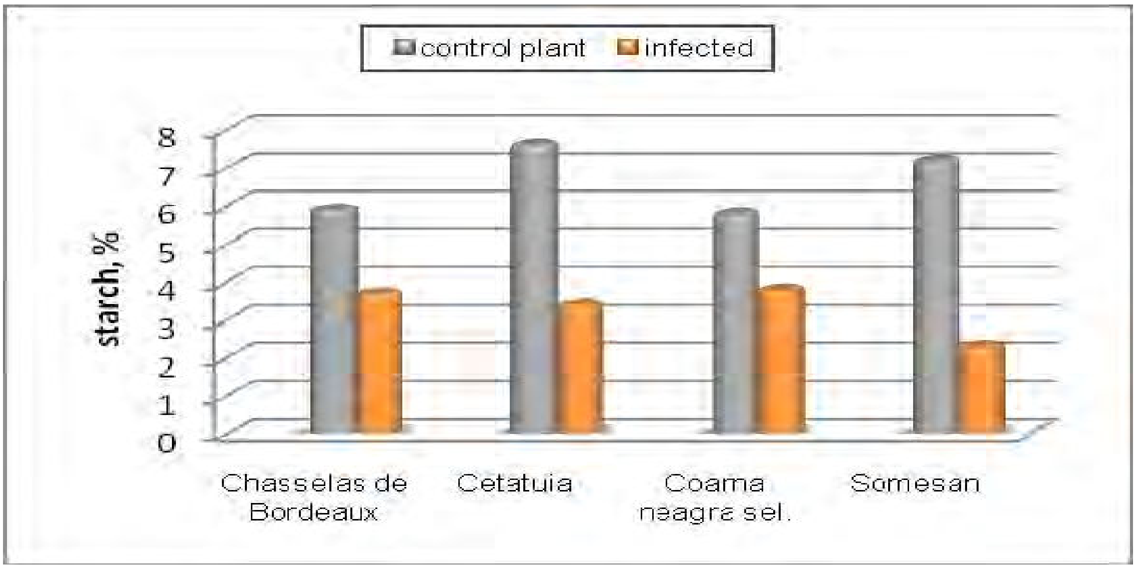

Fig. 5. Starch reserves in the grape vine chords at the end of dormancy

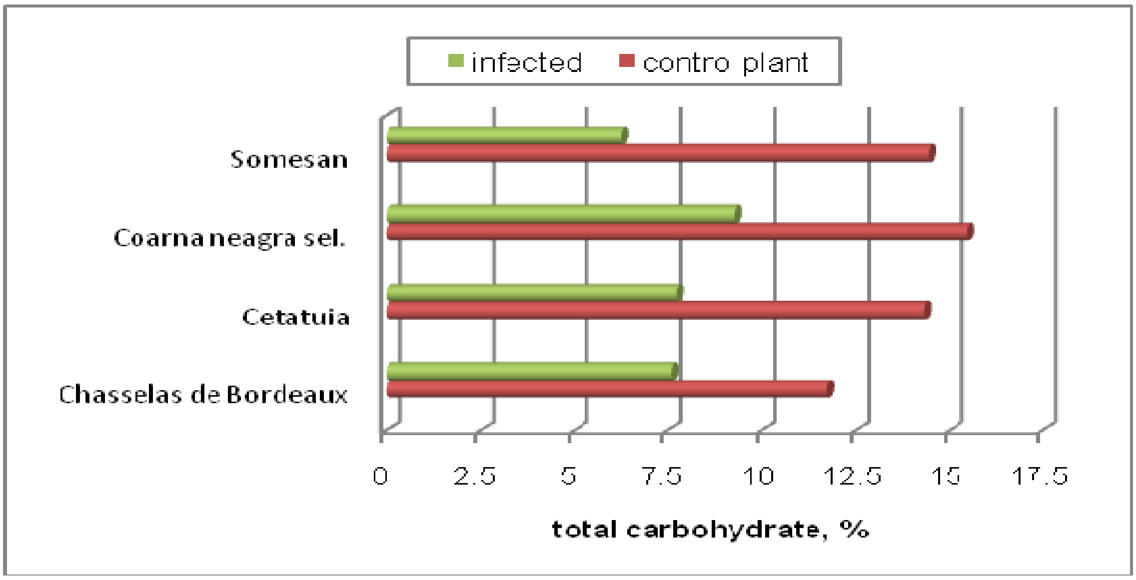

Fig. 6. Total carbohydrate reserves in the grape vine chords at the end of dormancy

Preliminary research regarding virulence testing of the bacteria *Agrobacterium tumefaciens*, *in vitro* and *in vivo*

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Keywords: *Agrobacterium vitis*, soil, nursery, graft, vineyard, vine

ABSTRACT

Crown gall of grape it is a dangerous disease, found in many regions of the world. The disease occurs mainly in cold climates, but also in Mediterranean countries. The purpose of this study was to isolate and identify, from several vine plants, the bacterium that causes crown gall, and to test the virulence *in vitro* and *in vivo*. For isolation of bacteria were used Lieske and D1 culture medium, and for identification Roy & Sasser and M1A culture media. The bacterium was identified as *Agrobacterium tumefaciens* and does not make the same number of bacterial colonies in any medium suitable for virulent strains of this species. The virulence was tested on carrots and vine plants from *in vitro* culture.

INTRODUCTION

Agrobacterium is an aerobic, gram-negative, rod-shaped bacteria, mobile, which does not form spores.

Crown gall of grape, mainly product by *Rhizobium vitis* (Ti) Young et al. 2001 [= *Agrobacterium vitis* Ophel şi Kerr 1990, *Agrobacerium tumefaciens* biovar 3 (Smith and Townsend 1907) Conn 1942] is the most important bacterial disease of the grapevine in worldwide (Szegedi et. al., 2005; Burr and Otten, 1999; Burr et.al., 1998; Sawada et. al., 1990). However, *A. tumefaciens* (which is found in other specie) has also been isolated from galls on grape and is associated with the disease at a much lower frequency than *A. vitis* (Smith and Stafne; Argun et al., 2001).

Farmers and nursery owners may suffer serious economic losses, due to illness plants, their decline and because the plants with galls cannot capitalize, and plantations give production increasingly smaller, thus reducing the profits considerably (Hamed, 2006).

The disease is favored by: heavy and compact land, with moisture excess and with northern exposure; alkaline slightly pH of the soil; frost; nematodes; insects with gnaw and chew appliance; no disinfection treatment for propagation material and tools used, weather conditions and/or injury producing agricultural machinery plant roots diseased plants and soil remaining after removal of infected plants, relative humidity greater than 80-90%, nitrogen fertilizers, potassium deficiency, lack of affinity between scion and rootstock, cold water used for irrigation (Tomoiagă, 2011; Severin and Dejeu, 1994).

MATERIALS AND METHODS

Galls were harvested from three varieties of vine (Somesan, Alphonse Lavallée, and Argessis) in February. The galls were lemnificate and brown. They were decontaminated with 70% alcohol and washed with sterile distilled water. Was removed the outer portion, which was dry, until reached to the living tissue, wherefrom samples were taken (small portions) which were introduced in sterile distilled water. Were left several hours bacteria to spread in water. The suspension was placed on the culture medium, with wire loop to obtain bacterial colonies.

To isolate bacteria that produced tumors were prepared Lieske and D1 culture media (Severin, Cornea, 2009). And in order to identify it were made Roy & Sasser and M1A media (Table 1). On these media grow only species of *Agrobacterium*. On the M1A grow only virulent bacteria *Agrobacterium tumefaciens*, and on the Roy&Sasser only bacteria *Agrobacterium vitis*.

After preparation, media Lieske and D1 for bacteria isolation were distributed in Petri dishes, in aseptic conditions, at the hood with vertical laminar airflow. The inoculation suspension obtained from gall tissue, was made after culture medium coagulation. The suspension was passed through the surface of culture medium in Petri dishes by drawing lines with wire loop, from left to right, turning the Petri dishes at 90° twice, achieving nine repetitions but grouped three.

After formation bacterial colonies, was harvested, with wire loop, from bacterial culture and have passed in sterile cryotubes with sterile distilled water. The cryotubes was agitated and wait 30 minutes for the bacteria to spread in water, then were shaken again. From suspension was taken with wire loop and were made inoculations on the M1A and Roy & Sasser culture media. Bacteria were formed only on M1A culture medium, so bacteria that caused the disease is *Agrobacterium tumefaciens*.

Bacteria virulence was tested *in vitro* and *in vivo*. Testing *in vitro* culture was performed on multiplied plantlets on specific culture media for vine, by artificial infection with the bacterial suspension using sterile syringes with needles very thin. To test the virulence of bacteria *in vivo*, were used carrots disinfected with 70% alcohol and rinse with sterile distilled water, then were cut into slices and place in glass Petri dishes, on filter paper. Each slice of carrot was inoculated with suspension bacteria, from pure culture.

RESULTS AND DISCUSSIONS

The bacteria were successfully isolated on Lieske and D1 culture media, showing round colonies with regular edges, convex, smooth and glossy translucent, slightly detached from the culture medium. In time the colonies have linear conflu (Fig.1a and b).

Even if inoculation was performed on the same day, same suspension, bacteria have developed much faster and much higher on the e Lieske culture medium (fig.1b) compared with D1 culture medium (Fig. 1a). On the D1 medium bacterial colonies were colored in yellow due to the addition in the culture medium of dye bromtimol blue, and on the Lieske medium formed pink bacterial colonies because the dye Congo red.

Mode of evolution of bacteria from Somesan and Argessis varieties was similar in both culture media.

Following measurements have found that the three varieties studied are infected with *Agrobacterium tumefaciens*, because after the suspension inoculation on Roy & Sasser and M1A media were formed bacterial colonies only on M1A medium (Fig. 2a and b). At first were formed shiny bacterial cells, purple, which, in time, conflu in linear bacterial colonies. Colony color was given by the crystal violet dye. If varieties would be formed bacterial colonies on Roy&Sasser medium, then the plants was infected with *Agrobacterium vitis*.

Evaluation of virulence of bacteria, extracted from galls varieties under study, *in vivo* and *in vitro*, was significant only for the infection of carrot slices.

The suspension obtained from pure cultures of bacteria, inoculated on carrot disks caused the formation of tumor growths around the central cylinder, green yellowish (Fig. 3 a). These manifestations show virulence of bacteria on vegetable species used as test plants and the ability of bacteria to develop on other plants than vines.

In case of virulence testing *Agrobacterium tumefaciens* bacterium on biological material multiplied in *in vitro* culture, observations and determinations made revealed tumors absence, and was recorded seedlings death (Fig. 3b). This was probably due to specific morphophysiological characteristics from *in vitro* biological material (fragile tissue, composed from cells with thin walls, with a high water content, etc.). Thus, tissue necrosis started from bacteria inoculation place, the blackened continuing quickly, probably with the spread infection throughout the plant.

CONCLUSIONS

At the vines can meet two species of virulent bacteria: *Agrobacterium vitis* and *Agrobacterium tumefaciens*.

Agrobacterium tumefaciens does not make the same number of bacterial colonies on any medium suitable for virulent strains of this species. All bacterial cultures from this experiment have developed much better on the Lieske medium than on the MD1 medium.

Virulence of *Agrobacterium tumefaciens* bacterium can be tested on carrots, but not on seedlings in *in vitro* culture.

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TABLE AND FIGURES

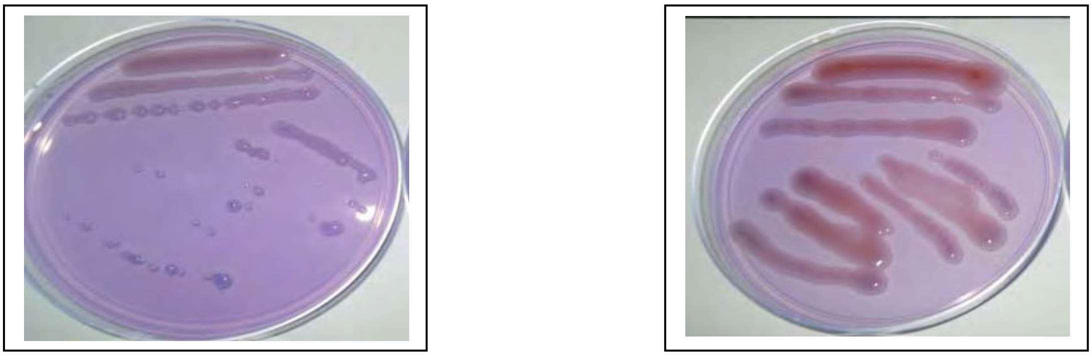
Table 1

Composition of media used to isolate and identify *Agrobacterium* species to grape-vine

Compositions	Lieske Media	D1 Media	M1A Media	Roy&Sasser Media
Glycerine	20 ml	-	-	-
KNO_3	5 g	-	-	-
$MgSO_47H_2O$	1 g	0,2 g	0,25 g	0,2 g
Agar	20 g	15 g	15 g	15,0 g
Water	2 liters	1 liter	1 liter	1 liter
Congo red	10 ml	-	-	-
Mannitol	-	15 g	-	-
$NaNO_3$	-	5 g	-	-
LiCl	-	6 g	-	-
$Ca(NO_3)_24H_2O$	-	20 mg	-	-
K_2HPO_4	-	2 g	1,04 g	1,04 g
Bromtimol blue	-	0,1 g	-	-
Arabitol	-	-	3,04 g	-
NH_4NO_3	-	-	0,16 g	0,16 g
KH_2PO_4	-	-	0,54 g	0,7 g
Taurocolat de sodium	-	-	0,29 g	-
Crystal violet	-	-	2 ml (from solution 1%)	-
Cycloheximide	-	-	1 ml	-
Na_2SeO_3	-	-	6,6 ml (from solution 1%)	-
Adonitol	-	-	-	4,0 g
Extract de drojdie 1 %	-	-	-	0,14 g
NaCl	-	-	-	0,2 g
H_3BO_3	-	-	-	1,0 g
Chlorothalonil	-	-	-	0,5 ml
Triphenyltertrazolium chloride	-	-	-	80 mg
D-cycloserine	-	-	-	20 mg
Trimethoprim	-	-	-	20 mg

a - MD1 Medium b- Lieske Medium

Fig. 1 Bacterial cultures from galas of Alphonse Lavallée variety, after 3 days since inoculation



a- early phase b- at maturity

Fig. 2 The evolution of the bacterium *Agrobacterium tumefaciens on the* M1A medium

a- infected carrot b-Biological material multiplied *in vitro*, infected

Fig. 3 *Agrobacterium tumefaciens* virulence tested *in vivo* and *in vitro*

Influence of oxygen on vital – metabolic processes of acetic bacteria

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Keywords: acetic acid, acetic bacteria, oxygen, viable cells.

ABSTRACT

Oxygen is generally indispensable for the multiplication of acetic bacteria. To multiply and make acetic fermentation, acetic bacteria need more air. Is known to increase the volatile acidity of wine with acetic acid 1 g (respectively 0.8 g H_2SO_4) acetic bacteria use oxygen in the air at least two liters.

INTRODUCTION

Oxygen can be considered as a main factor limiting the growth of acetic bacteria, which has a strictly aerobic metabolism in which oxygen is used as a terminal electron acceptor during respiration process (Matsushita et al., 1994). There is research showing that, besides oxygen and other compounds are as chinonele and pigments in reduced form, which can be used as electron acceptor (Aldercreutz, 1986), which shows that acetic bacteria can evolve in both aerobic and in environments semiaerobe (Drysdale and Fleet, 1988). Some researchers (Du Toit et al., 2005) found, for example, that strains of Acetobacter pasteurianus species can survive in a viable state but uncultured, the wine that oxygen is not present.

Oxygen is generally indispensable for the multiplication of acetic bacteria. To multiply and make acetic fermentation, acetic bacteria need more air. Is known to increase the volatile acidity of wine with acetic acid 1 g (respectively 0.8 g H_2SO_4) acetic bacteria use oxygen in the air at least two liters.

The critical roles of these oxidation processes have two enzymes are related to cytoplasm membrane: alcohol-dehydrogenises and aldehyde-dehidrogeneza. Active site of both enzymes is the external surface of cytoplasm membrane (Saeki et al., 1997).

MATERIALS AND METHODS

The material used for the experiments consisted of:

- White wine 10.5 vol% alcohol; 12.5 vol % alcohol, obtained from grapes coming from vineyards Segarcea center.
- Viable cells .

Analytical methods were related to:

- Determination of sugar in the grapes
- Determination of the alcoholic strength of wine
- Determination of acetic acid in wine
- Determination of sulfur dioxide dosage Microbiological examinations

RESULTS AND DISCUSIONS

Oxidation of alcohol to acetic acid is best-known feature of acetic bacteria, the oxidation process that occurs in two stages. First, alcohol is oxidized to acetaldehyde, which in turn is oxidized in the second stage, the acetic acid. In both reaction steps, the electrons transfer from byproducts is accepted by oxygen.

Oxygen is generally indispensable for the multiplication of acetic bacteria. To multiply and make acetic fermentation, acetic bacteria need more air. Is known to increase the volatile acidity of wine with acetic acid 1 g (respectively 0.8 g H_2SO_4) acetic bacteria use oxygen in the air at least two liters.

Since the enological practice, for reasons well justified or accidental causes, the containers in which wine is in various stages of development, carry out a so-called “empty”, air space from the surface of the wine, which may have different volumes, amounts of oxygen so their share is directly proportional to the size of the gap (air volume) have used the experiences to capture the influence of oxygen (O_2) on vital processes-metabolic acetic bacteria, for white wines whose alcohol content varied between 10.5 vol% alcohol and 12.5 vol% alcohol.

The value of pH was the same (3.3) and the temperature of wine storage warehouse atmosphere did not exceed 12^0C. The containers had a capacity of 500 liters and consisted of oak vessels store the wine for the third time.

The results are presented in tables 1 and 2.

Influence of oxygen on processes vital-metabolic of acetic bacteria, we sought to capture by increasing the number of viable cells (U.F.C./l) and as a consequence of their metabolic processes, increasing quantities of acetic acid (g/l H_2SO_4).

When observations and studies were related to white wine (variety) with alcoholic strength of 10.5 vol% (table 1) and kept the vessel in which wine was kept permanently on full, so without the presence of the gap, number of viable cells as acetic acid content increases not know. This as a consequence of acetic bacteria that had provided much needed oxygen.

When opening the container volume was 5% (table 1) increases the number of viable cells and acetic content is found already after the first 5 (five) days of wine storage. These increases are even more evident as the duration of storage is greater. Consequently, after 60 days of wine storage, the number of viable cells increased from 10^3 (initial) to 10^6 (after 60 days). The amount of acetic acid in wine growing and it accumulated from 0.45 g/l (H_2SO_4) at the beginning, to 1.14 g/(H_2SO_4) after 60 days of storage.

If opening of container volume is 10%, so oxygen and higher number of viable cells of acetic bacteria increases from 10^3 (initial) to 10^7 U.F.C/l after 60 days. Therefore, acetic acid content also increased from 0.45 g/l H_2SO_4 as was initially determined at 1.33 g/l H_2SO_4 after 60 days of storage.

The results are amplified when the opening of the container volume was 20%, the highest intake of oxygen carried in our experiments.

In this case the number of viable cells increased continuously from 10^3 U.F.C/ml (as was the original) to 10^9 U.F.C/ml after 60 days, thus registering an active metabolism of acetic bacteria in the presence of such large amounts of oxygen and result in acetic acid content of wine reaches the highest level, 1.51 g/l (H_2SO_4).

Following the influence of oxygen on metabolic processes of vital acetic bacteria, wines with higher alcohol content (12.5 vol%) found (table 2), meaning that in all cases studied phenomena are kept as and less alcoholic wines, but it seems that the pace of accumulation of acetic acid in wine are more restricted.

Our research confirms those reported in the literature in that it is alcoholic wine vinegar may harder, but vinegar. Only higher alcoholic strength of wine (more than 12.5 vol% alcohol), and the lower the pH of the same wine (pH $<$ 2.9-3) may prevent a certain amount metabolic processes of acetic bacteria.

CONCLUSIONS

1. Oxygen can be considered as a main factor limiting the growth of acetic bacteria, which has a strictly aerobic metabolism in which oxygen is used as a terminal electron acceptor during respiration process;
2. Oxygen is essential for bacterial multiplication acetic
3. Increasing the number of viable cells, the bacteria that accumulate acetic acid and acetic acid in wine are more dependent on the amount of oxygen present in the wine than the alcohol concentration in wine;
4. The term wine storage in the presence of oxygen is prolonged, the more increases the number of viable cells, and acetic acid content of wine;

5. For oenologist is important to note that during wine storage especially in oak vessels, oxygen must be extremely limited, so dishes that require the full. For white wines, from storage to final conditioning and bottling is advisable to use stainless steel containers. At last the red wines aged in small oak barrels capacity (225-250 liters) to avoid gaps that can be formed through which oxygen and metabolic activity in the acetic bacteria provide the adverse consequences;
6. Using an inhibitor (S02) of acetic bacteria activity at doses limited by law has no effect.

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TABLES

Table 1

Influence of oxygen (O_2) on vital-metabolic processes of acetic bacteria, over 60 days. White wine (variety), 10.5 vol% alcohol, pH = 3.3, t °=12° C.

Opening of the container volume (%)	Acetic acid content (g/l) H_2SO_4	Viable cells UFC/vol	Determinations after ... days									
			10		20		30		40		60	
			Acetic acid (g/l) H_2SO_4	Viable cells UFC/vol	Acetic acid (g/l) H_2SO_4	Viable cells UFC/vol	Acetic acid (g/l) H_2SO_4	Viable cells UFC/vol	Acetic acid (g/l) H_2SO_4	Viable cells UFC/vol	Acetic acid (g/l) H_2SO_4	Viable cells UFC/vol
0	0.45	10^3	0.45	10^3	0.45	10^3	0.45	10^3	0.45	10^3	1.47	10^3
5	0.45	10^3	0.47	10^3	0.51	10^4	0.67	10^4	0.89	10^5	1.14	10^6
10	0.45	10^3	0.52	10^4	0.68	10^4	0.79	10^5	0.98	10^6	1.33	10^7
20	0.45	10^3	0.70	10^5	0.83	10^6	0.98	10^7	1.20	10^7	1.51	10^9

Table 2

Influence of oxygen (O_2) on vital-metabolic processes of acetic bacteria over 60 days. White wine (variety), 12.5 vol% alcohol, pH = 3.3, t^0 =12°C

Opening of the container volume (%)	Acetic acid content (g/l) H_2SO_4	Viable cells UFC/vol	Determinations after ... days									
			10		20		30		40		60	
			Acetic acid (g/l) H_2SO_4	Viable cells UFC/vol	Acetic acid (g/l) H_2SO_4	Viable cells UFC/vol	Acetic acid (g/l) H_2SO_4	Viable cells UFC/vol	Acetic acid (g/l) H_2SO_4	Viable cells UFC/vol	Acetic acid (g/l) H_2SO_4	Viable cells UFC/vol
0	0.40	10^2	0.40	10^2	0.41	10^2	0.41	10^2	0.42	10^2	0.43	10^3
5	0.40	10^2	0.49	10^2	0.56	10^3	0.79	10^4	0.82	10^5	0.99	10^5
10	0.40	10^2	0.50	10^3	0.64	10^5	0.82	10^5	0.98	10^7	1.20	10^8
20	0.40	10^2	0.52	10^4	0.67	10^6	0.92	10^7	1.25	10^9	1.44	10^9

BOTANY & PHYSIOLOGY

Glandular trichomes and volatile oil composition of *Artemisia lerchiana* (*Asteraceae)*

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Keywords*:* tectorial hairs, secretory hairs, essential oil

ABSTRACT

This paper presents a study of *Artemisia lerchiana* species belonging to family *Asteraceae* coming from the spontaneous flora of Romania, county Tulcea, Capul-Doloşman. This research purposed to study the secretory structures in petiole and leaves of *Artemisia lerchiana* as well as the composition of the essenţial oils extracted from fresh herba. Analysis of the essential oil extracted by hydrodistillation was performed by GC-MS and emphasized the presence of some major chemical compounds in *Artemisia lerchiana* essential oil. The main components of *Artemisia lerchiana* essential oil are: eucalyptol, camphor and borneole.

INTRODUCTION

The genus *Artemisia* L. (Asteraceae) is the largest genus in the tribe Anthemideae, and one of the largest genera in the family (Watson et al., 2002). It contains almost 500 species.

Genus *Artemisia* is represented by herbs or small shrubs, frequently aromatic. Leaves alternate, capitula small, usually pendent, in racemose, paniculate or capitate inflorescences, rarely solitary. Involucral bracts are disposed in few rows. Receptacle is flat to hemispherical without scales, sometimes hirsute. Florets are all tubular. Achenes is obovoid, absent or sometimes a small scarious ring.

The plant *Artemisia lerchiana* (Weber in Stechm) is perennial, densely grey-to white-tomentose but glabrescent and the leaves withering at anthesis; leaf-lobes often longer and narrower, 2-6x 0.2-0.4 (-0.5) mm; branches often longer, sometimes erecto-patent, with patent to nodding capitula; involucral bracts oblong to narrowly elliptical, with narrowly linear midrib (Tutin, 1976).

MATERIALS AND METHODES

The plants where collected from Tulcea county, Capul-Doloşman. The identity of the plant was confirmed by Vasile Ciocârlan, Systematic Botany Division of Faculty of Horticulture, USAMV Bucharest, with herbarium specimens.

The anatomic study was made to the level of the leaves and petiole. For this study we used the hand-made sections of fresh material, which were clarified in chlorine-hydrate and colored with iodine green and carmine-alaunate. The photos and the histo-anatomical observations were made with optical microscope Novex (Holland) with a digital camera and photonic microscope (ML-4M IOR).

In order to analyze the volatile oil a vegetal material in two vegetation stages, bud and flower was used. The volatile compounds were extracted by hydrodistillation with a Singer-Nickerson apparatus. The separation and identification of components was carried out using an Agilent gas chromatograph, equipped with quadruple mass spectrometer detector. A capillary column DB-5 (25 m length x 0,25 mm i.d. and 0.25 μm film thickness) and helium as carrier gas were used. The initial oven temperature was 60°C, then rising to 280 °C at a rate of 4°C /min. The NIST spectra bank was used for to identify the volatile compounds, which were verified with the Kovats indices.

RESULTS AND DISCUSSIONS

In transversal section at the level of the leaf, a large number of long bending uniseriate tectorial hairs may be noticed, which give a whitish silky macroscopic appearance (Fig.1a).

The contour of the transversal section at the level of the stalk is slightly, with lateral-adaxial extremities slightly deepened. The single layer epidermis has slightly radially elongated cells, whose external walls are a little bit more thickened than the others and cutinized. From place to place there are stomata situated at the same level as the epidermal cells (both at the adaxial and the abaxial face). Especially at the adaxial face (and slightly on the lateral-abiaxial sides) there are multi-cell uniseriate tectorial hairs. As far as the secretory hairs are concerned, they are numerous at the adaxial face (and rare at the abaxial face) and they are of two types: short, with unicellular base, unicellular pedicel and the secretory part, which is usually two-cell, and long, with uniseriate two-three-cell pedicel and secretory part, which is two- or four-cell.

The total quantities of volatile oil extracted from studied *Artemisia lerchiana* plants varied between 0.6 ml/100g bud phenophase and 0.2 ml/100g flower phenophase .

The volatile oil composition extracted from *Artemisia lerchiana* has changed during the period between bud and flowering phenophases. During that period the number of compounds identified in the volatile oil extract grew from 7 in the bud phenophase to 26 at flowering, representing 96.32 % and 98.36% respectively from the total of the compounds identified.

The major components in the volatile oil extracted from bud phase plants where monoterpenes, especially eucalyptol (49.71%), borneole (16.79%), and camphor (12. 87%) (Fig.3). No sesquiterpenes where identified in this phase.

During the period between bud and flowering phenophases the borneol content grew up to 22.26 %, and the eucalyptol and camphor content decreased to 44% and 7.50% respectively. The accumulation of a small quantity of sesquiterpenes was observed. Among those: D germacrene, elixen, spatulenol, caryophyllen oxide, aromadendrene oxide and other low volatility substances.

CONCLUSIONS

1. In cross section, leaf and petiole showed uniseriate tectorial hairs.
2. The petiole presented secretory hairs, especially on the adaxial face.
3. Volatile oils present in the studied phenophases differ qualitatively and quantitatively as well.
4. The main components of *Artemisia lerchiana* essential oil are: eucalyptol, camphor, and borneole.

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TABLE AND FIGURES

Table 1

The main substance of the volatile oil extracted from *Artemisia lerchiana*
(% of total compounds)

Volatile compounds	*Artemisia lerchiana* –Ecotype Cap Doloşman phenophase	
	bud	flower
Ethyl methyl butyrat	nd	0.26
Ethyl 3 methyl butyrat	nd	0.31
Triciclene	nd	0.25
alfa- Pinene	nd	0.44
Camphene	3.74	4.99
Sabinene	nd	0.36
beta- Pinene	nd	0.70
Myrcene	nd	1.08
alpha- Terpinene	nd	0.46
o-Cimene	nd	1.78
Eucalyptol	**49.71**	**44.00**
gama –Terpinene	nd	0.82
Isopropyl methyl biciclohexen-2-ol	nd	0.69
alpha-Terpinolen	nd	0.21
Isopropyl methyl-ciclohexen-1-ol	nd	1.35
Camphor	**12.87**	**7.50**
Limonene oxide	nd	0.65
Borneole	**16.79**	**22.62**
Terpinen-4-ol	4.15	2.52
alpha –Terpineole	3.79	0.97
Myrtenol	nd	0.47
Isobornyl format	nd	0.31
Bornyl acetate	5.27	3.49
Chrysantenyl acetate	nd	0.51
alpha- Terpynyl acetate	nd	0.38
Germacrene D	nd	0.62
Elixen	nd	0.24
Spatulenol	nd	0.13
Caryophyllen oxid	nd	0.12
Aromadendrene oxid	nd	0.13

Fig. 1 Morphological aspect of *Artemisia lerchiana* W.S. (orig.)
Fig. 1a. Cross-section of leaves *Artemisia lerchiana* W.S. (orig.)

Fig. 2 Cross-section of petiole *Artemisia lerchiana* W.S. (orig)

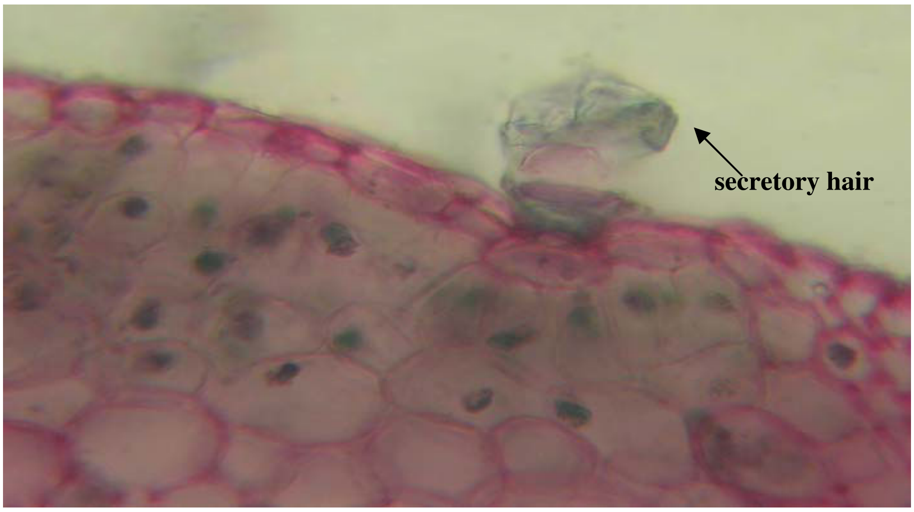

Fig. 2a. Details secretory hairs – *Artemisia lerchiana* W.S. (orig)

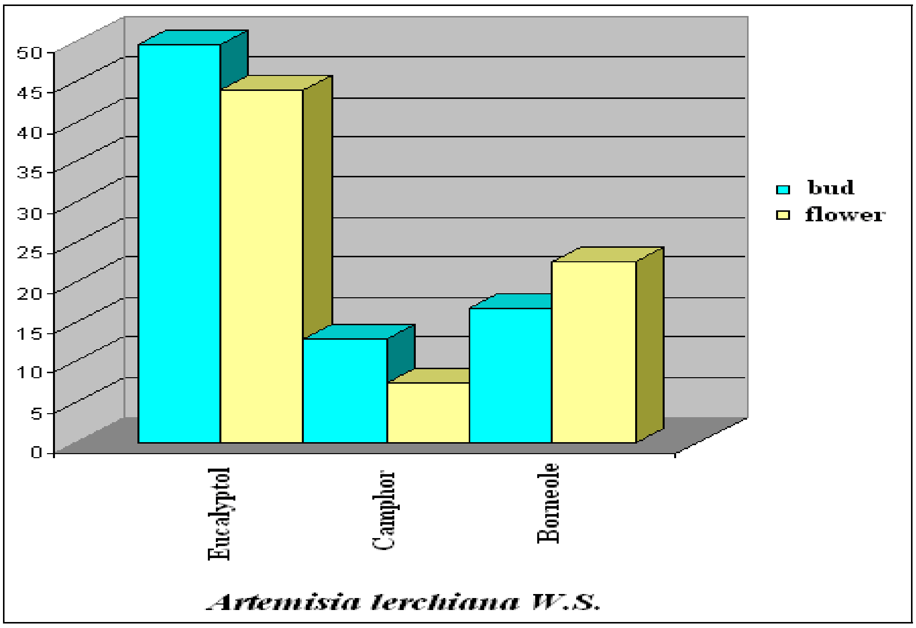

Fig. 3 Major chemical compounds

The chemical composition of volatile oils in ten species of *Achillea* from Romania

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Keywords: *Achillea*, volatile oil composition

ABSTRACT

We identified 72 different components in the volatile oils extracted from ten species of *Achillea*. The number of components in each species varies from 18 in *Achille afilipendulina* and 35 in *Achille aochroleuca*. Among identified substances, only three were found present in volatile oils of all *Achillea* species: camphor, terpinene-4-ol and germacren D. The main components of volatile oils in each species were identified as follows: *A. coarctata*: eucalyptol and germacren D., *A. distans*: germacren D (18.39%), eucalyptol (17.56%), borneol (6.26%), β-pinene (10.95%) and α-pinene (7.38%), *A. leptolphylla*: camphor and eucalyptol, *A. millefolium*: camazulene, β-pinene, eucalyptol, *A. nobilis subsp. neilrechii*: borneol, *A. ochroleuca*: eucalyptol, *A. panonica*: eucalyptol, sabinene and β-pinene, *A. setacea*: eucalyptol, eudesmol and borneol, *A. sudetica*: β-pinene, eucalyptol, sabinene and eudesmol and *A. filipendulina*: β-eudesmol, elemol and cubenol.

INTRODUCTION

Achileea belongs to the order *Asterales*, family Asteraceae and 32 species of *Achileea* are present in Romania (Ciocîrlan, 2010). This plant is perennial, with oblique or horizontal rhizome, with stem secretor ascending, striate, moderately hairy, simple or branched at the top. Its leaves are green, simple or pinnate-divided, covered with trichomes or smooth. Its blossoms are displayed in clusters of 3-5 mm long, its hipsofiles clasped with the edges brown to blackish brown, and its flowers are ligulate, white, rarely pink or yellow. *Achileea* blooms between June and August, and its fruits are achenes, 1.5-2 mm long. The structure of trichomes from these species was studied by Thomas and Rust (1998) and their ultra structure was studied by Figueiredo and Pais (1994). The chemical composition of volatile oils was analyzed and specified both by Romanian (Burzo et al, 2005, Oniga et al, 2006, etc.) and international researchers (Falk et al, 1974, Peleah et al, 2002, Maffei et al, 2003, Mokute et al, 2003, Nemeth, 2005, Boskovic et al, 2005, Orav et al, 2006, Toncer et al, 2010).

These plants have received much attention due to them many beneficial properties found in some of their species, such as: anti-inflammatory, antiseptic, antibacterial, antifungal, antispasmodic, anti-hepatotoxic, hypotensive diuretics, hemostatic, wound-healing, lipid-lowering, antitumor, antispermatogenic and insect repellent.

The present research aims to specify the chemical composition of the volatile oils extracted from ten species and subspecies of *Achillea* original from Romania.

MATERIALS AND METHODS

The research was done on the following nine spontaneous flora species of *Achillea*: *Achillea coarctata* Poir., *Achillea distans* Waldst. et Kit. ex Willd., *Achillea leptophylla* M. Bieb., *Achillea millefolium* L., *Achillea nobilis subsp. neilreichii* (A. Kern) Valen., *Achillea ochroleuca* Ehrh., *Achillea pannonica* Scheele, *Achillea setacea* Waldst. et Kit. and one cultivated species: *Achillea filipendulina* Lam.

We collected for analysis the aerial organs, harvested in full blooming stage.

The volatile oils were extracted by hydro-distillation over a period of three hours, using a Clevenger device.

The separation of components was achieved with a gas chromatograph AGILENT, with a mass spectrometric detector with quadruple.

We used a DB 5 capillary column, with a 25 meters length and 0.25 millimeters diameter, using helium as the carrier gas. The oven's initial temperature was 50º C, isotherm for 4 minutes and then increased to 280º C, with a gradient of 4 degrees per minute.

Also, we used Kovats retention indices in order to confirm the exact position of the peaks in the chromatogram, using a series of n-alkanes as reference.

RESULTS AND DISCUSSIONS

The analytical results illustrated in Table 1 show that 72 different chemical components were identified in the volatile oils extracted from the ten species of *Achillea*. The number of volatile oils varies with the species between 18 components in *Achillea filipendulina* and 35 components in *Achillea ochroleuca*.

Among the 72 chemical components, only three were identifies in all ten species of *Achillea*: camphor, terpinene-4-ol and germacren D. The amount of camphor varies between 0.36% of all identified components in the volatile oils of *A. millefolium* and 45.77% in the volatile oil extracted from *A. leptophylla*. The amount of terpinene-4-ol varies between 0.46% in the volatile oil of *A. millefolium* and 4.59% in that of *A. coarctata*. The amount of germacren D varies between 1.44% in *A. nobilis* subsp. *neireichii* and 18.39% in *A. distans*.

By analyzing the main components identified in the volatile oils from the 10 species of *Achillea*, we observe some specific variations by species.

For example, for three species the eucalyptus was the main component, alongside some other components found in large quantities, depending on the species. Specifically, the volatile oil extracted from *A. coarctata* was characterized by the presence in large quantities of eucalyptol (19.44% of all components), alongside germacren D (15.37%) and borneol (7.29%). Importantly, these results run contrary to the findings of Peleah et al (2002) who identified as main components the bornil acetate, the zingiberene and the lavandulil acetate. By contrast with the *A. coarctata* species, the volatile oils extracted from *A. distans* additional contains β-pinene (10.95%) and α-pinene (7.38%) as major components. Furthermore, in *A. ochreleuca* the main component of volatile oil was again the eucalyptol (29.12%), though we have also found verbenol and izoborneol in small quantities (6.62% and 5.69%, respectively.

For the *A. setacea* species the main components we three sesquiterpenic alcohols: eucalyptol (27.04%), eudesmol (26.36%) and borneol (9.30%). These results only partially accord with those of Todorova et al (2001), where the main components identified were the eucalyptol (41.8%) and the borneol (10.00%).

For the *A. sudetica* species the volatile oils have as main components the β-pinene (105.55%), eucalyptol (14.62%), sabinene (14.35%) and eudesmol (14.08%).

For the *A. leptophylla* the volatile oils contain camphor in large quantities (45.77%), and eucalyptol (9.13%).

The volatile oils of *A. millefolium* contain large quantities of camazulene (22.67%), β-pinene (22.17%) and eucalyptol (10.36%). These results differ from Hachey et al (1990) only in that instead of β-pinene they identified thujone.

The volatile oils extracted from *A. nobilis* subsp. *neilrechii* is characterized by large quantities of borneol (59.70%), but also β-terpineol, izoaromadendren epoxide and ledol in small quantities (5.18%, 4.78% and 3.93%, respectively).

Lastly, for the ornamental species *A. filipendulina*, the volatile oils extracted contain sesquiterpenic alcohols in large quantities: β-eudesmol (27.60%), elemol (12.25%) and cubenol (10.04%).

We note that, from the bio-chemical standpoint, our results show that the main components of volatile oils of the 10 *Achillea* species are monoterpene hydrocarbons(β-pinene, sabinene), monoterpenic alcohols (borneol, eucalyptol), monocyclic cetones (camphor), sesquiterpenic hydrocarbons (camazulene, germacren D) and sesquiterpenic alcohols (cubenol, elemol and eudesmol).

CONCLUSIONS

1. In the ten *Achillea* species analyzed, we identified 72 different components in the volatile oils, their number varying between 18 components in the *Achillea filipendulina* species and 35 components in the *Achillea ochroleuca* species.
2. Among the identified substances, the camphor, the 4-terpineol and the germacren D are the only ones found in the volatile oils of all species.
3. For each species, the main components identified vary as follows:
   - the eucalyptol (19.44%) and germacren D. (15.33%) in *A. coarctata*;
   - the camphor (45.77%) and eucalyptol (9.13%) in *A. leptophylla*;
   - the camazulene (22.67%), β-pinene(22.17%) and eucalyptol (10.36%) in *A. millefolim*;
   - the borneol(59.70%) in *A. nobilil subsp. neilrechii*;
   - the eucalyptol (29.12%) in *A. ochroleuca*;
   - the eucalyptol (16.97%), sabinene (16.97%) and β-pinene (10.06%) in *A. panonica*;
   - the eucalyptol (27.04%), eudesmol (26.36%) and borneol (9.30%) in *A. setacea*;
   - the β-pinene (15.99%), eucalyptol (14.62%), sabinene (14.35%) and eudesmol (14.08%) in *A. sudetica*;
   - the β-eudesmol (27.60%), elemol(12.25%) and cubenol (10.04%) in *A. filipendulina*.

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Table 1

The chemical composition of volatile oils in ten species of *Achillea*

Chemical component	***Achillea species***									
	coarctata	***distans***	***leptophylla***	***millefolium***	***nobilis ssp. neilrechii***	***ochroleuca***	***panonica***	***setacea***	***sudetica***	***filipendulina***
Santalina trien				0.23			0.67			
α-Thujen	0.90			0.26			0.28	0.28		
α-Pinen		**7.38**	1.32	4.07	0.60	1.12	3.21	1.27	3.26	
Camfen	1.15	1.45			1.78	1.10	0.44	0.72		
Sabinen		3.50	0.53	3.10		1.02	**11.55**	2.63	**14.35**	1.18
Octen-3-ol	1.10									
β-Pinen	2.21	**10.95**	0.76	**22.17**		0.28	**10.06**	0.78	**15.99**	
Mircen				3.40			0.30	0.29	0.50	
α-Terpinen			0.55	0.21		0.68	0.81	0.56		
p-Cimen	1.27	0.83	0.64	0.92			1.75			
Eucaliptol	**19.44**	**17.56**	**9.13**	**10.36**		**29.12**	**16.97**	**27.04**	**14.62**	0.63
Ocimen	1.46	0.25		0.21					0.48	
γ-Terpinen		0.88	0.87	1.07	0.32	1.14	1.58	0.74	1.96	
α-Terpinolen				0.12		0.28	0.29	2.94		
Linalol				0.17		1.35		1.61		
Crizantenonă						1.16				
Trans- β-Terpineol	3.79	0.98	1.38							
cis- β-Terpineol			1.14		**5.18**				1.21	
trans-Pinocarveol		0.40		0.58						
cis-Verbenol			3.28							
Camfor	3.74	4.27	**45.77**	0.36	1.44	3.68	4.22	1.05	0.75	4.56
Verbenol						**6.62**				
Izoborneol						**5.69**				
Pinocarvonă		0.65							1.87	
cis-Crizantemol				2.44			3.91			
Lavandulol							1.97			
Borneol	**7.29**	**6.26**	4.49		**59.70**			**9.30**	0.87	**6.43**
Terpinen-4-ol	4.14	0.91	1.92	0.46	1.57	3.32	1.61	1.65	2.64	1.16
α-Terpineol	4.59	3.40	1.83	1.43		3.20	2.93	3.48	2.29	0.34
Mirtenol		0.75		0.20			0.52		0.49	
trans-Caren-4-ol					0.48		0.86			

cis-Carveol			0.39			0.18				
Estragol										3.09
Nerol								0.23		
trans-Crizantenil acetat				0.26		1.30				
Carvonă			0.46		0.51			0.27		
Citral										
Izogeraniol						0.87		3.13		1.37
Geraniol					0.52	0.38				
Piperitonă		0.21					0.49			
Fenchil acetat		0.26								
Geranil format						1.53				
Bornil acetat	1.21	4.33	0.79	3.16	1.07	2.43			0.37	2.40
trans-Carvil acetat				0.38						
Carveol										0.49
Mirtenil acetat							0.41			
ciclo-Geraniol acetat							2.45			
Eugenol					0.68	1.14		0.41		
Neril acetat						0.52	**6.85**	0.86	0.28	
Geranil acetat			0.44	0.25		0.21	0.75			
β-Burbonen				0.21						
β-Elemen	1.08					0.53			0.99	
Metil-eugenol			0.33							
β-Cariofilen		1.87	0.59	**5.07**	1.11	1.19	0.25	0.41	2,44	2.06
β-Farnesen								0.32		
Patchoulen								0.64		
α-Cariofilen	1.25	0.32		0.71					0.73	
Germacren D	**15.37**	**18.39**	1.83	**5.31**	1.44	4.45	**6.04**	1.91	**8.02**	7.41
Elixen							0.68		1.38	
Elemen	**6.29**	1.78	0.46		1.32	0.54				0.37
α-Farnesen		0.37								
γ-Cadinen	3.65							1.10		
δ-Cadinen		0.85		0.22	0.69					
Elemol						3.71				**12.25**
Nerolidol		0.30				2.75		0.87		
Ledol					3.93					
Germacren D-4-ol		2.29								
Spatulenol	1.27				0.51				1.08	

Cariofilen oxid		1.34		1.32	2.77	2.71	1.77	1.83	1.01	
Izoaromadendren epoxid					4.78					0.49
Viridiflorol				1.62		0.31				1.87
r-Eudesmol						1.75		**26.36**	0.70	
T-Muurolol		0.76								
T-Cadinol							1.14			
Cubenol	**5.12**	0.40						2.58		**10.04**
α-Eudesmol	2.73				1.01	1.30		0.29	**14.08**	**27.60**
α-Cadinol		1.96		0.30			0.83			
Selinen-4-ol						1.26				
Bisabolen epoxid										
Farnesol									0.82	
Camazulenă				**22.67**					2.03	
Leden oxid							1.73			
Total compounds	**21**	**31**	**22**	**32**	**21**	**35**	**31**	**30**	**27**	**18**

Research on the biometric and biochemical features of some apple market varieties from western side of Romania (*Malus domestica*)

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Keywords: apple, fruits firmness, soluble glucyds, dry matter, starch-iodine test.

ABSTRACT

Fresh fruits and vegetables are highly perishable commodities that can easily spoil or deteriorate during produce handling along the supply chain from the producer to the final retailer. All fruits and vegetables are living parts of plants containing 65 to 95 percent water. They continue their life metabolisms after harvest and thus change their characteristics depending on product handling, storage and treatment; all of which have a decisive impact on the life of the product. In fruits occur a lot of physiological and biochemical processes from which result modifications of color, consistency, juicy and taste of fruits. Post-harvest losses following products can damage up to 50% or more for countries that are developing. Therefore reducing losses is highly economically significant for both producer and consumer (FAO, 2006). In this experiment we studied the biometric and biochemical features of some apple varieties form agricultural market in western side of Romania.

INTRODUCTION

Apples, peaches and pears have a wide range between climatic minimum and maximum level, in conclusion best possibilities of storage and transportation (Belding, 2008).

The ethylene is located in all plant organs, but in the largest amount is located in fruits and it is also used in artificial forms, producing forced ripening. The ethylene is also named senescence hormone, being essential in developing plants (Feng et al., 2000).

Apple ranks first, in grown fruit species, from temperate zone. Fruits have a long term for storage (from 7-9 months, to some winter varieties) and they present resistance to handling and transport.

Carbohydrates are important in terms of the possibility of preserving fresh fruit and plastic due to nutritional role they have. Carbohydrates provide different intensities for sweetness of fruit, depending on variety and stage of development of fruit and tannins and acids with specific causes of each fruit taste each product or horticultural (Gherghi et al., 2001).

MATERIALS AND METHODS

The biological material was represented by four varieties of apple, fruit which is sold on market in western Romania: Starkinson Ungaria, Jonathan Ungaria, Starkinson Varciorova, Jonathan Varciorova. The following parameters were studied: fruit's dimensions (diameter, weight), flesh firmness, acidity (pH) of vegetable juice, soluble carbohydrate content, dry matter and iodine – starch test (AI). To determine fruit firmness we used a digital penetrometer, removing the two small disks of peeled fruit in the middle of the dry flower stems and opposite sides of the apple. Soluble carbohydrate content was achieved with digital refractometer, Brix degrees was equate to the percentage depending on the temperature determination (for each 10°C we increase the percent of total soluble percent with 0.5 %). The percentage of dry fruit pulp was determined using Kern termobalance (Unay, 2004). The determination was made immediately after fruit prelevation from market.

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RESULTS AND DISCUSSIONS

Comparing with the standard values, the imported varieties, and even the local varieties, are falling in the Extra category. The highest weight and diameter belongs to Starkinson Ungaria variety, with the average weight of 206.34 g and 74.75 mm (Table 1).

Insignificant changes in key physical parameters after keeping reflect the standards quality. The uniformity of fruit marketed, from this point of view fits the category of "extra" (Table 2).

During the experiment was performed and the starch-iodine test in order to assess the degree of ripeness of fruit from the four varieties studied. Looking at the charts it was found that all the fruit fall within the "super-maturated" in terms of development stage (Fig. 1).

Comparing with AI diagram, usually all fruits with indicators of 3-4 AI, are suitable for long time storage in rooms with controlled atmosphere. Apples with indicators of 4-6, is best suited for short-term storage in rooms with controlled atmosphere, and those with indicators from 6-7-8-9 AI, should be placed in regular cold storage or sold immediately.

After the AI test performance, for starch/glucose observation was found that all samples present indicator 9, which indicates high levels of glucose. In this case all varieties are catalogued being as fruits of overripe category (Fig. 2).

Lowest value of dry matter was registered in Jonathan Varciorova variety (10.05 %), and the biggest value was registered in Jonathan Ungaria variety with 14.99 percent. Regarding to the soluble carbohydrates, the Jonathan Varciorova variety was showing a good percentage of glucose content (17.97 %), while Starkinson Ungaria exhibit a low of 10.7 % (Table 3).

Regarding acidity, the values obtained from the pulp of the fruit were significantly similar between the four genotypes. During the storage has seen a trend of increasing acidity, the highest value being recorded at the Starkinson Ungaria (4.42). There was a reduction in fruit flesh firmness at Jonathan Varciorova (3.63), while Starkinson Ungaria recorded a larger firm, which leads to the possibility of preserving for a longer period of time (Table 4).

Fruit firmness is determined easily and accurately in terms of pounds or grams of force required to penetrate the flesh. The fruit contains more calcium the more can be stored fruit, which will maintain its quality/good firmness. Low calcium content in apple reduces the firmness and duration of storage possible.

(http://www.acsa.md/public/publications/532252_md_458206_md_proto.pdf).

CONCLUSIONS

As regarding the physical and biochemical parameters in the four genotypes of apple studied Starkinson can see that Hungary had higher values in diameter, weight, acidity and firmness, while Jonathan Hungary had the greatest content in dry matter.

After establishing the content of starch/glucose using the AI test, the results show us that all samples present a number 9 indicator. In conclusion all varieties have a high level of glucose meaning that they belong to the overripe fruits category.

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TABLES AND FIGURES

Table 1

Results on the physical characteristics of apple varieties studied

Genotype	Diameter (mm)	Weight (g)
Starkinson Ungaria	74.75 ± 0.23	206.34 ± 1.17
Jonathan Ungaria	74.5 ± 0.63	176.98 ± 1.09
Starkinson Varciorova	67± 0.82	152.37 ± 1.72
Jonathan Varciorova	57.75 ± 0.41	119.84 ± 1.38

Table 2

Minimum standards to determine the weight of apples

(http://www.acsa.md/public/publications/532252_md_458206_md_proto.pdf)

	Extra	Category I	Category II
Large fruited varieties	110 g	≤90 g	≥90g
Other varieties	90 g	80 g	70 g

Table 3

Results regarding the dry matter percent and total content of soluble sugar in tested fruits

Genotype	Dry matter (%)	Total content of soluble sugars (%)
Starkinson Ungaria	12.92 ± 1.35	10.7 ± 0.46
Jonathan Ungaria	14.99 ± 1.28	15.4 ±1.21
Starkinson Varciorova	10.49 ± 0.84	12.86 ±1.08
Jonathan Varciorova	10.05 ± 0.26	17.97 ± 1.49

Table 4

Results regarding the fruits acidity and fruits firmly in tested genotypes

Genotype	Fruits acidity (pH)	Fruits firmness (pounds)
Starkinson Ungaria	4.42 ± 1.25	6.73 ± 1.89
Jonathan Ungaria	4.12 ± 0.98	5.40 ± 1.14
Starkinson Varciorova	4.40 ± 1.07	5.52 ± 1.28
Jonathan Varciorova	3.75 ± 1.15	3.63 ± 1.31

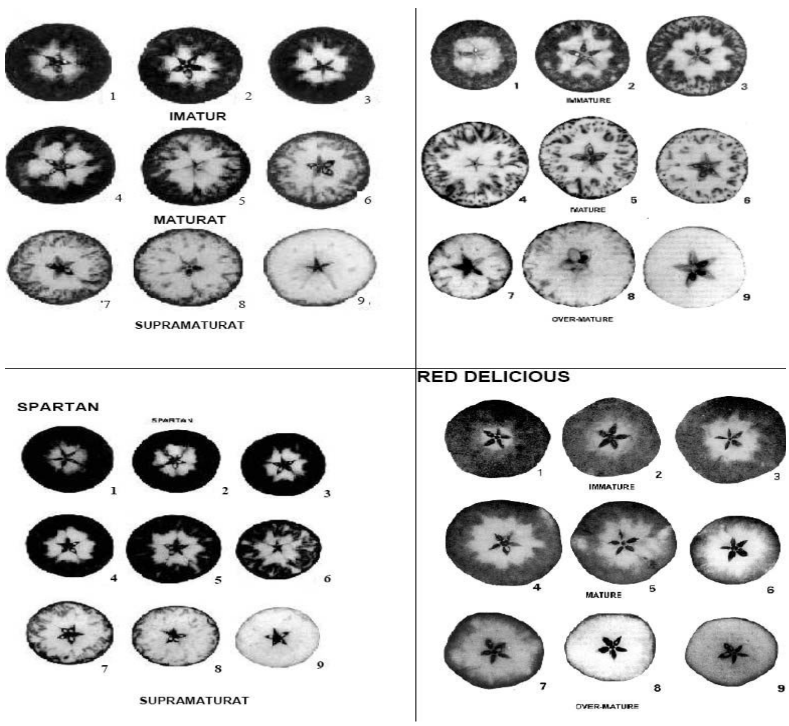

Fig 1. Assess the degree of ripeness of fruit with starch-iodine test (http://www.acsa.md/public/publications/532252_md_458206_md_proto.pdf)

Starkinson Ungaria

Starkinson Varciorova

Jonathan Ungaria

Jonathan Varciorova

Fig. 2 Results of starch-iodine test

Overview of physiological significance of hormonal signalling on plants defense responses against biotic stress

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Keywords: stress physiology, higher plants, molecular signaling

ABSTRACT

The plants are exploited by many stress factors, including biotic factors such as bacteria, fungi, nematodes, insects and even other plants nearby. Therefore, to successful overcome these drawbacks plants have developed specific mechanisms to recognize stressors and to shifting perceptions in defense responses. Within these complex molecular mechanisms hormones have a special role, being signals that integrate internal development processes and external inputs, with their translation in appropriate specific answers. In such context, this overview summarizes recent progress on plants hormonal signaling that is activated in response to biotic stress factors attack, from fundamental point of view and with relevance for practical activity.

INTRODUCTION

Plants growth, productivity, reproductive capacity or survival may be negatively affected by external stress factors. There's a wide variety of stressors, which can be classified into two main categories: abiotic stress factors (environmental factors) and biotic factors (biological stressors) (Rhodes and Nadolska-Orczyk, 2001). Therefore, plants have to cope such situations in various ways (Lamb and Dixon, 1997; Glazebrook et al. 1997), so, to survive at different levels of stress they produce a variety of biological active small peptides such as lipid transfer proteins, puroindolines, α/β –thionins, γ-thionins, plant defensins, hevein-like proteins, knottin-like peptides, glycine-rich peptides and homologs of MBP-1 (snakins) (Castro and Fontes, 2005).

Regarding the biotic stress, plants have sophisticated mechanisms for attack perception and perception translation into an adaptive response. Constitutive or inducible biochemical and molecular mechanisms are used (Ribeiro do Vale et al., 2001; Huey et al., 2002; Gachomo et al., 2003; Bauer et al., 2004; Chen et al., 2004; Chi-Chen Chang, 2005; Katou et al., 2005; Fujita et al., 2006; Walley et al., 2007; Freeman and Beattie, 2008; Iriti et al., 2007; Iriti and Faoro, 2009 etc.). The answer consists in command of a cascade or network of molecular events, beginning with stress perception and ends with a battery of target genes expression (Pastori and Foyer, 2002; Agarwal et al., 2006; Zhou et al., 2010). Mitogen activated protein kinase (MAPK) cascades are universal signal transduction modules in eukaryotes, including yeasts, animals and plants (MAPK Group, 2002).

MAPK cascades relay and amplify signals via three types of reversibly phosphorylated kinases leading to the phosphorylation of substrate proteins, whose altered activities mediate a wide array of responses, including changes in gene expression (Rodriquez et al, 2010). MAPK cascades have been identified as a universally conserved signal module consisting of MAPK kinase kinase (MAPKKK) – MAPK kinase (MAPKK) - MAPK, which mediates plant responses to biotic and abiotic stresses (Pitzschke et.al, 2009), including phytohormones. One of the plants identified and characterized MAPKs are rice OsSIPK (Salicylic acid (SA) – Induced protein Kinase). Results obtained in different plants permit to be stated that SIPK functions as a ‘‘central master switch” for integrating and converting numerous signals derived from external stimuli, for adjusting physiological responses. Further study on SIPK interacting components will help elaborate signal mechanisms governed by SIPK in plants, including rice, and that may help in designing new generation plants resistant to biotic and abiotic stresses (Cho et al., 2009).

Although defense genes in animals and plants differ considerably, connecting signal transduction receptor activity for induction of defence response has some similarities (Hirt, 2002). Some of the more interesting examples of these include prostaglandin/octadecanoid-mediated responses to wounding, steroid-based signalling systems, and pathogen-recognition mechanisms. Some of these similarities probably represent evolutionary convergence and others may be ancestral to plants and animals (Schultz, 2002).

Molecular bases of defense systems in plants have been based on the theory of "gene for gene" by Flor (1971) that resistance to pathogens is governed by processes of dominant or semidominant resistance (R) genes in the plant and dominant avirulence (*avr*) genes in the pathogen. Understanding the genetic control of plants response to pathogens and abiotic stress, as well as knowledge of molecular regulation of physiological responses is the key to rational breeding of cultivated plants varieties (Mengiste et al. 2003). Today, there are known plant species with complete genome sequence key information: *Arabidopsis thaliana*, *Populus trichocarpa* and *Oryza sativa*. As Öktem et al. (2008) reviewed, identification of stress related genes via microarrays provide valuable information to improve biotic and abiotic stress tolerance in plants.

Morever, taking into consideration that plants responses to different environmental stresses include also some protective compounds and proteins (*PR* proteins – pathogenesis related; *HSPs*- heat shock proteins; *AFRs* – antifreeze proteins; *dehydrins* and other proteins, Vitámvás et al. (2007) summarized some examples based on proteomics. The conclusion was that this information can enable us to find the biomarkers of plant tolerance to stress, to identify unknown pathogens, to quantify the biomarkers in different cultivars or evaluate the quality of products. Recently, Delaure´ et al. (2008) reviews the main components of the ubiquitination pathway, with focus on E3 ubiquitin ligases and their involvement in the different disease resistance mechanisms. The conclusion was that E3 ubiquitin ligases are involved in different defense responses including gene-for-gene resistance, early defense reactions and induced disease resistance. Angot et al. (2007) cited by Delaure´ et al. (2008) mentioned that although the understanding of the interaction between pathogens and their host's ubiquitin proteasome system is just beginning, several examples already indicate that mimicry of host ubiquitination proteins is an important tactic among (bacterial) pathogens to block intermediates in both mammalian and plant innate immunity.

Normal processes of plant growth and development are controlled by internal and external factors. Among the internal factors **plant hormones have a key role** (Salisbury and Ross, 1992; Farnsworth, 2004; Jaillais and Chory, 2010). They are signals that integrate internal development and external inputs and also made their translation into appropriate responses. Plants in turn have many ways to modulate hormone responses, control processes that can occur at different levels of synthesis, transport, absorption and hormone turnover (Klee, 2004; Wolters and Jürgens, 2009; Bari and Jones, 2009; Robert-Seilaniantz et al., 2011).

In such context, this overview summarizes recent progress on plants hormonal signaling that is activated in response to biotic stress factors attack, from fundamental point of view and with relevance for practical activity.

HORMONAL SIGNALLING AND PLANT RESPONSE TO BIOTIC STRESS FACTORS: fundamental and practical insights

Regarding to **the signals transmission mode** it can be talk about a real history of electrical signals transmitted over long distances. Rapid long-distance signaling is classically realized by action potentials, affecting the various processes of plants (Fromm and Lautner, 2007). Also, many neuronal molecules are synthesized and plants meet certain criteria for intelligent behavior. Baluška et al. (2005) proposed that plant cells establish modes of exchange of information that have properties in common with neuronal synapses. Moreover, plants made adhesion contacts that orchestrate cell-cell communication, between host cells exposed to pathogens, parasites and potential symbionts. These contacts resemble adhesion immunological synapses found in animals.

Thus, the first known recording of a plant action potential (APs) was done on leaves of the Venus flytrap (the sensitive plant *Dionea muscipula* Ellis) in 1873 (Darwin, 1875) and *Mimosa* and at the end of the nineteenth century, there was also rediscover in normal plants. In the 1950s, there was reported to the giant alga cells and were identified mechanisms related to ion experiments "voltage-clamp". Given the comparison between plants and animals, there were also used terms such as plant neurobiology (Baluška et al., 2005; Brenner et al., 2006; Stahlberg, 2006).

Sometimes, the information corresponding to a stimulus can be "stored" in the plant, where it remains inactive until a new stimulus "reconsidering" the information and ultimately enable effect to occur (Tafforeau et al., 2006). In a recent review, Bruce et al. (2007) used the term ''stress imprint'' to describe how plant metabolism is altered by exposure to various stresses. Alternatively epigenetic changes could play a role by enabling long-term changes in gene expression. Exposure to a priming agent could activate a gene or set of genes but instead of reverting to the transcriptional silent state once the stimulus is removed, an epigenetic mark could perhaps be left, keeping the region in a 'permissive' state, facilitating quicker and more potent responses to subsequent attacks.

When plants encounter an invading pathogen there are activated responses signaled by defense hormones to restrict pathogen invasion. There are also modulated additional hormone pathways to serve other purposes. All of these are equally important for plant survival, such as re-allocation of resources, control of cell death and regulation of water stress and modification of plant architecture. Pathogens can counteract both types of responses as a strategy to enhance virulence: they regulate production and signaling responses of plant hormones during infection, also produce phytohormones themselves to modulate plant responses (López et al., 2008). Some plant pathogens take advantage of this regulatory system by mimicking hormones that interfere with host immune responses, to promote virulence (Spoel and Dong, 2008).

The number of known plant hormones has grown from five to at least ten, during the last 15 years. Furthermore, many of the proteins involved in plant hormone signaling pathways have been identified, including receptors for many of the major hormones. Strikingly, the ubiquitin–proteasome pathway plays a central part in most hormone-signaling pathways. In addition, recent studies confirm that hormone signaling is integrated at several levels during plant growth and development (see reviewed by Santner and Estelle, 2009; 2010).

Most studies on the role of hormones in plant-pathogen interactions focused on salicylic acid (SA), jasmonic acid (JA), and ethylene (ET), as being three signaling molecules (Kunkel and Brooks, 2002). Defense signaling are more complex and additional plant signaling pathways are likely to involved in regulation pathways defense, such as abscisic acid (ABA), reactive oxygen species (ROS) and glutathione (GSH). It was suggested that GSH can be a member in cross-communication with other signaling molecules in mitigating biotic stress likely through NPR1-dependent SA-mediated pathway (Ghanta et al., 2011).

Nowadays it is clear that pathogen-induced modulation of signaling via other hormones contributes to virulence. There are reported recent advances, updating current knowledge on classical defense hormones SA, JA, and ET, and the roles of auxin, abscisic acid (ABA), cytokinins (CKs), and brassinosteroids in mouldings plant-pathogen interactions.

Systemin, a 18- amino acid wound signaling peptide present in tomato determine local and systemic induction of variety of defense related genes, too (Ryan and Pearce, 1998). The emerging theme was that positive and negative regulators of these disparate hormone signaling pathways are crucial regulatory targets of hormonal crosstalk in disease and defence (Robert-Seilaniantzet al., 2011).

The responses of plants to stress factors can be seen as orchestrated by *a network that integrates the signal pathways* characterized by production of JA, SA, ET and to a lesser extent, auxines, gibberellins and citochinines (Eckardt, 2001; Swain şi Singh, 2005; Dermastia şi Ravnikar, 1996). Of course, other ways characterized by abscisic acid production and brassinosterioids are involved in this network (Deveto and Turner, 2005, Navarro et. al., 2008, reviewed by Bari and Jones, 2009). Moreover, complex interactions between phytohormones and other elements involved in signal transduction (Dmitriev, 2002), as well as training and combining the action of metabolites in plants can be as synergistic action on plant responses to unfavorable factors (Ryabushkina, 2005).

Many pathogens cause changes in hormone levels or sometimes the host themselves produce substances that control growth (Jameson, 2000). As regard as the interrelations between pathogens and changing hormone levels in affected plants, it was found that hormone levels often increase, which may be due by host increasing production, production of hormones by pathogen, or both (Cheong et al., 2002; Block et al., 2005).

The review presented by Kazan and Manners (2009) shows that recent study reveal new insights into the role of auxin in plant defense. **Auxin** and SA pathways act in a mutually antagonistic manner during plant defense, while auxin and JA signaling share many commonalities. Auxin also affects disease outcomes indirectly through effects on development.

Cytokinins affect plant immunity to various pathogens, but the mechanisms coupling plant derived cytokinins to pathogen responses have been elusive. Experiments carried out on pear fruit (to control the blue mold fungus *Penicillium expansum*) by Zheng et al. (2007) based on N^6 –benzyladenine (6-BA) alone or in combination with *Cryptococcus laurentii*, as a biocontrol yeast suggested that the combination of these two treatments could integrate the dual biological activities and might be developed into a novel protection strategy. Choi et al. (2010) found that plant-derived cytokinins promote resistance of *Arabidopsis* to *Pseudomonas syringae* pv. *tomato* DC3000 (Pst). Großkinsky and Naseem (2011) revealed that cytokinins as phytohormones involved in various regulatory processes throughout plant development, are also produced by pathogens and known to modulate plant immunity. A novel transgenic approach enabling autoregulated cytokinin synthesis in response to pathogen infection showed that cytokinins mediate enhanced resistance against the virulent hemibiotrophic pathogen *Pseudomonas syringae* pv *tabaci*. The novel function of cytokinins in the primary defense response of solanaceous plant species is rather mediated through a high phytoalexin-pathogen ratio in the early phase of infection, which efficiently restricts pathogen growth.

Signal cascade mediated by salicylic acid, jasmonic acid and ethylene do not activate defense responses independently, but rather establish complex antagonist, cooperative or synergistic interactions types, depending on the species, the combination of plant-attacking agent, and stage of plant development, as well as its physiological status. Characterization of interactions between signal paths defense and determination of molecular components that mediate the interaction between different routes will be the key to rational transgenic plants with increased resistance to disease and / or damage, without compromising other agronomic characteristics (Rojo et al., 2003). ERFs (ETHYLENE RESPONSE FACTOR) as a member of the ethylene-responsive transcription factor (ERF) family function as a transcription factor that integrates signals from ethylene and jasmonic acid pathway. ERFs constitute a control point for crosstalk with other signals. Multiple signaling pathways converge on ERFs by transcriptional and post-transcriptional regulation. Also, a specific subset of ethylene responses is modulated by ERFs that are regulated not only by ethylene, but also by other signals (see synthesis of Shinshi, 2008).

Salicylic acid (SA) is an important signal molecule in plants (a phenolic compound) that may derive from the phenylpropanoid pathway or via isochorismate synthase as demonstrated in *Nicotiana benthamiana*, tomato and *Arabidopsis*. It is involved in the induction of systemic acquired resistance (SAR) against a broad spectrum of pathogens (fungi, bacteria and viruses). Regarding the relationship between salicylic acid and plant disease resistance, salicylic acid is involved in achieving *hypersensitivity reaction* (HR). This consist to restrict pathogen infection, at a small area around the initial point of penetration and the emergence of an injury necrotic cell death induction, respectively induction of programmed cell death (PCD) (Brodersen şi al., 2005; Mur et al., 2010; Coll et.al., 2011). Recently there were distinguished two large PCD classes: autolytic and non-autolytic (van Doorn, 2011). Progresses have been made in identifying key components and bioactive derivatives of SA-signaling pathways. Revealing the inherent complexity of the SA defense signaling network requires resolving the dynamics of host pathogen interactions through detailed time-delimited analyses of infection, and infection compromised mutants, at all functional genomics scales. This includes recognizing the contribution of volatile and conjugated SA derivatives as signalling molecules (reviewed by Loake and Grant, 2007). Studies performed on cucumber plants, by treatment with acibenzolar-S-methyl (ASM) or salicylic acid emphasized that there is an antagonism or a negative crosstalk between ASM-induced local acquired resistance LAR/systemic acquired resistance SAR and JA-induced local acquired susceptibility LAS/systemic acquired susceptibility SAS (Liu et al., 2008).

Ethylene (C_2H_4) coordinates many physiological and morphological responses of plants (Bleecker and Kende, 2000; Bent et al., 2006; Khan, 2006; Zhao and Guo, 2011) including interaction with jasmonic acid, to mediate plant defense against herbivores, in fact a known action of this hormone as it was also recently emphasised by Onkokesung et al. (2010). From the practically point of view, changes its synthesis by biotechnological means may be a promising method in terms of preventing damage to agricultural and horticultural products during post-harvest (Kępczyński şi Kępczyńska, 2005; Klee, 2005).

Polyamines (PAs) are low molecular weight polycations ubiquitous biogenic amines that are implicated in diverse cellular functions in widely distributed organisms (Cohen, 1998). In plant cells the diamine putresceine (Put), triamine spermidine (Spd) and tetramine spermine (Spm) represent the major Pas (Kaur-Sawhney et al., 2003). Mutant and transgenic plants with altered Pas activity pointed to their involvement with different abiotic and biotic stresses. Microarray, transcriptomic and proteomic approaches have elucidated key functions of different PAs in signalling networks subjected to abiotic and biotic stresses, however the exact molecular mechanism remains enigmatic. PAs should not be taken only as a protective molecule but rather like a double-faced molecule, that likely serves as a major area for further research efforts to characterize the potential mechanisms of action during environmental stresses and diseases (Hussain et al., 2011).

Brassinosteroids (BRs) are natural compounds from steroids group with pleiotropic effects acting to change plant metabolism, also in protection against stress factors (Nakashita şi al. 2003; Xia et al., 2009; Xia et al., 2010; Xia et al., 2011). Bajguz and Hayat (2009) reviewed their role in response to various kinds of stresses via activation of different mechanisms. BR regulated stress response as a result of a complex sequence of biochemical reactions such as activation or suppression of key enzymatic reactions, induction of protein synthesis, and the production of various chemical defence compounds. The noticed conclusion was that BRs open up new approaches for plant resistance against hazardous environmental conditions.

Another important signaling molecule is **nitric oxid** (NO) leading to the expression of different responses genes and can provoke both beneficial and harmful effects in plant cell as summarized by Arasimowicz and Floryszak-Wieczorek (2007).

Oligosaccharides signals are able to elicit overlapping responses, including the emission of *volatile organic compounds* (VOCs) which are mainly considered a typical mode of inducible indirect defense against herbivores. In addition to simple gases, such as oxygen, carbon dioxide and water vapor, plants emit an enormous wealth of different terpenes, fatty acid derivatives, benzenoids, phenylpropanoids, and amino acid derived metabolite. There was demonstrated that *M. truncatula* emits a variety of VOCs in reaction to pathogenic and symbiotic oligosaccharides signals (Leitner et al., 2008). Studying the basic effects of single stress factors on the volatile emission of plants, also survey the influence of multiple stresses. Holopainen and Gershenzon (2010) noticed that when two or more stresses co-occur, their effects are sometimes additive while in other cases the influence of one stress has priority. The conclusion was that further investigations on the effects of multiple stress factors will improve our understanding of the patterns and functions of plant volatile emission.

Arimura et al. (2011) revealed that the signaling network for plant defense response is elicited and driven by both herbivores induced factors (e.g. elicitors, effectors, and wounding) and plant signaling (e.g. phytohormons and plant volatiles) in response to arthropode factors. Understanding insect–plant interactions is of interest not only from an ecological and evolutionary perspective, but also for the development of novel crop protection strategies.

Reactive oxygen species (ROS) and *calcium* signaling appear to be a common event in induced processes directed against herbivores (both chewing and piercing/sucking). The way the plant discerns enemy's lies in the speed and intensity of damage, as well as in the nature of specific elicitors delivered to the attacked plant cell. Despite all evidence, the connection between early perceptions of the aggressor, the generation of ROS and second messengers, and the specific emission of VOC is still far from being clear. Much work is still needed in order to better understand the important linkage between recognition of a particular biotic stress and the appropriate plant responses (see synthesis by Maffei et al., 2007).

In recent years, is becoming increasingly clear that ***lipids*** also function as mediators in many plant processes, including signal transduction, cytoskeleton rearrangement elements and transmembrane transport (Welti and Wang, 2004). These processes are crucial for cell survival, growth and differentiation, and responses to water temperature, salinity, pests and pathogens (Wang, 2004). Moreover, it is known that animal and plant cell organization has many elements in common. Recent researches provide new data on **lipid language of plant cellular signalling** (Van Leeuwen et al., 2004; Munnik, 2010; Christensen and Kolomiets, 2011).

Oxylipins are lipophilic signaling molecules derived from the oxidation of polyunsaturated fatty acids. Initial fatty acid oxidation occurs mainly by the enzymatic or chemical formation of fatty acid hydroperoxides. An array of alternative reactions further converting fatty acid hydroperoxides gives rise to a multitude of oxylipins classes, many with reported signaling functions in plants. Oxylipins include the phytohormone, jasmonic acid and a number of other molecules including hydroxy-, oxo- or keto-fatty acids or volatile aldehydes that may perform various biological roles as second messengers, messengers in inter-organism signaling, or even as bactericidal agents (see reviewed by Mosblech et al., 2009).

Jasmonic acid (JA) *and other structures such as methyl jasmonates derivative (MeJA) are substances derived from lipids* (León and Sánchez-Serrano, 1999) that *is why these signaling are treated larger here***.**

This signal regulates plant defense responses to biotic stress (pathogens and certain insects), but it control many developmental process or abiotic stress reactions (Deveto and

Turner, 2004; Koo et. al., 2009; Pauw and Memelink, 2004; Peña-Cortes, 2004; Thaler şi al. 2004; Stukkens et al. , 2005; Halim et al., 2006; Hind et al., 2011). JA is widely distributed oxylipin that is biosynthesized de novo in chloroplasts and peroxisomes in acute stress responses, controlled at the level of substrate availability, so, lipases have a key regulatory function (Ellinger et.al, 2010). As Matos and Pham-Thi (2009) summarized, in recent years it was observed a growing interest in the understanding of signaling processes in plants. Lipid molecules and lipid metabolism enzyme appear to be key players in this context. In fact, lipids are the major component of cellular membranes and their degradation under stress conditions compromises compartmentalization.

Jasmonic acid action and its interaction with others hormons

Studies in potato plants infected with potato virus Y NTN demonstrated jasmonic acid and salicylic acid involvement during the first plants responses (Kovač et al., 2005; Kovač et al., 2009). For susceptible varieties, symptoms of infection consisted of tubers necrosis apparition, chlorosis and leaf curl, accelerating senescence and a severe yield reduction. In the case of resistant varieties there have been registered an increased amount of jasmonic acid in inoculated leaves, that indicated a correlation between jasmonic acid metabolism and resistance expression. The role of salicylic acid in early defense responses has not been fully elucidated at that time.

JA signal transduction permits modulation the expression of primary response genes and some of them products allow expression of some secondary response genes. In *Catharanthus roseus*, the APETALA2-domain transcription factor is involved in the jasmonate *ORCA3*-responsive activation of terpenoids indole biosynthetic genes. By loss-and gain-of-function experiments, there was located the 74-bp promoter region within the *ORCA3*, which contains jasmonate-responsive element (JRE) (Von Endt et al., 2007). Montiel et al. (2011) revealed that at *Catharanthus roseus*, the ethylene response factor (ERF) transcription factor *ORCA3* controls the jasmonate-responsive activation of terpenoid indole alkaloid biosynthetic genes. *ORCA3* gene expression is itself induced by jasmonate. Its promoter contains an autonomous jasmonate-responsive element (JRE). There was described the jasmonate-responsive activity of the JRE from the *ORCA3* promoter in *Arabidopsis thaliana*. It was found that it interacts *in vitro* and *in vivo* with the basic helix–loop–helix transcription factor AtMYC2. Analysis of JRE-mediated reporter gene expression in an *atmyc2-1* mutant background showed that the activity was strictly dependent on AtMYC2.

Nicotiana plumbaginifolia NpPDR1, a plasma membrane pleiotropic drug resistance-type ATP-binding cassette transporter formerly named NpABC1, has been suggested to transport the diterpene sclareol, an antifungal compound. NpPDR1 was constitutively expressed throughout the root, the leaves and glandular trichoms of leaves and petals of flowers, induced expression throughout the entire leaf after infection by the fungus *Botrytis cinerea* and bacteria *Pseudomonas syringae* pv. *tabaci*, *Pseudomonas fluorescens* and *Pseudomonas marginalis* pv. *marginalis*, which induced a hypersensitive response in *N. plumbaginifolia*. By using *P. syringae* pv. *syringae* it was observed a poor response, being induced a hypersensitive response. Induction NpPDR1 expression was associated with more jasmonic acid, than with the way due to salicylic acid, which suggests that NpPDR1 is involved both in constitutive defense and jasmonic acid-dependence (Stukkens şi al. , 2005).

Thaler et al. (2004) found that tomato plants deficient in jasmonic acid had an increased susceptibility to five of the eight pathogens examined, while all pathogens were virulent on wild-type plants. Increased susceptibility has been registered for both used bacteria (*P. syringae* and *X. campestris*), for the two fungi that cause vascular wilt (*F. oxysporum* and *V. dahliae*) and *P. infestans* oomiceta. Susceptibility to three other fungi, *S. lycopersici*, *C. fulvum* and *O. neolycopersici* was not affected. So, the jasmonate answer is involved in limiting susceptibility to pathogens belonging to different taxonomic groups and different ways of life.

Studies carried out by Li et al. (2005) on a mutant tomato (*Lycopersicon esculentum*) JA-deficient, lacking local and systemic expression of defensive proteinase inhibitors (PIs) in response to injury, have shown that this phenotype resulted from loss of function of acyl-CoA oxidase (ACXIA), which catalyzes the first step in β-oxidation located in peroxisome during the biosynthesis of JA. Therefore, it was considered the role of peroxisome in the production of lipid signal molecule that promotes plant defense responses.

The tomato pathotype of *Alternaria alternata* (Aa), (a necrotrophic pathogen that causes *Alternaria* stem canker on tomato) pathogenicity depends on the production of host-specific AAL-toxin (*A. alternata* f.sp. *lycopersici* host specific toxins). Pre-inoculation with non-pathogenic Aa or pre-treatment with an elicitor prepared from Aa reduced disease symptoms by the pathogen. Salicylic acid and jasmonic acid dependent defense responses were not involved in the resistance to the pathogen induced by non-pathogenic Aa. These results indicated that SA- and JA-dependent defense responses in tomato were not involved in induced resistance by non-pathogenic Aa against infection with the toxigenic and necrotrophic pathogen, the tomato pathotype of Aa. This finding suggested that an alternative and unknown signaling pathway that is independent of SA and JA signaling may modulate the induced resistance by non-pathogenic Aa based on basal, non-host or general resistance in tomato. However, some SA- and JA-dependent genes were expressed during the induced resistance response, suggesting the existence of SA- and JA-independent signaling pathways in this induced defense pathway in tomato. The expression profiling and functional analysis of suppressive substractive hybridization (SSH) clones should reveal the details of the induced resistance against toxin-dependent necrotrophic pathogens (Egusa et al., 2008). In the case of tomato plants there were also investigated what gene(s) from the roots level have a positive role to repress root-knot nematode (RKN) infection. It was studied the interaction between RKN infection and gene expression induced by methyl jasmonate (MeJA). Expression of multicystation (MC) and of proteinase inhibitors (PIs) may represent as marker genes for estimating the induced resistance response against RKN infection (Fujimoto et al., 2011).

Feng et al. (2007) showed that there is a synergic interaction between Bt gene and internally induced chemical defence system triggered by externally applied JA in Bt corn, one of the top three large scale commercialized transgenic crop around the world.

Jasmonates influence glucosinolate biosynthesis, naturally product with role in plant defense to pathogens and herbivores. By proteomic approach, Chen et al. (2011) studied methyl jasmonate impact on physiological processes, including glucosinolate metabolism on *Arabidopsis thaliana*. There were identified 194 differentially expressed protein spots that contained proteins which participated to different physiological processes. By analyzing the functional classification there was showed that photosynthesis and anabolism carbohydrates were repressed after MeJA treatment, while carbohydrate catabolism was up-regulated. Moreover, the obtained results indicated that MeJA elicited a defense response at the proteome level through a mechanism of redirecting growth-related metabolism to defense-related metabolism.

Jasmonic acid and salicylic acid independently provide resistance to herbivores insect and pathogens, respectively. In general, JA-mediated signalling pathways are implicated in the regulation of antiherbivore defenses, while the SA pathway is associated with defense responses against pathogens. Jasmonate and salicylate pathways are two biochemical response mechanisms that can be put into action by different attackers and components of these pathways interact with each other. However, there are many exceptions to this basic framework, and recent work suggests that interactions between the JA and SA pathways may play important roles in fine-tuning defense responses (see reviewed by Smith et al., 2009). Mankandar et al. (2010) emphasized the important role for SA and JA in *Arabidopsis* defense against *Fusarium graminearum*. Disease resistance was enhance in transgenic wheat and *Arabidopsis* plants that constitutively over express the *NONEXPRESSOR OF PATHOGENESIS - RELATED GENES 1 (NPR1)* which regulate salicylic acid signaling and modulates the activation of jasmonic acid dependent defences.

Li et al. (2004) suggested the interaction of the mutualist antagonistic pathways of salicylic acid and jasmonic acid, in that WRKY70 (plant specific transcription factor, a common component of SA and JA paths) acts as an activator of genes induced by SA and as a repressor of genes responsible for JA. Also, results obtained by Li et al. (2006) indicate that WRKY70 has a pivotal role in determining the balance between SA-dependent and JA-dependent defense pathways, using transgenic plants altered in WRKY70 expression, as well as WRKY70 knockout mutants of *Arabidopsis* with the fungal pathogens *Alternaria brassicicola* and *Erysiphe cichoracearum.* On the other hand, Ren et al. (2008) indicated that the WRKY70 is important but not indispensable for JA and SA signaling, and other regulators may display the redundant role with WRKY70 in modulation of JA and SA responses in *Arabidopsis*.

In some cases it was suggested a negative inter-relation and developing strategies for defense against an attacker, negatively or positively affect other attackers (Thaler et al. (2002). Tests regarding jasmonate and salicylate interaction ways on wild tomato and examination the effects on herbivores of cultivated tomato indicated that for wild tomato, salicylic acid induction reported defense reduced expression of jasmonic acid pathway, but did not affected the performance of *Spodoptera exigua* (caterpillars). This result indicated that the interaction is not a result of the selection for culture. Cipollini et al. (2004) demonstrated that SA had little effect on the induction of defence protein activity by JA, but SA attenuated the induction of glucosinolates by JA and therefore may explain better the interactive effects of SA and JA on insect performance. There was also revealed that direct and indirect cross-effects of SA on resistance to *S. exigua* can occur in *A. thaliana*. Effects of SA may be mediated through effects on plant defense chemistry or other aspects of the suitability of foliage for insect feeding and growth.

Jasmonic acid also plays a key role in basic and induced resistance to pathogens in relation to alarm signals due to salicylic acid and ethylene, being involved in the establishment and operation of beneficial plant microorganisms associations, too (Pozo et al., 2004).

As regard as **relationship relative to ethylene** Kępczyński Kępczyńska (2005) showed that methyl jasmonate (MeJA) reduced spore germination as well as hyphae and mycelium growth for the fungus *Alternaria alternata* (Fr.) Keissl. Adding ethephon or 1-aminociclopropan acid-1-carboxylic acid (ACC), the precursor of ethylene to methyl jasmonat (MeJA) in the culture medium resulted in promoting all stages of the fungus development. Therefore, these compounds partially or completely reversed the inhibition of MeJA in relation to the applied concentration. Methyl jasmonate alone had no effect on ethylene production by the mycelium, but after 6 days of incubation in the presence of ACC, the release of this gas increased significantly, which showed that ethylene was involved in reversing inhibition of *A. alternata* due to MeJA.

Green tomatoes (*Solanum esculentum* cv. Lichum) treatment with MeJA and nordihydroguaiaredic acid (NDGA, LOX-inhibitor) revealed that MeJA reduced symptoms in tomato fruits, soon after being inoculated with *B. cinerea*. It was also activated ethylene biosynthesis, but its level was under the control. Ethylene increase was interrelated with ACC conversion to ethylene and ethylene biosynthesis was accompanied by significance increase in LOX activity (Yu et al., 2009). Plant activator, as for instance benzothiadiazole (BTH, Bion^{TM}) could represent a valid tool to improve the health benefits of plants foodstuffs, because of their stimulating effect on plant secondary metabolism, as Iriti et al. (2007) emphasized by tests performed on ripened red tomatoes (cv. Ciliegino), to control the fungus *B. cinerea*.

Moreover, as mentioned Martin et al. (2003) terpenoids are constitutive and inducible chemical defenses in conifers. Adjusting terpenes synthesis, accumulation and their releasing by leaves was studied in *Picea abies* L. Karst. MeJA treatment determined a doubling of monoterpene and sesquiterpene accumulation in leaves, without changes in the terpenes composition. Simultaneously, MeJA has ordered an increase of 5 times the total emission of terpenes from leaves, with a change in the composition dominated by a mixture of monoterpenes (e.g. linalool) and sesquiterpenes (e.g. farnesane) which also induced methyl salicylate. Linalool emission rate increased over 100 times and that of sesquiterpenes was more than 30 times. Mainly, terpenes induced synthesis by MeJA seems to be made by novo synthesis after treatment, rather than being released from stored terpenes, because they were almost completely absent from the leaves oleoresins and represent major product of terpene synthase activity measured after MeJA treatment.

Overexpression of *Prosystemin* gene (35S::PS) in transgenic tomato plants determined an increases of accumulation of volatiles emissions as against to wild plants. There was also emphasized that plants deficient in the wound induced expression of system in mediated direct defenses (*def1*) were deficient in the induction itself volatile emission in response to wounding due by *Manduca sativa*. These results suggested that system in pathway is involved in the regulation of volatile emissions (Degenhardt et al., 2010).

Studies carried out by Wolucka et al. (2005) have also demonstrated that jasmonic acid and its methyl esters mediates plant response to stress through control of transcriptional reprogramming that allows cells to cope with pathogens and stress. Among its functions it was demonstrated that treatment with methyl jasmonate increase de novo synthesis of ascorbic acid in *Arabidopsis* cell cultures and it seems to be the first report of hormonal regulation of biosynthesis of vitamin C (L-ascorbic acid) in plants, a metabolite which acts as an antioxidant, enzyme cofactor and modulator of cellular alert in the various physiological processes.

Application of methyl jasmonate and its synthetic analog *n*-propyl dihydrojasmonate (PDJ) on peach (*Prunus persica*) at a late developing stage under field conditions demonstrated that PDJ induced a late maturation as emphasized the interference with ethylene biosynthesis, next to higher levels of polyamines, as compared with the control. The practical importance of these works consist that JAs application on fruits in the field is very important because plants must overcome many stress factors (Ziosi et al., 2009).

Jasmonates are important **regulators of plant immune responses** *that are triggered by beneficial soil-borne microorganisms*. In many cases ISR is associated with potentate expression of jasmonate-responsive genes. Recent advances in research on induced systemic resistance (ISR) signaling suggests a model in which jasmonate-related transcription factors play a central role in establishing the primed state that is characteristic for ISR (reviewed by Van der Ent, 2009).

Exogenous application *of non-specific lipid transfer proteins* (nsLTPs) as constituents of pathogenesis-related (PR) proteins (PR-14 family) purified from the culture media of grapevine cell suspension on grapevine plantlets induced a high level of tolerance towards *Botrytis cinerea*, as compared with the control plants. Plants treated with jasmonic acid or LTP alone exhibited a lower protection level (Girault et al., 2008). Treatment of transgenic tobacco plants with methyl jasmonate restored resistance to insect herbivore *Helicoverpa armigera* larvae and expression of hydroperoxid lyase (HPL) and proteinase inhibitor (PI-I and PI-II). The suggestion was that monogalactosyldiacilglycerol (MGDG) play important roles as source of linolenic acid (18:3) and hexadecatrienoic acid (16:3) in jasmonic acid biosynthesis, also that JA mediated defense responses to insect herbivores in tobacco (Wang, 2009).

There was demonstrated that tuberonic acid (12-hydroxy epi-jasmonic acid, TA) and its glucoside (TAG) isolated from potato leaflets had tuber-inducing properties. Moreover, results obtained by Sato et al. (2009) emphasized that an important role of TAG is also in stress response in plants and that the salicylic acid glucosyltransferase can work for TA glucosylation.

On rice, jasmonic acid exogenous application induced resistance against *Rhizoctonia solani* in a manner similar to riboflavin, priming the express of lipoxygenase (LOX), a key gene in octadecanoid pathway and enhanced lignification (Taheri and Tarighi, 2010). Kravchut et al. (2011) noticed that soil drench treatment with hexanoic acid can effectively protect *Arabidopsis* plants against *B. cinerea* trough a mechanism based on a stronger and faster accumulation of JA-dependent defenses. There was also provided a new interesting research tool taking into consideration that JA priming is rarely stimulated by other known priming inducers.

Jasmonates are also useful to prevent post harvest decay as there was demonstrated by a lot of experiments**.** Application of SA and MeJA specially pre-harvesting to induce resistance systems against sweet cherry fruit diseases may be a useful measure to control post harvest decay on a commercial scale (Yao and Tian, 2005).

Experiments performed on freshly harvested peach fruit treated with MeJA vapours, then artificial induced injury, followed by inoculation with spore suspension of *Penicilium expansum*, *Botrytis cinerea* or *Rhizopus stolonifer* have concluded that MeJA significantly reduced post-harvest diseases (Jin et al., 2009).

Pre-harvest and/or post-harvest conditions are known to affect products quality since plants produce signaling molecules (e.g. salicylic acid, jasmonic acid, etc.) that cause a direct or indirect activation of metabolic pathways. These ultimately affect the production of phytochemicals, such as carbohydrates (sucrose and glucose), amino acids, phenolics (phenylpropanoids and flavonoids) and glucosinolates. These phytochemicals have diverse applications due to their antimicrobial, antioxidant and anti-carcinogenic properties, but on the other hand these compounds or their breakdown products can act as anti-nutritional factors in diet. In this context, there are interesting insights in the synthesis paper of Jahangir et al., (2009), based on a wide range of the stress-induced metabolic responses in the *Brassica* plants, commonly used for human consumption. As authors mentioned, all efforts should contribute to provide the means of controlling these different defense systems, leading to the development of more resistant plant varieties. Additionally, it is essential to fully understand, how different environmental factors triggering mechanisms and pathways affect their metabolic profile, since these will ultimately affect its quality, functional properties, and attributes such as taste and aroma, which will influence consumer acceptability.

CONCLUSIONS

The plants are exploited by many stress factors, including biotic factors such as bacteria, fungi, nematodes, insects and even other plants nearby. To successful overcome these drawbacks plants have developed specific mechanisms to recognize stressors and to shifting perceptions in defense responses. Within these complex molecular mechanisms hormones have a special role, being signals that integrate internal development processes and external inputs, with their translation in appropriate specific answers. In recent years it was observed a growing interest in the understanding of signaling processes in plants. For instance, lipid molecules and lipid metabolism enzyme appear to be key players in this context. In fact, lipids are the major component of cellular membranes and their degradation under stress conditions compromises compartmentalization (Matos and Pham-Thi, 2009).

When two or more stresses co-occur, their effects are sometimes additive, while in other cases the influence of one stress has priority. Thus, further investigations on the effects of multiple stress factors will improve our understanding of the patterns and functions of plant volatile emission (Holopainen and Gershenzon, 2010). Future research on hormonal signaling pathways involved in plant development will reveal the innovative ways that plants adapt their biotic environment and maximize their chances of survival (Kazan and Manners, 2009). Their signaling pathways cross-communicate in an antagonistic or synergistic manner, providing the plant with a powerful capacity to finely regulate its immune response (Pieterse et al., 2009). Study of the evolution of hormone pathways will provide insights into how these pathways have adapted to regulate complex and diverse developmental processes (Singh et al., 2011).These knowledge and future discoveries have not only strictly scientifically significance, or are interesting from ecological and evolutionary perspective, but also they have applicability for the development of novel crop protection strategies.

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Contribution to knowledge the volatile oil from Freesia x hybrida lowers, "Yvonne" and "Versailles" variety

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Keywords: Fressia x hybrida, volatile oil, floral scent, perfume.

ABSTRACT

The scent from the *"Yvonne"* and *"Versaille"* varieties of the *Freesia x hybrida* flowers contains till 87.5 % monoterpenes and sesquiterpenes, and small quantities of benzene compounds (0.45 – 3.76 % of identified substances) and hydrocarbons (0.13 – 0.43 % of identified substances). Only 4 substances, from the indentified, was present in both Freesia hybrids, in both years (2010 and 2011): linalool, α-terpineol, nerol and geraniol. The share is owned by linalool which is about 53.47 – 82.43 % from the total indentified compounds from the both Freesia hybrids, and the α-terpineol was 1.20 – 17.08 % from the total indentified compounds.

INTRODUCTION

From the Freesia x hybrida varieties, the most known are the Superfreesia (Zamfir Vâsca, 2005), featured as stronger, fragrance weak, special size of the flowers, good reproduction by seeds (Şelaru, 2002). In this category, the varieties "Yvonne" and "Versailles" stand by their very pleasant scent.

Yoichi et. al. (2002) assessed the sensorial features of flowers in 26 samples, came from 13 Freesia x hybrida varieties and Fu et. al. (2007) analyzed the composition of the volatile compounds came from the diploide variety of the Freesia refracta, 3 tetraploide varieties and the interspecific hybrids came from 3 tetraploide varieties. Were identified 75 of compounds: terpenes, hydrocarbons, alcohols, fatty acids esters and flavored compounds, the share being owned by linalool.

Wongchaochant et. al. (2005) assessed the volatile compounds came from 9 species and 16 Freesia varieties. Based on the results there was sorted into 3 classes, in accordance with the main compounds: the first class had the linalool as the main compound, the second class had linalol, 2-phenylethyl acetate and benzilic alcohol and the third class – terpinolene.

Dudareva and Pichersky (2006), Burzo and Dobrescu (2011) summarized the world research results, on substances that make up the fragrance of flowers.

The research presented in this study has aimed to specify the composition of the perfume coming from two hybrids of Freesia, from two harvests (2010 and 2011).

MATERIALS AND METHODS

The investigations were carried out with Fressia x hybrida "Yvonne" and "Versailles" variety flowers. The flowers were harvested from the same producer, each year, after 1-3-5 days of the irrigation stopped. This time was chosen because the nice perfume streamed emanated.

Volatile substances were extracted from flowers by hydrodistilation, using for this purpose a device type Singer Nikerson. Their capture was made in hexane.

Separation of components was performed by AGILENT gaschromatograph, with a masspectrometric detector, with quadrupol. It was used a capillary column type DB5 having a length 30 m and diameter of 0,25 mm, helium as carried gas. The initial temperature of the oven was 50 ^{o}C, isothermal 4 minutes and increased to 280 ^{o}C, with a gradient 4 ^{o}C / minute.

To confirm exact position of the peaks in chromatogram, also were used the Kovats retention index and a series of n-alkanes as references.

RESULTS AND DISCUSSIONS

The components of volatile oil from Fressia x hybrida “Yvonne” and ”Versailles” variety flowers and their concentration are presented in Table 1.

The number of volatile compounds, found in the essential oil, extracted from both Freesia hybrids, was different, according with climatic conditions of the year. Therefore, the essential oil extracted form the Freesia 2010 harvest had a bigger number of compounds (21-25), comparing with the one came from 2011 harvest (11-12).

From the 42 substances identified in the volatile oil derived from flowers of two Freesia hybrids, the share was owned by terpenes, which represented up to 87.5% of all substances identified, and from the terpenes the share was owned by monoterpenes. The terpenes were the terpenic hydrocarbons (eg limonene, ocimen, terpinene, terpinolen, cubeben, elemen, etc.), terpene alcohols (eg linalool, terpinene-4-ol, cadinol, eucalyptol) and terpene oxides (linalool oxide, caryophyllene oxide).

Along with terpenes, was identified also the benzene compounds, represented by: benzyl benzoate (0.45 to 3.76% from the total identified compounds) and β-phenylethyl benzoate (0.98 to 3.24% from the total identified compounds).

The hydrocarbons had a low share: 0.13 to 0.43% and were the dodecane, pentadecane, dimethyl heptane, dimethyl heptene, dimethyl octane and dimethyl nonane.

Among the identified substances, only 4 were present in the scent of Freesia flowers of both hybrids in both years. Of these, the share was owned by linalool, which was present in a greater quantity for ” Yvonne” hybrid flowers (61.15 to 82.43% from the total identified compounds), and lower in ”Versailles” hybrid flowers (53.47 to 56.88% from the total identified compounds). These results correspond to those obtained by Fu et. al. (2007).

α-Terpineol was determined in a lesser amount in the perfume of ”Yvonne” hybrid (1.20 to 1.77% from the total identified compounds) and much higher in the perfume of ”Versaille” (16.44 to 17.08% from the total identified compounds) . A similar variation but with smaller differences, was found in the case of the nerol and geraniol. Thus, the flowers perfume of the ”Yvonne” hybrid has contained 0.17 to 0.49% nerol and 0.55 to 1.34% geraniol, while the scent of flowers from ”Versaille” hybrid has contained 0.35 to 0.55% nerol and 0.89 to 1.78% geraniol.

CONCLUSIONS

Fressia x hybrida “Yvonne” and ”Versailles” variety flowers had a low content of volatile substances; this was the reason for using the hexane as capture.

The perfume of these two hybrids contained of up to 87.5% monoterpenes and sesquiterpenes and lower amounts of benzene (0.45 to 3.76%) and hydrocarbons (from 0.13 to 0.43% from the total identified compounds) .

Among the substances identified, only 4 were present in both varieties Freesia fragrance in both years: linalool, α-terpineol, nerol and geraniol.

The share is held by linalool, which accounted for 53.47 to 82.43% from the total identified compounds in two varieties Freesia fragrance.

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TABLE AND FIGURES

Table 1

The main components from open flower volatile oil of Freesia x hybrid variety "Yvonne" and "Versailles" (% from the total identified compounds)

No.	Substances	Yvonne		Versaille	
		2010	2011	2010	2011
1	Dimethyl heptane	0.17	-	-	-
2	Dimethyl heptene	0.43	-	0.33	-
3	Caren-2-ol	0.13	-	-	-
4	Dimethyl octane	0.13	-	-	-
5	Dimethyl nonane	0.13	-	-	-
6	Limonene	0.15	0.16	0.35	-
7	Trimethyl cyclohexene-1-one	19.43	-	4.45	-
8	Eucalyptol	-	-	0.50	-
9	cis-ß-Ocimene	0.27	-	-	-
10	Ocimene	-	0.12	1.10	-
11	γ-Terpinene	-	-	0.70	-
12	Dodecane	0.27	-	-	-
13	Linalool oxide	0.20	-	-	-
14	cis-Linalool oxide	-	0.16	-	-
15	trans-Linalool oxide	0.20	0.21	-	-
16	Terpinolene	-	-	0.39	-
17	Linalool	61.15	82.43	56.88	53.47
18	α-Izophorone	4.96	2.64	-	-
19	4 - Oxoizophorone	0.16	-	-	-
20	Terpinene-4-ol	-	-	0.92	0.35
21	α- Terpineol	1.20	1.77	16.44	17.08
22	Eucarvone	1.89	0.79	-	-
23	Nerol	0.17	0.49	0.35	0.55
24	Geraniol	0.55	1.34	0.89	1.78
25	α-Copaene	-	-	3.22	0.58
26	β-Cubebene	-	-	0.79	0.49
27	β-Elemene	-	-	0.43	-
28	α-Gurjunene	-	-	0.80	-
29	β-Selinene	-	-	2.10	2.67
30	β-Cadinene	-	-	1.10	0.49
31	Globulol	-	-	0.83	0.50
32	Gurjunene epoxide	-	-	1.30	-
33	α-Cadinol	-	-	0.28	-
34	Caryophyllene oxide	-	-	0.58	-
35	Selinene-4-ol	-	-	0.46	-
36	Farnesol	-	-	-	0.98
37	Pentadecane	0.26	-	-	-
38	Benzyl benzoate	0.45	-	3.76	-
39	Hexahydrofarnesyl acetone	-	-	3.24	-
40	ß-Phenylethyl benzoate	0.98	-	3.24	-
41	Safranal	-	0.26	-	-
42	Tridecanol	-	0.45	-	-

Fig.1. Fressia hybrida "Yvonne"

Fig.2. Fressia hybrida "Versailles"

Contribution to knowledge the volatile oil from *Iris germanica* L. Flowers

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Keywords: *Iris germanica*, volatile oil, floral scent, perfume.

ABSTRACT

The volatile substances that make up the scent of flower buds of Iris germanica contained 8 compounds: benzyl benzoate (32.83% from the total identified compounds) and 7 hydrocarbons (49.39 from the total identified compounds). In perfume mature flowers were identified 26 substances, represented by 12 hydrocarbons (67.97% from the total identified compounds), 8 sesquiterpenes (15.65% from the total identified compounds) 3 fatty acids (5.27% from the total identified compounds), 2 monoterpenes (0.94% from the total identified compounds) and 1 aldehyde (0.51% from the total identified compounds).

INTRODUCTION

Iris germanica L. (flag), is an ornamental plant that has underground rhizomes, thick, that there are buds; the leaves grow out to the surface from buds, like swords, and the flower's strains, tall until 100 cm. The flowers which suggest the orchid shaped, appear in May - June (Şelaru, 2001).

The flowers have a low content of volatile oil and the scent is discreet, which is why it has not been used in perfumery. To this end rhizomes and roots are used dried for three years, during this time the irones are synthesized, substances valuable in this viewpoint (Rădoias et. al., 2005).

Depending on the used extraction process, the iris rhizomes harvested after 3 years of vegetation, can be obtained: iris absolute (55-75% irones), iris butter (8-12% irones), concrete and resin of iris.

MATERIALS AND METHODS

The investigations were carried out with Iris germanica flowers, from a private garden. Volatile substances were extracted from flowers (open flower and buds) by hydrodistilation, using for this purpose a divice type Singer Nikerson. Their capture was made in hexane.

Separation of components was performed by AGILENT gaschromatograph, with a masspectrometric detector, with quadrupol. It was used a capillary column type DB5 having a lenght 30 m and diameter of 0,25 mm, helium as carried gas. The initial temperature of the oven was 50 oC, isothermal 4 minutes and increased to 280 oC, with a gradient 4 oC/ minute.

To confirm exact position of the peaks in chromatogram, also were used the Kovats retention index and a series of n-alkanes as references.

RESULTS AND DISCUSSIONS

The analysis performed showed that volatile substances produced by the buds of Iris germanica contain only 8 compounds. Of these, the share is held by benzyl benzoate, which is 32.83% of all identified substances. The remaining 7 substances are composed of hydrocarbons, which represents 49.39% of all substances identified. Of hydrocarbons, the share is held by tricosan (14.36% from the total identified compounds), octacosane (11.37% from the total identified compounds) and heptacosane (10.55% from the total identified compounds).

In the volatile substances extracted from Iris germanica the mature flowers were found the presence to 12 hydrocarbons, which held 67.97% of all substances identified. Among them was found in greater quantities of tricosane (18.26% from the total identified compounds), heptacadiene (14.24% from the total identified compounds), heptacosane (7.44% from the total identified compounds), heneicosane (6.42% from the total identified compounds), methyl tricosane (5.18% from the total identified compounds) , nonadecane (5.00% from the total identified compounds) and octacosane (4.97% from the total identified compounds).

In the volatile substances produced by the mature flowers of Iris germanica was determined the presence of 8 sesquiterpenes, which represented 15.65% of all identified compounds. Their content varied between 0.79% and 4.71%, the share is held by ß-Farnesene (4.71% from the total identified compounds), trans-farnesol (3.28% from the total identified compounds), ß-sesquiphellandrene (2.18% from the total identified compounds), farnesol (1.38% from the total identified compounds) and ß-cedrene (1.16% from the total identified compounds). Besides these substances have been identified the presence of 3 fatty acids from the cerumen on the surface of floral components. Their content ranged from 3.48% in the methyl palmitate, 1.15% for the acid-γ-linolenic, and 0.64% of methyl stearate.

The determined monoterpenes in the volatile substances from the mature flowers, was 0.94% of total of the identified compounds and were represented by the terpinene-4-ol (0.52% from the total identified compounds) and α-pinene (0.42% from the total identified compounds).

Of aldehydes, was found the presence of the nonanal, those share was 0.51% of the identified compounds total.

From these data results that, in the flower buds case, prevail the volatile substances from the biodegradation of fatty acids (hydrocarbons) and the precursors resulting from the phenylpropanoid cycle (benzyl benzoate), while in the case of mature flowers, the substances came from the cerumen biodegradation prevail (hydrocarbons, fatty acids, aldehydes), melovonate cycle (sesquiterpenes) and methyl eritrotiol phosphate cycle (monoterpenes).

CONCLUSIONS

The volatile substances made by the Iris germanica flower buds contain 8 substances: benzyl benzoate (32.83% from the total identified compounds) and 7 hydrocarbons which are 49.39 % of all substances identified.

Of hydrocarbons identified in the volatile substances produced by the flower buds, the share is held by tricosane (14.36% from the total identified compounds), octacosane (11.37% from the total identified compounds) and heptacosane (10.55% from the total identified compounds).

The volatile substances produced by the mature flowers of Iris germanica contains 26 compounds, of which 12 hydrocarbons which are 67.97% of the total identified compounds, 8 sesquiterpenes (15.65% from the total identified compounds) 3 fatty acids (5.27% from the total identified compounds), 2 monoterpenes (0.94% from the total identified compounds) and 1 aldehyde (0.51% from the total identified compounds).

Among the hydrocarbons identified in the volatile substances which are produced by Iris germanica mature flowers, the share was owned by tricosane (18.26% from the total identified compounds) and heptadecadiene (14.24% from the total identified compounds).

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TABLE AND FIGURES

Table 1

The main components from volatile oil of Iris germanica flowers
(% from the total identified compounds)

No.	Substances	Buds	Open flowers
1	α-Pinene	-	0.42
2	Acid-γ-linolenic	-	1.15
3	Farnesol	-	1.38
4	Nanonal	-	0.51
5	α-Cedrene	-	0.79
6	ß-Cedrene	-	1.16
7	ß-Caryophyllene	-	1.04
8	ß-Farnesene	-	4.71
9	Z-ß-Farnesene	-	1.11
10	Heptadecane	-	1.11
11	Terpinene-4-ol	-	0.52
12	ß-Sequiphellandrene	-	2.18
13	Heptadecadiene	3.09	14.24
14	trans-Farnesol	-	3.28
15	Benzyl benzoate	32.83	-
16	Octadecane	-	0.40
17	Nonadecane	-	5.00
18	Methyl palmitate	-	3.48
19	Methyl stearate	-	0.64
20	Tricosane	14.36	18.26
21	Eicosane	-	0.94
22	Methyl tricosane	5.49	5.18
23	Heptacosane	10.55	7.44
24	Tetracosane	2.70	2.39
25	Octacosane	11.37	4.97
26	Heneicosane	-	6.42
27	Docosan	-	1.62
28	Phenylpropyl acetate	1.83	-

Fig.1. Iris germanica

Analysis of ruderal communities located along the railway Bucharest - Oltenita (segment Morarilor Road-Ion Şahighian Street)

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Keywords: ruderal flora, specific composition, life forms, allochoric, autochoric species

ABSTRACT

Specific composition of the ruderal flora along an abandoned railroad from the eastern part of Bucharest includes both wild and ornamental species. They have specific requirements to the conditions of the biotope and a high capacity to multiply. Analyzing the composition of species according to economic categories and their role in biocoenosis were found several with medicinal, culinary, dyeing, aromatic, cosmetic uses or honey producers.

INTRODUCTION

Along the line of communication (railways, roads) are installed specific anthropic communities with edificatory-plants: *Cephalaria transsilvanica*, *Agropyron* (*Elymus*) *repens*, *Conium maculatum*, and characteristic species, like: *Cynodon dactylon*, *Leonurus cardiaca*, *Nepeta cataria* (Doniţă et al., 2005). When these lines cross the city, the composition of anthropic plant communities is diversified due to specific environmental conditions and the emergence of adventitious species from the ornamental ones. Such an association is made up of plants with certain features for multiplication and regeneration, dispersal mode and specific requirements for light and other biotope factors (Paşcovschi, 1967; Ciocârlan et al., 2004, Ciocârlan, 2009; Doniţă et al. 2004). It can be analysed in phytosociological (Cristea et al., 2004) and landscape (Walker, 2005; Vermeulen, 2006) terms.

MATERIALS AND METHODS

To achieve the specific inventory, we went along the Bucharest-Oltenita railway, track between the Morarilor Road and Ion Şahighian Street. The identified species were listed in two tables that were noted, also, the botanical family, life form, environmental requirements, underground organs, dispersal mode, and uses. Field data collections were made in May and in June 2011 to highlight the spring and summer appearance of the ruderal communities.

RESULTS AND DISCUSSION

<u>Specific composition</u>

In the segment submitted observations were identified 66 species and 30 plant families.

We appreciate that the specific diversity in the analysed area is high. The causes of this are related to biotope, microclimate and anthropogenic influence. Two kind of plant communities were found in the field: the first consists of herbaceous species with some young specimens of woody plants (fig. 1) and the second in which trees and shrubs are well developed. In the first case the microclimate is more arid, and annual or biannual xero-mesophilous herbaceous species are representative. They are adapted to colonize trodden lands and disturbed ground (eg *Torilis arvensis*, *Tragopogon dubius*, *Papaver rhoeas*, *Onopordon acanthium*, *Hordeum murinum*, etc.; Table 1). Also, in this community were identified some ornamental species who migrated from nearby landscapes (*Papaver somniferum*, *Ailanthus altissima*, *Ulmus minor*). In the second case well developed woody plants have created a more humid microclimate, which allowed the installation of mesophilous herbaceous species (fig. 2) (*Silene alba*, *Poa pratensis*, *Lolium perenne*, *Vicia cracca*, *Artemisia vulgaris*, *Erigeron annuus*; Table 1); most trees, shrubs and lianas are from street alignments or *landscape of the area (Tilia platyphyllos, Acer tataricum, A.negundo, Symphoricarpos albus, Parthenocissus inserta*; Table 2).

High specific diversity is also an indicator of increased likelihood of development of communities (Cristea et al., 2004).

<u>Grow habits and life forms</u>

Total number of herbaceous species is 53 (Table 1) and of the wood ones is 13 (Table 2). Among the herbaceous most are annual 31 (5 are ephemerous), 4 are biannual and 18 are perennial (Fig. 3). The large number of annual herbaceous species is characteristic of the first community. This is in the first stage of land colonization and it may progress to a stable community if the external disturbances will be reduced.

Perennial herbaceous species are associated with the second community where the intervention of external factors, particularly the anthropic ones, is minimal.

The life forms encountered on the field support these aspects (Table 1,2): 32 species belong to the Therophyta form (plant that survives unfavourable conditions in the form of a seed) (Bailey, 2006), 3 to Hemytherophyta form (hibernate annual or biannual plants), 11 are of the form Hemychryptofita (plants with perennating buds situated at or just below the soil surface), 5 of Geophyta (plants with its perennating buds situated just below ground on a rhizome, tuber bulb or corm), 1 of Chamaephyta (a low-growing plants whose perennating buds are borne at or near the soil surface, up to 25-30 cm height) and 13 of Phanerophyta (plants with perennating buds situated on upright stems, above soil level over 25-30 cm height) (fig. 4).

<u>Dispersal or propagation mode</u>

Analysed communities comprise species with large possibilities of propagation by seed or by vegetative organs, due to abundant fructification, the large number of seeds produced by plants, easy regeneration or rapidly development in the early stages of vegetation.

Half of the species forms fruits and seeds that are spread through external agents (20 are anemochorous and 13 are anthropo-zoochorous) allowing them to cross long distances and to exceed barriers of biotope. Some of the autochorous species have an "explosive" dehiscence of the fruit and so they can throw seeds at a certain distance from the parent plant (*Erodium cicutarium*, *Geranium dissectum*). 11 species are spreads through vegetative organs such as metamorphosed roots or stems (Table 1,2).

<u>Plants importance and uses</u>

In the two tables are noted the plants uses. Thus, among the herbaceous species 16 have medicinal uses, 10 are culinary herbs, 5 have dyes properties, 5 are ornamental plants, 5 are fodder plants, 2 are used in cosmetics, 2 are spices herbs, 1 is used in industry and 1 has repellents properties (Table 1). Mostly of the woody species are ornamental (Table 2).

Some species play an important role for the ecosystem (*Urtica dioica*, *Cirsium arvense*, *Rubus caesius*, etc.), supporting others organisms. It is recommended to be created spaces, in landscape arrangements, with "savages" vegetation which plays a role in sustaining and restoring biodiversity. Parts or entire “green” gardens can be achieved where plant species will provide opportunities for feeding or shelter insects, birds or small animals (Walker, 2005).

CONCLUSIONS

In the analysed segment of railway Bucharest-Oltenita the pressure of external factors, especially the anthropogenic ones divide the ruderal vegetation in the two communities with different specific composition. When the anthropic pressure is greater in the community develops annual or biannual xero-mesophilous herbaceous species. The presence of well-developed woody species and the low intervention of external factors allow installation of the perennial mesophilous herbaceous species. Species found in the two communities are spreading easily on generative or vegetative way and most of them are allochorous. A significant number of species have different uses.

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TABLES AND FIGURES

Table 1

Herbaceous species from the ruderal communities near railway Bucharest – Oltenita (segment Morarilor Road– Ion Şahighian Street)

Species	Botanical family	Lifelong	Life form	Ecology	Under grounds organs	Way of dispersal	Plants importance and uses
1. *Papaver rhoeas* Corn poppy	*Papaveraceae*	annual	Thero-phyte	heliphyte, meso-phylous	-	Dehiscent fruit (gravitate)	ruderal, field-weeds, medicinally, for dye
2. *Papaver somniferum* Opium poppy	*Papaveraceae*	annual	Thero-phyte	heliphyte, xero-meso phylous	-	Dehiscent fruit (gravitate)	ornamental, medicinally, culinary, cosmetic
3. *Fumaria schleicherii* Common Fumitory	*Fumariaceae*	annual, epheme-rous	Thero-phyte	heliphyte, mesophylous	-	Indehiscent fruit (gravitate)	ruderal, field-weeds
4. *Humulus lupulus* Hop	*Cannabaceae*	perennial	Hemi-crypto phyte	heli-sciadophylous, mesophylous	-	anemo-chorous	medicinally for dye, culinary, spices, cosmetic
5. *Urtica dioica* Common nettle	*Urticaceae*	perennial	Hemy-chrypto phyte	heli-sciado-phylous, meso-phylous	-	Indehiscent fruit (gravitate)	ruderal, medicinally for dye, culinary, industrially
6. *Silene alba* White champion	*Caryophyllaceae*	annual - perennial	Thero-phyte – Hemi therophyte	heliphyte, mesophylous	-	Dehiscent fruit (gravitate)	Hedgerows, roadsides, arable lands, waste areas
7. *Stellaria media* Common Chickweed	*Caryophyllaceae*	annual - epheme-rous	Thero-phyte – Hemi therophyte	heli-sciado-phylous, mesophylous	-	Dehiscent fruit (gravitate)	ruderal, field-weed, culinary, medicinally
8. *Chenopodium album* Fat Hen	*Chenopodiaceae*	annual	Thero-phyte	heli-sciadophylous, meso-phylous	-	anthropo-chorous, endozoo-chorous	pioneer ruderal, field-weed

9. *Atriplex prostrata* Orache	*Chenopodiaceae*	annual	Thero-phyte	heli-phylous, meso-phylous	-	Indehiscent fruit (gravitate)	ruderal, on the railways side
10. *Fallopia convolvulus* Black-bindweed	*Polygonaceae*	annual	Thero-phyte	heli-phylous, mesophylous	-	Indehiscent fruit (gravitate)	ruderal, field-weeds
11. *Polygonum aviculare* Knotgrass	*Polygonaceae*	annual	Thero-phyte	heli-phylous, meso-phylous	-	Indehiscent fruit (gravitate)	ruderal, medicinally, mellipherous, for dye
12. *Rumex crispus* Curled Dock	*Polygonaceae*	perennial	Hemy-chrypto phyte	Heli-phylous, meso-phylous	-	Indehiscent fruit (gravitate)	ruderal, field-weed
13. *Lathyrus tuberosus* Fyfield Pea	*Fabaceae*	perennial	Geo phyte	heli-sciado-phylous, xero-meso-phylous	rhizome, roots with buds	Dehiscent fruit (gravitate)	Grassy places, waste grounds
14. *Medicago lupulina* Black Medick	*Fabaceae*	annual	Thero-phyte	heli-sciado-phylous, xero-meso phylous	-	Indehiscent fruit (gravitate)	grasslands, waste places
15. *Medicago sativa* Lucerne	*Fabaceae*	perennial	Chamae-phyte Hemy-chrypto phyte	heli-phylous, meso phylous	-	Dehiscent fruit (gravitate)	fodder, waste places, medicinally, culinary
16. *Vicia cracca* Tufted Vetch	*Fabaceae*	perennial	Hemy-chrypto Phyte Geophyte	heli-phylous, meso phylous	rhizome	Dehiscent fruit (gravitate)	grasslands, waste places, mellipherous, fodder
17. *Epilobium hirsutum* Great Willowherb	*Onagraceae*	perennial	Hemy-chrypto phyte	heli-sciado phylous, meso phylous	rhizome, under ground stolon	anemochorous (seeds with pappus)	waste places, field-weeds
18. *Geranium dissectum* Cut-leaved Crane's-bill	*Geraniaceae*	annual	Thero-phyte – Hemi-thero-phyte	heli-sciado-phylous, xero-meso phylous	-	"explosive" dehiscent fruit (gravitate)	waste places, field-weeds
19. *Erodium cicutarium* Common Stork'-bill	*Geraniaceae*	perennial	Hemy-chrypto phyte	heli-sciado phylous, xero-meso phylous	rhizome	"explosive" dehiscent fruit (gravitate)	waste places, field-weeds, disturbed ground
20. *Torillis arvensis* Spreading Hedge-parsley	*Apiaceae*	annual	Thero-phyte	heli-sciado phylous, xero-meso phylous	-	epizoo-chorous	disturbed ground
21. *Malva sylvestris* Common Mallow	*Malvaceae*	biannual - perennial	Hemi thero-phyte, Hemy-chrypto phyte	heli-sciado phylous, xero-meso phylous	-	split-fruit (gravitate)	ruderal, culinary, medicinally
22. *Capsella bursa pastoris* Shepherd's-purse	*Brassicaceae*	annual	Thero-phyte	heli-phylous, euri-phylous	-	Dehiscent fruit (gravitate)	pioneer, ruderal, field-weeds, medicinally, culinary
23. *Cardaria draba* Hoary Cress	*Brassicaceae*	perennial	Geo phyte	heli-phylous, xero-meso phylous	roots with buds	Indehiscent fruit (gravitate)	ruderal, field-weeds

24. *Descurainia sophia* FlixWeed	*Brassicaceae*	annual	Thero-phyte	heli-phylous, xero-meso phylous	-	Dehiscent fruit (gravitate)	ruderal, field-weeds
25. *Raphanus raphanistrum* Wild Radish	*Brassicaceae*	annual	Thero-phyte	heli-sciado phylous, xero-meso phylous	-	Indehiscent fruit (gravitate)	ruderal, field-weeds
26. *Lithospermum arvense* Common Gromwell	*Boraginaceae*	annual	Thero-phyte – Hemi-thero-phyte	heli-phylous, meso phylous	-	Indehiscent fruit (gravitate)	ruderal, field-weeds
27. *Ballota nigra* Black Horehound	*Lamiaceae*	perennial	Hemy-chrypto phyte	heli-sciado phylous, xero-meso phylous	-	Indehiscent fruit (gravitate)	ruderal, medicinally
28. *Lamium amplexicaule* Henbit Dead-nettle	*Lamiaceae*	annual - epheme-rous	Thero-phyte	heli-phylous, xero- meso phylous	-	Indehiscent fruit (gravitate)	ruderal, field-weeds
29. *Linaria vulgaris* Common Toadflax	*Scrophulariaceae*	perennial	Geo phyte	heli-phylous, meso phylous	roots with buds	Anemo chorous (wing seeds)	ruderal, field-weeds, medicinally, dye, ornamental
30. *Veronica polita* Grey Field-speedwell	*Scrophulariaceae*	annual - epheme-rous	Thero-phyte – Hemi thero-phyte	heli-sciado phylous, meso-phylous	-	Dehiscent fruit (gravitate)	ruderal, field-weeds
31. *Galium aparine* Gosse Grass	*Rubiaceae*	annual	Thero-phyte	heli-sciado phylous, euri phylous	-	epizoo- chorous	ruderal, field-weeds, culinary, medicinally
32. *Artemisia annuua* Sweet wormwood	*Asteraceae*	annual	Thero-phyte	heli-phylous, xero-meso phylous	-	Indehiscent fruit (gravitate)	ruderal, repellent, medicinally
33. *Artemisia vulgaris* Mugwort	*Asteraceae*	perennial	Hemy-chrypto phyte	heli-phylous, meso phylous	-	Indehiscent fruit (gravitate)	ruderal, spice medicinally
34. *Carduus acanthoides* Welted Thstle	*Asteraceae*	biannual	Hemi thero-phyte	heli-phylous, xero-meso phylous	-	Anemo chorous, achene with pappus	ruderal
35. *Centaurea biebersteinii* Knapweeds	*Asteraceae*	biannual - perennial	Thero-phyte – Hemi thero-phyte	heli-phylous, xero meso-phylous	-	Anemo chorous, achene with pappus	meadows
36. *Cichorium inthybus* Chicory	*Asteraceae*	perennial	Hemy-chrypto phyte	heli-phylous, xero-meso phylous	-	anemochorous, achene with pappus	ruderal, field-weeds, medicinally, culinary
37. *Cirsium arvense* Creeping Thistle	*Asteraceae*	perennial	Geo phyte	heli-sciado phylous, xero-meso phylous	roots with buds	anemo chorous, achene with pappus	ruderal, field-weed, mellipherous
38. *Conyza canadensis* Canadian Fleabane	*Asteraceae*	annual	Thero-phyte – Hemi thero-phyte	heli-sciado phylous, xero- meso phylous	-	anemochorous, achene with pappus	ruderal, field-weed

39. *Erigeron annuus* Fleabane	*Asteraceae*	annual	Thero-phyte	heli-phylous, meso phylous	-	Anemo chorous, achene with pappus	ruderal, field-weed
40. *Matricaria perforata* Scentless Mayweed	*Asteraceae*	annual	Thero-phyte	Heli phylous, meso phylous	-	Indehiscent fruit (gravitation)	ruderal, field-weed
41. *Onopordon acanthioides* Cotton Thistle	*Asteraceae*	biannual	Hemi thero-phyte	heli-phylous, xero -meso phylous	-	anemochorous, achene with pappus	ruderal, medicinally, culinary
42. *Senecio vernalis* Welsh Ragwort	*Asteraceae*	annual – ephe-merous	Thero-phyte – Hemi thero-phyte	Heli phylous, xero -meso phylous	-	anemochorous, achene with pappus	ruderal, field-weed
43. *Sonchus arvensis* Perennial saw-thistle	*Asteraceae*	perennial	Geo phyte	heli-sciado phylous, meso phylous	-	anemochorous, achene with pappus	ruderal, field-weed
44. *Tragopogon dubius* Goat's-beard	*Asteraceae*	annual	Thero-phyte – Hemi thero-phyte	heli-phylous, xero- meso phylous	-	anemochorous, achene with pappus	ruderal
45. *Carex riparia* Greater Pond Sedge	*Cyperaceae*	perennial	Geo phyte	heli-sciado phylous, hygro-phylous	rhizome	Indehiscent fruit (gravitation)	humid
46. *Aegylops cylindrical*	*Poaceae*	annual	Thero-phyte	heli-phylous, xero- meso phylous	-	Indehiscent fruit (gravitation)	ruderal
47. *Avena fatua*	*Poaceae*	annual	Thero-phyte	heli-sciado-phylous, xero -meso phylous	-	Epizoo-chorous	ruderal, field-weeds
48. *Bromus tectorum* Brome grass	*Poaceae*	annual	Thero-phyte	heli-phylous, xero- meso phylous	-	Epizoo-chorous	ruderal, pioneer
49. *Bromus sterilis* Brome grass	*Poaceae*	annual	Thero-phyte	heli-phylous, xero- meso phylous	-	Epizoo-chorous	ruderal, on sandy soils
50. *Dactylis glomerata* Orchard grass	*Poaceae*	perennial	Hemy-chrypto phyte	heli-phylous, xero- meso phylous	-	Indehiscent fruit (gravitation)	fodder, turf
51. *Hordeum murinum* Foxtail barley	*Poaceae*	annual	Thero-phyte	heli-phylous, xero- meso phylous	-	Epizoo-chorous	ruderal
52. *Lolium perenne*	*Poaceae*	perennial	Hemy-chrypto phyte	heli-phylous, meso phylous	-	Indehiscent fruit (gravitation)	fodder, turf
53. *Poa pratensis* Firuţa	*Poaceae*	perennial	Hemy-chrypto phyte	heli-phylous, meso phylous	short rhizome	Indehiscent fruit (gravitation)	fodder, turf

Table 2

Woddy species from the ruderal communities near railway Bucharest – Oltenita (segment Morarilor Road– Ion Şahighian Street)

Species	Botanical family	Lifelong	Life form	Ecology	Under grounds organs	Way of dispersal	Plants importance and uses
1. *Ulmus minor* Smooth-leaved Elm	*Ulmaceae*	tree	Phanero phyte	Heli-sciadophylous Euri phylous	-	Anemo-chorous	ornamental
2. *Morus alba* White Mulberry	*Moraceae*	tree	Phanero phyte	Heli-sciado phylous Meso-phylous	-	zoochorous	ornamental
3. *Rosa canina* Dog-rose	*Rosaceae*	shrub	Phanero phyte	Heli-phylous meso phylous	Roots with buds	zoochorous	Hedges, scrub, woodland margins ornamental
4. *Rubus caesius* Dewberry	*Rosaceae*	shrub	Phanero phyte	Heli-phylous meso phylous	-	zoochorous	dry grassland, scrub, field-weed
5. *Parthenocissus inserta* Viţa de Canada	*Vitaceae*	climber	Phanero phyte	Heli-phylous meso phylous	-	zoochorous	ornamental
6. *Vitis vinifera* Vine	*Vitaceae*	climber	Phanero phyte	Heli-phylous meso phylous	-	anthropo-zoochorous	culinary
7. *Acer negundo* Ash-leaved marple	*Aceraceae*	tree	Phanero phyte	Heli-sciado phylous meso phylous	-	Anemo-chorous	ornamental
8. *Acer tataricum* Marple	*Aceraceae*	tree	Phanero phyte	Heli-phylous xeromeso phylous	-	Anemo-chorous	ornamental
9. *Ailanthus altissima* Tree of Heaven	*Simarubaceae*	tree	Phanero phyte	Heli-phylous xeromeso phylous	-	Anemo-chorous rapid regeneration	ornamental
10. *Tilia platyphyllos* Large-leaved Lime	*Tiliaceae*	tree	Phanero phyte	Heli-sciado phylous xeromeso phylous	Roots with buds	Anemo-chorous	ornamental
11. *Populus nigra* Black Poplar	*Salicaceae*	tree	Phanero phyte	Heli-phylous euri phylous	-	Anemo-chorous (seeds with pappus)	ornamental
12. *Catalpa speciosa* Indian bean tree	*Bignoniaceae*	tree	Phanero phyte	Heli-phylous xeromeso phylous	-	Anemo-chorous (wing seeds)	ornamental
13. *Symphoricarpos albus* Snowberry	*Caprifoliaceae*	shrub	Phanero phyte	Heli-sciado phylous meso phylous	-	Zoo-chorous	ornamental

Figure 1: Herbaceous, xero-mesophylous species (first plant community)

Figure 2: Herbaceous, mesophylous species (second plant community)

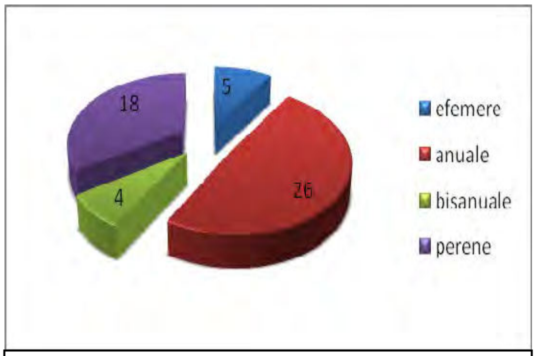

Fig. 3: Specific distribution according lifetime

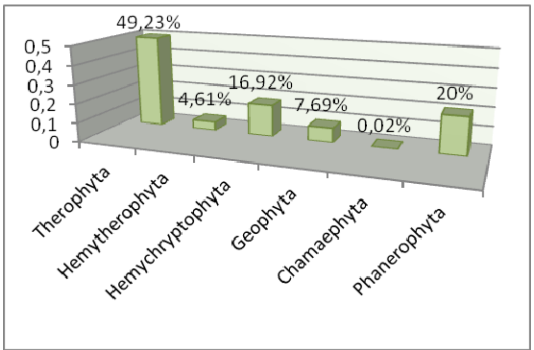

Fig. 4: Specific distribution according life forms

Anatomy study of *Physalis peruviana* L. species (*Solanaceae*)

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Keywords: stem, leaf, epidermis, stomata, bicollateral vascular bundle

ABSTRACT
The anatomical observations were made at the stem and leaves *of the Physalis peruviana* plant, cropped in the field. The shape of the stem is round in transversal section, with slightly nervures with the many multicellular tector and secretor hairs and a lot of bicollateral-opened fascicle bundle. There are cells with crystals of calcium oxalate into the cortex and medulla of the stem. The petiole of the leaf is semicircle in the transversal section with two adaxial nervures with a big median bicollateral opened fascicle and two small fascicles in the nervures. There are many tector and secretor hairs in the epidermis of the stem. The blade of leaf is amfistomatic with anomocitic stomata. There are multicellular tector and secretor hairs on the both epidermis. The average number of the stomata/square millimeter is higher in the lower epidermis. The mesophyll of the leaf blade is bifacial and monolayer palisade tissue.

INTRODUCTION

The genus *Physalis* from the family Solanaceae, includes annual and perennial plants bearing globular fruits enclosed in a bladderlike hush which becomes papery at the maturity (Morton and Russell, 1954). The *Physalis peruviana* (cape gooseberry) is vigorous perennial plant, but treated as annual in cultivation, higher up to 1 m with the angular stems and branch and hairy dense (Stace, 2010). It can be grown whenever the tomato is cultivated.

The leaves are higher (7-11 cm longer), petiolated, wide-ovate, with the base shape like the heart and the acuminate leaf with round, corrugated and sometime toothed leaf border, dense and uncinte hairs (Griffiths, 1994).

The flowers are solitary on the leaf axils, with pedicel, nutant, 10-12 mm longer. The calyx is campanulate, after flowering is vesiculous bump and greenish color with acuminate teeth and 5-10 outside nervures and with dense and long hairs (Wagner et al. 1999, Fischer and Lüdders, 1997).

The color of corolla is yellow roundish with 5 violet spots. The fruit is a spherical berry with 10-15 mm diameter and many round and lenticular seeds closed in the calyx and aromatic sweet-sourish taste (Popova et al. 2010).

The origins are from South-America (Peru, Chile).

MATERIALS AND METHODS

The plants of *Physalis peruviana* were cropped in field of University of Agricultural Sciences and Veterinary Medicines, Bucharest.

In June, the stems and leaves from median zone plant were use in the assessment.

Transversal sections were made using common technique. The anatomical sections were clarified 24 hours using chloral hydrate and after that there was washed and fixed into the gelatinous glycerin.

The number of stomata per square millimeter was observed in both leaf epidermises. The observations and measurements were made with the optical microscope.

RESULTS AND DISCUSSIONS

Stem anatomy (figure 1)

The shape of the stem in transversal section is round with the slightly ribs and with the epidermis, cortex and central cylinder from outside to inside (Andrei, 1978).

The epidermis is monolayer made up of izodiametric cells with external wall covered by a slightly cuticle. In the epidermis there are stomata and many multicellular tector and secretor hairs.

In the cortex there are three zones: at the outside is the collenchyma with 2-3 layers of cells, many cells containing the chloroplasts; in the middle there is cortical parenchyma with 4-5 layer of large ovoid cells with thin wall and crystals of calcium oxalates and inside is the primary monolayer endodermis.

In the central cylinder there are many bicollateral-opened vascular bundles, very closed together with different size only separated by slight radial parenchyma (Esau, Katherine, 1983).

The secondary structure is developed by cambium activity generating a slim ring of secondary phloem outside and thick secondary xylem inside.

The phloem is composed by few parenchyma cells and the xylem has irregularly distributed vessels and separated by cellulosic parenchyma.

The internal phloem is interrupted forming spots in the perimedullar zone.

The medulla is thick, parenchymatous, meatic type with many cells filled with calcium oxalate crystals.

Leaf anatomy

The petiole is semicircle in transversal section, with two adaxial ribs (figure 2).

The petiole structure is like the stem with many tector and secretors hairs on the epidermis. In the median zone there is a big bicollateral-opened vascular bundle as an arc shape and two small vascular bundles into the ribs with the same structure (Zanoschi and Toma, 1985).

The stomata are in the upper and lower epidermis (figure 3; 4). The leaf blade is amphystomatic type with tector and secretor multicellular hairs. The stomata are anomocitic type. The average number of stomata in upper epidermis is 22.56 and 135.14 in lower epidermis (Cotthem, 1970).

The walls of epidermis cells are strongly corrugated.

The mesophyll is bifacial with monolayer palisade tissue and pluristratified lacunose tissue (figure 5). In the lacunous tissue there were oxaliferous cells.

The median nervure is more apparent in lower leaf blade and less protuberant on upper leaf blade with epidermis, collenchymas and parenchyma.

CONCLUSIONS

In the stem and leaf epidermis there are many multicellular tector and secretor hairs.

The vascular bundles are bicollateral-opened into the stem and leaf.

The leaf is amphystomatic type with anomocitic stomata.

The average number of the stomata on the lower epidermis is 6 time higher than in the upper epidermis.

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FIGURES

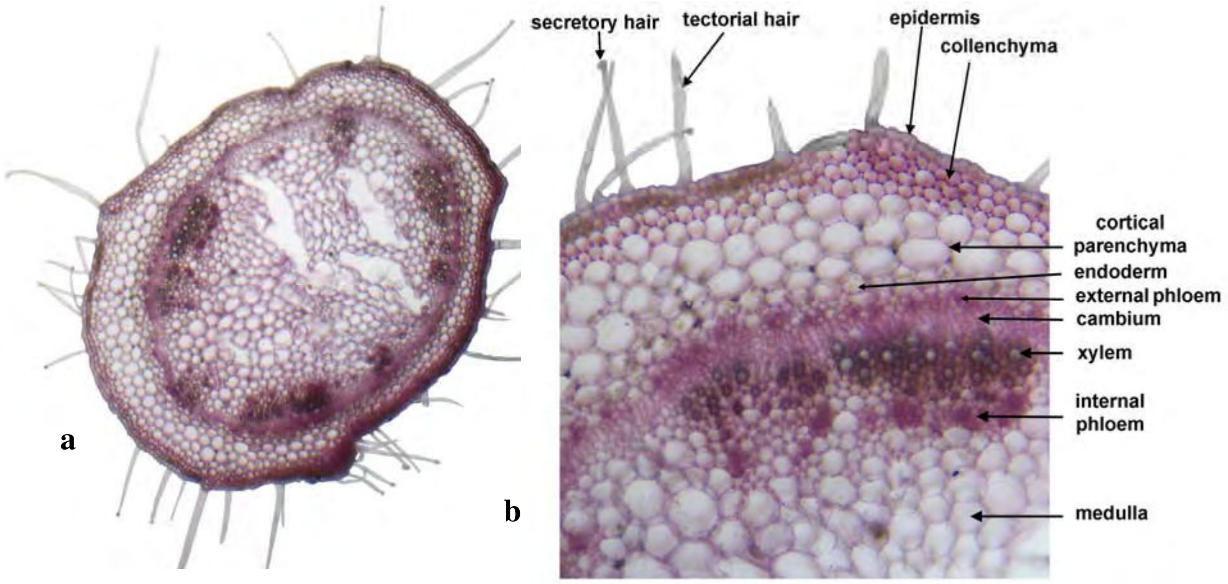

Fig. 1. Transversal section of *Physalis peruviana* stem: a. general view; b. image detail

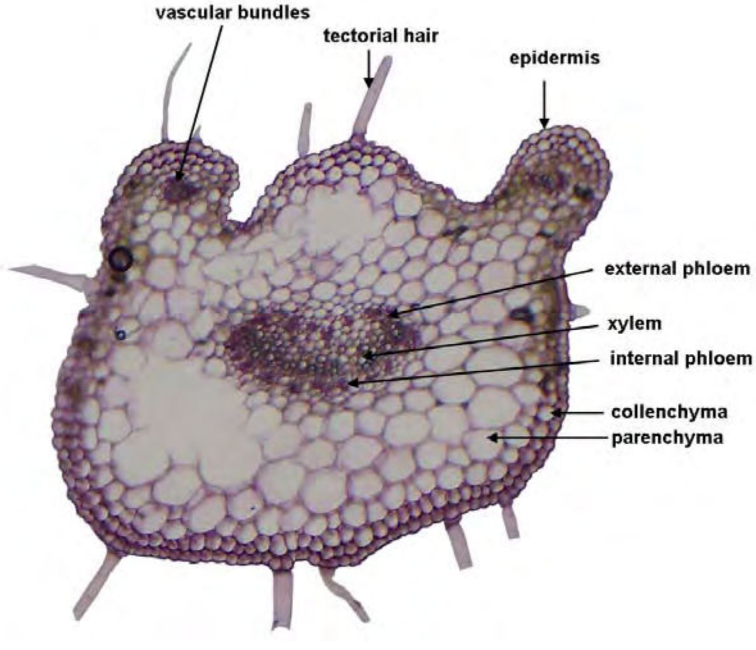

Fig. 2. Transversal section of *Physalis peruviana* petiole

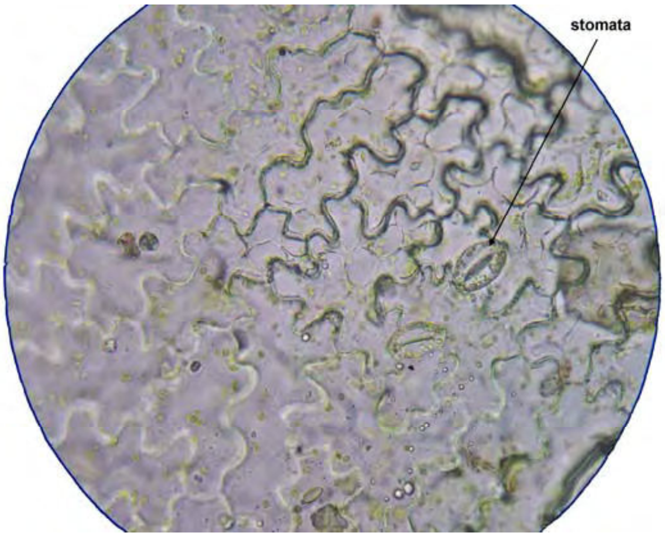

Fig. 3. Upper epidermis of *Physalis peruviana* leaf

Fig. 4. Lower epidermis of *Physalis peruviana* leaf

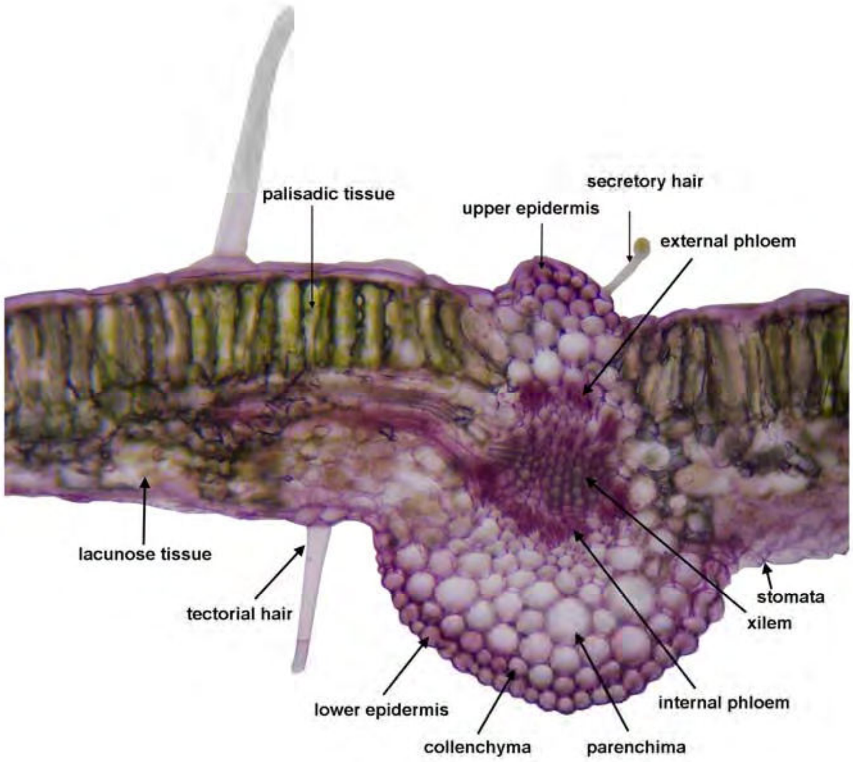

Fig. 5. Transversal section of *Physalis peruviana* leaf

The influence of mulch color and eggplant variety on some leaves physiological parameters

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Keywords: *Solanum melongena* L., photosynthesis, respiration, chlorophyll, carotenoid pigments, colored mulch

ABSTRACT

This paper presents haw different soil cover with polyethylene sheeting (mulch) influence plant physiological processes and their precocity. Mulching the soil with polyethylene film, regardless of color, accelerated plant growth and taking advantage *of Solanum melongena*, compared with plants grown in uncovered field, as a result of a high photosynthesis: respiration ratio, probably due to the higher temperatures achieved under the polyethylene film. The intensity of photosynthesis, respiration and accumulation of carotenoids pigments depend on variety and mulch used.

INTRODUCTION

Solanaceae family is very large comprising 100 genera and 2,000 species, including some of economic importance such as: *Lycopersicon esculentum, Capsicum annuum* and *Solanum melongena.*

Solanum melongena as a part of the family *Solanaceae* is originating in India and Burmese where grows in the wild. Hand et al. (1993) found that leaves of *Solanum melongena* receive 93-98% of incident light and light compensation point is 20-30 J/m^2/sec and decreases slightly at higher concentrations of carbon dioxide. Efficiency of photosynthesis in the intercepted light increases from zero to light compensation point and achieves a maximum luminous flux density of 100 J/m^2/sec.

Enriching the atmosphere with carbon dioxide caused a slight increase in net photosynthesis. Intensity of photosynthesis decreases in the midday because of stomata closure (Yingjie, 2006), that carried on to a decrease of stomata conductivity, transpiration intensity, photosynthesis and intercellular CO_2 concentration in leaves. Research aimed at specifying the dynamic intensity of photosynthesis, respiration and chlorophyll pigments in terms of three varieties of eggplant cultivated in greenhouses. It was also watched how different soil cover with polyethylene sheeting (mulch) influence plant physiological processes and their precocity. Dynamic analysis of the intensity of the main physiological processes that influence plant growth and development can establish a predictive evolution of cultures in the period of fructification.

MATERIALS AND METHODS

In accordance with the intended use, research aim was to establish the influence of photosynthesis and respiration rates and the total assimilating pigments in the three varieties of *Solanum melongena*. The biological material was represented by three varieties of *Solanum melongena*: Pana corbului, Luiza and Rodica, grown in greenhouses, using 4 colored polyethylene mulch: white, green, blue and black for each variety. It was practiced the classical culture technology of the *Solanum melongena* species (Tab. 1).

Sowing was done on February 20 in the alveoli at 10/10 cm, planting in greenhouses achieved on May 16, the distance between rows and 65 cm between plants per row of 40 cm. Installation of mulch film was made with 5 days earlier planting on 11 May. Plants were led by tying with string; each plant was conducted with three arms. Culture was irrigated weekly, does not apply fertilizers. Mulching will help conserve moisture and prevent weeds and fungal diseases.

Determination of photosynthesis and respiration rates was determined by automatic analyzer LCA-4, *in vivo*, the main leaflets of fourth leaf seedlings and seventh leaf mature plants. The results were expressed as µmols CO_2 m^{-2} s^{-1}.

Total content of leaf assimilating pigments was determined spectrophotometrically after extraction in acetone 80%, at wavelengths 663 nm, 646 nm and 470 nm, against a blank of acetone 80%. Results were calculated based on formulas developed by Mackiney and values expressed in mg $100g^{-1}$ fresh weight:

Chlorophyll a = ((2.26 x DO663) - (2.81 x DO646)) x 5

Chlorophyll b = ((20.13 x DO646) - (5.03 x DO663)) x 5

Carotenoids and xanthophylls = ((1000 x DO470) - (3.27 x Cl.a - 1.04 x Cl.b))/229

RESULTS AND DISCUSSION

Dynamic analysis in three varieties *Solanum melongena* indicates the following: at 10 days after planting the photosynthesis rates ranged from 4.96 µmol CO_2 m^{-2} s^{-1} the variety Rodica (uncovered) and 12.72 µmol CO_2 m^{-2} s^{-1} the variety Luiza (white mulch).

At the beginning flowering, photosynthesis rate variation limits ranged from 8.95 µmol CO_2 $m^{-2}s^{-1}$ the variety Pana corbului (green mulch) and 20.03 µmol CO_2 m^{-2} s^{-1} the variety Luiza (black mulch).

At full flowering stage, the varieties Rodica and Luiza were marked by elevated intensity of photosynthesis 25.59 µmol CO_2 m^{-2} s^{-1} (Rodica - green mulch) and 24.48 µmol CO_2 m^{-2} s^{-1} (Luiza – white mulch) compared with Pana corbului.

At the fructification phase, the highest value of photosynthesis rate was reported for Luiza variety 24.79 µmol CO_2 m^{-2} s^{-1} (green mulch), and the lowest value being recorded in variety Pana corbului 3.72 µmol CO_2 m^{-2} s^{-1} (uncovered).

On the intensity of photosynthesis it can be concluded that this was influenced by the color of mulch used, the highest values were found in terms to use the green and blue mulch (Fig. 1). Generally, the varieties Rodica and Luiza were distinguished by elevated photosynthesis rates, higher than Pana corbului variety.

The respiration rate was determined in the dynamics during the same four phases of vegetation and, generally, its values were significantly lower than photosynthesis rate (Fig. 2).

At 10 days after planting, the leaf respiration rate had a higher value for the variety Rodica 4.49 µmol CO_2 m^{-2} s^{-1} (white mulch) and a three times lower value for the variety Pana corbului 1.42 µmol CO_2 m^{-2} s^{-1} (green mulch).

At the flowering beginning, Rodica variety recorded the highest value of respiration rate when was used the black mulch 11.24 µmol CO_2 m^{-2} s^{-1} and the blue mulch 10,87 µmol CO_2 m^{-2} s^{-1}, also the lowest value (1.57 µmol CO_2 m^{-2} s^{-1}) when was cultivated in uncovered field.

The plants analyzed at the full flowering stage revealed that Rodica variety grown in presence of blue mulch recorded the highest value of leaf respiration (10.38 µmol CO_2 m^{-2} s^{-1}), while the variety Luiza cultivated with green mulch recorded the lowest value 1.01 µmol CO_2 m^{-2} s^{-1}.

Also in the fructification phase, it could be noticed a decrease of leaves respiration rate for all varieties, except Pana corbului cultivated with black mulch (6 µmol CO_2 m^{-2} s^{-1}) and Luiza grown with green mulch (4.82 µmol CO_2 m^{-2} s^{-1}).

Data analysis revealed that the intensity of leaf respiration varied depending on the plant age, also the precocity, as well as the cultural conditions (uncovered field or protected with different colored mulch). Both photosynthesis and respiration rates influence eggplant growth and development, as well as the yield. Although the photosynthesis rate of Rodica and Luiza varieties generally recorded high values, because of the high leaf respiration rate of

Rodica variety, it could be predict that the Luiza variety will have a good evolution in the period of fructification.

The accumulation of photosynthetic pigments increased with leaf age from seedling to full flowering stage as follows: at 10 days after planting the highest value of total chlorophyll was registered for Luiza variety (86.22 mg 100g-1) that increase to 131,58 mg 100g-1 at begining flowering (green mulch) and 149,59 mg 100g-1 at full flowering (blue mulch) (Fig. 3, 4, 5).

Generally, the quantities of photosynthetic pigments in eggplants leaves are higher in Rodica and Luiza varieties than in Pana corbului variety, which correlates with photosyntesis rate dinamics. At full flowering stage, there is a variation of chlorophyll pigment content depending on variety as follows: the chlorophyll a highest value recorded at 121,60 mg 100g-1 (variety Rodica - black mulch), the chlorophyll b records the highest value of 39,13 mg 100g-1 the (variety Rodica – green mulch), the total chlorophyll highest value recorded at 159.35 mg 100g-1 (variety Rodica - black mulch) and the carotenoids highest value recorded at 4.44 mg 100g-1 (variety Pana corbului - black mulch) (Fig. 4.).

CONCLUSIONS

1. Based on these results it could be give valuable recommendations on the eggplant technology with biodegradable mulching films.
2. The photosynthesis rate was influenced by the mulch color, the highest values being registered at the green and blue mulch variants.
3. Leaves respiration intensity varied depending on the plant age, precocity, as well as the cultural conditions (uncovered field or protected with different colored mulch).
4. The best evolution was noticed for Luiza variety due to a high photosynthesis rate as against a low leaf respiration rate.
5. A higher level of photosynthetically pigments was revealed at Rodica and Luiza varieties, corellated with a higher photosynthesis rate, higher than Pana corbului variety.
6. Mulching the soil with polyethylene film, regardless of color, accelerated plant growth and taking advantage of *Solanum melongena*, compared with plants grown in uncovered field as a result a high photosynthesis: respiration ratio, probably due to the higher temperatures achieved under the polyethylene film.

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TABLE AND FIGURES

Table 1

Experimental variants

Eggplant variety	Polyethylene films (mulch)
Pana Corbului	uncovered
	Green mulch
	Blue mulch
	Black mulch
	White mulch
Luiza	uncovered
	Green mulch
	Blue mulch
	Black mulch
	White mulch
Rodica	uncovered
	Green mulch
	Blue mulch
	Black mulch
	White mulch

Figure 1. The dynamics of photosynthesis rate depends on cultivar and mulch colour

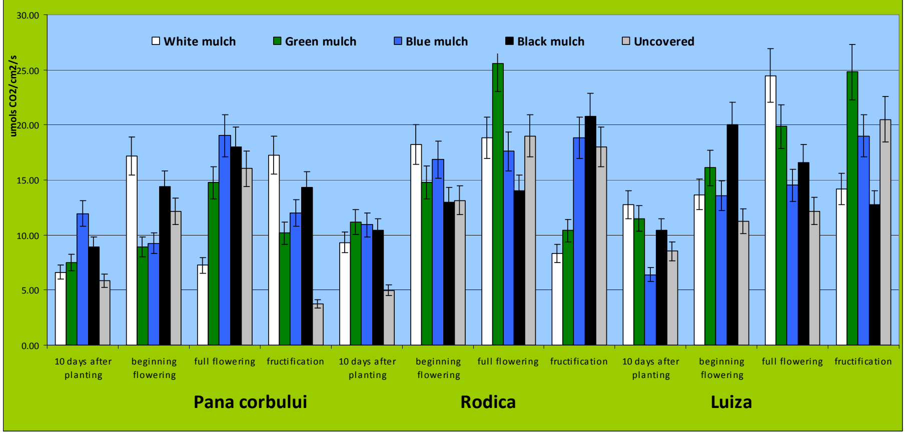


Figure 2. The dynamics of respiration rate depends on cultivar and mulch colour

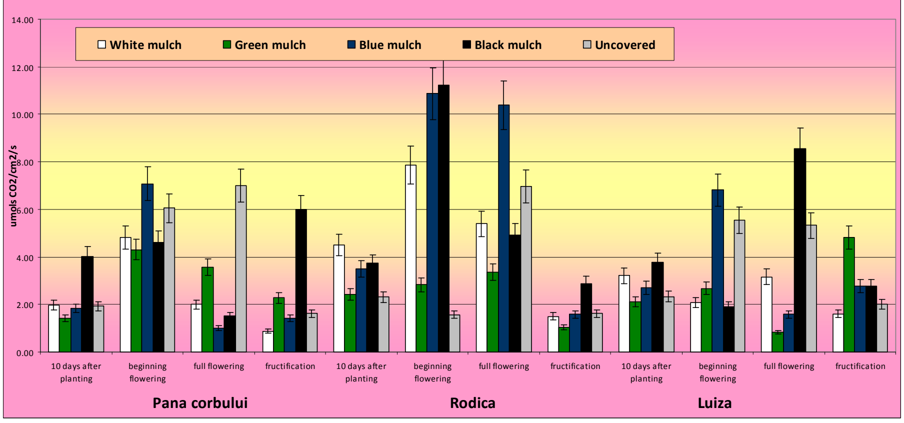


Figure 3. The variation of leaf seadling pigments depends on cultivar

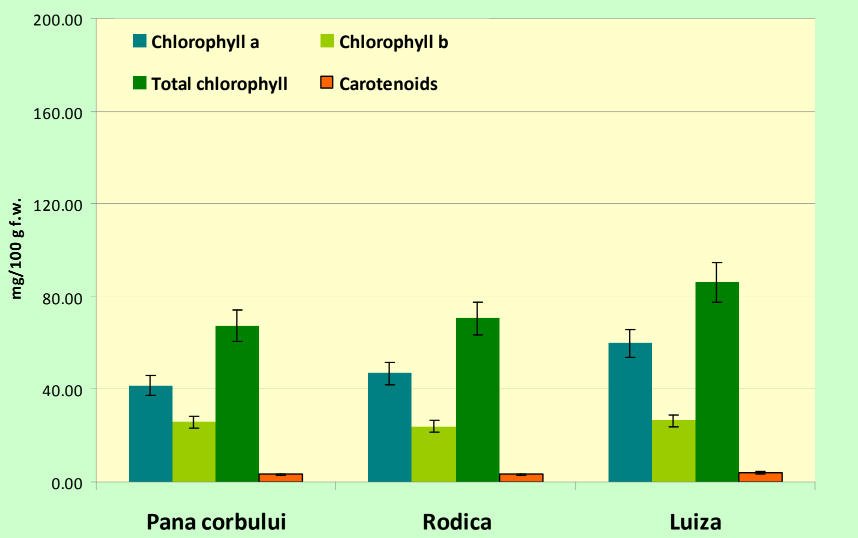


Figure 4. The variation of leaf pigments depends on cultivar and mulch colour, on begining flowering

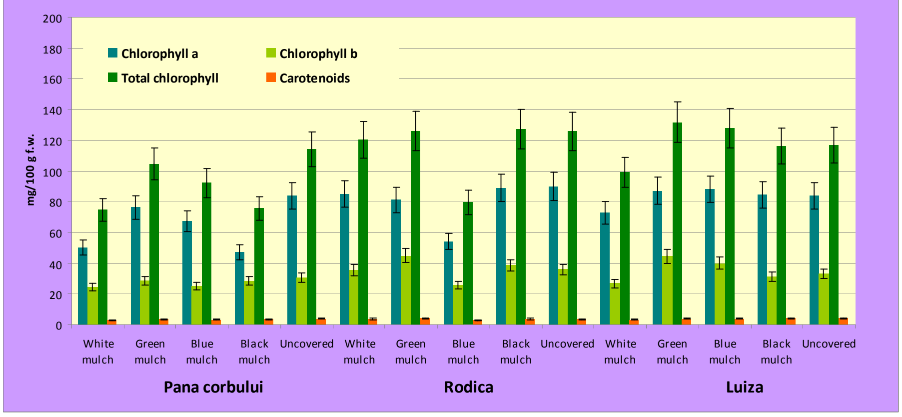
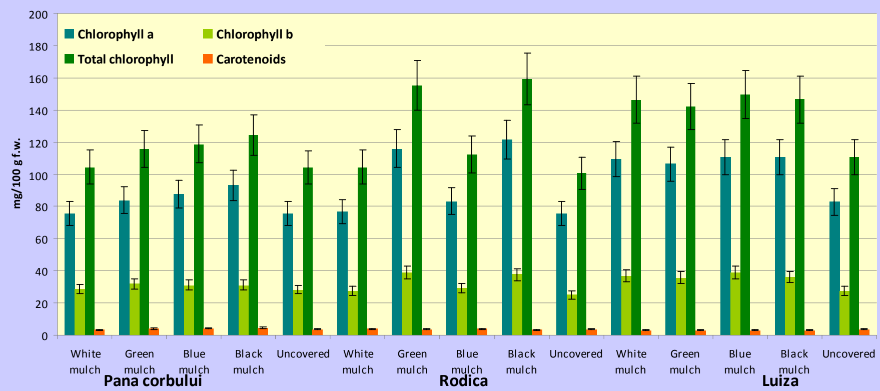


Figure 5. The variation of leaf pigments depends on cultivar and mulch colour, on full flowering stage



Studies concerning combinative ability of some French bean cultivars in organically grown condition

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Keywords: general and specific combinative ability, garden beans hybrids

ABSTRACT

The paper presents the studies of F1 hybrids resulting from diallel crosses and the parental forms according to Griffing model. According to this method, we selected parental forms with different origins: 4 certified varieties (Carson, Jutta, Inka, and Lingua di Fuoco) and 3 local populations from Brăila County (Tichileşti, Vădeni and Movila Miresii). The main objective of our study was to establish the value of some genotypes as parental forms for the quantitative characters. It has been observed that for the general combining ability, the effect amplitude was between –0,95 for pods/plants character at Lingua di Fuoco variety to 2,4 at Inka variety, between –0,4 for seeds/pod at Jutta variety to 0,8 for seeds/pod at Movila Miresii variety. As for the specific combining ability, it has been noticed that each combination produced different outcomes, most values registered being positive. The best effects for general and specific combining ability has been observed for Lingua di Fuoco x Jutta hybrid (4,25 – CCG for no. pods/plant and 1,34 – CCG for no. seeds/pod) and for qualitative characters (crude proteins in pods and seeds) the best results has been observed for Inka x Carson hybrid (0,32 – CCS for crude protein in pods, and 1,05 – CCS for crude proteins in seeds).

INTRODUCTION

The hybridation is a based method of plant breeding, followed by targeted plant selection in hybrid generations. It is very important in the breeding programs to can identify the initial biological material that forms the original characters have both precious and the ability to transmit this complex of characters to hybrid generations (Leonte, 2005).

One of the most commonly used methods of analysis top-cross, which allows property appraisal and genetic level utility parental forms, is to determine the ability combination.

General combining ability (GCC) is the average variety (line) in hybrid combinations and modified according to the average of character deviation from all the hybrids produced by using this parental form to the common media (after all hybrids). Specific combining ability (SCC) characterizes separated crossings when certain combinations are proving to be good or less good in comparison with those expected on the average quality of parental lines established by the general combining ability (Leonte et. al., 2000).

Efficiency breeder work depends primarily on the availability of original material with important biological, technological and agricultural characters.

Thus, the original material value is determined by its ability to produce crossbred with other lines with a descent towards increased productivity as parental genitors.

The combining ability of parental lines allows the investigator to predict results of future crosses and choose material perspective, thus avoiding the extra time and money that would be repeated by testing those hybrids parental lines not important in terms of production (Trifan, 2007).

MATERIALS AND METHODS

The investigations carried out to determine the combining ability of some garden bean (*Phaseolus vulgaris L.*) cultivars of growing were conducted in two adjacent areas Braila city during 2005 to 2009. Diallel hybridation was done in a greenhouse at Tichilesti, and hybridation method were used as parental material 4 approved varieties (Carson, Jutta, Inka and Lingua di Fuoco) and 3 local populations (Tichilesti, Vădeni and Movila Miresii) who was initially studied in a comparative culture, all under glass, for acquiring morphological, physiological and productive indices also (Trifan, 2006).

It were obtained following hybrid combinations: H1 – Inka ♀ x Carson ♂; H2 – Inka ♀ x Jutta ♂; H3 – Jutta ♀ x Carson ♂; H4 – Lingua di Fuoco ♀ x Carson ♂; H5 – Lingua di Fuoco ♀ x Jutta ♂; H6 – Vădeni ♀ x Lingua di Fuoco ♂; H7 – Inka ♀ x Vădeni ♂; H8 – Lingua di Fuoco ♀ x Movila Miresii ♂; H9 – Tichilesti ♀ x Carson ♂; H10 – Movila Miresii ♀ x Carson ♂ (Figure 1). The study of F1 generation was carried out on the field at Vădeni, from Brăila county, in 2007 – 2009 period, on calcaric aluviosol type of soil. We studied the productive indices of the average number of pod per plant, average length of pods, the average number of beans in the pod, and in terms of production quality was analysed crude protein content of pods at technological maturity and of grain at physiological maturity, determinations made by Kjeldahl method.

Genetic variability indices have been taken in a series of mathematical analysis, which enabled the record of the GCC and SCC, and reciprocal effects for all quantitative and qualitative characters for production (Table 1).

The general and specific combining abilities were calculated by standard methods (Snedecor, 1968). Thus, the general combining ability (GCC) of both forms was calculated by formula (1) and (2):

$$GCC = \overline{X}_{F1} - \overline{X} \qquad \textbf{(1)}$$

where:

$\overline{X}_{F1}$ = the general average of the average parameter observed in hybrids resulting from cross of female genitors with male genitors:

$\overline{X}$ = the general average parameter for all hybrids.

$$GCC = \overline{X}_{M1} - \overline{X} \qquad \textbf{(2)}$$

where:

$\overline{X}_{M1}$ = the general average of the average parameter observed in hybrids resulting from cross of female genitors with male genitors:

$\overline{X}$ = the general average parameter for all hybrids.

The specific combining ability (SCC) was calculated by formula (3):

$$SCC_{11} = \bar{x} - (GCC_{F1} + GCC_{M1} + \overline{X}) \qquad \textbf{(3)}$$

where:

$\bar{x}$ = the average parameter observed at hybrid;

GCC_{F1} = the general combining ability of female genitor;

GCC_{M1} = the general combining ability of male genitor;

$\overline{X}$ = the average parameter for all hybrids.

Statistics and processing mathematics experimental data was conducted by the standard method of analysis by sample variant F, by calculating the following statistics: SP – the squares of deviations, GL – degrees of freedom; s^2 - variant.

RESULTS AND DISCUSSIONS

The combining ability to garden beans lines in the diallel hybridation was calculated for 3 productive quantitative indices: the average number of pods per plant, the average number of seeds in the pod, MMB and crude protein content, indicating that the quality of production. Results on the combining ability to different genotypes showed that the highest values of pod number per plant (2,4) Inka the variety and number of seeds in the pod (0,8) and length (3,3) to the Movila Miresii cultivar.

Results concerning the effects on the GCC genotypes studied for productive indices showed the highest values for protein content in the pod (0,15) the Lingua di Fuoco approved variety and for protein content in seeds (1,33) in Jutta approved variety (Table 2).

The lower values of the GCC indices for production were recorded at Lingua di Fuoco variety for number of pod per plant (- 0,95), at Carson variety for number of seeds per pod (- 0,4), at Jutta variety for pods length (-1,7). For crude protein content in pods and seeds the lowest values of GCC has been made in Tichilesti line (- 0,46 and – 1,2).

The analysis of specific combining ability (SCC) at various genotypes beans garden for productive indices (Table 3) revealed the high index for the number of pods per plant at H1 hybrid – Inka ♀ x Carson ♂ (5), followed by H5 hybrid – Lingua di Fuoco ♀ x Jutta ♂ (4,25) and H6 – Vădeni ♀ x Lingua di Fuoco ♂ (1,45).

The highest value for seeds / pods index was recorded at H5 hybrid Lingua di Fuoco ♀ x Jutta ♂ (1,34), followed in descending order of hybrids: H7 - Inka ♀ x Vădeni ♂(0,54) and H10 – Movila Miresii ♀ x Carson ♂ (1,7), H8 - Lingua di Fuoco ♀ x Movila Miresii ♂ (1,58) and H3 - Jutta ♀ x Carson ♂ (0,7).

For production quality indices, the best values of SCC were obtained at following hybrids: H1 - Inka ♀ x Carson ♂ (0,32 for the crude protein in pods and 1,05 for the crude protein in seeds), H8 - Lingua di Fuoco ♀ x Movila Miresii ♂ (0,1 for the crude protein in pods and 2,53 for crude protein in seeds) and H5 - Lingua di Fuoco ♀ x Jutta ♂ (0,25 for crude protein in pods and 0,95 for crude protein in seeds).

Crosses lines Lingua di Fuoco and Carson were characterized by negative values for productive quantitative indices, and crosses lines Vădeni, Lingua di Fuoco, Inka and Jutta were characterized by negative values for productive qualitative indices, namely pods and seeds crude proteins. The number of pods per plant is a determinant character for garden beans productivity, so when using the pods as well as dried beans. The number of seeds in pod is particularly important when the production is intended for use only as seeds.

Study results revealed a maximum quantitative production for Lingua di Fuoco x Jutta hybrid combination (4,25 for no. pods / plant and 1,34 for no. seeds / pod) and the production quality (content of crude protein) the best results for SCC were obtained from the Inka x Carson hybrid combination (0,32 – SCC protein content in pod, respectively 1,05 – SCC protein content of seeds).

CONCLUSIONS

Comparative analysis of quantitative and quality indices of production for these 10 garden beans hybrids allow their separation into different level of expression groups for heterosis effect which correlates with the combining of genitors, significant positive for the indices that determines pods intensive growth, the number of pod per plant, and the crude protein content of seeds on the pods. The most favorable effects of general and specific combining ability for productivity indices were recorded to Carson, Inka, Lingua di Fuoco and Movila Miresii lines.

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TABLES AND FIGURE

Table 1

The analysis diallel incomplete used in experience

Name of line ♀ \ ♂	Carson	Jutta	Inka	Lingua di Fuoco	Vădeni	Tichileşti	Movila Miresii
Carson		X	X	X		X	X
Jutta	H3		X	X			
Inka	H1	H2			H7		
Lingua di Fuoco	H4	H5			X		H8
Vădeni			X	H6			
Tichileşti	H9						
Movila Miresii	H10			X			

Table 2

GCC in various genotypes of garden beans for productive indices

Cultivar	No pods/plant	No seeds/pod	Leight of pods	Crude protein	
				in pods	in seeds
Carson	- 0,6	- 0,4	- 0,2	0,02	- 0,32
Jutta	- 0,5	- 0,3	- 1,7	0,09	1,33
Inka	2,4	0,1	- 0,2	0,1	0,1
Lingua di Fuoco	- 0,95	0,3	0,42	0,15	- 0,05
Vădeni	0,3	0,2	0,2	0,04	- 1,15
Tichileşti	- 1,2	0,6	- 1,2	- 0,46	- 1,2
Movila Miresii	0,8	0,8	3,3	- 0,11	- 0,8

Table 3

SCC in various genotypes of garden beans for productive indices

Hybrid	Pod /plant	Seeds / pod	Leight of pods	Crude protein	
				in pods	in seeds
H1 – Inka ♀ x Carson ♂	5	0,46	1,7	0,32	1,05
H2 – Inka ♀ x Jutta ♂	- 1,1	0,24	0,2	- 0,35	- 1,2
H3 – Jutta ♀ x Carson ♂	- 4,1	- 1,76	0,7	- 0,17	0,92
H4 – Lingua di Fuoco ♀ x Carson ♂	- 4,65	- 0,36	- 1,42	0,37	- 0,4
H5 – Lingua di Fuoco ♀ x Jutta ♂	4,25	1,34	0,92	0,25	0,95
H6 – Vadeni ♀ x Lingua di Fuoco ♂	1,45	- 1,06	- 0,82	- 0,75	- 0,47
H7 – Inka ♀ x Vădeni ♂	- 2,9	0,54	- 0,2	- 0,1	0,68
H8 – Lingua di Fuoco ♀ x Movila Miresii ♂	1,05	0,46	1,58	0,1	2,53
H9 – Tichileşti ♀ x Carson ♂	0,6	0,34	0,2	- 0,02	0,45
H10 – Movila Miresii ♀ x Carson ♂.	2,6	0,44	- 1,8	- 0,27	- 0,75

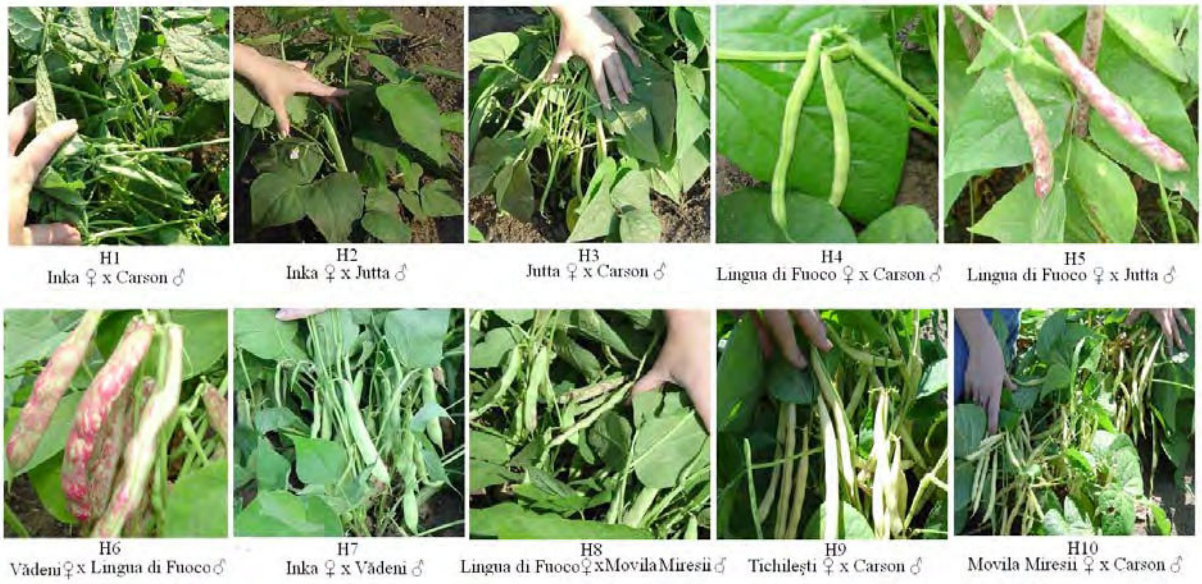

Fig. 1. Pods look at the ten hybrids obtained

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Total protein and starch dynamics in an assortment of barley genotypes cultivated on different types of soil

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Keywords: protein and starch content, barley genotypes

ABSTRACT

The paper shows how varying crude protein and starch content of barley grain in two varieties (Thuringia and Annabell), grown on two soil types (chernozem and alluvial soil) area Vadeni, Braila county. In addition to these quality indicators were determined and humidity and dry beans, 10, 17, 24, 31, 38 days after ear emergence were seen in the significant negative correlation between water content and dry matter content and between water content and crude protein content. To highlight how the accumulation of the protein and starch in grains of barley were used the same technology culture in the two study years (2009 and 2010) and have made charts and calculating the coefficients of correlation between quality indices analyzed, using Microsoft Excel.

INTRODUCTION

The starch is quantitatively the most important component of barley for beer, currently becomes dextrin amylolytic enzymes and maltose. The content of this component in barley spring ranges from 55-65%, depending on genotype, climatic conditions and crop technologies used. Nitrogen content in spring barley depends almost exclusively of mature field conditions. Nitrogenous substances accumulate in the grain before the starch. If goes well maturing, starch accumulates in sufficient quantity and proportion of nitrogen in grain is normal. among nitrogen compounds, the most important proteins. Only one third of total protein going into beer, having influence on beer quality. The total protein content depends on the color of beer, the fullness of taste qualities and characteristics of foaming, flavored beer and they colloidal stability. Protein content decreases during the manufacture of malt and beer, due to hydrolysis or enzymatic coagulation. Minerals or ash is 2-3% and is determined by burning grain. The ashes are particularly phosphorus, potassium and salicylic acid, then measurable amounts of calcium, magnesium, sodium, iron, sulfur. Phosphates are essential for fermentation. Minerals are important for grain to germination physiology, nutritional yeast for fermentation and to ensure optimal pH conditions the enzymes, which in the utmost form buffer systems must and beer. Improving the quality of barley for malt and beer has a long tradition, especially in the countries of central Europe and is one of the main directions of improvement of barley for beer are considered as important as the goals to improve production and variety of other features. In this context, having regard to the large number of breweries operating in the country, mostly those processing the raw material (barley) of import, increasing research is fully justified for this purpose nationally. Requirements for soil of barley are higher than those of wheat and, as with climate, varieties of barley are more demanding than those required by barley. The reasons for this behavior is explained by the relatively short growing season, during which assimilate nutrients from the soil, the volume of barley roots is lower than that of wheat, and barley prefers fertile soils. Prefer soils with medium texture barley, the type brown forest and podzols chernozem brown degraded. Not recommended for sandy soils or those with excess moisture.

MATERIALS AND METHODS

The biological material studied consists of certified varieties Annabell and Thuringia, manufactured by SAATEN-Union. Annabell is a kind of early spring barley, highly productive, modern biotechnological methods obtained characterized by a short waist, ear with two rows of beans and high capacity to adapt to different environmental conditions.

Annabell variety of special value is given by the high degree of adaptability to extreme climatic conditions. This variety of barley has a high capacity and earring and twinning is early ripening. The plant has a high resistance to drop and average heat and drought tolerant (Table 1). Thuringia is a spring barley variety characterized early through a high productivity, plant size is medium-short ear with two rows of grain and malt qualities that the beer industry. The variety is adapted to all areas of spring barley culture. Morphological characters are: high twinning capacity, plant height medium to short and cooking takes place early earing. Plants of the Thuringia barley variety has a high resistance to failure is heat and drought tolerance (Table 1). Experience has been made in the Vadeni, Braila (Fig. 1), in two consecutive years (2009 and 2010) and was bifactorial, type 2A x 2B x 4R, experimental factors are: - A - variety, with two graduations A1-A2 and Annabell - Thuringia - B - soil type, with two graduations: b1 - chernozem and b2 - alluvial soil.

Experimental plots measured 100m2 and settlement was made in parcels subdivided experience. Samples were collected in five phases of vegetation, weekly, starting from ear emergence to maturity, the diagonal method, each experimental plot, respectively 10, 17, 24, 31, 38 days after ear emergence. For each version were made these determinations in two repetitions: - humidity - by gravimetric method at 105 ° C drying oven - starch content - by means of hydrolysis with HCl - crude protein content - Kjeldahl method - content Ash - by calcination method. The results were used to calculate the statistical average of the three repetitions for each experimental variant.

RESULTS AND DISCUSSION

Dynamics of moisture content, ash content, starch content and crude protein content of grain from ear emergence to maturity, the two varieties (average rehearsals), grown on two different types of soil is represented Figure 2.

Water content of grains was analyzed vegetation loss phases, from 81-82% in the tenth day after earing up to 16 to 17% on day 38, while the dry matter content was growing, from 17 to 18% on day 10, up to 85-87% at day 38. The dynamics of crude protein and starch content of grains of spring barley revealed that crude protein was up from Thin stage, ranging from 3.5 - 3.8% on day 10 to 10.1 - 11.2% on day 38, and starch content increased from the day 10 of Thin, from 18.1 to 18.9% to 57.6 to 61.6% at day 38 after Thin.

These values are recorded as average results for each experimental variant repetition, show that among the four indices studied there are significant correlations; coefficients are found in Table 2. Recorded negative correlations were highly significant between moisture and dry (- 0.994) between moisture and crude protein (-0.932) between dry matter and starch content (- 0.787) and between crude protein and starch content (-0.817) . Meanwhile, there were highly significant positive correlation between dry matter content and crude protein (0.926) and a significant positive correlation between moisture and starch content (0.789) (Fig. 2). Influence of soil type on index analysis accounts for the fact that both species studied accumulated crude protein on days 10, 17, 24 and 31 after Thin more than the variants grown on chernozem alluvial soil, while in day 38th after Thin was an inversion of the relationship, meaning the crude protein content exceeded the variants grown on chernozem.

Dynamics of starch accumulation in grains of barley has been increasing on days 10 and 17 after Thin, all experimental variants, then decreasing in the days 24, 31 and 38, both varieties recorded higher amounts of the variants grown on limestone alluvial soil.

CONCLUSIONS

To obtain a high quality production with barley for brewing, it is important to know how chemicals accumulate protein and starch and soil influence on these processes.

Properties of alluvial soil have a positive influence on starch accumulation in spring barley, while the mold culture of spring barley help build a greater extent of protein substances. The dynamics of nitrogenous substances and starch accumulation in barley seeds is different, so after earring recorded a negative correlation between starch accumulation and total protein accumulation, while humidity favors the accumulation of starch positive and negative accumulation of crude protein. Equally, one can say that between the dry matter content and starch content of grain there is a significant negative correlation, while between dry matter content of grain and crude protein content there is a very significant positive correlation.

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TABLES AND FIGURES

Table 1

Data quality features of varieties

Variety	MMB (gr)	MH(kg)	UNIFORMITY %	CRUDE PROTEIN%
Annabell	42-46	69,2	94	9,9
Thuringia	43-46	64,2	91,3	10,9

Table 2

Correlation coefficients to analyzed indices

Specification	Humidity %	Dry substance %	Crude protein %	Starch content %
Humidity %		- 0,994	- 0,932	0,789
Dry substance %			0,926	- 0,787
Crude protein %				- 0,817
Starch content %				

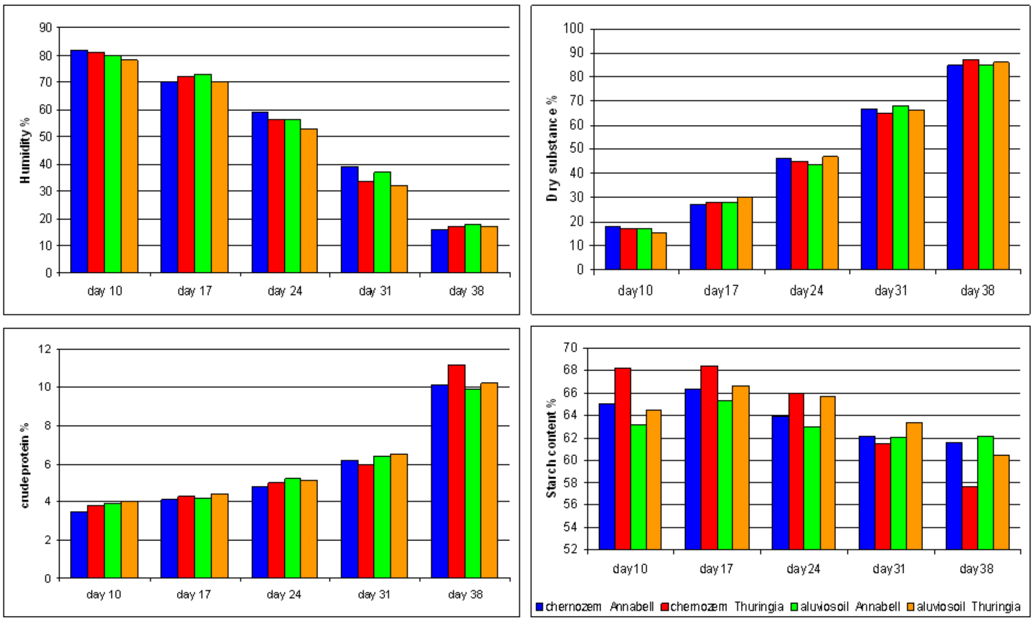

Fig. 1. Dynamics of water accumulation, dry matter, starch and total protein in barley grains after earring (average of repetitions)

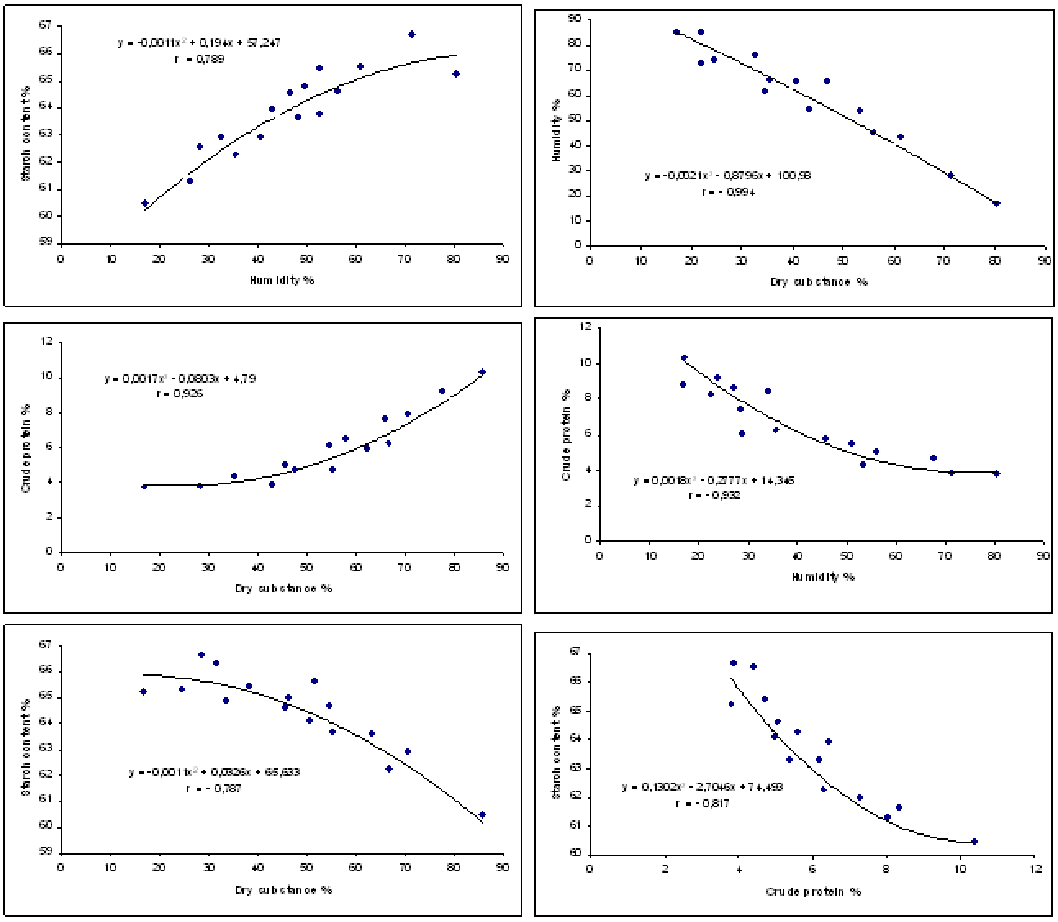

Fig. 2. Charts of correlation between analyzed indices of spring barley

OTHER FIELDS

Study regarding the tendencies of the international organic product market

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Keywords: certified, requirements, consumers, quality, fruit and vegetables, yields, conversion period

ABSTRACT

In the last two decades, a strong steady growth in the sales of organic foods has provided these products with a viable and sometimes value added market nice. Changes in dietary habits among many segments of the population of developed countries- resulting from increased health awareness and the increasing demand for a wider variety of products, including convenience food- have contributed to this growth. Due to major food scares, which hit many countries in Western Europe in the late 1990s and early years of this century, consumers in general have become more critical when purchasing food. Moreover, they have become more demanding regarding information on production and processing aspects (including traceability of the product). The sales organic horticultural product has been expanding rapidly in many of the major organic markets (ex. The United States, countries in the Union Europe and Japan). However, the market share of organic products in total food sales is still small. Diversification towards high-value crops can help to reduce the vulnerability of many agricultural producers in some countries, especially for resource poor and small-scale farmers. This study focuses on fresh certified organic fruit and vegetables.

INTRODUCTION

Products labeled as “organic” are those certified as having been produced through clearly defined organic production methods. In other words, “organic” is a claim on the production process rather than a claim on the product itself.

Organic agriculture is best known as a farming method where no synthetic fertilizers and pesticides are used (Dejeu et al., 2007). However, this description does not mention the essence of this form of agriculture, which is the holistic management of farming system. According to the definition of the Codex Alimentarius, “organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted system. This is accomplished by using, where possible, agronomic, biological and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system”. Several national governments and a multitude of private farmer organizations have defined organic agriculture. In the past, differences in these definitions were significant, but the demand for consistency by the trade has led to greater uniformity (Dejeu et al., 2007).

Basic criteria for the production, storage and transport of organic fruit and vegetables

One of the essential elements distinguishing organic farming from other forms of sustainable agriculture is the existence of production standards and certification procedures (Dankers, Cora, 2003). There are no universal standards for production and handling of organic fruit and vegetables. Initially, private associations, entitling members to use the respective association’s organic brands and labels when marketing their products, developed organic standards. The International Federation of Organic Agriculture Movements (IFOAM), a non-governmental organization promoting organic agriculture internationally, has established guidelines that have been widely adopted for organic production and processing

(Lenuta Chira, 2005). These guidelines are commonly considered as “minimum standards”, leaving room for more detailed requirements, depending on regional or local situations. As organic agriculture has became more widespread, many developed countries have defined their own organic standards. Since early 1990s, EC countries have endorsed a common organic standard, which is spelled out in Regulation EEC 2092/91. CE Regulation 834/2007 replaced this regulation. Canada, the United States and Japan have adopted organic standards and regulations, too. The Committee on Food Labeling of the FAO/WHO Codex Alimentarius Commission adopted “Guidelines for the Production, Processing, Labeling and Marketing of Organically Produced Foods” in 1999. Organic standards are usually similar as they derive from IFOAM”s guidelines for organic production.

In general, the use of methods that contribute to maintaining or enhancing soil fertility is mandatory (Lenuta Chira, 2005). Another common feature is that generally natural inputs are approved and synthetic inputs are prohibited.

Nevertheless, there are exceptions in both cases. Certain natural inputs which various certification programs determine to be harmful to human health or the environment are prohibited. In addition, certain synthetic inputs are allowed. For example, Regulation 834/2007 allows, when required, the use specific fertilizers and plant preservatives. All certification programs maintain lists of specific approved synthetic inputs and prohibited natural inputs. Many certification programs require additional environmental protection measures beyond the above prerequisites. For example, specific measures are generally applied in the areas of soil and water conservation, pollution control or the use of biological control agents.

While many farmers in the developing world do not use synthetic inputs, this alone is not sufficient to classify their products as organic. Farmers who produce organic crops for export and the sometime grow basic foodstuffs on other areas of the farm using conventional methods with fertilizers and pesticides, inadmissible to the organic system, are at high risk of violating the standards, unless effective measures are taken to prevent prohibited substances from passing to the organic plots.

Consumers prefer organic products from their country or region

The surveys have shown that in virtually all markets, organic consumers have a clear distrust of the authenticity of certified organic imports. The case of Switzerland is most striking where the main domestic organic label (Bio Suisse) prohibits organic products to be transported by plane (Switzerland is a land-locked country). Consumers in Austria are said to strongly prefer domestic organic products (preferably bought directly at the farm) and only appreciate imports during off-season periods or for products, which cannot be grown domestically. If imports are needed, produce originating from nearby countries is favored. The Danish market survey mentions that consumers’ confidence in foreign organic products declines with geographical distance. Also, consumers in Japan and the United States have a strong preference for locally grown organic produce (www.fao.org.). In order to successfully introduce imported organic produce into these markets, specific marketing efforts might be needed to gain buyers confidence. These efforts would clearly be linked to the organic importer, wholesaler and retailer. Use of the same domestic organic label in the country of consumption would help to make consumers familiar with imported organic produce, as they are more likely to recognize the equivalency of the product based on domestic standards.

There are a few exceptions. The United Kingdom and Belgium are two examples where the difference in trust between domestically grown and imported organic products in found to be relatively minor. This is probably explained by the fact that domestic organic production in these countries is not able to catch with growing demand, and imports are therefore common practice (www.fao.org.).

Price vary strongly among place, time and product group

Although there is a general lack of publicity available data on prices (at the producer, fob and retail levels), some of the market surveys give some insight into this issue. For most countries, sample of prices is given (mostly at real level), but no price series or complete set of price data could be obtained. Since the organic sector in many countries is still dominated by a few traders, willingness to provide data has often been found to be limited, and market transparency is far from optimal. With the continuing growth of organic sales volumes in developed markets and progression to mare transparent and competitive markets, most surveys indicate that this trend will probably result in a decrease in the price difference between organic and conventional products. The extent, to which price differences will decrease, however, is not known and will depend largely on the respective growth rates of demand and supply (/www.organic-world.net/statistics\world.html).

As expected, prices vary widely over time, due to seasonal trends in production (and consumption), but also from one market place to another within a country. Some non-representative samples of retail prices obtained by various authors suggest that price premia generally range between 20 and 40 percent above conventional prices, with price differences in production and distribution costs (Alexandrescu and Chira, 2010).

Organic price premia and consumer behavior

Groups of consumers are said to be willing to pay a certain price premium for organic foods (Lenuta Chira et al., 2008). In many countries, most consumers are willing to pay 20 percent more than for conventional products, but no precise figures could be obtained. Organic sales through supermarkets are the fastest growing distribution channel in most markets. Some market sources stated that consumers buying organic produce in the conventional retail channels (e.g. supermarket) differ somewhat from other organic consumers, in the sense that environmental considerations are less environmentally conscious consumers lend some support to the expectation of decreasing price premia in the next few years.

Some organic marketing trends

During the market surveys various market trends have been observed, including:

- **Organic supermarkets**. Many surveys report the introduction of small supermarkets which only sell fully organic products;
- **Biodegradable packaging**, in order to provide consumers with organic products which are packed in an environmentally-friendly manner;
- **Convenience organic foods.** Convenience foods have been among the fastest growing food items in conventional markets, and over the last years more and more organic convenience products, such as fresh pre-packed salads are to be found;
- **Sales through the Internet, often combined with box schemes, are growing in importance.** Many of the country reports provide detailed information on companies which trade organic produce through the Internet;
- **Organic food sales through public canteens and catering**. The food service sector and other sectors are becoming more and more involved in organics.

Some opportunities for developing countries and basics requirements for success

Internal production of organic products in developed countries is expected to rise within the next few years (there is usually a time-lag of three years between conversion and production of certified organic produce), but it is unlikely to meet demand for most products. Consumers' preference for locally or regionally produced organic fruit and vegetables indicates that the best opportunities are in counter-seasonal fresh organic temperate zone produce and non-temperate zone products. For products that cannot be produced in the colder climates in northern developed countries (e.g. oranges, kiwi, etc.) most organic supply comes from producing countries close to these markets, such as countries in the Mediterranean area for the UE (e.g. Italy, Spain, Israel, Morocco and Egypt). It is important to note that UE member countries or third countries have a clear advantage. For other countries, the highest potential is seen when internal supply from these countries is absent or insufficient. There may also be some opportunities in seasonal produce, which is short in supply and in processed fruit and vegetables. Basic requirements for success include a more competitive producer and fob price while meeting at least the organic and phytosanitary standards and providing the same quality as conventional products. Moreover, strong marketing efforts may be required to educate the organic consumer to mitigate the current distrust towards imported organic products. Some countries have already established a "green" or "fresh produce" export image (e.g. Costa Rica, Chile), which will help them enjoy marketing advantages in organics.

Required planning

When deciding on whether to convert to organic production, one should bear in mind the different (and many times difficult) production and management methods needed in order to succeed. The generally needed conversion period of three year makes long-term planning indispensable. For such planning, a careful cost-benefits analysis should be carried out. The size of the expected decrease in organic price premia, if any, is not well known; neither is the amplitude of the possible drop in yields during conversion and possibly after. Therefore, producers and exporters are advised to carefully assess the potential of their product in the targeted market, as well as to identify competing suppliers of that market. With the recent introduction of organic rules in two of the major organic markets, the USA and Japan, the legislative framework is in place to provide better information and guidance on import rules and, consequently, in theory, to reduce unpleasant surprises for potential organic exporters to those markets.

Some possible strategies to follow

Before certified organic fresh fruit and vegetables can be successfully exported to developed countries, many steps have to be undertaken. The list below - although not exhaustive - gives some of the main conclusions and information

An important step is **to establish national or regional organic standards and regulations** and a **reliable independent accreditation and control system** to enforce those rules. When the domestic organic rules are recognized as equivalent to the organic rules of the country to which exports are sent, unnecessary additional certification costs are avoided. Although most developing countries do not yet have their own organic standards, they are often capable of exporting certified organic products through close cooperation with an accredited certification body and a specialized importer.

Another fundamental requirement is the **availability of know-how on organic farming** and **organic inputs**. Organic farming is generally more labor intensive and requires a high level of management attention in order to avoid contamination and pests. Some of the interviewed organic producers stated that the highest initial costs of converting towards organic farming were not so much the costs of certification and control, but the huge losses during the first harvests, resulting from insufficient knowledge and capability to protect the crops from pests and plagues. Organic farming was said to be carried out on a trial-and-error basis until the appropriate techniques were developed through continuous adjustments. Moreover, during conversion towards organic agriculture, yields might drop significantly (and may remain lower even after the transition period), and there are higher risks of severe pest and disease attacks.

Good post-harvest handling (e.g. cold storage), **good infrastructure** and **logistics** (including harbor or airports) will enable the fresh produce to arrive in good condition in the country of destination. Quality problems finally led to discontinuing organic exports.

In order to export successfully, **good and reliable relations with an importer, trader or wholesaler in the target market** are important. The importer has up to date information on the latest market developments.

Supermarkets, the fastest growing sales outlet for organic produce, prefer to sell organic fresh produce year-round, with a constant quality and regular supply. International trade in conventional fresh fruit and vegetables shows increasingly characteristics of **buyer-driven global commodity chains**. In such commodity chains, the larger supermarkets in developed countries specify the requirements for price, quality, delivery and food safety for the fresh food produced in developing countries (without owning farms or processing facilities in those countries), in order to guarantee year-round supply. With the increasing importance of supermarkets as a sales outlet for organic fruit and vegetables in developed countries, supermarkets will increasingly establish such commodity chains in international organic trade, as well. The generally high requirements for produce to be purchased by foreign supermarket chains can act as a barrier for some organic producers who are not able to meet such levels. However, this situation can provide considerable rewards and income guarantees for those organic producers who do meet the standards and can operate at the supply side of such chains.

CONCLUSIONS

One of the essential elements distinguishing organic farming from other forms of sustainable agriculture is the existence of production standards and certification procedures.

In the EU countries the production of organic products are developed according EC Regulation 834/2007.

In virtually all markets, organic consumers have a clear distrust of the authenticity of certified organic imports.

Organic sales through supermarkets are the fastest growing distribution channel in most markets.

In order to export successfully, good and reliable relations with an importer, trader or wholesaler in the target market are important

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*** www.organic-world.net/statistics\world.html

*** www. Fao.org.

*** www.ec. Europa.eu/regionalapolicy-Comisia Europeana Directoratul pentru Politica Regionala.

*** www.M.A.D.R. -agricultura ecologica. Acte legislative.

Alternaria ribis, pathogen of curran bushes. Biological growth parameters

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Keywords: biological parameters, pathogen fungi, curran bush,

ABSTRACT

The most suitable moments to apply any preventing control measures, aimed at stopping he infection development can be determined by learning the biology of these pathogens. Our studies have been oriented toward defining the biological development parameters of fungal growth, under controlled circumstances, related to the influence of some abiotic factors: temperature, relative atmospheric humidity, pH value of culture media. The Alternaria ribis fungal colony development is influenced by temperature values.: the lowest temperature limit for colony development was 2°C; the optimum temperature needed for colony development was between 20-24°C; the highest temperature level may be considered at 32°C; the lethal temperature level was identified at 34°C, when colonies did not germinate, not even when the Petri dish was exposed to an optimal temperature of 32°C; the atmospheric relative humidity is an important factor in fungal evolution. Colonies did not develop at a 15% level. The lowest humidity limit was established at 36.8%; the formed mycelium was loose and no conidia had been formed.The optimal humidity limit was established at values over 75.6% when the formed colonies had a characteristic appearance.

The exposure to either a permanent or alternating light (12h/12h or 8h/16h), enhanced the best development of *Alternaria ribis*. The total absence of light had a negative impact on sporulation. The pH values of the culture medium influenced the fungal growth: the lowest limit was 3; the optimum limit ranged from 4-8. Higher values of medium alkalinity exerted a negative influence by stopping the colony growth. *A. ribis* fungal incubation period on leaves was determined by temperature in 95% humidity. At a 8°C temperature the fungal incubation lasted for 14 days. Between 20°C – 28°C the incubation period decreased to 6 days. Over 32°C the infection did not occurred any longer. The presence of a carbon source is indispensable for the *Alternaria ribis* fungal growth on a culture medium. This fungus metabolizes carbon well from mono-saccharides: glucose, dextrose, levulose, maltose, manose, trehalose, arabinose, manitose and ribose; in the same manner it metabolizes the polysaccharides: cellulose and starch. The absence of a nitrate source inhibits the formation of Alternaria Ribis colonies. This fungus metabolized very well the nitrate from the inorganic compounds based on potassium nitrate and the organic compound, peptone.

Out of the 7 culture mediums tested (Leonian, Czapek, those containing wood, oat, wheat, barley, PGA and malt 2%) the best fitted for the growth of *Alternaria ribis* were those containing oat, wheat, barley, PGA and malt 2%.

INTRODUCTION

The phylloplane is populated with microorganisms belonging to the group of ascomycete and micromycete fungi developed as plant saprophytes and pathogens. Pathogenic fungi cause quantitative and qualitative damages on currant bushes cultivated as medicinal herbs through their metabolic activity (by secreting toxic secondary metabolites and thus damaging the chemical composition of their tissues). There has been a constant preoccupation to identify such diseases and to study control methods (Radulescu and Rafaila, 1962; Hulea Ana, 1969; Bontea Vera, 1988; Smith, 1987; Neville, 1995).

Consequently, controlling such diseases and particularly preventing them is mandatory. The most suitable moments to apply any preventing control measures, aimed at stopping he infection development can be determined by learning the biology of these pathogens. Our studies have been oriented toward defining the biological development parameters of fungal growth, under controlled circumstances, related to the influence of some abiotic factors: temperature, relative atmospheric humidity, pH value of culture media (Cristea and Oprea, 1996).

MATERIALS AND METHODS

The abiotic factors influencing *Alternaria ribis* fungal development were identified by following the Tuite 1968 method.

Temperature

The *Alternaria ribis* fungus was pricked out on a PDA medium, in 8 cm diameter Petri dishes, and then distributed in thermostats at temperatures from 2°C – 40°C. Colony increasing diameter and fruiting were registered at a 3 day interval.

Relative Atmospheric Humidity. Different values of humidity, from 15%-100% were generated in excicators by using concentrated solutions containing some salts (table 1 and 2).

The Petri dishes containing PGA medium where the studied fungus had been pricked out, were put into exicators and were kept there for 21 days without any lid.

The influence of the pH values on the studied fungal development was identified by using a PDA medium with a modified pH value and sodium hydroxide or hydrochloric acid solutions for each alternative apart. The fungus was pricked out on mediums with pH values from 3 – 11. The colony diameters were measured at a 3 day interval, period in which we surveyed fruiting occurrence. The experiment developed along a 15 day period.

Further to exposing the culture to continuous light, continuous dark and light/dark alternation for 8h/16h or 12h/12h, we found out light had acted differently on the *Alternaria ribis* colony fungal development. The final observations were made after 15 days when growth and fruiting parameters were estimated.

Incubation Period

Artificial infestations were made on leaves by their spreading with a suspension of conidiae in distilled water (in a concentration of 10^6 spores/ml), obtained from a 10 days old culture developed on a PDA medium. The infected organs were kept in humid containers put in thermostats with constant temperatures from 2°C – 36°C. Observations were made on a daily basis and the occurrence of the first symptoms was recorded.

In order to observe the way this fungus metabolized the carbon and nitrogen sources on which it had developed we employed a Czapek medium, where we replaced the carbon source with different mono- and polysaccharides, and the nitrogen source with inorganic and organic compounds. As the Czapek medium was less favorable for fungal growth, it was enriched by adding beer yeast, which facilitated growth and fruiting.

The fungus was inoculated on such a medium and was allowed to grow for 15 days at a 22°C temperature after which the formation of the vegetative mass and fruiting appearance were recorded.

The influence of temperature on the *Alternaria ribis* conidia germination was lab determined. Petri dishes were filled with water-agar layers and conidia spread over their surface, then they were placed in thermostats at a 26°C temperature and kept there for 24 hours. The germination of 100 conidia for each alternative was examined at a 2 h interval

RESULTS AND DISCUSSIONS

Temperature. The colony growth of *Alternaria ribis* is influenced by temperature values. As one may notice in table 3, at which colonies were formed was 2°C, under the form of a loose, light grey mycelium with a dark grey reverse side; sporulation was absent. The appearance was also preserved at 4°C and 6°C. The 8°C temperature determined a better colony growth, so that the mycelium was compact with a dark grey velvet-like appearance and with light grey reverse side; rare conidiae were observed and they were spread all over the mycelium surface.

At 12°C and 14°C the colonies presented the same features, and starting from 16°C the colonies formed a good and highly sporulating vegetative mass.

The optimum temperature needed for colony growth was ranged between 20^{o}C - 24^{o}C; there was also noted a 50 mm colony diameter, with a dense dark grey velvet-like appearance and a light grey reverse side. Sporulation was very good, the colonies being present in big numbers (table 3)..Above 26^{o}C the colony growth rate and the number of formed conidiae were lower. 32^{o}C can be considered the highest temperature limit. The already formed colonies had a frail appearance and no sporulating was noticed (Fig.1).

The influence of temperature on the *Alternaria ribis* conidia germination was lab determined. Petri .Table 4 shows the conidia germination. The 8^{o}C temperature may be considered the lower limit, 16 h being required.

The range between 20^{o}C – 26^{o}C may be considered the optimum temperature**.**

The maximum temperature is considered to be 32^{0}C.

The lethal temperature was identified at 34^{o}C, when the conidia did not germinate any longer, not even after the Petri dish had been placed back at a 32^{o}C optimum temperature (Fig. 2).

The relative atmospheric humidity is a very important factor in fungal development. As per the table bellow there can be noticed that the colonies did not develop at a 15% value. At a 36.8% humidity the formed mycelium was loose and without formed conidia. At 66%-72% the colonies showed a thick, felt-like, grey appearance with no fruiting.

Conidia were formed on the upper side of the colonies at above 75.6% humidity. When increasing the relative humidity values the colony growth became very good, the vegetative mass was very dense, felt-like and grey and sporulation was sometimes abundant. These observations are presented in Fig. 3

The Influence of pH Values on *Alternaria ribis* colony development.

The fungal growth and sporulation are influenced by the pH values of the layer on which fungus develops. In table 6 one may notice there is a large range, as colonies formed a good vegetative mass including the development of conidiae at a pH value of 3, the optimum values being ranked from 4 – 7. Once the environment had been alkalinized, the fungus developed less vegetation, but continued to fruit very well (fig. 4.).

The *Alternaria ribis* colonies developed very well when exposed to light, as it can be observed in table 7. Either exposed to a permanent or alternating light source the vegetative mass of the formed colonies was rich, with a grey, velvet-like mycelium and an abundant sporulation.

Exposed to a permanent darkness all along the experiment, the fungal growth showed a colony development with very poor vegetative mass and rare conidia grown on the mycelium surface.

Establishing incubation duration related to temperature levels. Temperature and relative humidity were important factors in the occurrence of the first symptoms. After performing artificial infestations we provided a high humidity all along the experiment duration by keeping the infected organs in humid chambers (table 8).

The incubation period was as long as 14 days at 4^{o}C, on infected but not injured leaves.

Plastic and energy sources are decisive in the *Alternaria ribis* colony development as the basic feeding elements are carbon and nitrogen.

The table 9 shows this fungus metabolizes carbon very well from glucose, dextrose, levulose, maltose, trehalose, arabinose, manitose and ribose.

On a surface containing polysaccharides, like cellulose and starch, carbon was poorly metabolized. The lack of a carbon source exerted a negative impact over the colony growth, as it formed a loose mycelium and soon ceased to grow.

As per the table 10 bellow, this fungus metabolizes nitrogen easily from organic compounds like potassium and ammonium nitrate, but with more difficulty from ammonium phosphate. The following organic compounds were metabolized well: urea and asparagine.

The influence of some culture mediums on *Alternaria ribis* fungal growth

This fungus developed very well on natural culture mediums. As one can see in the table11 bellow culture mediums cultivated with oat, wheat, barley determined a very prolific growth of the vegetative mass and an abundant formation of conidiae. The PGA and 2% malt semi-synthetic culture mediums enhanced the colony development with a morphologic appearance specific to this fungus and a very good sporulating.

The Czapek and Leonian synthetic mediums interrupted the vegetative fungal growth, and fruiting was absent.(table 11)

CONCLUSION

The *Alternaria ribis* fungal colony development is influenced by temperature values.the lowest temperature limit for colony development was 2^oC.; the optimum temperature needed for colony development was between 20^oC – 24^oC; the highest temperature level may be considered at 32^oC. The lethal temperature level was identified at 34^oC, when colonies did not germinate, not even when the Petri dish was exposed to an optimal temperature of 32^oC.

The atmospheric relative humidity is an important factor in fungal evolution. Colonies did not develop at a 15% level; the lowest humidity limit was established at 36.8%; the formed mycelium was loose and no conidia had been formed ; the optimal humidity limit was established at values over 75.6% when the formed colonies had a characteristic appearance

The pH values of the culture medium influenced the fungal growth: the lowest limit was 3; the optimum limit ranged from 4-8. Higher values of medium alkalinity exerted a negative influence by stopping the colony growth

The exposure to either a permanent or alternating light (12h/12h or 8h/16h), enhanced the best development of *Alternaria ribis*. The total absence of light had a negative impact on sporulation.

.*Alternria ribis* fungal incubation period on leaves was determined by temperature in a 95% humidity. At a 8^oC temperature the fungal incubation lasted for 14 days. Between 20^oC – 28^oC the incubation period decreased to 6 days. Over 32^oC the infection did not occurred any longer.

The presence of a carbon source is indispensable for the *Alternaria ribis* fungal growth on a culture medium. This fungus metabolizes carbon well from mono-saccharides: glucose, dextrose, levulose, maltose, manose, trehalose, arabinose, manitose, ribose; in the same manner it metabolizes the polysaccharides: cellulose and starch.

The absence of a nitrate source inhibits the formation of *Alternaria ribis* colonies. This fungus metabolized very well the nitrate from the inorganic compounds based on potassium nitrate and the organic compound, peptone.

Out of the culture mediums tested (Leonian, Czapek, those containing wood, oat, wheat, barley, PGA and malt 2%) the best fitted for the growth of *Alternaria ribis* were those containing oat, wheat, barley, PGA and malt 2%.

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TABLES AND FIGURES

Table 1

Achieving several values of relative atmospheric humidity within controlled spaces

Supersaturated Salted Solution	The achieved relative atmospheric humidity %
Litium Chloride	15
Calcic Chloride	35
Mg $(C_2H_3O_2)_2.H_2O$	65
Ammonium Sulphate	81
Disodium Acid Sulphate $Na_2HPO_4 . 2H_2O$	95

Table 2

Achieving several values of relative atmospheric humidity within controlled spaces

Sodic Chloride Supersaturated Solution	The achieved relative atmospheric humidity %
5.2 mol = 304 gr Sodic Chloride	76
4.5 mol = 262 gr Sodic Chloride	80
3.6 mol = 210 gr Sodic Chloride	85
2.5 mol = 147 gr Sodic Chloride	90
1.5 mol = 88 gr Sodic Chloride	95
0.75mol = 44 gr Sodic Chloride	98
0.3 mol = 17.5 gr Sodic Chloride	99
0.1 mol = 6.0 gr Sodic Chloride	100

Table 3

The Influence of temperature on fungal colony development *Alternaria ribis*

T°C/days	2	4	6	8	10	12	14	Observations after 14 days
	Colony diameter in mm							
2	0	0	0	0	2	4	10	Vm± 0
4	0	0	1	8	11	13	11	Vm ± 0
6	0	0	1	8	11	13	11	Vm± 0
8	0	0	2	8	12	16	15	Vm+ Spr. ±
10	0	1	4	13	15	27	21	Vm+ Spr +
12	0	4	13	17	31	33	28	Vm+ Spr +
14	2	7	12	20	30	30	30	Vm++ Spr +
16	2	9	12	20	24	32	38	Vm++ Spr+
18	2	9	14	20	25	36	45	Vm++ Spr ++
20	2	10	15	23	27	37	70	Vm++ Spr ++
22	2	12	17	27	30	37	70	Vm++ Spr +++
24	2	12	18	27	30	38	70	Vm+ + Spr. +++
26	2	14	22	28	35	38	45	Vm++ Spr. +
28	3	17	30	40	70	70	30	Vm + -
30	3	9	13	15	16	20	27	Vm± -
3 2	3	6	6	8	9	9	10	-
34	3	0	0	0	0	0	0	-
36	2	0	0	0	0	0	0	-

Vm± = Very poor vegetative mass
Vm.+ = Poor vegetative mass
Vm ++ = Good vegetative mass
Vm +++ = Very good vegetative mass

0= Fungus did not fruit
Spr. ± = Very poor fruiting
Spr. + = Poor fruiting
Spr..++ = Fruiting Fr+++ = Abundant fruiting

Table 4

The influence of temperature on the *Alternaria ribis* conidia
Germination after a 16 hour incubation

T°C,	2	8	14	18	20	24	26	28	30	32	34	36	38	40
%	0	9	50	53	78	81	84	69	18	12	0	0	0	0

Table 5

The Influence of relative humidity on the *Alternaria Ribis* colony development

Relative Humidity RH%	Colony Diameter after 12 days	Observations
15	0	Colonies are not formed
36.8	20	Poor growth
43	32	Vm± Spr..0
56	37	Vm± Spr.0
66	70	Vm ++: Spr. 0
72	70	Vm ++: Spr. 0
75.6	70	Vm ++: Spr.+
78.6	70	Vm+++ Sp++
82.9	70	Vm+++ Spr.+++
88.5	70	Vm+++ Spr.+++
90	70	Vm+++ Spr.+++
92.7	70	Vmv+++ Spr.+++
96.1	70	Vm+++ Spr.+++
98.5	70	Vm+++ Spr.+++
99	70	Vm+++ Spr.+++

Vm± = Very poor vegetative mass
Vm.+ = Poor vegetative mass
Vm ++ = Good vegetative mass
Vm +++ = Very good vegetative mass

0= Fungus did not sporulation
Spr ± = Very poor sporulation
Spr + = Poor sporulation
Spr.+++ = Abundant fruiting

Table 6

The Influence of pH Values on the *Alternaria ribis* Fungal Growth
Observations after 12 days

pH Values	Colony diameter (φmm)
3	15 (Vm ++, Spr.+++)
4	70 (Vm ++, Spr.+++)
5	70 (Vm ++, Spr.+++)
6	70 (Vm ++, Spr.+++)
7	70 (Vm ++, Spr.+++)
8	35 (Vm ++, Spr.+++)
9	30 (Vm ++, Spr.+++)
10	26 (Vm ++, Spr.+++)
11	0 (Vm ++, Spr.+++)

Vm++ = Good vegetative mass
Vm.+++ = Very good vegetative mass

Spr++ Good sporulation
Spr++ = Abundent sporulation

Table 7

The Influence of Light on the *Alternatia Ribis* Fungal Growth

Light	Colony Development
24 h Light	Rich vegetative mass, thick grey mycelium, abundant sporulation.
12 h/12 h light/dark alternation	Rich vegetative mass, thick grey mycelium, abundant sporulation.
8 h/16 h light/dark alternation	Rich vegetative mass, thick grey mycelium, abundant sporulation.
Permanent darkness	Very poor vegetative mass, poor sporulation

Table 8

Incubation period of leaves infected by *Alternaria Ribis*

T º	2	4	8	14	16	20	24	26	28	30	32	34	36
Days	0	14	14	11	9	6	6	6	6	12	16	0	0

Table 9

Colony Growth on Different Carbon Sources

Carbon Sources	*Alternaria ribis* Fungal Colony Growth
Monosaccharides	
Glucose	Abundant vegetative mass, grey, velvet-like mycelium, rich sporulation
Dextrose	Abundant vegetative mass, grey, velvet-like mycelium, rich sporulation
Levulose	Abundant vegetative mass, grey, velvet-like mycelium, rich sporulation
Maltose	Abundant vegetative mass, grey, velvet-like mycelium, rich sporulation
Manose	Abundant vegetative mass, grey, velvet-like mycelium, rich sporulation
Manitose	Abundant vegetative mass, grey velvet-like mycelium, rich sporulation
Trehalose	Abundant vegetative mass, grey velvet-like mycelium, rich sporulation
Arabinose	Abundant vegetative mass, grey velvet-like mycelium, rich sporulation
Levulose	Abundant vegetative mass, grey velvet-like mycelium, rich sporulation
Sorbose	Very poor vegetative mass, without fruiting.
Ribose	Abundant vegetative mass, grey velvet-like mycelium, rich sporulation
Polysaccharides	
Celullose	Poor vegetative mass, very light grey mycelium developed in subsoil, poor sporulation toward colony centre
Starch	Poorly developed mycelium, in concentric rings, with a lobate colony edge, poor pigmentation, good sporulation, conidia disposed concentrically.
Without carbon source	The formed mycelium is loose, surrounding the pricking-out point.

Table 10

Colony Growth on Different Nitrate Sources

Nitrate sources	*Alternaria Ribis colony development*
Inorganic compounds	
Potassium Nitrate	Abundant vegetative mass, brown yellowish velvet-like mycelium, rich sporulation
Ammonium Nitrate	Limited growth, poor grey velvet-like vegetative mass. Poor fruiting
Ammonium Phosphate	Limited growth, poor grey, velvet-like vegetative mass, no conidiae formed.
Organic Compounds	
Urea	Abundant vegetative mass, grey velvet-like mycelium, irregular colony edges, good sporulation
Asparagine	Abundant vegetative mass, grey velvet-like mycelium, irregular colony edges, good sporulation
Absence of a nitrate source	The fungal mycelium does not grow

Table 11

Alternaria Ribis **fungal growth on culture mediums**

Culture lots	Colony growth after 15 days (φ mm)
Synthetic Culture Mediums	
Leonian	Poor vegetative mass (35 mm); no fruiting
Czapek	Poor vegetative mass (35 mm); no fruiting
Semi-synthetic Culture Mediums	
Potato-Glucose-Agar(PGA)	Very good vegetative mass (70mm); very good sporulation
Malt 2%	Very good vegetative mass (70mm); very good sporulation
Natural Culture Mediums	
Oat	Very good vegetative mass (70mm); very good fruiting
Barley	Very good vegetative mass (70mm); very good sporulation
Wheat	Very good vegetative mass (70mm); very good sporulation

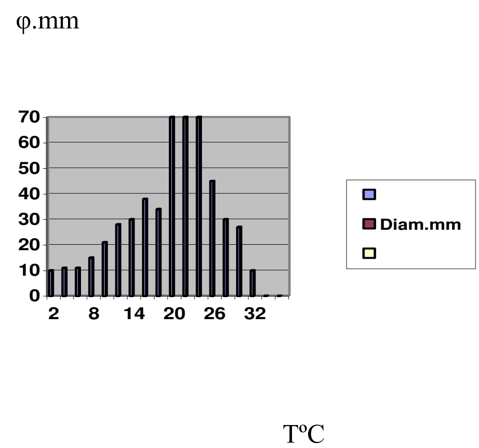

Fig. 1 The influence of Temperature on the Fungal Colony Development

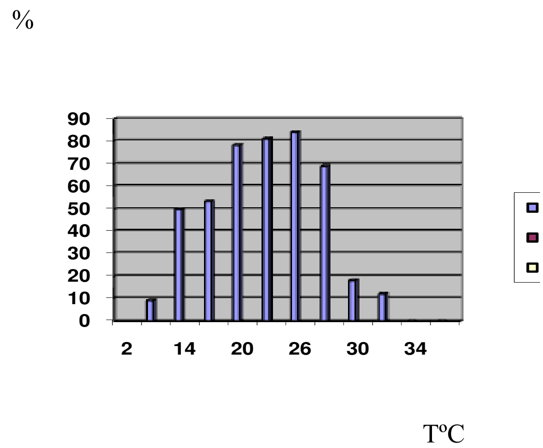

Fig.2 *Alternaria ribis* conidia germination related to temperature

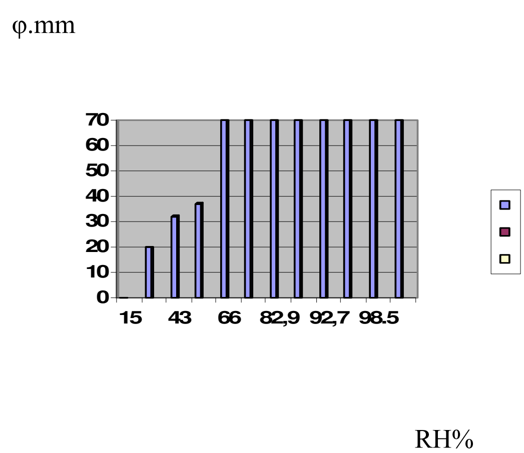

Fig. 3 The Influence of Humidity on *Alternaria ribis* fungal growth

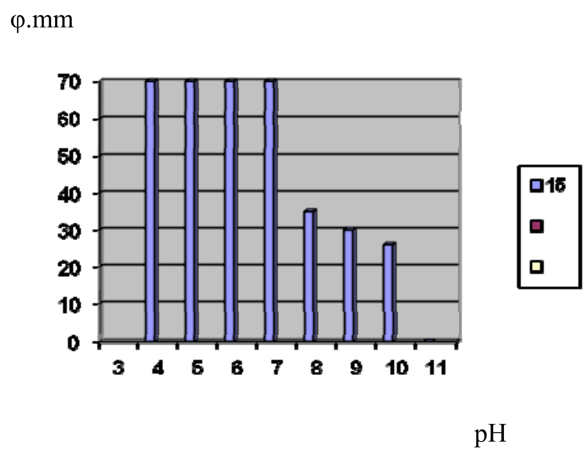

Fig. 4 . *Alternaria ribis* fungal development dynamics related to the pH value of the culture medium
Observations after 12 days

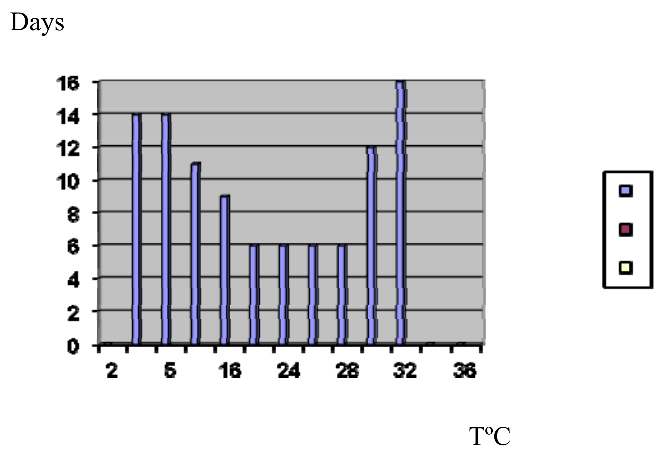

Fig.5 . Incubation period according to temperature levels at 95% RH

The dosing of active substances from vegetal extracts

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Keywords: vegetal extract, active substance, plans diseases

ABSTRACT

The vegetal extract was obtained by using 4 species of plants: *Hyssopus officinalis Rosmarinus officinalis, Satureja hortenis and Valeriana officinalis*. In HOFIGAL laboratory was determining active substance on all this hidrolachohlic extracts: dosing the total polyphenols as chlorogenic acid, the total content of hydroxycynammic derivatives as rosmarinic acid, the total polyphenols as caffeic acid and determination sesquiterpenic acids as valerenic acid (%).In our investigations we have obtained results regarding the antifungical activity of the extract in vitro against the pathogenic fungi from the gooseberry. The colonies of the fungi *Botrytis cinerea* were inhibated by the S*atureja hortensis* extracts to a concentration of minimum 5%; and demostrated a toxic effect on the fungi *Alternaria ribis* and the germination of the *Oidium* condia (teleomorph *Sphaeroteca mors-uvae)* was inhibited too.

The development of the fungi *Botrytis cinerea* colonies was inhibited by the *Hyssopus officinalis* extract with 5% concentration. The germination of the *Oidium* conidia (teleomorfa *Sphaeroteca mors-uvae)* was totally inhibited by the same extract. The plant extract obtained from *Valeriana officinalis* included in the culture media in concentration of 20% demonstrated to have an inhibitory action against the fungi *Alternaria ribis.*

INTRODUCTION

The medicinal plants culture was strongly developed in the purpose to obtain natural medicines recommended in the treatment of human diseases. The medicinal plants in culture are affected by different pathogens and pests. The pathogenic fungi are developing on vegetative organs, diminishing their therapeutically value. This means for this kind of cultures must be used only environmental friendly methods in order to avoid the contamination of plant material with chemical residues.

For this purpose were used for experiments some plant extracts with antifungi properties (Brito, J.C.. 2003, Ionescu et al., 2009). The extracts were obtained from 9 plants species: Hysopus *officinalis, Tagetes sp., Satureja hortenis, Allium sativum, Artemisia sarivus, Valeriana officinalis, Alchemilla milefolium,, Menta sp*. The selection of the extracts was made on some criteria like the synthesis of some pesticide analogs, the facility of obtaining the extracts and the costs. The organs used in extraction was the aerian stems, flowers, bulbs, cropped at recommended periods. Method for dosirung of active substances is presented in the debates of the researches workers (Bruneton et al., 1993; Cosentin et al, 1999**;** Jindal et al., 2006; Sancheti et al, 2006; Soyal et al, 2007).

MATERIALS AND METHODS

In laboratory conditions, was established the biological activity of the extracts against the fiungi grown on the curranr. The toxic hydro-alcoholic plant extracts were obtained from *Hyssopus officinalis, Satureja hortensis, Rozmarinus officinalis and Valeriana officinalis*

Dosing of total polyphenols as chlorogenic acid from the *Hyssopus officinalis* extract. Reagents: natrium wolframate R; phosphoric acid R; water R; sodium phosphowolframate - solution R (Reactiv Folin): 10 g wolframat de sodiu *R,* 10 ml *phosphoric acid R* and 75 ml *water R* heated to boiling temperature, with reflux, for 2 hours; after cooling is diluted with *water R* to 100 ml. Sodium carbonate R, 200 g/l ; Caffeic acidc R ; Standard solutions: caffeic acid solutions R, 20 µg/ml - 90 µg/ml; ethanol R, 50% (v/v); test solution: 10g of sample of hyssopus leaves (wheighted at laboratory analtical balance) were introduced in a boiling flask of 150-200 ml, with 100 ml *ethanol R 50% (v/v)* followed by heating up to boiling temperature on water bath (with reflux) for 30 min. The hot solution is filtered through cotton in a volumeric flask and then adjusted to 100 ml with solvent (from residues washing).

Method. 5,0 ml *test solution* mix toghether with 5 ml *sodium phospho wolframate - solution R,* was filtered, discharging the first filtrate. 2,5 ml of filtrate was diluted with *sodium carbonate solution* R, 200 g/l to 25 ml, in volumetric flask. Then the absorbance of the solution was measured at 660 nm, against a blank solution prepared from 2,5 ml filtrate diluted with water to 25 ml in volumetric flask.

The concentration of the sample in total polyphenols content is calculated on the standard curve prepared in the same conditions like the samples, with a diluted series of solutions of caffeic acid and using a blank prepared from *1,25 ml sodium phosphowolframate -solution R,* and adding *water R* to 25 ml, in a volumetric flask.

The total polyphenosl content as caffeic acid is calculated after the formula:

$$\text{Total polyphenols as caffeic acid mg\%} = \frac{c \times 10}{m_p}$$

in which:

c = concentration in caffeic acid (µg/ml) on standard curve, µg/ml;

m_p = the quantity of sample analysed in laboratory in g;

The total polyphenols as chlorogenic acids was calculated multiplying the result by 2,016.

Dosing the total content of hydroxycynammic derivatives as rosmarinic acid from the *Rosmarinus officinalis* extract (metods Jindal, 2006, Sancheti, 2006, Soyal D.)

Reagents: *ethanol solution R 50% v/v; chlorhydric acid R 0,5M; sodium nitrate R; sodium molybdate R; diluted solution of sodium hydroxide R 850 g/L; water R; sample for analysis; stock solution:* at 2,0 g *sample* is diluted to 00 mL cu *ethanol solution R 50% v/v.*; *test solution:* 1 mL *stock solution* is mixed with 2 mL *chlorhydric acid solution R 0,5M*, 2 mL solution (10 g *sodium nitrate R* and 10 g *sodium R* olved in 100 mL *water R)* . 2 mL *(diluted solution of sodium hydroxyde R 850 g/L)*, was diluted up to 10 mL cu *water R* and mixed.; *clearing fluid :* 1 mL *stock solution is diluted wtih water R at* 10 mL final volume.

Method: the absorbance of the solution was measured at 505 nm.

The specific absorbace of rosmarinic acid is 400, and the content in hydroxycynnamic derivatives as rosmarinic acid was calculated after the formula:

$$\text{The total content in hydroxycynnamic devrivatesas rosmarinic acid \%} = \frac{A \times 2{,}5}{m}$$

A = absorbance of test solution at 505 nm;

m = sample volume mL.

Determination of total polyphenols as caffeic from *Satureja hortensis* (determinnd of metods Singleton, 1999)

Reagents: *sodium wolframate de sodiu R; phosphoric acid R; water R;*

sodium phosph- wolframate solution R (Reactiv Folin): 10 g *sodium wolframate R,* 10 ml *phosphoric acid R* and 75 ml *water R* are heated to boil, la reflux, for 2 hours after cooling was diluted with water *R* at 100 ml. *Sodium caerbonate R, 200 g/l ; Caffeic acid R ; Standard solution of caffeic acid R, 20 µg/ml - 90 µg/ml; ethanol R, 50% (v/v);*

- ***test solution:*** 10 g of sample (weighted at analytical balance) are inserted in a boiling flask of 50-200 ml, toghether with 100 ml *ethanol R 50 % (v/v)* and heated up to boiling temperature on water bath with reflux, for 30 min. The hot solution is filtered on cotton in a volumetric flask volumeric flask and then adjusted to 100 ml with the same solvent (from residues washing).

Method at each 5,0 ml *tests solution,* 5 ml *fosfowolframat de sodiu-solutie R* was added, mixed and filtered (discharging first filtrate drops). 2,5 ml filtrate was diluted with *sodium carbonate solution R,* 200 g/l and brought at 25 ml in volumetric flask. The absorbance of the solution is measured at 660 nm, using clearing liquid prepared from 2,5 ml filtrate and *water R* to 25 ml in a volumetric flask.

Total polyphenols content of the sample is calculated with the help of a standard curve in the same conditions as the test solution, with standard solutions of caffeic acids and using as clearing liquid (marker sample) a solution prepared from *1,25 sodium phosphowolframate - solution R* and *water R* brought to 25 ml in a volumetric flask.

The total polyphenols content as caffeic acid is calculated by the formula:

$$\text{Total polyphenols as caffeic acid mg\%} = \frac{c \times 10}{m_p}$$

in which

c = concentration in caffeic acid (µg/ml) read on the standard curve, in µg/ml;

m_p = sample quantity in g;

Note: For expressing as chlorogenic acid the result is multiplied with 2,016.

Valerian active substances is determining methods by Farmacopeea Romana Valerian rhizoma, roots and flower stems contains 0,5-2% volatile oils. In laboratory we performed the determination sesquiterpenic acids as valerenic acid (%) from the

Reagents: test solution: 10g tincture (sample for analysis) diluted up to 50ml with methanol R; reference solution: obtained by dissolution of an quantity of standard dry valerian CRS equivalent to 1.0 mg valerenic acid, in methanol R and was diluted to 10.0 ml with the same solvent;

- mobile phase A : is a mix of 20 volumes acetonitrile R and 80 volumes phosphoric acid solution 5 g/l R
- mobile phase B: mix of 80 volumes acetonitrile R and 20 volume phosphoric acid 5 g/l

Chromatografic system:

a) Liquid chromatograph with:

- detector spectrophotometric setat la 220 nm

b) octadecylsylil silicagel column for chromatography R (5 µm) 0,25 m long and 4,6 mm diameter

Working conditions:

- debit: 1,5 ml/min
- injection volume: 20 µl

Time (minutes)	**Mobile A phase (% v/v)**	**Mobila B phase (% v/v)**	**Observations**
0-5	55	45	isocratic
5-18	55-20	45-80	Linear gradient
18-20	20	80	isocratic

Working protocol

The test and reference solution are injected.

The peaks of the acetoxyvalerenic acid and valerenic acid are estimated by comparison with the reference solution chromatogram (standard valerian extract CRS). The retention relative time for valerenic acid is about of ~ 20 minute, and the relative retention time for acetoxyvalerenic acid is ~ 0,5.

The percent content in sesquiterpenic acids as valerenic acid is calculated by formula:

$$\frac{(A_1 + A_2) \times m_2 \times p \times 5}{A_3 \times m_1}$$

A_1 = peak area due to the acetoxyvalerianic acid from the chromatogram obtained with the test solution;
A_2 = peak area of valerenic acid from the chromatogram obtained with test solution;
A_3 = peak area due to valerenic acid from the chromatogram obtained with reference solution;
m_1 = mass of the tincture in grams;
m_2 = mass of the standard valeriana extract CRS used for the reference solution preparation in grams;
p = the percent content of valerenic acid from the standard valeriane extract CRS.

RESULTS AND DISCUSSION

Hyssopus officinalis contains a volatile oil rich in polyphenols, thymol, carvacrol, cymol, α-thujone, α-terpinene, terpenes, tannoids, sterolic coumpounds, hesperidine, flavonoids, and minerals like calcium, natrium, sulphur, iron, magnesium, copper, manganese and others.(Cretu et all,.. 2006; Sigelton, 1999) In our reserches we focus on the content in total polyphenols and flavonoids (fig.1). In the frame of the experiments, ten hyssopus samples were analysed by the described method and the results are presented in the table1 .From our laboratory investigations, we obtained precious results regarding the antifungi activity of the extact in vitro. The development of the fungi *Botrytis cinerea* colonies was inhibited by the *Hyssopus officinalis* extract with 5% concentration. The germination of the *Oidium* conidia (teleomorfa *Sphaeroteca mors-uvae)* was totally inhibited by the same extract.

Rosmarinus officinalis contains important active compounds the volatile oils like: hydroxycynnamic derivates, terpene, borneol, cineole and camphor. In addition, the plant contains tanin, resins, bitter compounds and saponins too (fig.2). In the frame of the present experiments 10 rosemary samples were analysed by the described method, and the results are presented in the table 2 The plant extract obtained from *Rosmarinus officinalis* included in the culture media in concentration of 20% demonstrated to have an inhibitory action against the fungi *Alternaria ribis*.

Satureja hortensis The most important active substances contains by the volatile oil are the polyphenols like thimol, p-cymol, borneol, geraniol carvacrol, linalol, bornil acetate, α-pinene In the frame of the experiments, ten thyme samples were analysed regarding their total polyphenol content as caffeic acid (%), total polyphenols as chlorogenic acid polifenoli (%) and flavones as rutin (%), by the method presented above (fig.3). The results are presented in the table 3.In our investigations we have obtained results regarding the antifungical activity of the extract in vitro agauinst the pathogenic fungi from the currant. The colonies of the fungi *Botrytis cinerea* were inhibated by the S*atureja hortensis* extracts to a concentration of minimum 5%; and demostrated a toxic effect on the fungi *Alternaria ribis* and the germination of the *Oidium* condia (teleomorph *Sphaeroteca mors-uvae)* was inhibited too (table 3).

Valeriana officinalis In the frame of the experiments, 10 valeriana samples were analysed regarding their to*tal* sesquitherpenic acids content as valerenic acid by the method presented in European Pharmacopeea, 6th edition, the monography “VALERIAN TINCTURE” by liquid chromatography HPLC type (fig. 4).

The results are presented in the table 4.

The extracts obtained from Valeriana officinalis, included in the culture media in 10% concentation inhibit the development of the fungi Alternaria ribis in vitro and have a limitative effect on the development of the fungi Fusarium oxysporum

CONCLUSIONS

The researches demonstrated another use of the hydroxy alcoholic extracts. The selected plant extracts showed a toxic activity on the pathogens of the foliar diseases of the currant:

- the development of the fungal colonies of *Botrytis cinerea* was totaly inhibited by the plants extracts of *Hyssopus officinalis,* contains polyphenols and flavones down to concentration and the germnination of the *Oidium* conidia (teleomorph *Sphaeroteca mors-uvae)* was totally inhibited.
- the *Botrytis cinerea* şi *Alternaria ribis* colonies, was totally inhibited by the extracts of S*atureja hortensis,* whith contains polyphenol as caffeic acid (%), total polyphenols as chlorogenic acid polifenoli (%) and flavones as rutin (%), and the germination of O*idium* conidia (teleomorph *Sphaeroteca mors-uvae)* was inhibited 100%.
- the extracts from *Valeriana officinalis,*as active substances total sesquitherpenic acids content as valerenic**,** had an inhibitory action against the fungi *Alternaria ribis* and a limitative effect against the fungi *Fusarium oxysporum*.

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TABLES AND FIGURES

Table 1

Determination of content in active substances of Hyssopus samples

No. crt.	Sample	Total polyphenols content (%)	Flavones (%)
1	Sample 1	0,52	0,03
2	Sample 2	0,48	0,02
3	Sample 3	0,47	0,03
4	Sample 4	0,50	0,02
5	Sample 5	0,51	0,02
6	Sample 6	0,49	0,02
7	Sample 7	0,48	0,03
8	Sample 8	0,46	0,03
9	Sample 9	0,50	0,03
10	Sample10	0,51	0,02

Table 2

Determination of the content in rosmarinic acid

No.	Sample	Content in total hydrocynnamic derivatives as rosmarinic acid (%)
1	Sample1	0,12
2	Sample 2	0,13
3	Sample 3	0,10
4	Sample 4	0,15
5	Sample 5	0,11
6	Sample 6	0,12
7	Sample 7	0,13
8	Sample 8	0,11
9	Sample 9	0,13
10	Sample 10	0,12

Table 3

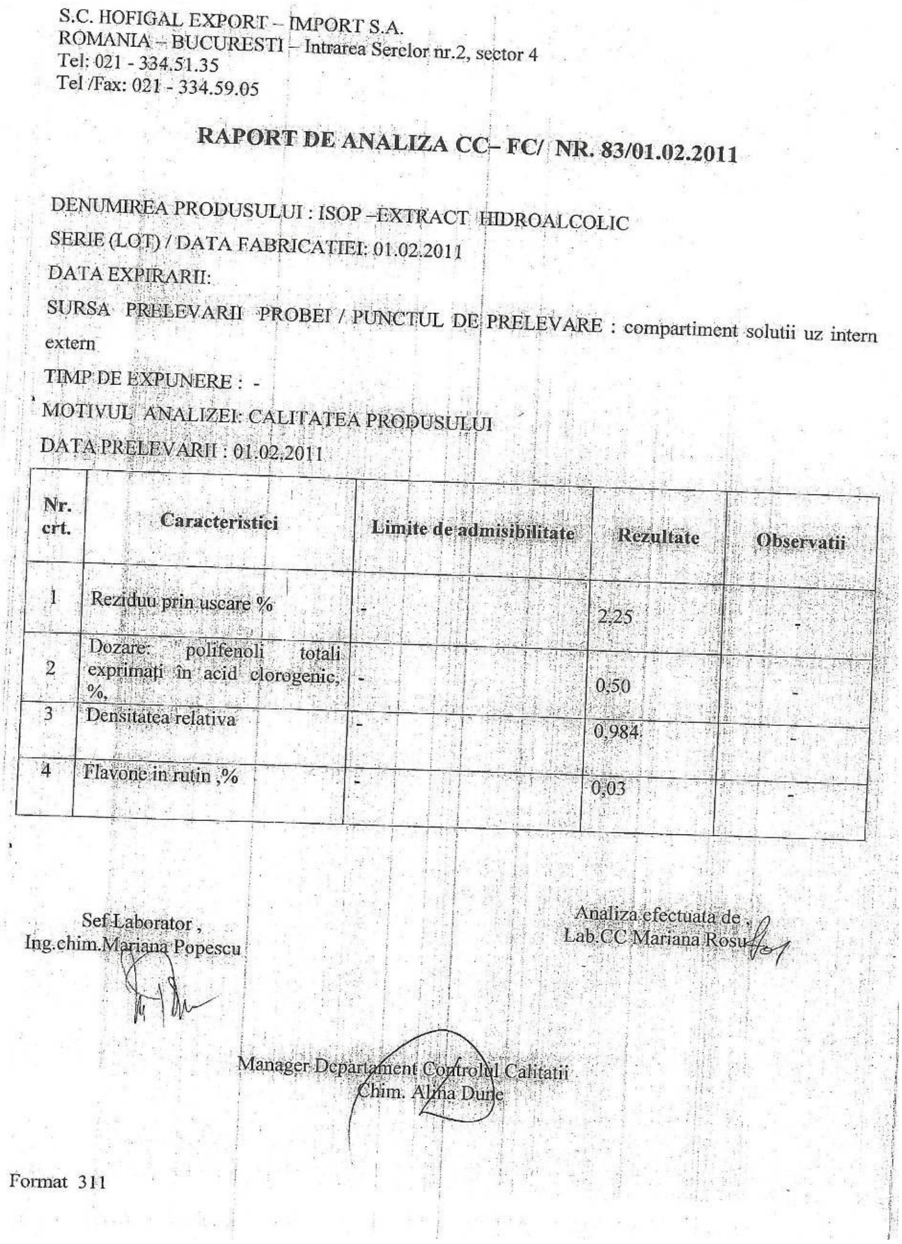
Determination of the content in active substances of thyme samples

No. crt.	Sample	Total polyphenol content as caffeic acid (%)	Total polyphenol content as chlorogenic acid (%)	Flavone content as rutin (%)
1	Sample 1	0,06	0,12	0,083
2	Sample 2	0,05	0,013	0,081
3	Sample 3	0,06	0,11	0,079
4	Sample 4	0,04	0,12	0,081
5	Sample 5	0,06	0,11	0,083
6	Sample 6	0,05	0,12	0,080
7	Sample 7	0,05	0,13	0,081
8	Sample 8	0,06	0,11	0,085
9	Sample 9	0,07	0,12	0,082
10	Sample 10	0,05	0,13	0,083

Table 4

Determination of active substances (compounds) of valerian samples

No. crt.	Sample	Sesquiterpenic acids as valerenic acid (%)
1	Sample 1	0,015
2	Sample 2	0,016
3	Sample 3	0,015
4	Sample 4	0,014
5	Sample 5	0,015
6	Sample 6	0,017
7	Sample 7	0,016
8	Sample 8	0,015
9	Sample 9	0,014
10	Sample 10	0,015



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RAPORT DE ANALIZA CC– FC/ NR. 83/01.02.2011

DENUMIREA PRODUSULUI : ISOP –EXTRACT HIDROALCOLIC
SERIE (LOT) / DATA FABRICATIEI: 01.02.2011
DATA EXPIRARII:
SURSA PRELEVARII PROBEI / PUNCTUL DE PRELEVARE : compartiment solutii uz intern extern
TIMP DE EXPUNERE : -
MOTIVUL ANALIZEI: CALITATEA PRODUSULUI
DATA PRELEVARII : 01.02.2011

Nr. crt.	Caracteristici	Limite de admisibilitate	Rezultate	Observatii
1	Reziduu prin uscare %	-	2,25	-
2	Dozare: polifenoli totali exprimaţi în acid clorogenic, %,	-	0,50	-
3	Densitatea relativa	-	0,984	-
4	Flavone in rutin ,%	-	0,03	-

Sef Laborator ,
Ing.chim.Mariana Popescu

Analiza efectuata de ,
Lab.CC Mariana Rosu

Manager Departament Controlul Calitatii
Chim. Alina Dune

Format 311

Fig. 1. Dosing of total polyphenols as chlorogenic acid from the *Hyssopus officinalis* extract

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RAPORT DE ANALIZA CC– FC/ NR . 82/01.02.2011

DENUMIREA PRODUSULUI: ROZMARIN – EXTRACT HIDROALCOOLIC
SERIE (LOT) / DATA FABRICATIEI: 01.02.2011
DATA EXPIRARII: -
SURSA PRELEVARII PROBEI / PUNCTUL DE PRELEVARE : Compartiment solutii uzintern - extern
TIMP DE EXPUNERE : -
MOTIVUL ANALIZEI:
DATA PRELEVARII : 01.02.2011

Nr. crt.	Caracteristici	Limite de admisibilitate	Rezultate	Observatii
1	Densitate relativă	-	0,969	-
2	Reziduu prin evaporare %	-	2,5	-
3	Dozare: - continut in derivati hidroxicinamici totali, exprimati in acid rozmarinic %, min.	-	0,12	-

Analiza efectuata de ,
Lab. CC. Maricica Zamfir

Sef Laborator Control Fizico-Chimic
Ing. Chim. Mariana Popescu

Manager Departament Controlul Calitatii
Chim. Alina Dune

Format 311

Fig.2 Dosing the total content of hydroxycynammic derivatives as rosmarinic acid from the *Rosmarinus officinalis* extract Rosmasinus

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RAPORT DE ANALIZA CC– FC/ NR. 84/01.02.2011

DENUMIREA PRODUSULUI : ***CIMBRU - EXTRACT HIDROALCOOLIC***

SERIE (LOT) / DATA FABRICATIEI: - 01.02.11

DATA EXPIRARII: -

SURSA PRELEVARII PROBEI / PUNCTUL DE PRELEVARE : Compartiment solutii uz intern extern

TIMP DE EXPUNERE : -

MOTIVUL ANALIZEI: CALITATEA PRODUSULUI

DATA PRELEVARII : 01.02.2011

Nr. crt.	Caracteristici	Limite de admisibilitate	Rezultate	Observatii
1	Reziduu prin uscare ,% , min	-	1, 9	-
2	Densitate relativă, d_{20}^{20}	-	0,975	-
3	Dozare: - polifenoli totali exprimaţi în acid cafeic, %. - polifenoli totali exprimaţi în acid clorogenic, %. - continut in flavone exprimate in rutin,%.	- - -	0,06 0,12 0,083	- - -

Analiza efectuata de ,
Chim. Alina Mihai

Sef Laborator ,
Ing.chim.Mariana Popescu

Manager Departament Controlul Calitatii
Chim. Alina Dune

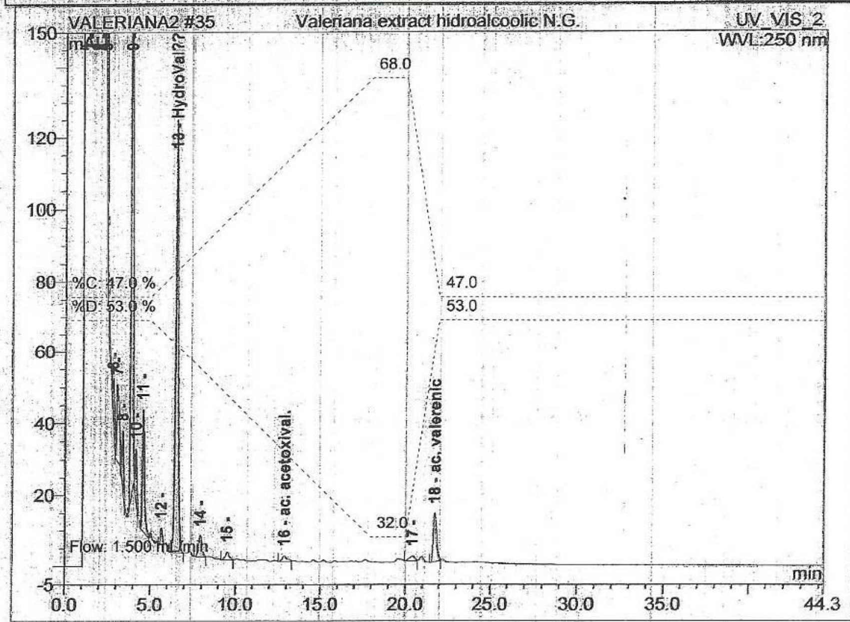
Format 311

Fig.3 Determination of total polyphenols as caffeic from *Satureja hortensis*

Operator:HPLC Timebase:CERCETARE Sequence:VALERIANA2 Page 1-4
2/22/2011 10:03 AM

n.a. Valeriana extract hidroalcoolic N.G.

Sample Name:	**Valeriana extract hidroalcoolic N.G.**	*Injection Volume:*	**20.0**
Vial Number:	**0**	*Channel:*	**UV_VIS_2**
Sample Type:	**unknown**	*Wavelength:*	**250**
Control Program:	**VALER6**	*Bandwidth:*	**1**
Quantif. Method:	**VAL 3 KATY**	*Dilution Factor:*	**1.0000**
Recording Time:	**2/1/2011 10:57**	*Sample Weight:*	**1.0000**
Run Time (min):	**44.26**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount mg/ml	Type
1	1.28	n.a.	757.366	207.055	40.91	n.a.	BMb
2	1.40	n.a.	966.718	171.688	33.92	n.a.	bMB
3	2.04	n.a.	106.119	28.941	5.72	n.a.	BMb
4	2.15	n.a.	261.928	25.023	4.94	n.a.	bMB
5	2.34	n.a.	35.203	5.442	1.08	n.a.	BMB
6	2.82	n.a.	9.255	0.992	0.20	n.a.	BMB
7	3.05	n.a.	20.841	3.645	0.72	n.a.	BMB
8	3.38	n.a.	13.678	1.176	0.23	n.a.	bMB
9	3.86	n.a.	255.745	28.537	5.64	n.a.	BMb
10	4.16	n.a.	12.580	1.225	0.24	n.a.	bMB
11	4.57	n.a.	33.780	4.664	0.92	n.a.	BMB
12	5.64	n.a.	4.749	0.612	0.12	n.a.	BMB
13	6.52	HydroVal??	121.113	21.280	4.20	n.a.	BMB
14	7.93	n.a.	5.954	1.314	0.26	n.a.	BMB
15	9.52	n.a.	2.203	0.575	0.11	n.a.	BMB

RapAsy2/Integration — Chromeleon (c) Dionex 1996-2001 Version 6.40 SP1, Build 711

Fig.4. Valeriana to*tal* sesquitherpenic acids content as valerenic acid

Bacterial cancer of horse chestnut

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State Institute for Variety Testing and Registration Bucharest, Romania

Keywords: horse chestnut, *Agrobacterium tumefaciens* (Smith et.Townsend). Con., first signaling

ABSTRACT

The development of horse chestnut (*Aesculus hippocastanum* L.) is affected by the attack of pathogens, for example, phytopathogenic fungies like: *Mycospahaerella maculiformis* (pp) Schrot., which produced a chestnut leafs brown staining; *Mycosphaerella alphitoides* Griff.et Maubl., which causes mildew leaves, *Endothia parasitica* (Murr.) Piet HW Anderson etc. In 2008, we identified the presence of bacterial cancer disease at horse chestnut caused by the *Agrobacterium tumefaciens* (Smith et.Townsend) Con., which wasn't mentioned before in Romania.

Horse chestnut (*Aesculus hippocastanum L.)* is a tree widespread in southeastern Europe, especially in central and southern Balkan Peninsula, and in parts of Europe northwest.

In our country parks, horse chestnut is found in all cities and major institutions, imposing in size and majestic beauty and gentleness of flowers. This species occupies an important place in terms of blood circulation disease phytotherapy, as shown by the works of Dr. Artault di Vevej, who made in 1896.

For this purpose the most used parts of the plant are seeds (chestnuts) and bark are astringent, antiseptic effect. Leaves decoction, taken in small doses, successive, is a good remedy for children whooping cough.

The development of this species is affected by the attack of pathogens, for example, phytopathogenic fungies like: *Mycospahaerella maculiformis* (pp) Schrot., which produced a chestnut leafs brown staining; *Mycosphaerella alphitoides* Griff et Maubl, which causes mildew leaves, *Endothia parasitica* (Murr.) Piet HW Anderson, etc.

In 2008, we identified the presence of bacterial cancer disease at horse chestnut caused by the *Agrobacterium tumefaciens* (Smith et.Townsend) Con. (V. Severin 2006), which was not mentioned before in Romania. The attack is manifested by the presence in the lower tree strain like a strong tumor, brown, with rough surface and 1.5-2m large (Fig. 1, 2, 3). The attacked tree, which has over 80 years old, do not have symptoms of pain yet, the leafy and flowering arising about normal.

As protective measures, following a number of research conducted in different countries, revealed the possibility of preventing this disease. Some of the most important preventive measures are the agro-phyto-technical measures. Thus, we require nurseries to be located on light land which, for 3-4 years, to be planted with grass. For planting will be used only healthy saplings (from nurseries uncontaminated). The suspect's saplings, coming from the infected nurseries will be disinfected by immersing the roots, before planting, and the package in a 1% salt mixture of potassium and 0.4% chalk chloride (Minoiu N., 1997). The saplings with tumors will be removal from the nursery and will be destroyed by burning.

Horse chestnut chemical composition

Chestnut fruit contains starch, triterpenic saponoside (which prints and unpleasant bitter taste of seeds), fats, proteins, tannins, esecin, afrodescin, argirescin, criptoescin, flavonoids, oxicumarins, vitamins of group B, C, K and D - catechol, bitter substances.

The bark contains: esculin, cvercitrin, fraxin, oxicumarine, cellulose, resins, mineral substances.

Therapeutic indications

Due to the saponoside presence, especially esecin and D-catechol, the chestnut extracts have moderate action against phlebitis problem; escin has anti-inflammatory action, reducing capillary fragility, edematous properties, photoprotection and hemostatic action. We can use the cestnuts to the followingconditions: stroke, contusions, frostbite, postoperastive edema, trauma, phlebitis, gangrene, hemorrhoids, herniated disc, vein inflammation, ringworm, sprains, Parkinson desease, wound infections exudative processes, sciatica,sequelae after fractures, spondylosis, circulatory disorders, varicose veins, varicose ulcer. Traditionally, the bark was used in tanning and dyeing hides and skins. Crushed or finely chopped chestnuts and put in alcohol or boiled in water bath, used for rheumatism.

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FIGURES

Fig. 1 *Agrobacterium tumefaciens* attack to the trunk (original photo)

Fig. 2. Large tumor, 1.5 - 2 m in diameter (original photo)

Fig. 3. Large tumor, 1.5 - 2 m in diameter – detail (original photo)

Industrial voids and multifunctional sites

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Keywords: industrial void, brownfield, friche, adaptive reuse, multifunctional sites

ABSTRACT

Industrial areas may be located either in town or at the periphery, squeezing out discrete industries, cleaner or other small laboratories and workshop. Most times, however, are grouped around the station, along the transport axes, on the seashore or ocean. Other industrial changes are occurring in the last decades that influence the localization of the sites and the activities. Relocation, deindustrialization, upgrading are the process that influence the industrial areas. This industrial areas can be describes by using different terms. Brownfield is one of them, it's represent any land which was used in the past in certain sectors, but now no longer in use. Friche can be another but doesn't include the polluted areas. Sociological analyze can introduce the term industrial void. Redevelopment is the main idea for these industrial areas. Demolition or adaptive reuse, are the two major strategies. Adaptive reuse refers in changing the primary function of maintaining buildings keeping some details that make them unique. Multifunctional sites can be a method of redevelopment of industrial sites.

INTRODUCTION

Social geographic structuralism studies space as a product. Space is seen as a product of society that includes and provides the structural characteristics of society, described as urban landscape and something that we can see and experience. Economic structures endlessly revise social and physical character. The concept of functional urban structure has a strong social character as defined by the use of urban structure in different urban activities. The concept integrates the physical regeneration of urban space use in urban and local economic structure. As a result of the dynamics, the center is different than it was before the development can be seen, for example, the number of jobs or in real estate prices.

Urban regeneration policy is regarded as an intervention by the local government, which aims to meet the challenges arising in the economic structure, social and urban culture. If industry leads to the formation of cities, in return industry is contributing to the growth of the city. The most known categories of industrial cities are mining towns and manufacturing cities.

Mining towns are present everywhere, needs raw materials regardless of the conditions imposed by the geography. The mine is the origin, even though later the city managed to diversify their functions. These cities have been formed due to the identification of deposits of precious metals or oil and gas. If they are exhausted cities seem doomed to die, but urban phenomenon tends to endure, workers are attracted to other industries (Selman, 2009).

A city has many functional areas, which are located almost unique, because of the different condition of development. Industrial and storage areas characterized industrial cities (Alfrey and Poutledge, 2001) they appeared in the late nineteenth century in the urban landscape.

After putting them in relation to the territory of living, there are the following situations: extension of industrial areas in residential land, industrial areas located within the housing parallel, wedge-shaped industrial areas, industrial areas located in the balance, industrial areas located in alternation and industrial areas located in the band.

The complicated problems posed by industrial clusters located in residential areas, the position of these groups or isolated industrial units often expressing development phases and conditions of a city. As is spatial, urban industrial growth cannot be synthesized by general rules, for two reasons: on one hand while generalized decline is much nuanced, on the other hand, the increase has reduced frequency and incidence of isolated space. The two trends are unable to create models of spatial development.

MATERIALS AND METHODS

After massive industrialization characteristic in the socialist period, the Romanian town experienced radical changes. Oversized and centralized industry and lack of private sector have made the Romanian industry unprepared for restructuring. During the transition period, there have been some functional changes within the industry and the urban industrial areas, such as mass privatization, massive labor layoffs and refurbishment or dissolution of companies.

The emergence of old industrial enterprises left derelict with no investment, create industrial void. The phenomenon was felt both in the case of enterprises which have limited their activity, leaving non-functional spaces and facilities, and in the case of bankruptcy.

Thus, there was a break in the relationship urbanization – industrialization. There is a trend in mending and redevelopment of the industrial activities and the city itself.

In Romania we can observe the relocations phenomenon (Chelcea, 2008), with only few exceptions spatial restructuring of the industry does not mean transfer of activities, but their disappearance. Preferences are evident but the location of new private firms along the access roads to major cities, which provide greater accessibility, reasonable prices and avoid congestion. The disappearance of these activities has occurred in many industrial areas (Popescu, 2003). These areas can be classified in several categories and may use different terms.

Territorial planning has come to increasingly use the term Brownfield in an attempt to describe a specific territorial reality. Analyzing the origin and evolution of the concept, it was first used in 1995 in the U.S. The concept became popular in Europe here and there and most of the concerns in an attempt to theorize.

In the U.S. the concept describe "the lands affected or potentially affected by contamination" (Alker, 2000), but in Europe it is considered that can include "any land which was used in the past in certain sectors, but now no longer in use". Therefore a brownfield can be used immediately without external intervention. Other similar concepts for the integrated brownfield or have been submitted, the most cited being the land contaminated or left field.

Studies undertaken have adopted the same definition considering that a brownfield site means that: it was affected by his previous use, it is now deserted, there is a real or suspected contamination is usually located in urban areas and requiring to be reused.

Thus, the urban and semi urban brownfield occur following categories: abandoned industrial sites (industrial voids). During the communist regime in Romania were built oversized industrial areas (which did not survive the economic changes) or vacant or abandoned agricultural economic unit, or the type residential, this category is quite rare in Romania and is especially characteristic of certain rural areas in the process of depopulation.

The practice of EU countries showed that the most typical example of brownfield industrial sites is that of an abandoned as draw attention to the effects of economic restructuring on urban space and economy.

Analyzing the brownfields we can identify two causes that influence their occurrence, namely: economic restructuring and deindustrialization. The two events combined have led to manifest land was previously developed but which are now abandoned and have no functionality. These direct interests in urban planning and in analyzing the brownfields purposes to find optimal solutions of functional restructuring of space. At European level, in industrialized countries, there is concern at all levels (economic, political, and administrative) for the purposes of addressing reuse brownfields.

Debates over the course of action are divided into two opposite directions: either demolish the building that constitutes industrial void and reuse the land or redevelopment. Urban concepts in this list including various terms more like those renovation, restoration, revitalization, recycling, regeneration or rehabilitation.

Redevelopment of industrial voids could lead to solving urban, socioeconomic and environmental problems. First solution to the decreased green space (Greenfield) is reusing brownfields. Redevelopment of industrial voids is important in urban centers in the crisis area. In the last decade the Romanian urban rehabilitation resulted in extending to the periphery of residential or commercial areas consuming more and more green field, while the brownfields remains unused and then the demolish direction seems to be the only option. Second solution is improving design and a functional space by removing abandoned land is a step in urban redevelopment. Third is creating employment opportunities or industrial heritage preservation and finding new uses for industrial buildings with historical value.

Brownfield sites can be analyzed on the possibility of their reintegration based on certain characteristics. The main characteristic of brownfields is that they have their own dynamic of development. Assisted redevelopment is characteristic for brownfields and requires administrative intervention from central level. Redevelopment assistance is needed for some sites that require large investments for rehabilitation.

In France, the term used to define an industrial void (in the figurative sense unkempt) is friche (Chiriţă and Puşcaşu, 2009). This term is not synonymous with the brownfield because contaminated land is integrated in another category in French literature. Etymologically, the word comes from Dutch versch/virsch meaning fresh, new and used alongside the word earth means land won from the sea. Used as an attribute, frisia temporary status means a space left deliberately fallow. Interesting to note is that to refer to unused land, located in any other medium from that area, the word friche is followed by an adjective: urban, industrial, seashore, etc.

The term friche industrielle is used in a situation involving a potential temporary idle land. It can have two connotations: one negative link to the present regime of that potential, uncultivated, unused for various reasons, and second a positive aspect arising from the default potentiality of any place currently unused. It can become the origin of a spatial reorganization in the future. Terms can also be used: fallow, vacant or tertiary landscape, the first is used to define a particularly fallow land in rural area; while the maidan is a vacant land located within or near a locality and tertiary landscape be derived from the sequence of activities or economic sector that has undergone transformation.

The future of the industrial voids or the buildings from industrial sites can be the adaptive reuse they can become multifunctional sites (Antrop, 2004).

RESULTS AND DISCUSSION

Adaptive reuse is the process of adapting old structures for purposes other than originally intended when they were closed, so architects can change the primary function of maintaining buildings some details that make them unique (Pereira, 2007). Adaptive reuse and reducing industrial voids are seen as solutions to urban sprawl and increasing environmental quality. Compared with the proposed idea of smart growth is more responsible and environmentally efficient. Adaptive reuse in cities is better than construction of modern buildings in the vicinity of green areas.

Creating a multifunctional site with money obtained through UE financing programs. Examples are numerous in Western Europe and Central not Eastern. Their success is not guaranteed (Brandt and Vejre, 2004), but the will is the main factor, then knowledge and only thirdly funding. A great example is the complex "Le Grand-Hornu".

The complex is located in Borinage region in Wallonia, Belgium at 15km west southwest of the city of Mons. Coal exploited in this area was used in the country but especially in northern France. Complex "Le Grand-Hornu" is important because it keeps building complex with all components of the mine after the original plans in the first period of industrialization. Even if the Grand-Hornu was not the greatest and most important mine the owner remains a visionary in the field of industrial development. Henri De Gorge bought mine Hornu in 1810 after which he requested the support of a socialist idealist architect, Bruno Renard, from Tournai in the planning and construction of the mining town between 1816 -1835. In late 1823 when plans were finalized last, the result was a symbiosis between an industrial site and functional city. This city is the first of its kind in Europe.

The project was for a city entirely built in the pure neoclassical style, including: industrial complex, living neighborhood workers and administration building. The central element of neoclassical complex includes two courts which are well preserved today. The city had 425 houses for workers held approximately 2500 people; they were built along paved streets with sidewalks linear and shops, a library, a hospital, a school, a dance hall, a public bathroom.

After a complex evolution the mine was closed. The site was on the demolished buildings list, but was saved by another architect. The state involvement contributed to the transformation of the industrial complex in a multifunctional site.

To create an economic and cultural development pole in Grand-Hornu is necessary to use a development strategy. This strategy focuses on four areas: culture, tourism, technology and perspective (Gallent, Andersson and Bianconi, 2004). The basic activities of the multifunctional site (Figures no. 1) are exhibitions and receive tourists. Then it was implemented Contemporary Art Museum of the French Community. MAC is an open space for contemporary art lovers and those who want to admire the heritage. Make this museum, the museum all - this is particularly the objective of the new MAC team.

In Romania mono-industrial cities suffered severe socio-economic transformations in the last two decades. Comăneşti was known mainly through the industrial activity such as coal mining. The energy sector is represented by the thermal plant Comăneşti, which was founded in 1954. The thermal plant Comăneşti was the second unit of its kind in the country (Ciocan, 2001), and worked on coal and then was converted to methane gas. After the closing of the mines subsequently the thermal plant was closed also.

Thermal plant Comăneşti is not as old or has an original character as Grand-Hornu site, but expresses the Trotus Valley industrial evolution. It is located on Route 12A close to the train station and to Palace “D. Ghica” the most important two buildings from architectural point of view in Comăneşti.

Can the thermal plant site (Figures no. 2) become a multifunctional site? With exhibition hall or a museum, a panorama terrace to observe the city, the formed dining room would become a restaurant or nightclub, workshops would be used as commercial spaces and the office buildings could be renovated rented for the same purpose. Also a park, a track bike can be built.

CONCLUSIONS

Changes in economy and in industrial activities are frequent. The industrial areas and their landscape can’t always succeed in reintegrating in the contemporary trend of urban renewing. Industrial void, brownfield, friche or many other terms can be use in describing the state in which we find some industrial sites. The terms aren’t perfect synonyms and sometime describe facts extremely linked but still complementary.

Adaptive reuse can be indeed a solution, a compromise between heritage restoration and demolition. Multifunctional sites can be developed using integrated tourism and other types of conservation. Multifunctional sites can maintain the identity of the site and sometime the whole city.

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FIGURES

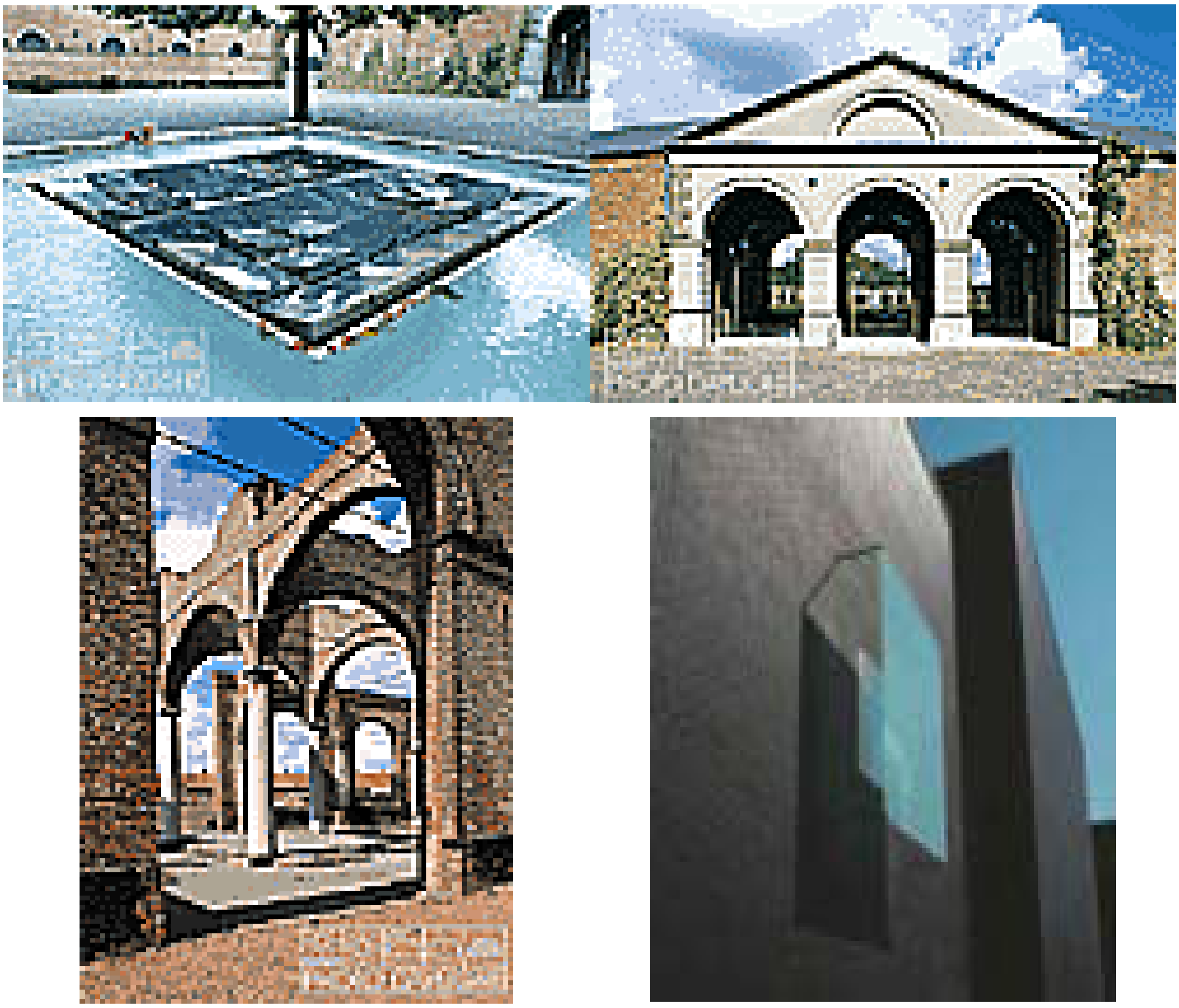

Fig. 1 Situl Grand-Hornu Sursa: www.photo-daylight.com

Fig. 2 Situl Comăneşti Thermal plant, Romania, 2011

Industrial landscape

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Keywords: industrial landscape, cultural landscape, integrated tourism

ABSTRACT

Landscape as we know changed its meaning during time and is studied by many sciences. Industrial landscape concept itself doesn’t have a history as long as the landscape itself. Cultural landscape can be widened today because of the indirect influence of mankind on the environment. Cultural landscape is analyzed as a system but also by its components. Industrial landscape is a cultural landscape. Industrial landscapes taxonomy is complex, but the majority of landscapes are the evolved type. An industrial landscape analysis models require different steps: determination of the industrial enterprises location, interpretation of the industrial changes through time and examination of spatial relations, both among themselves and with the development pattern of settlements and transport systems. The disappearance of part of industrial sites in the world has enabled the expansion and planning of new public spaces, more cities have opened new perspectives for development. Rehabilitation of old industrial sites in a spirit of ecological concepts is the main concern. Conservation and conversion features as historic cultural and artistic part of the new trend of industrial landscape regeneration. Integrated tourism is a sustainable method of development.

INTRODUCTION

The term landscape has a range of ways but if we want to discover the meaning of landscape for people, it is better not to think of as a collection of materials placed in geographical space, but as social and cultural constructions that people use. In this sense, the sociology definition of landscapes is "symbolic environments created by people to give meaning and shape of the living space" (Greider and Garkovich 1994). Cultural groups construct social landscape after its own reflection. In this process, social media, culture and nature are interconnected and become part of common symbols and beliefs of group members. The natural environments and acquires new meanings inside changes, depending on the social and cultural symbols (Crang, 1998) associated with them.

Cultural space, of geographically defined, is an area that has social or cultural value.

Etymological, landscape is originally a German compound word, the word field with a verb that means, literally, land forms. Lands were considered to have been shaped by natural forces, and became themselves the subject of landscape paintings.

The term cultural landscape was used in the twentieth century by Otto Schlüter, who agreed that by defining geography as a science of landscapes, it would give geography, logic, a subject unrequited by any other discipline. He give definitions of two types of landscape: Urlandschaft (original landscape) or landscape that existed before the human and Kulturlandschaft ("cultural landscape"), a landscape created by human culture. Geography major task was to observe changes in these two types of landscapes.

The idea of cultural landscape was later promoted and developed by Carl O. Sauer. By definition, the physical environment keeps a central meaning, as environment and human culture acting. The definition of cultural landscape is: "cultural landscape comes from a natural landscape by the action of a cultural group… the interdependence between culture and natural environment"(Sauer, 1925).

In the same direction the World Heritage Committee has decided to reformulate its operational guidelines (Haber, 1995) and thus the cultural landscape was included in the list of mixed heritage or natural or pure product of cultural activities. "Although the concept of landscape has been for some time separated from the original meaning derived from the art, there is still a dominant idea of landscape as an area shown, similar to a map or a text on the cultural and social forms which can be simply read" (Fowler, 2003).

Cultural landscapes have been defined as distinct geographic areas or have unique properties that are combined work between nature and man (Birks, 1988). World Heritage Committee has identified and adopted three categories of cultural landscape, ranging from those landscapes, most people deliberately formed through a full range of mixed views toward the least processed.

The first category, easily identifiable, is clearly defined landscape designed and created intentionally by man, including parks and landscaped gardens for aesthetic reasons, which are often (but not always) associated with religious buildings and ensembles.

The second category is the organically evolved landscape or mixed. It results from a requirement of social, economic, administrative and/or religion has reached its present form by association with and in response to its natural environment. Such landscapes reflect the process of evolution through their composition and form. They fall into two subcategories. A fossil landscape is a landscape that has undergone an evolutionary process that has stopped for a certain period of time in the past. His distinctive features are physically visible. The second subcategory is a continuous landscape; it is a landscape that keeps an active social role in contemporary society, in conjunction with traditional lifestyle in the process of evolving. At the same time, shows clear evidence of its evolution over time.

Associative cultural landscape is the final category and inclusion of such landscapes on the World Heritage List is justified by the strength of association of religious phenomena, artistic or cultural to natural elements, even if evidence of cultural material may be insignificant or even absent in that space. Heritage of urban or industrial is the next stage of enlargement of the proposed list of World Heritage Committee.

Industrial landscapes were the product of the Industrial Revolution and occurred in Britain in the late eighth century (even earlier, the mining and textile activities showed some forms of proto-industrial landscapes). These landscapes were created by innovations in technology and changes in work organization, resulting innumerous varieties (Alfrey and Poutledge, 2001). Water mills to power cotton spinning units have integrated well into the natural environment. Major steel mills had a violent impact on traditional landscapes, also mines and nonferrous metal foundries, which all have generated more pollution. After 1800, industrial landscapes and space were expanded in depth and semi-rural landscapes have become mostly urban. Industrial city was created by the growing use of the steam engine and was dominated by the chimneys of factories. Despite some differences, initial industrial landscapes were a common feature: smoke, pollution, which has changed some parts of the regions. She also gave a negative image of the industry.

MATERIALS AND METHODS

Industrial constructions are less spectacular in general, but the architectural creation receives important impulse during urban renewing. Huge transformation of industrial technologies is an objective necessity in the way of compliance of such buildings. Great industrialists, eager to benefit from modern facilities required by new processes, progress and developments in science, accepts proposals for recovery, by framing the new requirements related to efficient use of production space, the possibilities offered by reinforced concrete structure and not least a new aesthetic parts selection system.

Contextual nature of the industrial landscape is important for their analysis (Claval, 1995). Process analysis of industrial landscape must follow the following steps:

- Determine why the location of industrial enterprises;
- Interpretation of their changes through time;
- Examination of spatial relations, both among themselves and with the development pattern of settlements and transport systems.

The existence of industrial activity in particular areas are due to the interaction of three factors: the presence of natural resources: raw materials or energy, topographic features that affect energy supply and transport capacity and facilities or employees that use natural resources and topography for industrial production.

Industrial landscapes are, in most cases because they are the result of changes in landscapes evolved in the past. Analysis of an industrial landscape, therefore, required to establish the sequence of events that have occurred since the initial establishment of an industry in one place. Spatial relationship analysis models require an industrial landscape settlements and transport networks are essential elements of the industry.

The industrial landscape is imbued with meaning, both by participation and by revealing social dynamics. This approach would make it possible landscape to compare various reasons and the power relations involved.

RESULTS AND DISCUSSION

Landscapes in a broader historical sense are physical manifestations of change in the natural environment by human activity in space and time. Industrial landscape is a type of historic landscape and fall in the continue category with a profile of economic, social and infrastructure.

There are three sets of factors that influence the meanings attributed to industrial landscapes. They are related to:

• Dynamic regional development and industrial history of the place in the community.
• The relationship between industry and residents and local governance capacity.
• Social impact experienced.

Social constructivism approach, coupled with a radical perspective on Sustainable Development, was elected to address the issues raised and is the analytical framework for landscape analysis. Thus we can define the landscape as "relatively experimental, reflective and symbolic maintained by social actors on a given environment." This relationship "is based not only on specific aspects of the physical environment but also on the experiences of everyday life and sharing cultural representations that are embedded in a particular set of social relations" (Cosgrove and Daniels, 1989). In this approach, industrial landscape becomes an object of social and political negotiation, and a basic problem of social relations and dynamics of regional development. This radical perspective, linking landscape development, implies that the notion of sustainable development goes beyond the environment itself and even economic efficiency to include social equity and the environment.

As cultural and industrial landscapes, are characterized by physical evidence and technical and industrial structures, which is very important, by linking these structures with their physical and cultural environment, so we can distinguish four major types (Palmer and Neaverson, 1998) of industrial landscapes:

(1) Linear landscapes or sites using hydroelectric plants along the river or means of transport such as railways or highways.

(2) Geological landscapes caused by using raw materials base of a region, such as pre-industrial mining and industrial regions.

(3) Production landscapes using production technologies and relevant factors such as tradition, skills and knowledge of production and employment in the region. Examples of industrial landscapes are the one from the textile industry more recent semiconductor industry.

(4) Urban industrial landscape, as many cities have developed special areas of industrial of all kinds. Some cities are dominated by specialized structures of the industry. An industrialized city functions as a production center, the market as a center of transport network or industrial class residence with all necessary infrastructure have created a

landscape, characterized by strong growth in technological change and social pressure and economic.

Another typology of industrial landscapes can be achieved by evolution and stages of industrialization:

- Original landscapes or cities in the formed mining areas, oil so-called "black area" (Shackel and Palus 2006) of states that developed in the first stage of industrialization;
- Heavy industry landscape has been developed in the second stage of the industrial revolution with new sources of energy: industrial areas, old port spaces, which have managed to maintain production and technopoles based on high-tech industry.
- Post industrial landscape (Ghershuny, 1978) and new industrial spaces: the evolution of industrial landscapes, developments in industrial areas old deindustrialization: abandoned sites, the disappearance of large complex of abandoned industrial land, cultural heritage (which also includes the industrial) or technology parks, recent changes: specialization or dissociation (the emergence of many new sites).

The last two can be complementary or mutually exclusive, depending on the evolution of industrial sector and socio-economic characteristics of the site or the state they are located, and they have the same rank.

Service economy can refer to the increased importance of the service sector in industrialized economies or to the relative importance of service in a product offering. The service economy is mostly concentrated in financial services, health, and education. Products today have a higher service component (Vandermerwe and Rada, 1988) than in previous decades. Virtually every product today has a service component to it.

In green economics can be observed these benefits: easier integration with accounting for nature's services, easier integration with state services under globalization, association of goods movements in commodity markets with negative commodity (pollution, biodiversity risk and loss), easier integration with urban ecology and industrial ecology, the user's experience with the brand (implying a service they expect) is far more important than its technical characteristics.

Sustainable development is the main strategy (Stockdale and Barker, 2009) in green economics. Integrated tourism is seen as a method of sustainable development (Harribey, 1998). Tourism is part of an integrated regional economy with the possibility to activate unused resources by linking economic branches with new tourist industry. Delivering an integrated tourism area must meet several conditions: the presence of good channels of communication infrastructure, integration into the landscape of tourist routes and their location away from noise areas; accessibility modern communication systems and information, services offered by the hotels must focus on customer options, the natural or cultural environment must be kept accessible and originality, the enhancement of regional folk customs, folk art and culture, providing a professional marketing.

In terms of tourism activity, its main focus should be towards meeting the requirements of tourist traffic in terms of profitability. Profitability is the criterion to be considered in the planning process of a tourist area that affects other industries and economic activities in these cities, with implications on both the active population in tourism and the training of specialists.

In rural or urban areas with industrial activities, the concept of heritage is ever present. This extension is not only thematic, is also space, and thus moves from the protection of a unique monument to protect an entire landscape, or even an entire city. Therefore, new laws and policies are necessary to claim, protect and highlight our cultural heritage. "The concept of cultural heritage clearly meant different things to different groups of researchers and interested public in the recovery of traditions and landscapes, as part of the common past"(Palang and Fry, 2003).

However, planning and conservation structures have exerted a strong influence especially on the subject of heritage, encouraging in particular by defining resources in connection with the landscape (Kirkwood, 2001) and define values according to certain criteria. Abandoned industrial landscape conservation is increasingly recognized as a valuable tool for urban redevelopment (Aplleton, 1996). Unlike explanations that tend to become dominant, the recovery of industrial landscapes is an instrument of social strategy to recover and redeem a post-industrial site in order to transform it into a multifunctional landscape so it will be integrated into contemporary space.

CONCLUSIONS

Lately there is the general idea that natural landscape do not exist anymore because of the indirect influence of mankind. The taxonomy of cultural landscape is very complex, but industrial landscape is very imposing in the eyes of the viewer. The existence of different types of the industrial landscape makes it difficult to constantly integrate in the social perception. Industrial activities changes and the typical landscape can be seen as old, undeveloped, disharmonic. Industrial landscape can be analyzed and integrated using proper strategies and methods. Integrated tourism is a method that link economic branches with tourist industry. Integrated tourism can absorb the industrial heritage and can change the identity of industrial landscape. This change in identity can conduct to development of branding and redevelopment of the industrial regions.

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Future of the agriculture on degraded lands by water erosion in Romania

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Keywords: farms on eroded lands, sociological investigations, rural areas.

ABSTRACT

The future of the Horticulture on degraded lands by water erosion depends on certain factors, grouped as follows: farmers, engineers involved in soil and water resources management, specialists in environmental protection, economists deciding upon financial issues, political factors. Population can benefit from the effects of interventions for mitigation of major negative implications generated by water erosion. Farmers should accept the rehabilitation projects as well as adopt and maintain the works. It is obviously that the eroded lands management must rely on knowledge about the land-owner's priorities and psychology.

The paper presents how the sociological investigations could facilitate the understanding of farmers' requirements and customs. The main tasks are as follows: the identification of farmers' perception and behavior on the anti-erosion works as well as their view-points of the perspective of their future life level and progress.

INTRODUCTION

Romania has an agricultural area of about 14 million hectares. The ratio between the agricultural area and the number of inhabitants is 0.68 ha per capita, which apparently shows an extremely favorable situation. Nevertheless, in many areas the soil productivity is affected by some disasters such as drought, water erosion, floods, landslides etc. Consequently, the yields and their stability depend, mostly, on the interventions for disaster prevention. Water erosion process is active on 42.6% of the agricultural area, which represents a high value. Therefore, the anti-erosion works are of public interest, their contribution to the safety of nourishment being more than obviously.

In 1989, Romania changed its economic system and became the country with the highest number of farms in Europe. Since 1991, more than 96% of agricultural farm land owned by state farms has been given back to private owners. In 2007, there were 3,913,651 holdings with an average farm size of 2.29 ha.

The excessive fragmentation due to ownership in agriculture and the reduced degree of association have lead to a dualism, represented on one hand by the great number of subsistence and semi-subsistence farms and on the other hand by the reduced number of commercial holdings fully present on the market. Out of the agricultural used land, the subsistence farms have 45.24 %, semi-subsistence farms 16.09 % and commercial holdings, 38.67 %. Subsistence holdings are defined as smaller than 2 Economic Size Units.

Rural areas have substantial growth potential but, most importantly, they play a vital social role in Romania. Soil is mainly a private natural resource, but of common interest.

MATERIALS AND METHODS

In the frame of an interdisciplinary co-operation, the authors of the paper carried out their research activity on social and economic aspects in 5 watersheds. In order to settle the investigative tools, the activity was based on direct observations in each location, on analysis of primarily documents found in the town halls, as well as on interviews with decision-making factors. For the sociological investigations there was used a methodology based on questionnaires. The questionnaires are tools for sociologists, which provide information about the farmer's requirements and customs. The sample was approx. 10% of the total amount of farms from 7 locations.

Questionnaires provide 36 questions based on categories of institutional, ecologic, economical and social indices. Twenty-one of the questions have suggested answers; fifteen have open answers. At the social category we were interested in the descriptors showing the social status i.e.: family structure, population density, infrastructural works in the area. Knowing the pressure caused by the working force emigrational trends, intensification of informational rate – we tested the feed-back social indices, such as: demographic behavior, emotional bond to the rural areas and its values, the educational size and instruction motivation, the trends and the requirements for the rural areas.

Considering the economical point of view, the questions aimed to the farm size, the income resources of the farmers, the products marketing, the profit, and the trade's forms in the area. Feed-back economic indices were obtained from questions about acknowledgement of ways of income and production increasing. Answers were processed, analyzed and aggregated, Nedelcu (1998 and 2006)

RESULTS AND DISCUSSION

The family structure is mainly compound by husband, wife and about 2 – 4 children. Age: 53.3 per cent are over 50 years old and 80 per cent still live together with children. Despite youth is more receptive to progress, it remains in the old pattern because the young members must take into account customs and traditions and, at the same time, the offer for alternating activities is reduced for the rural youth. Under those given circumstances, the farms are still characterized by income from selling products and self consume. Farming continues to be the most important activity in rural areas, and an essential source of income for rural households.

Most of farms are mix – that is farmers deal with fruit cultivation as well as with animal breeding. The interview revealed that 85.7 per cent of farmers acquired the know-how in fruit growing in their own families or from their neighbors and only 14.3 per cent had specialists' assistance. The animal breeders declared (96 per cent) that the know-how was acquired in their own families/neighbors and only 4 per cent asked for specialized assistance. People declare that the benefit is good, but lower than the possibilities.

Anti-erosion works can be found only on 4th – 5th place on the scale of importance of solutions for the income increasing, as declared by farmers who own lands vulnerable to water erosion The situation is better in areas in which there are gully erosion/landslides and in areas of tourist interest. In such cases the population is more aware of danger; they solicit help but consider that government should bear all expenses. Their willingness to contributing financially is very low, although the land price in such areas increased 15 – 18 times in comparison with the situation 7-8 years ago. The persistence of being used to be helped by the government is obvious.

The future of the Romanian eroded lands is building on an existing foundation. It is closely connected to the rural development plan and to the human capital education and training. The diversification of rural economic activities also depends on education, knowledge and skills. The evolution and specialization in agriculture require an adequate level of technical, economical and juridical training, including expertise in new informational technologies, to correspond to the Community requests in phyto-sanitary, animal welfare and quality standards fields.

Subsistence holdings lack capital and knowledge, which results in very low returns on their activity. Accordingly, subsistence farmers have practically no incentives or capacity to observe European standards, including those on environmental quality, animal hygiene and food safety.

The semi-subsistence farm segment suggests the need for targeted interventions. Due to the fact that in Romania there is an important number of small sized farms (of subsistence and semi subsistence) for which no real restructuring possibilities exists, the number of farms taken into account for assistance in order to transform them into commercial holdings shall include only the semi subsistence farms between 2 and 8 ESU (approximately 350 thousands of holdings).

The acceptance of the new elements, the process of innovative diffusion in rural areas depends on individual social and psychological features, on motivation and also on a favorable climate (see Figure 1).

The management of degraded lands by water erosion requires the knowledge of these correlations and actions by means of persuasion and coercion.

Major development opportunities can arise from restructuring the agriculture and from revitalizing the rural economy. The restructuring of the activities at farms' level and the capital intensification for commercial farms will definitively lead to using fewer work forces for improving the competitiveness.

On a national level – there is a Rural Development Plan, in accordance with the EU regulations, that has four axes, and funds may be accessed through projects.

Axis 1 has in view to improve the competitiveness of agricultural and forestry sector;

Axis 2 aims to improve the environment and the countryside.

The main objective of the Axis 3 is to enhance the quality of life in rural areas and the diversification of the rural economy

The support granted through Axis 4 has as purpose the improvement of the local governance and promotion of the endogenous potential of the rural area.

CONCLUSIONS

The anti-erosion works hardly occupy the 4th or 5th place in a hierarchy of priorities assumed by farmers who own lands vulnerable to erosion**.** Our conclusion is that an intense lobby activity is necessary for the development of the awareness on erosion damages. Additionally, the theory must be replaced by practice in order to facilitate communication between groups involved in the field of soil erosion.

We have implemented several ways of developing the awareness on erosion damages. Additionally, we have replaced the theory by practice in order to facilitate communication between the groups involved in the field of soil erosion.

On a national level, the legislative, institutional, educational and financial framework has been creating. Supported by the EU, authorities started off the reform of farming exploitation and promoting systems of the best agricultural practices.

European Agricultural Fund for Rural Development will support up to 80% from investments.

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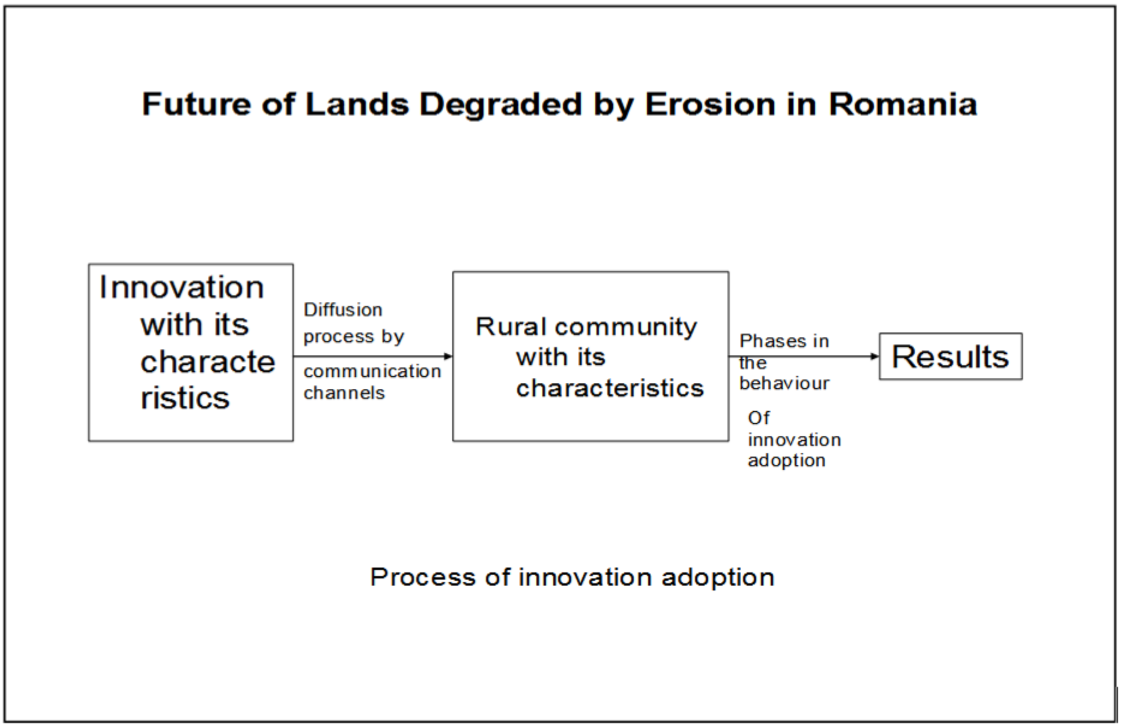
Future of Lands Degraded by Erosion in Romania
Innovation with its characte ristics
Diffusion process by communication channels
Rural community with its characteristics
Phases in the behaviour Of innovation adoption
Results
Process of innovation adoption

Considerations on the evolution and current situation of agricultural cooperatives in relation to those whose activity domain is horticulture

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Keywords: association, agricultural cooperatives, horticulture profile.

ABSTRACT

Romania's economy is based largely on the agricultural production due to the large areas of arable land that our country holds. Regarding that, these areas are still divided into many parcels; there is a problem in the efficient use of arable land. Romanian farmers also have limited production capacity, resulting in an imbalance of supply that although has large amounts, it is not uniform. Solution for these weak points and also for strengthen sustainable rural development can be achieved through the process of association between producers. One of the most widespread forms of association is agricultural cooperative. This concept emerged in Romania in the nineteenth century and evolved up to the beginning of the Second World War, has succeed to capacitate large agricultural resources in our country. After the war, followed the communist period, at which agricultural cooperatives were reduced to instruments of permanent state intervention in agriculture. In 2004 appeared the first agricultural cooperative based on democratic principles that can support an integrated development and marketing management concepts in relation with EU requirements. Agricultural cooperatives in the horticultural domain has emphasized both numerically (they represent one third of the total number of agricultural cooperatives in Romania) and in terms of structures and development programs that they have adopted.

INTRODUCTION

In recent years, worldwide, radical changes appear regarding agri-business concept, global competition on the market, which determines a new strategy on farmers' association methods. Faced with such an environment with new rules, farmers are confronted with fundamental strategic decisions, namely how to do better in these conditions of uncertainty, to make farms viable, cost-effective, and resistant to compete with commerce markets.

Regarding Romania, placed currently in the situation to implement Community Agricultural Policy, and with available heterogeneous structures and farm sizes, efforts must be directed primarily to rehabilitate the notion of cooperation, compromise in the totalitarian period. In our country, the general perception about the cooperative is still based mainly on the negative experience of the former agricultural production cooperatives (CAP), which existed from 1947 until 1989 (Oancea and Terunuma, 2008).

Starting with the year 1990, the former agricultural production cooperatives (CAP's) have been removed, and agricultural land, which was administered by CAP, was returned to former owners and their successors. Have been established approximately 4 million small farms, each having an average of about 2-3 ha of arable land. For 20 years, agriculture trade imbalance grew. Meanwhile, the older population component has grew and rural communities has difficulties to find young people interested in farming, and family farms face a lack of stable markets because they have to purchase quality raw materials, and this is done often to the detriment of farmers, because they feel the difficulty of investments in agricultural activities due to their limited capital (Terunuma, 2006).

As the EU enlargement started, the countries in Central and Eastern Europe have understood the necessity of a democratic agricultural cooperative which support and develop rural areas, and a legal system for the establishment of a new type agricultural cooperative has been created.

These are based on cooperative principles imposed by the International Cooperative Alliance (ICA) in which democratic agricultural cooperatives are registered and are able to provide the necessary raw materials to households, to share equipment and agricultural machinery, to ensure marketing activities, to reduce production costs and increase market price.

The present work investigated the evolution and current situation of agricultural cooperatives from our country in relation to those whose activity domain is horticulture

RESULTS AND DISCUSSION

Short history of Romanian agricultural cooperatives

In terms of legal, 1893 is considered to be the starting point of cooperation system in Romania.

Towards the end of the 19th century the land conservatism, has determined the necessity to develop the economic potential of farmers by encouraging and legalizing forms of association that were intended for sale or rental of arable land. As a consequence in 1903 Popular Banking Law was adopted and applied in the Central House of the Popular Banks and on 1 February 1904 a law was passed and this law stated that the rental or sale of rural property can be made only through the rural real estate communities.

The Law, regarding the establishment and control of cooperatives for rural production and consumption, was enacted in 1905 and this law has made official for first time the name "cooperative" and also required the existence of a statute for real estate rural communities to give them a legal personality.

In 1910 cooperatives were following structure of activity presented in Table 1 and figure 1.

Cooperatives Law enacted in January 1919 legalize The Central Cooperative House and Citizens Appropriation, Rural House of Production and Consumption Cooperatives, Rural Communities for Agricultural Exploitation.

According to the law adopted on 28 March 1928 regarding the Organization of Cooperatives, which was revised in 1930, 1933 and 1938, was established National Office of Romanian Cooperatives, whose Steering Committee was called the General Council of the Cooperation. (Popescu G. and Florentina Constantin, 2007)

It can be considered that Romania has a tradition in development of agricultural cooperatives within a specific social environment. So, positive results were obtained before the Second World War in terms of mutual aid, loans and technical implementation, supply and trade of agricultural products in various forms of cooperation in agriculture.

At the initiative of the National Bank of Romania, in late 1937 and early 1938, was carried out an analysis of the activity of the cooperative movement, to review the law of cooperatives. Later, in 1938-1941 interval, were new changes to the Cooperation Law to define the notion of "Cooperative Societies" and to classify types of such companies.

During the Second World War, regardless of their political affinities, agricultural economists and politicians were forced to admit that the only solution to save Romanian villages and protecting the economic interests of Romania was represented by cooperatives. Yet, towards the end of the interbellum period, there was a small general decline of the cooperatives movement.

After 1950, the cooperative idea has been compromised by replacing his democratic profound meaning and content with new, communistic Russian - type.

Since 1952, Romania were Russian type associations (întovărăşiri) that have experienced a real development until 1959, when they started to turn into Agricultural Production Cooperatives (CAP).

Together with the elements of political coercion, an important role in the forced enlistment of peasants into cooperatives had quotas imposed by the system, introduced in 1948 and withdrawn in 1957. To speed up the cooperativization process of agriculture and to implement in the Romanian villages new types of Socialist relations of production, was launched a new campaign of political dissemination , under pressure from the Communist Party, the peasants were forced to ask themselves enrollment in Agricultural Production Cooperatives.

Table 2 and Figure 2, shows the evolution of agricultural cooperatives in the period 1949-1962. It can be observed that in a period of 13 years, number of agricultural cooperatives has grown on approximately 120 times more, and the afferent surface for these cooperatives of 680 times more.

Although the cooperativization process continued, the Romanian Communist party leaders have declared the official end of this process in 1962.

The diversity of forms or types of cooperatives in our agriculture system from 1945 to 1989, as conditions of their development, have made it difficult even impossible the evolution of the economic benefits that could result from the activity of agricultural cooperatives.

In the communist cooperatives, peasants, although theoretically they were landowners, they had no rights over land, situation which led to a total rejection of the idea of cooperative after 1990.

Looking back we see that the disappearance of cooperatives in Romania was a big mistake, because not everyone can afford in our country to work efficient the land.

Evolution and characteristics of democratic agricultural cooperatives founded after 2004 in Romania

The current form of agricultural cooperatives in our country represents a new concept, which differs radically from the "socialist-type cooperative" and that it is based on modern principles of association, used throughout the world. An agricultural cooperative is based on the free will of each farmer, the joint needs to have a business and the jointly use of facilities. Founders must be highly motivated when they start an agricultural cooperative, being required a positive participation of all involved parties.

The Agricultural Cooperative Law was adopted in the Romanian Parliament on December 2004 and the law was enacted on January 2005 in Romania and has established the legal framework for the organization, operation and management of agricultural cooperatives and cooperative unions. After the law was enacted it was imperative for farm households of Romania to understand correctly the intention of this law without any biases originated from the bad experience of the past, to think ardently what is needed to be done for their farm management and put them into action (ANCA Report, 2006)

The definition and the principles of agricultural cooperative according with the law published in Official Monitor in 2004 is as follows:

The Agricultural Co-operative Society represents an autonomous association of private individuals and/or legal entities, and as the case may be Romanian legal entity by individual right constituted based on their free willingness with the purpose of promoting the interests of cooperative members, according to the cooperative principles which are to be organized and function in concordance with the stipulations of the this law (Article 2).

The Agricultural Co-operative Society is an autonomous association, with an unlimited number of members, with a variable capital, that carries out economic, technical and social activities, to supply goods, providing services and jobs exclusively or mainly for its members (Article 3).

The Agricultural Co-operative Societies are based on the following co-operative principles (Article 8):

- *Voluntary and Open Membership;*
- *Democratic Member Control;*
- *Member Economic Participation;*
- *Autonomy and Independence;*

- *Education, Training and Information;*
- *Co-operation among Co-operatives;*
- *Concern for Community.*

According with official International Cooperative Alliance (www.ica.coop/al-ica/), these cooperative principles were revised in 1996 and adopted by International Cooperative Alliance (ICA, established in 1895, Headquarter, Geneva) and at present it is adopted by ICA member organizations in 98 countries and about 800 million cooperative members. The characteristics of agricultural cooperative are explained by the principle which emphasizes democratic control by members which is different from the characteristics of Production Agricultural Cooperative of Romania until 1989.

Hiroshi Terunuma (2006) mention in his work – "Agricultural cooperative management", that the condition of a successful agricultural cooperative is not appearance of good office building or ownership of equipment at starting point but it should be a society with strong solidarity of members who share the same objective as movement.

Agricultural cooperative must fulfill the following tasks:

a) to sale farm products of farm households with advantageous prices;
b) to supply production materials with lower price;
c) to provide joint use facilities (such as farm machinery, warehouse, grading center and processing plant) to help reduction of production cost or to give added value to the products;
d) to supply farm management funds to farm households with satisfactory capital;
e) to provide adequate guidance to improve quality of products;
f) to promote efficient use of farmland in the region;
g) to secure stable price of products;
h) to secure democratic management centering members.

We can appreciate that, the fundamental goal of agricultural cooperative movement is not in increasing profit of agricultural cooperative but it is in protecting and improving farm management and life of its members. Agricultural cooperative has its own objective of organization different from private companies. Members of agricultural cooperative are participating in agricultural cooperative by holding three positions, namely a position as share holders (duty as members), a position as managers (participation in general meeting, as directors and auditors) and a position to utilize business of agricultural cooperative (users).

The development of any cooperative movement is depending on the basis of strong cooperative spirit of members and for that, it is necessary to promote educational activities for members, officials and employees of agricultural cooperative through any possible measures and methodologies. Under this approach, the necessity for educational activities must be underlined within the cooperative movement.

Bearing in mind that the level of agricultural cooperative movement will be limited by the level of the organizers such as members, officials and employees must be kept in mind that one of the main principles adopted by the International Cooperative Alliance (ICA) is the one referring to "Education, training and information." Above all, the principle stresses the importance of education and was implemented at the beginning of cooperation until today.

Effective management is directly proportional to the profit or losses of members. Therefore, it must implement a continuous professional training for managers in order to improve their managerial capabilities.

The current situation of horticulture profile cooperatives in Romania

Democratic agricultural cooperatives concept was launched in Romania after the project developed between Romania and the Government of Japan, in the period 2001-2004. At that time our country has requested support to create association network in agriculture. Japan has provided this support through the Japan International Cooperation Agency (JICA) who has worked internally with the National Agency for Agricultural Consulting (ANCA). The project resulted in the occurrence of the agricultural cooperatives Law - 566/2004.

The second phase of Romanian-Japanese collaboration was conducted over a period of about two and half years with the purpose to improve farm management through the development of agricultural cooperatives. (ANCA Report, 2007)

These projects have favored the emergence over time of a growing number of agricultural cooperatives increased from 50 such structures in 2006 to about 400 agricultural cooperatives today.

Areas of activity of these forms of association are varied, having the percentage structure according to data presented in Table 3, Figure 3.

As is apparent, the majority of agricultural cooperatives of Romania constituted according to law 566/2004, have as their main area of activity, horticulture (41%). Also must be specified that within this area, there are 2 activities clearly defined, vegetable-fruit and viticulture-wine-making.

Accelerated establishment of agricultural cooperatives, gave rise to the upper structures of these forms of association, which ware organized into Branch Unions. Unions not only strengthens the capacity of cooperatives representation in relation with similar bodies or authorities but also causes a type of marketing based on the maintenance of the unit price quotes for products obtained by agricultural cooperatives.

Chronologically speaking Branch Unions of the Agricultural Cooperatives have been established for the following areas:

- beekeeping; - vine production; - vegetable and fruits; - livestock

Union is a complex body of legal representation engaged in relationship with partners, which can be economic, state structures (ministries, agencies) and external partners. Other activities of the Union refer to facilitating access to public and private resources, information transfer and sustainable development of agricultural production.

Such forms of associations in agriculture work with success in EU member countries and for Romania can be role models, even more because after 1990 also in Romania such forms of organization have emerged and these are ready to strengthen and performance.

Chronologically speaking, the viticulture agricultural cooperatives quickly realized the need to establish Branch Union. In 2008 this structure was established in Vrancea County. Branch Union had the precursor body Clubul Podgorenilor, part of the leadership of this association being found in management decision-making at the Union. New created structure had an extremely important role in the development of wine specialized agricultural cooperatives, making it easier not only to establish cooperation relations with the authorities but also carrying out a comprehensive plan of management and marketing (Terunuma et al, 2008). Were established sale shops for wine products obtained in the cooperatives and the collaboration with European partners.

Although the Branch Union of agricultural cooperatives in the wine was the second, the largest share is for fruit and vegetable producing cooperatives. The number of these cooperatives is a third of the total number of agricultural cooperatives in Romania.

On the date 27.02.2009 was established National Branch Union of the Fruits and Vegetable Producing Agricultural Cooperatives. This has succeeded to develop relations of partnership with beneficiaries also in Poland and Russia, with commercial banks for loan contracts with favorable interest rates.

The agricultural cooperatives members or not of the Union started taking action as the construction or financing of projects for modern storage spaces, the main priority of the producers. It should be noted that the terminology for "fruit and vegetable market" as marketing concept is necessary to develop a network of warehouses for fruits and vegetables similar with grain silos networks.

CONCLUSION

The competition on the global market of the agricultural products is high. Small farmers have to find solution to face this competition and to concentrate agricultural resources. The alternative is the association process and in Romania the best associative form is represented by agricultural cooperatives established, based on the Law 566/2004.

Agricultural cooperatives have a long history and their starting point in Romania was in the XVIII Century. In the communist period agricultural cooperatives became an instrument for the state intervention in agriculture.

Democratic cooperatives founded after 2004 offer to the producers various opportunities for representation and marketing strategies. Also, relations with European financial institutions and use of the structural funds are facilitated by the cooperation between farmers.

In horticulture area represented by the viticulture and vegetables domains Branch Unions has been created. These are superior forms of organization for agricultural cooperatives.

The major objective in the development of democratic agricultural cooperatives is to create in Romania Central Union of Agricultural Cooperatives which unite all other Branch Unions After establishment through the affiliation to the International Cooperative Alliance (ICA), it will create a joint body to represent Romania.

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TABLES AND FIGURES

Table 1

Activity domains structure of Romanian cooperatives in 1910

Cooperatives type	Cooperatives number	Members number	Subscribed share capital
Credit Cooperatives	2.656	454.187	61.016.395
Real estate communities	378	62.009	2.486.433
Cooperatives shops	204	9.902	1.156.815
Supply cooperatives	72	2.414	199.655
Forest exploitation cooperatives	86	4.328	601.221
Other types of cooperatives (animal husbandry, bakeries, mechanization,)	93	-	-
Total	3.498	537.432	66.191.121

Table 2

Evolution of agricultural cooperatives of production between the years 1949-1962

Year	1949	1950	1955	1960	1961	1962
Agricultural Production Cooperatives No.	56	1027	6623	13685	13101	6715
Agricultural surface (thousand hectares)	14	288,9	1301,2	7645,6	8031,6	9517,8

Table 3

Activity areas of agricultural cooperatives established under Law 566/2004

No.	Activity domain	Percentage structure
1	Horticulture (vegetable, fruits, vine production)	41%
2	Agricultural activities (services, marketing)	20%
3	Beekeeping	14%
4	Livestock	10%
5	Cereals cultivation	10%
6	Fishing	5%

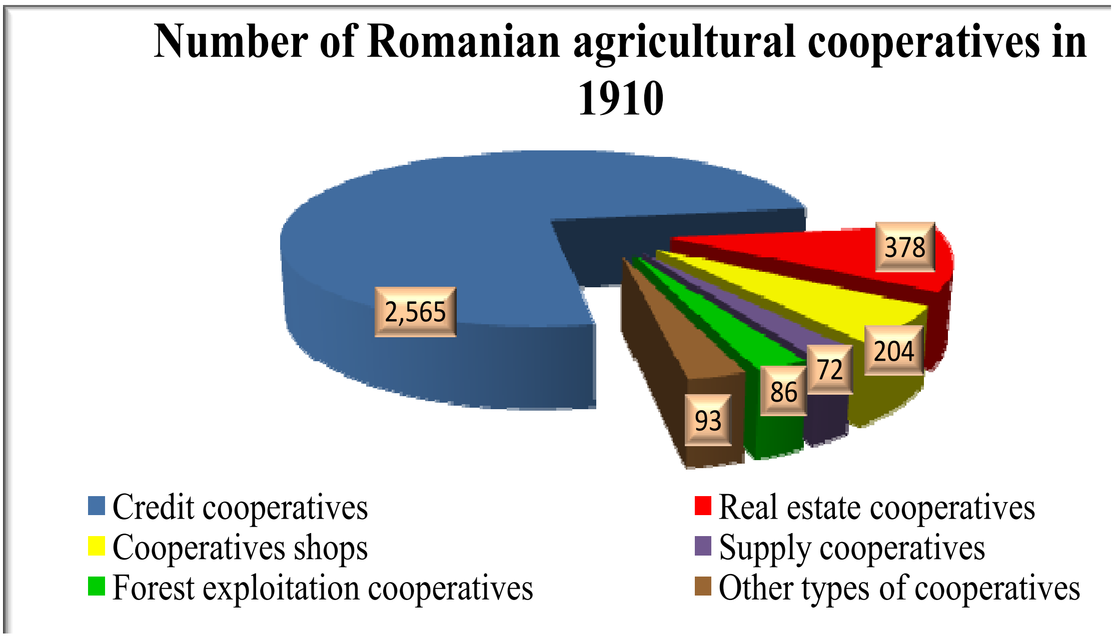

Fig. 1. Numeric situation of the agricultural cooperatives with various activity domains

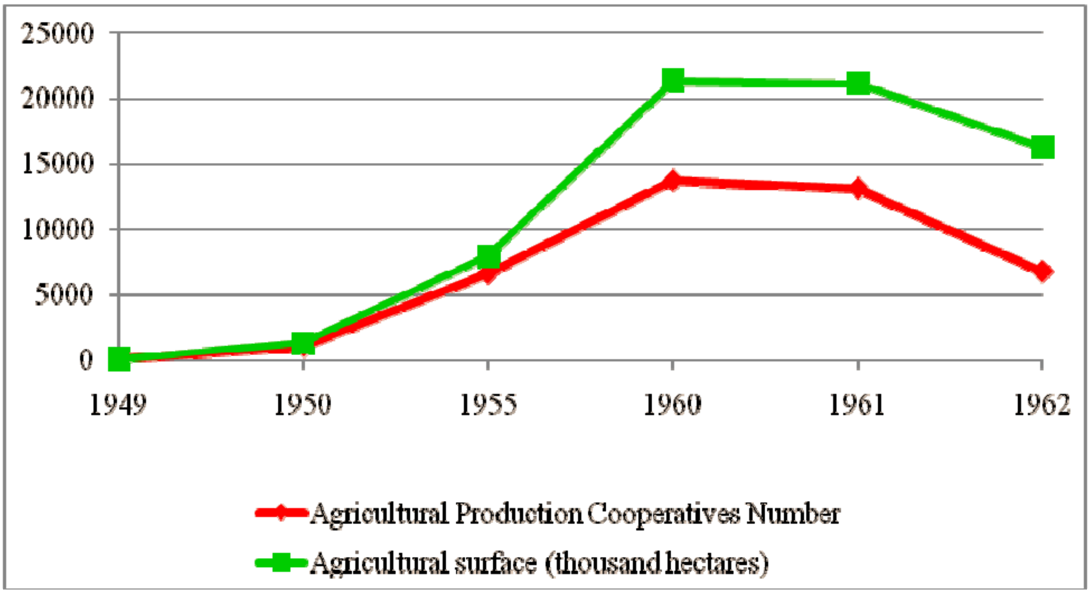

Fig. 2. Dynamic of agricultural cooperative establishment

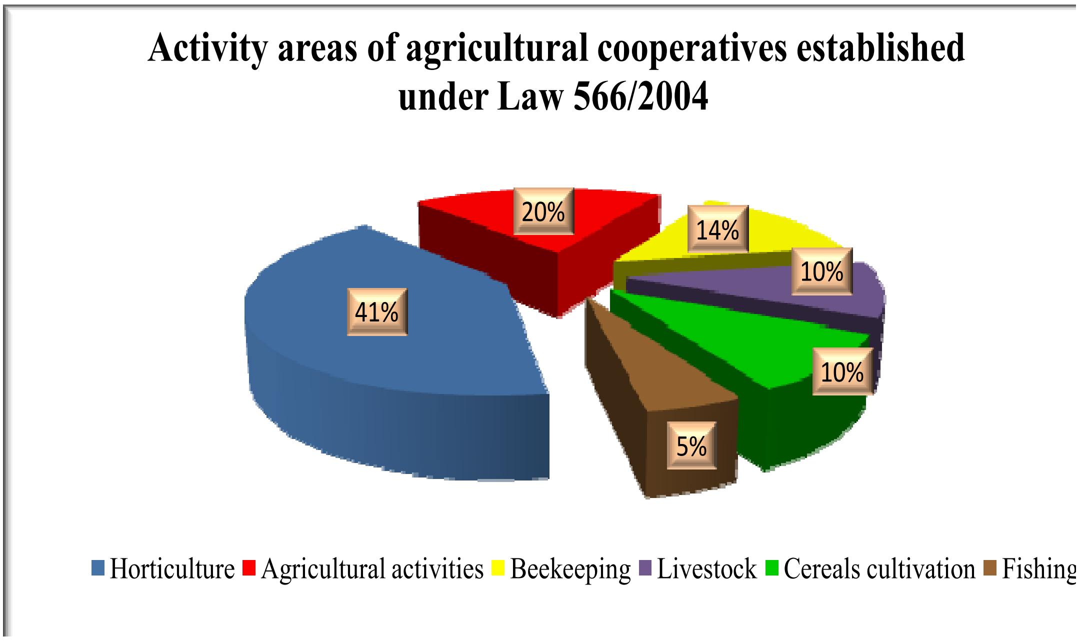

Fig. 3. Share of agricultural cooperatives with various activity domains

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Biotechnology for solid-state cultivation of mushrooms on organic wastes from wine making industry

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Keywords: biotechnology, biomass, edible mushrooms, solid-state cultivation, winery wastes

ABSTRACT

The main aim of this research work was to establish the best cultivation biotechnology of medicinal mushrooms by using such organic wastes as appropriate growth substrata for two mushroom species, namely *Ganoderma lucidum* and *Pleurotus ostreatus*. The experiments of inoculum preparation were set up under the following conditions: constant temperature, 23°C; agitation speed, 90-120 rev. min^{-1}; pH level, 5.0–6.0. All mushroom cultures were incubated for 120–168h. In the next stage of experiments, the culture composts for mushroom growing were prepared from wine wastes in the shape of marc of grapes that were used as substrates for mycelia development and mushroom fruit body formation. The tested culture variants were monitored continuously to keep constant the temperature during the incubation as well as air humidity, air pressure and a balanced ratio of the molecular oxygen and carbon dioxide. During the whole culture cycles all the physical and chemical parameters that can influence the mycelia growing and mushroom fruit body formation were investigated.

INTRODUCTION

The solid-state fermentation of plant wastes from agro-food industry is one of the challenging and technically demanding of all biotechnologies known to humankind so far (Carlile and Watkinson, 1996; Stamets, 2000).

The industrial activities related to wine processing have generally been matched by a huge formation of wide range of wastes (Raaska, 1990; Moser, 1994; Smith, 1998). Many of these organic wastes cause serious environmental pollution effects, if they are allowed to accumulate nearby wine making factories or much worse if they are incorporated in the soil matrix (Petre and Petre, 2008; Verstraete and Top, 1992; Wainwright, 1992).

In this respect, the major group of fungi which is capable to degrade cellulose and ligno-cellulose wastes belongs to Basidiomycetes group (Petre et al., 2007; Petre et al., 2010).

The main aim of this work was focused on the finding out the best biotechnology of recycling the winery wastes by using them as a growing source for edible and medicinal mushrooms and, last but not least, to protect the agro-ecosystems.

Taking into consideration that most of the mushroom species requires a specific micro-environment including complex nutrients, the influence of all physical and chemical factors upon fungal biomass production and mushroom fruit bodies formation has been studied by testing new biotechnological procedures (Petre et al., 2007; Petre and Petre, 2008)

MATERIALS AND METHODS

According to the main purposes of this work, two fungal species of Basidiomycetes group, namely *Ganoderma lucidum* (folk name: Reishi) as well as *Pleurotus ostreatus* (folk name: Oyster Mushroom) were used as pure mushroom cultures isolated from the natural environment and being preserved in the local collection of the University of Pitesti.

The stock cultures were maintained on malt-extract agar (MEA) slants (20% malt extract, 2% yeast extract, 20% agar-agar). Slants were incubated at 25°C for 120-168 h and stored at 4°C.

The pure mushroom cultures were expanded by growing in 250-ml flasks containing 100 ml of liquid malt-extract medium at 23°C on rotary shaker incubators at 110 rev min^{-1} for 72-120 h. After expanding, the pure mushroom cultures were inoculated into 100 ml of liquid malt-yeast extract culture medium with 3-5% (v/v) and then maintained at 23-25°C in 250 ml rotary shake flasks.

The experiments of inoculum preparation were set up under the following conditions: constant temperature, 25°C; agitation speed, 90-120 rev min^{-1}; initial pH, 5.5–6.5. All seed mushroom cultures were incubated for 120–168 h and after that, these mushroom species were inoculated in liquid culture media (20% malt extract, 10% wheat bran, 3% yeast extract, 1% peptone) at pH 6.5 previously distributed into rotary shake flasks of 1,000 ml.

During the incubation time period, all the spawn cultures were maintained in special culture rooms, designed for optimal incubation at 25°C. There were prepared three variants of culture compost made of marc grapes in the following ratios: 1:1, 1:2, 1:4 (w/w).

The winery wastes were mechanically pre-treated by using an electric grinding device to breakdown the lignin and cellulose structures to make them more susceptible to the enzyme actions (Petre et al., 2007; Petre and Petre, 2008).

All the culture compost variants made of winery wastes were transferred into 1,000 ml glass jars and disinfected by steam sterilization at 120°C for 60 min. When the jars filled with composts were chilled they were inoculated with the liquid spawn already prepared.

Each culture compost variant for mushroom growing was inoculated using liquid spawn having the age of 72–220 h and the volume size ranging between 3–9% (v/w).

RESULTS AND DISCUSSION

During a period of time of 18–20 d after inoculation, all the mushroom cultures had developed a significant mycelia biomass on the culture substrates made of marc of grapes (Petre et al., 2007; Petre and Petre, 2008; Petre et al., 2010).

The effects induced by some additional ingredients as nitrogen and mineral sources upon the mycelia growing during the incubation were investigated.

From the tested nitrogen sources, wheat bran was the most efficient upon the mycelia growing and fungal biomass producing at 35-40 g% fresh fungal biomass weight, being closely followed by the malt extract at 25–30g%. Peptone, tryptone and yeast extract are well known nitrogen sources for fungal biomass synthesis but their efficiency in experiments was relatively lower than the mycelia growing and fungal biomass production induced by the wheat bran added as natural organic nitrogen source (Table 1)

Among the various mineral sources examined $CaCO_3$ yielded the best mycelia growing as well as fungal biomass production at 28-32 g% and for this reason it was registered as the most appropriate mineral source. The experiments were carried out for 288 h at 25°C with the initial pH 6.5 and all data are the means of triple determinations carried out on the compost variants containing marc of grapes in the ratio 1:4, as it is shown in Table 2.

Similar experiments concerning such mushroom cultivation methods were made by Stamets as well as other researchers, but the culture substrates were different (Stamets, 2000; Carlile and Watkinson, 1996; Raaska, 1990).

Also, other mineral sources, such as $MgSO_4 \cdot 5\ H_2O$ have also shown a significant influence upon the fungal biomass growing. The mineral sources K_2HPO_4 and KH_2PO_4 as essential phosphates improved the pH level through their buffering action, but they were less appropriate for mycelia growing in submerged as well as in surface cultures of mushrooms.

According to the registered results of the performed experiments the optimal laboratory-scale biotechnology for edible mushroom cultivation on composts made of marc of grapes was established (Fig. 1).

During the stage of mushroom fruit body formation, the culture parameters were set up and maintained at the following levels: air temperature, 15–17°C; the air flow volume, 5–6m^3/h; air flow speed, 0.2–0.3 m/s; the relative moisture content, 80–85%, light intensity, 500–1,000 luces for 8–10 h/d.

The final fruit body production of these mushroom species used was registered between 1.5 – 2.8 kg relative to 10 kg of composts made of winery wastes. The whole mycelia growing during the incubation period from the moment of inoculation up to the mushroom fruit body formation lasted between 30–60 d, depending on each fungal species used in experiments.

CONCLUSIONS

1. Among the five nitrogen sources examined, wheat bran was the most efficient upon the mycelia growing and fungal biomass production of *L. edodes* and *P. ostreatus*, at 35-40 g% fresh fungal biomass weight, closely followed by malt extract at 25–30 g%.
2. $CaCO_3$ yielded the best mycelia growing as well as fungal biomass production at 28-32g% and was registered as the best mineral source.
3. The final fruit body productions of these two mushroom species were registered between 1.5–2.8 kg relative to 10 kg of composts made of winery wastes.

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TABLES AND FIGURE

Table 1

The effect of nitrogen source upon mycelia growth of *P. ostreatus* and *G. lucidum* *

Nitrogen sources (1%, w/v)	Dry Fungal Biomass Weight (g/l)		Fresh Fungal Biomass Weight (g/l)		Final pH	
	P. ostreatus	*G. lucidum*	*P. ostreatus*	*G. lucidum*	*P. ostreatus*	*G. lucidum*
Rice bran	6.47±0.14	7.05±0.10	57±0.05	63±0.23	5.5	5.1
Malt extract	6.41±0.23	6.83±0.12	55±0.03	69±0.20	5.3	5.7
Peptone	4.45±0.15	5.43±0.03	41±0.12	57±0.15	4.6	5.3
Tryptone	5.23±0.09	6.95±0.15	28±0.70	55±0.17	5.1	5.9
Yeast extract	5.83±0.35	7.15±0.21	35±0.01	61±0.14	4.3	5.1

* All data are the means ± S.D. of triple determinations

Table 2

The effect of mineral source upon mycelia growth of *P. ostreatus* and *G. lucidum* *

Mineral Source (5 mg)	Dry Fungal Biomass Weight (g/l)		Fresh Fungal Biomass Weight (g/l)		Final pH	
	P. ostreatus	*G. lucidum*	*P. ostreatus*	*G. lucidum*	*P. ostreatus*	*G. lucidum*
KH_2PO_4	5.71±0.09	6.05±0.15	45±0.07	53±0.12	5.5	5.9
K_2HPO_4	6.98±0.13	5.93±0.07	57±0.05	59±0.07	5.1	5.7
$MgSO_4 \cdot 5H_2O$	6.18±0.20	7.01±0.25	55±0.09	63±0.28	5.6	6.1

* All data are the means ± S.D. of triple determinations

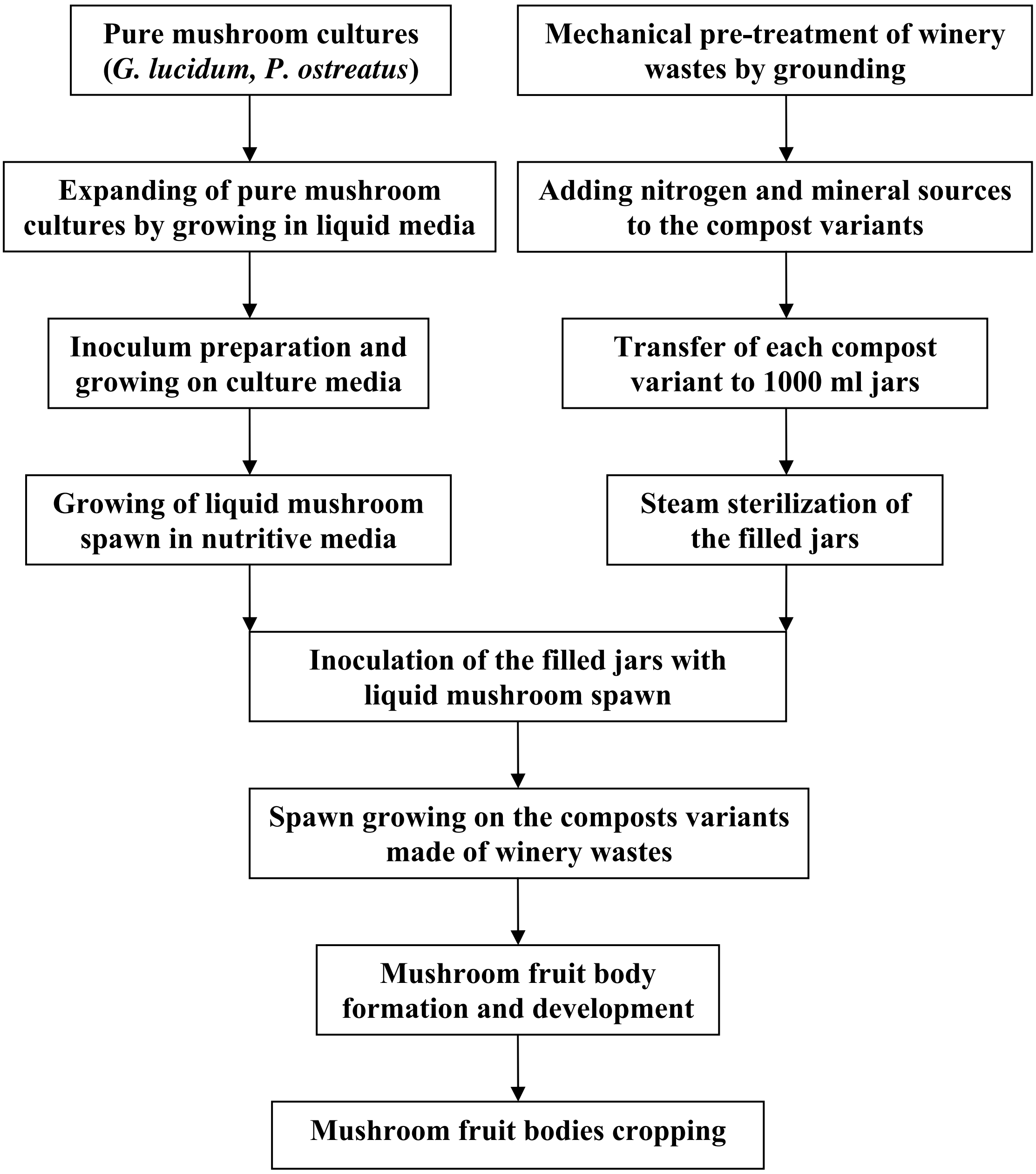

Fig. 1. Scheme of enhanced cultivation of edible mushrooms on organic winery wastes

Submerged fermentation of cereal wastes by enhanced cultivation of edible and medicinal mushrooms

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Keywords: biotechnology, continuous cultivation, edible and medicinal mushrooms, submerged fermentation

ABSTRACT

The main aim of this work was focused on testing new practical procedures in order to optimize the efficiency of medicinal mushrooms cultivation by enhancing the enzymatic activity of mycelia to get high nutritive biomass as fungal pellets. In this respect, special culture media for fungal growing were prepared by using a liquid nutritive broth, having the following composition: 15% cellulose powder, 5% wheat bran, 3% malt extract, 0.5% yeast extract, 0.5% peptone, 0.3% powder of natural argillaceous materials. After the steam sterilization at 121^{o}C, 1.1 atm., for 15 min. this nutritive broth was transferred aseptically inside of the culture vessel of a 15 l laboratory scale bioreactor. This complex culture medium was aseptically inoculated by using a suspension of activated spores of pure strains of *Ganoderma lucidum* and *Lentinula edodes*. The submerged fermentation was set up at the following parameters: constant temperature, 23°C; agitation speed, 80 - 100 rev.min $^{-1}$; pH level, 5.7 – 6.0 units; dissolved oxygen tension within the range of 30 - 70%. During a period of submerged fermentation lasting up to 120 h, small fungal pellets were developed inside the broth. In this stage, 70-80% of the former fungal pellets were harvested by extracting them from the culture vessel of the bioreactor and separating them from the broth by slow vacuum filtration.

INTRODUCTION

Submerged cultivation in liquid media of mushroom mycelium is a promising method which can be used in novel biotechnological processes for obtaining pharmaceutical substances of anticancer, antiviral, immuno-modulating, and anti-sclerotic action from fungal biomass and cultural liquids and also for the production of liquid spawn (Breene, 1990). The researches made for getting nutritive supplements from the biomass of *Ganoderma lucidum* species (Reishi) have shown that the nutritive value of its mycelia is own to the huge protein content, carbohydrates and mineral salts. *Lentinula edodes* species (Shiitake) is a good source of proteins, carbohydrates (especially polysaccharides) and mineral elements with beneficial effects on human nutrition (Wasser and Weis, 1994; Mizuno et al., 1995).

The main purpose of this work consists in the application of biotechnology for continuous cultivation of medicinal mushrooms by submerged fermentation in agro-food industry which has a couple of effects by solving the ecological problems generated by the accumulation of plant wastes in agro-food industry through biological means to valorize them without pollutant effects as well as getting fungal biomass with high nutritive value which can be used to prepare functional food (Carlile and Watkinson, 1996; Moser, 1994).

The continuous cultivation of medicinal mushrooms was applied using the submerged fermentation of different natural by-products of agro-food industry that provided a fast growth as well as high biomass productivity of the investigated strains (Petre et al., 2001).

MATERIALS AND METHODS

Ganoderma lucidum (Reishi) and *Lentinula edodes* (Shiitake) were used as pure mushroom strains. The stock cultures were maintained on malt-extract agar (MEA) slants, incubated at 25°C for 5 - 7 d and then stored at 4°C. The seed cultures were grown in 250-ml flasks containing 100 ml of MEA medium (20% malt extract, 2% yeast extract, 20% agar-agar) at 23°C on rotary shaker incubators at 150 rev min $^{-1}$ for 7 d (Petre and Petre, 2008).

The fungal cultures were achieved by inoculating 100 ml of culture medium using 3 - 5% (v/v) of the seed culture and then cultivated at 23 - 25°C in rotary shake flasks of 250 ml.

The experiments were conducted under the following conditions: temperature, 25°C; agitation speed, 120 - 180 rev min $^{-1}$; initial pH, 4.5 – 5.5. After 10 – 12 d of incubation the fungal cultures were ready to be inoculated aseptically into the glass vessel of laboratory-scale bioreactor (Fig. 1).

For the fungal growing in this bioreactor special culture media were prepared by using liquid nutritive broth, having the following composition: 15% cellulose powder, 5% wheat bran, 3% malt extract, 0.5% yeast extract, 0.5% peptone, 0.3% powder of natural argillaceous materials. After the steam sterilization at 121^{0}C, 1.1 atm., for 15 min. this nutritive broth was transferred aseptically inside of the culture vessel of a laboratory scale bioreactor. This culture medium was aseptically inoculated with activated spores of *Ganoderma lucidum* and *Lentinula edodes* species. After inoculation into the bioreactor vessel, a slow constant flow of nutritive liquid broth was maintained inside the nutritive culture medium by recycling it and adding from time to time a fresh new one.

The submerged fermentation was set up at the following parameters: constant temperature, 23°C; agitation speed, 80 - 100 rev. min $^{-1}$; pH level, 5.7 – 6.0 units; dissolved oxygen tension within the range of 30 - 70%. After a period of submerged fermentation lasting up to 120 h, small fungal pellets were developed inside the broth.

The experimental model of biotechnological installation, represented by the laboratory scale bioreactor (Fig. 1), was designed to be used in submerged cultivation of the mentioned medicinal mushrooms on substrata made of wastes resulted from the industrial processing of cereals for nutritive fungal biomass production (Petre et al., 2005; Stamets, 1993) .

RESULTS AND DISCUSSIONS

Fermentation process was carried out by inoculating the growing medium volume (10,000 ml) with secondary mycelium inside the culture vessel of the laboratory-scale bioreactor (Fig. 1). The whole process of growing lasts for a single cycle between 5-7 days in case of *L. edodes* and between 3 to 5 days for *G. lucidum*.

The strains of these fungal species were characterized by morphological stability, manifested by its ability to maintain the phenotypic and taxonomic identity. Observations on morphological and physiological characters of these two tested species of fungi were made after each culture cycle, highlighting the following aspects:

► sphere-shaped structure of fungal pellets, sometimes elongated, irregular, with various sizes (from 2 to 5 mm in diameter), reddish-brown colour–*G. lucidum* specific culture (Fig. 2)

► globular structures of fungal pellets, irregular with diameters of 4 up to 7 mm or mycelia congestion, which have developed specific hyphae of *L. edodes* (Fig. 3).

Experiments were carried out in three repetitions. Samples for analysis were collected at the end of the fermentation process, when pellets formed specific shapes and characteristic sizes. For this purpose, fungal biomass was washed repeatedly with double distilled water in a sieve with 2 mm diameter eye, to remove the remained bran in each culture medium.

Biochemical analyses of fungal biomass samples obtained by submerged cultivation of edible and medicinal mushrooms were carried out separately for the solid fraction and extract fluid remaining after the separation of fungal biomass by pressing and filtering. The percentage distribution of solid substrate and liquid fraction in the preliminary samples of fungal biomass are shown in table 1, together with the percentage of substance remaining (which was measured for dry matter content) and the percentage level of liquid fraction (resulted after pressing the solid substrate).

Also, the most obvious sensory characteristics (color, odor, consistency) were evaluated and presented at this stage of biosynthesis taking into consideration that they are very important in the prospective view of fungal biomass using as raw matarials for nutraceuticals producing. In each experimental variant the amount of fresh biomass mycelia was determined. Percentage amount of dry biomass was determined by dehydration obtained at a temperature of 70° C, until constant weight.

The total protein content was determined by biuret method, whose principle is similar to the Lowry method, this method being recommended for the protein content ranging from 0.5 to 20 mg/100 mg sample (Bae et al., 2000; Lamar et al., 1992). In addition, this method requires only one sample incubation period (20 min) and using them is eliminated interference with various chemical agents (ammonium salts, for example).

The principle method is based on reaction that takes place between copper salts and compounds with two or more peptides in the composition in alkali, which results in a red-purple complex, whose absorbance is read in a spectrophotometer in the visible domain (λ - 550 nm). In tables 2 and 3 are presented the amounts of fresh and dry biomass as well as the protein contents for each fungal species and variants of culture media.

According to registered data, using wheat bran strains the growth of *G. lucidum* biomass was stimulated, while the barley bran led to increased growth of *L. edodes* mycelium and *G. lucidum* as well. In contrast, dry matter content is significantly higher when using barley bran for both species used. Protein accumulation is more intense when using barley bran compared with those of wheat and rye, at both species of mushrooms.

The sugar content of dried mushroom pellets collected after the biotechnological experiments was determined by using Dubois method. The mushroom extracts were prepared by immersion of dried pellets inside a solution of NaOH pH 9, in the ratio 1:5. All dispersed solutions containing the dried pellets were maintained 24 h at a precise temperature of 25^0C, in full darkness, with continuous homogenization to avoid the oxidation reactions. After the removal of solid residues by filtration the samples were analyzed by the previous mention method (Wasser and Weis, 1994).

The nitrogen content of mushroom pellets was analyzed by Kjeldahl method. All the registered results are related to the dry weight of mushroom pellets that were collected at the end of each biotechnological culture cycle (Table 4).

Comparing all the registered data, it could be noticed that the correlation between the dry weight of mushroom pellets and their sugar and nitrogen contents is kept at a balanced ratio for each tested mushroom species. From these mushroom species that were tested in biotechnological experiments *G. lucidum* – culture variant III showed the best values concerning the sugar and total nitrogen content.

In order, on the very next places, *L. edodes* – culture variant I and *G. lucidum* - culture variant II could be mentioned from these points of view. These registered results concerning the sugar and total nitrogen contents have higher values than those obtained by other researchers (Bae et al., 2000; Moo-Young, 1993).

The nitrogen content in fungal biomass is a key factor for assessing its nutraceutical potential, but the assessing of differential protein nitrogen compounds requires additional investigations.

CONCLUSIONS

1. The cereal by-products used as substrata for growing the fungal species *L. edodes* and *G. lucidum* by controlled submerged fermentation showed optimal effects on the mycelia development in order to get high nutritive biomass.
2. The dry matter content of fungal biomass produced by submerged fermentation of barley bran was higher for both tested species.
3. The protein accumulation is more intense when using barley bran compared with those of wheat and rye, at both fungal species.
4. The correlation between the dry weight of mushroom pellets and their sugar and nitrogen contents is kept at a balanced ratio for each tested mushroom species.

5. *G. lucidum* - culture variant III showed the best values of sugar and total nitrogen contents, being followed by *L. edodes* – culture variant I.

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TABLES AND FIGURES

Table 1

Percentage distribution of solid substrate and liquid fraction in the preliminary samples of fungal biomass

Mushroom species	Total volume of separated liquid per sample (ml)	Total biomass weight per sample (g)	Water content after separation (%)
L. edodes	83	5.81	83.35
L. edodes	105	7.83	82.50
L. edodes	95	7.75	82.15
L. edodes	80	5.70	79.55
G. lucidum	75	7.95	83.70
G. lucidum	115	6.70	82.95
G. lucidum	97	5.45	80.75
G. lucidum	110	6.30	77.70

Table 2

Fresh and dry biomass and protein content of *L. edodes* grown by submerged fermentation

Culture variants	Fresh biomass (g)	Dry biomass (%)	Total proteins (g % d.w.)
I	20.30	5.23	0.55
II	23.95	6.10	0.53
III	22.27	4.79	0.73
IV	20.10	4.21	0.49
Control	4.7	0.5	0.2

Table 3

Fresh and dry biomass and protein content of *G. lucidum* grown by submerged fermentation

Culture variants	Fresh biomass (g)	Dry biomass (%)	Total proteins (g % d.w.)
I	25.94	9.03	0.67
II	22.45	10.70	0.55
III	23.47	9.95	0.73
IV	21.97	9.15	0.51
Control	5.9	0.7	0.3

Table 4

The sugar and total nitrogen contents of dried mushroom pellets

Mushroom species	Culture variant	Sugar content (mg/ml)	Kjeldahl nitrogen (%)
L. edodes	I	5.15	6.30
L. edodes	II	4.93	5.35
L. edodes	III	4.50	5.70
L. edodes	IV	4.35	5.75
	Control	0.55	0.30
G. lucidum	I	4.95	5.95
G. lucidum	II	5.05	6.15
G. lucidum	III	5.55	6.53
G. lucidum	IV	4.70	5.05
	Control	0.45	0.35

Fig. 1. Laboratoy-scale bioreactor for submerged fermentation

Fig. 2. Biomass of *G. lucidum* as fungal pellets

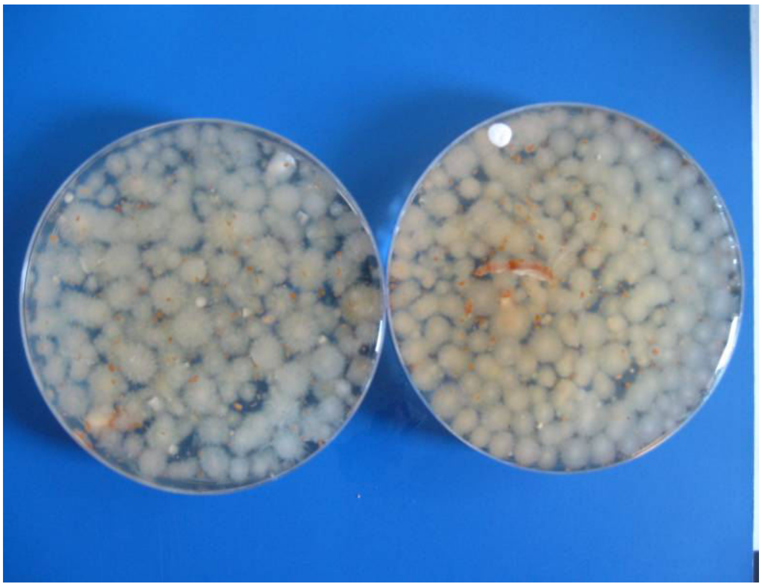

Fig. 3. Fungal pellets of *L. edodes* biomass

Research on the biological features of the *Phoma lingam* (Tode ex Schw) Desm. pathogen isolated on rape

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Keywords: biology, fungus, pycnidia

Abstract
The *Phoma lingam* fungus is manifest on every plant organ in every stage of plant development. The abiotic factors play an important role during the fungus development and pathogenicity. The study must be done in order to establish its needs regarding certain abiotic factors such as: temperature, humidity-atmospheric and light. The study is necessary in order to get to know the moment when the first infections occur. Under laboratory condition, the phytopathogenic fungus *Phoma lingam* was isolated on potato-glucose-agar. The sick biological material of rape, formed from leaves and stems with specific disease symptoms, was put in a wet room where the mycelium formation was observed after 3 days. The conditions germination is possible at 4°C, and 16 hours are necessary. The *Phoma lingam* fungus colonies developed extremely well in the presence of light. As relative atmospheric humidity value grows higher, the colony development is very good, and the vegetative mass is extremely dense, thick, grey in colour. Temperature, relative atmospheric humidity and light are important factors in the *Phoma lingam* fungus evolution.

INTRODUCTION

Phoma lingam is a serious pathogen causing black leg, canker, and dry rot of brassicas and other crucifers (Agrios, 1988).

The abiotic factors have an important role during the fungus development and pathogenicity. The fungi produce diseases on crop plants, these being very sensitive during their whole vegetation period.

Therefore, a certain biological study is necessary. The study concerns the research of the *Phoma lingam* pathogen fungus biology. The study must be done in order to establish its needs regarding certain abiotic factors such as: temperature, humidity-atmospheric and light. The study is necessary in order to know the moment when the first infections occur. Also, the study is aimed at analysing the evolution of the infection in the field, depending on the climatic weather conditions during the year.

By knowing these elements, a prognosis can be made, and also a warning for the recommended treatment, in order to end the disease.

The *Phoma lingam* fungus is passed on from one year to another through the seed which comes from sick plants. The fungus is able to survive for at least three years on crop debris in the soil (Smith et al. 1988).

MATERIALS AND METHODS

In laboratory conditions, phytopathogenic fungus *Phoma lingam* was isolated on potato-glucose-agar. The sick biological material of rape, which was formed from leaves and stems with specific disease symptoms, was put in a wet room, where, the mycelium formation was observed after 3 days. Placed on CGA culture medium again, in Petri recipients, colonies were formed; after 6 days, they purified the *Phoma lingam* species.

The abiotic factor was established in laboratory conditions. They influenced the *Phoma lingam* fungus development, after Tuite's method, 1968.

RESULTS AND DISCUSSION

The influence of temperature upon the *Phoma lingam* fungus colonies development:

On CGA culture medium, the *Phoma lingam* fungus formed colony with silky aspect, of grey-greenish color, which after 7 days formed pycnidias subglobose (65-80 µm x 105-240 µm), of brownish black color.

The *Phoma lingam* fungus was placed on CGA culture medium again, in Petri recipients of 8 cm in diameter, and then each of them was placed in thermostats at temperatures of 2-36°C. At a 3 days interval, the constant colonies diameter growth was registered. Also, fructifications growth was registered. The observations lasted for 14 days.

The colonies growth and fructification of *Phoma lingam* fungus are influenced by the thermal values. As we can see (table 1), the minimum temperature for the colony formation was 4°C; they occurred under the form of a lax mycelium, of grey color, with a light-grey back. Fructifications were absent. The aspect was the same at higher temperatures as well, such as 6°C. The 8°C temperature determined a better colony development, so that the mycelium was compact, with silky aspect, of grey color, with a light-grey back. The fructifications presence was registered.

The optimum temperature which is necessary in order for the fructifications to develop is between 16°C and 22°C degrees, when 50mm colony diameter was registered, with silky aspect, dense, grey in color, with the light-grey back. Fructification was very good, and the colony number was high.

Over 28°C, colony development was weaker, and also the number of formed fructifications was smaller.

The maximum value of temperature can be considered to be at 34-36°C.

The influence of atmospheric relative humidity upon the *Phoma lingam* fungus colony development (table 2): Different humidity values were created in exicators, from 15% up to 100%, using super concentrated solutions of some salts. The Petri recipient with CGA culture medium, in which the fungus was placed again, was introduced in exicators, and kept for 21 days, without a Petri top. The atmospheric relative humidity represents an important factor in the fungus evolution. Table 2 shows that, at values of 15%, the colonies were not formed. At an atmospheric humidity between 36.8-72% the formed mycelium was lax and fructifications did not form. As the relative atmospheric humidity grows higher (from 78.60 to 99.00 %), the colony development is very good, and the vegetative mass is extremely dense, think, grey in color. Also, fructifications are abundant.

The influence of light upon the *Phoma lingam* fungus development (table 3): Light recorded a different action on the *Phoma lingam* fungus colony development, as a result of the crop's constant light exposure, continuous darkness and also light/darkness alternation 8/16 or 12/12. The final observations were made after 14 days, when fungus growth and fructification was noted.

The *Phoma lingam* fungus colonies developed extremely well in the presence of light, as it can be observed in table 3. On permanent or alternative light, the colony vegetative mass was rich, had a silky mycelium, of grey color, and sporulation was abundant. Permanent darkness throughout the whole experiment led to a good vegetative mass, but weak fructifications.

CONCLUSIONS

Temperature, relative atmospheric humidity and light are important factors in the *Phoma lingam* fungus evolution.

Concerning temperature, the minimum temperature for the colonies to be formed was 4°C, optimum necessary for the colonies to develop is 16°C and 22°C, and the maximum threshold (value) can be considered at 36°C when colonies formed have a weak-looking aspect, and fructifications do not form any longer.

Related to humidity, it was noted that on relative values of 15% colonies did not form, and as the relative atmospheric humidity values grow (superior to 78.6% value), colony development is very good, the vegetative mass is dense, thick-looking, and fructifications are abundant.

On permanent and alternative light, the vegetative mass of formed colonies was rich, the mycelium was silky, and sporulation was abundant.

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TABLES

Table 1

Influence of temperature upon the *Phoma lingam* fungus development

t°C/days	2	4	6	8	10	12	14	Observations after 14 days
	Colonies diameter(mm)							
2	0	0	0	0	0	0	0	Mv 0 Fr 0
4	0	0	1	8	11	13	14	Mv ± Fr 0
6	0	0	1	8	11	13	14	Mv ± Fr 0
8	1	10	11	12	12	18	25	Mv + Fr ±
10	3	15	18	23	25	27	32	Mv + Fr +
12	6	16	18	25	27	30	33	Mv + Fr +
14	9	12	18	25	32	33	38	Mv ++ Fr +
16	11	19	26	28	39	45	50	Mv ++ Fr +++
18	10	12	14	20	25	46	50	Mv +++ Fr +++
20	9	10	15	23	27	47	50	Mv +++ Fr +++
22	2	12	17	27	30	47	50	Mv ++ Fr +++
24	2	12	18	27	30	38	40	Mv + + Fr ++
26	2	14	22	28	35	38	38	Mv ++ Fr +
28	2	17	18	23	24	26	30	Mv + Fr +
30	2	8	12	15	19	23	30	Mv + Fr ±
32	2	6	10	15	18	20	20	Mv + Fr ±
34	3	0	0	0	0	0	0	Stops growth
36	2	0	0	0	0	0	0	Stops growth

Legend:

Mv ± = very weak vegetative mass Mv + = weak vegetative mass
Mv ++ = good vegetative mass Mv +++ = very good vegetative mass
0 = fungus did not fructify
Fr ± =very weak fructification Fr + = weak fructification
Fr.++ = good fructification Fr+++ = abundent fructification

Table 2

Influence of relative atmospheric humidity upon the *Phoma lingam* fungus colony development

Relative atmospheric humidity RH%	Colony diameter after 12 days	Observations
15	0	Colonies are not formed
36,8	10	Weak growth
43	22	Mv ± Fr.0
56	34	Mv ± Fr.0
66	45	Mv + Fr 0
72	50	Mv + Fr 0
75,6	50	Mv ++ Fr +
78.6	50	Mv +++ Fr ++
82,9	50	Mv +++ Fr +++
88.5	50	Mv +++ Fr+++
90	50	Mv +++ Fr +++
92,7	50	Mv +++ Fr +++
96.1	50	Mv +++ Fr +++
98,5	50	Mv +++ Fr +++
99	50	Mv +++ Fr +++

Legend:

Mv ± = very weak vegetative mass
Mv + = weak vegetative mass
Mv ++ = good vegetative mass
Mv +++ = very good vegetative mass
0 = fungus did not fructify
Fr + = weak fructification
Fr ++ = good fructification
Fr +++ = abundent fructification

Table 3

Influence of light upon *Phoma lingam* fungus development

Light	Colony development
Light 24 hours	Rich vegetative mass, thick-looking mycelium, grey in colour, good sporulation
Light/Darkness alternation 12/12 hours	
Light/Darkness alternation 8/16 hours	Rich vegetative mass, thick-looking mycelium, grey in colour, rich sporulation
Permanent darkness	Good vegetative mass, weak fructifications

Profit versus entrepreneurial profit in agricultural activities

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Keywords: agricultural companies, farms, economic results

ABSTRACT

The demand for vegetables made in Romania is increasing. It requires the analysis about activity and economic results, obtained in farms with different forms of organization. The companies which are deeply rooted in agricultural world, have need for machinery and equipment, a relatively easy access to credit for business and investment, have firm supply contracts with suppliers of brand, that use scientific technologies for vegetables and sell your products to wholesalers or supermarkets. Small family farms, without legal personality, have difficulties due to: low self-financing capacity, impossible lending, insufficient working capital, expensive inputs, relatively small production, limited markets, and lack of knowledge on current technologies. All these difficulties do not allow extension activities in small farms and moving to a new form of organization. The achieved analysis is based on determining the level of expenses, costs, revenues and economic results in two farms with different forms of organization (profit versus profit, entrepreneurial profit).

INTRODUCTION

Under the conditions in which the demand for local leguminous products is increasing in Romania, the analysis of the economic activity and results obtained in the production farms is required, with different organization forms. Agricultural trading companies are deeply rooted in the agricultural world have a developed technical-material basis, easier access to credits for their activity and investments, it is supplied based on firm contracts by outstanding suppliers in the field, they apply scientifically-based cultivation technologies, and their products marketing is certain, through the existence of delivery contracts to the large commercial chains. Smaller family farms that are not legal entities are faced with problems related to their limited self-funding capacity, the impossibility to obtain credits, the insufficient current assets, the high input prices, low production competitiveness and the market limitation, the lack of information on the new existing technologies. All these difficulties do not allow small farms to expand their activity and progress to a new organization form.

MATERIALS AND METHODS

The analysis we propose is based on calculating the economic indicators using a practical method: we start from calculating the Gross Margin (GM) by deducting the proportionally variable expenses specific to activity/crop from the gross product (Draghici, 2004). In the actual case of the various agricultural businesses, the capital factors, labour and land, may be optionally variable or fixed. In case there are capital expenses (on current assets), labour (in production), land and other variable expenses, according to the practical method they are not included in the step-by-step calculation and the GM I, II, III are calculated. The factors of production may originate from the agricultural business' own or external sources. For their own factors, different usage expenses may be taken into account, estimated on the basis of usage alternatives (opportunity costs). In calculating the profit of an activity/crop (Oancea, 2007), they are not included in the opportunity costs for capital, labour, land. The difference between the entrepreneurial profit and profit is that all these expenses are included in calculating the entrepreneurial profit, which causes the profit to be larger than the entrepreneurial profit all the time. In order to express the efficiency of the employed factors as accurately as possible and to compare the versions, the remuneration per each factor unit employed is calculated. If we add the expense on a certain factor of production to the entrepreneurial profit and report this to the employed factor quantity, we calculate the long-term remuneration of the respective factor. When we consider the variable expenses and the gross margin we calculate the short-term remuneration for a factor of production. An activity's economic efficiency may be checked by comparing the price of the respective product with the production expenses per unit, considered at various levels expressed in the long-term threshold price (corresponding to the profitability threshold) and the short-term threshold price (corresponding to the production threshold). The economic indicators and results were calculated to the year 2010 for the early potato crop, in two legume farms, respectively in an agricultural trading company and a family farm – which mainly use their own factors of production (capital and labour).

RESULTS AND DISCUSSION

Overall expenses, entrepreneurial profit and profit

By deducting the production expenses from the gross product, we calculate the profit and the entrepreneurial profit for each activity/crop (per ha and year). The expenses that are relevant in calculating both indicators are added step by step to the variable expenses calculated previously in the gross margins, as presented in Table 1 and Table 2 for the two farms. The positive profit value shows the amount of money available to each business so that it can remunerate its own factors of production (family labour, own capital, own land). The positive value of the entrepreneurial profit made in the trading company shows that the factors of production are remunerated entirely, and the own factors are better remunerated in this type of usage than in the previous one.

In the family farm, a positive profit was made, but the entrepreneurial profit is negative, which means that all the external factors of production: salaries, interest and lease were paid, but little money was left to remunerate the own production factors properly.

In order to be able to deduct the factors' economic efficiency based on their remuneration calculations, the factors' remuneration is compared to the factors' expenses. The use of the factor is profitable if its remuneration is equal or larger that the expenses, as it happens in the case of the potato crop in the commercial farm. (Table 3 and Table 4).

Knowing that the entrepreneurial profit must be at least zero in order to reach the economic limit, the main product's price (the threshold price) for which profit could be made was calculated. From the calculations it resulted that the lower limit of the short-term price was of 0.76 respectively 0.89 lei/kg. The long-term threshold price was calculated as 0.86 and respectively 1.01 lei/kg.

If the product's price is equal to the lower limit of the long-term price (the profitability threshold) we obtain as result a null entrepreneurial profit (achievements = overall expenses) and precisely the remuneration for the necessary expenses on labour, land and capital (on average).

If we establish the expenses for one of the capital factors, labour or land, at the value of the issued remuneration, we obtain as result the null entrepreneurial profit (achievements = overall expenses), for the factors' remuneration precisely the expenses obtained (on average) and as a price lower limit precisely the current product price. These connections are valid even for a longer interval (entrepreneurial profit and the profitability threshold), as well as for a short interval (gross margin l, ii, iii and the production threshold l, ii, iii).

CONCLUSIONS

In the case of a family farm, because the entrepreneurial profit is negative, and Gross Margin III is still positive, it means that some of the fixed expenses can be covered. This implies that: a) on the long terms, continuing the production is not profitable; b) increasing or changing the production capacity in a complete investment is not profitable; c) on the short term, continuing the production may be worthwhile, as long as the fixed factors (cars, buildings, etc.) are still at the farm's availability, because these factors generate lower expenses than in the case of alternative use.

The ling-term factors' remuneration is lower than the expenses on them, which means that for the own factors of production a long-term alternative could make sense. All these difficulties d not allow the small farms to expand their activity and progress towards a new organization form.

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TABLES

Table 1

Overall expenses, Entrepreneurial profit, Profit

*potato-small family farm

Overall expenses, Entrepreneurial profit, Profit — **Potato -small family farm, 1 ha**

Basic data:		
Main production	15.000	kg/ha
Price	1,00	lei/kg
Secondary production		lei/ha
Proportional direct payments		lei/ha
Proportional variable expenses.	10.483,00	lei/ha
Direct (general) payments	200,00	lei/ha

Inputs:		External-%	Own-%
Current assets	5.242 lei	50%	50%
Fixed assets	5.410 lei	28%	72%
Labour (for prod.)	228 hours	76%	24%
Labour (adm+ desf)	48 hours	0%	100%
Used area of land	1 ha	30%	70%

lei/ha		Expenses		Entrepreneurial-profit		Profit
Overall production *)		———		15.000		15.000
± Proportional variable expenses **)		10.483	–	10.483	–	10.483
= **Prop.var.exp. / Gross margin **)**	=	**10.483**	=	**4.517**	=	**4.517**
± **Capital exp. Current assets**						
External: 2.620,75 lei × 10,0 %	+	262	–	262	–	262
Own: 2.620,75 lei × 5,0 %	+	131	–	131	–	———
= **Variable expenses I / Gross margin I**	=	**10.876**	=	**4.124**	=	**4.255**
± **Expenses on labour (production)**						
External: 173,28 hour × 6,5 lei/hour	+	1.126	–	1.126	–	1.126
Own: 54,72 hour × 7,2 lei/hour	+	394	–	394	–	———
= **Variable expenses II / Gross margin II**	=	**12.396**	=	**2.604**	=	**3.129**
± **Expenses on the used area of land**						
External: 0,30 ha × 1000 lei/ha	+	300	–	300	–	300
Own: 0,70 ha × 1000 lei/ha	+	700	–	700	–	———
± **Expenses on other proportional factors**						
External: ____ × lei/____	+	0	–	0	–	0
Own: ____ × lei/____	+	0	–	0	–	———
= **Variable expenses III / Gross margin III**	=	**13.396**	=	**1.604**	=	**2.829**
on direct payments amounting to 200,00 lei/ha		*13.196*		*1.804*		*3.029*
Fixed and indirect expenses:						
± **Amortisation, insurance, building maintenance, etc **)**						
Technica 10.819 lei (A) × 9,49 %of CA	+	102.689	–	1.027	–	1.027
Buildings lei (A) × %of CA	+	0	–	0	–	0
± **Capital exp. on fixed assets**						
External: 1.514,67 lei × 10,0 %	+	151	–	151	–	151
Own: 3.894,86 lei × 5,0 %	+	195	–	195	–	———
± **Expenses on admistrative labour**						
External: hour × 6,5 lei/hour	+	0	–	0	–	0
Own: 48,00 hour × 7,2 lei/hour	+	346	–	346	–	———
± Other special expenses 23,0 lei/ha	+	23	–	23	–	23
± Other indirect expenses 15,0 lei/ha	+	15	–	15	–	15
= **Overall expenses / Entrepreneurial profit/Profit**	=	**116.815**	=	**-153**	=	**1.612**
on direct payments amounting to 200,00 lei/ha		*116.615*		*47*		*1.812*
For comparison: the sum of the expenses on using own factors						1.765,36

*) Main production × Price + Secondary production + proportional direct payments

**) without interest, salary and lease

***) Purchase expenses × cost per year rate

Table 2

Overall expenses, Entrepreneurial profit, Profit

* potato-agricultural company

Overall expenses, Entrepreneurial profit, Profit **Potato - agricultural company** **1 ha**

Basic data:		
Main production	25.000	kg/ha
Price	1,00	lei/kg
Secondary production		lei/ha
Proportional direct payments		lei/ha
Proportional variable expenses.	15.595,50	lei/ha
Direct (general) payments	200,00	lei/ha

Inputs:		External-%	Own-%
Current assets	7.798 lei	50%	50%
Fixed assets	7.791 lei	70%	30%
Labour (for prod.)	259 hours	85%	15%
Labour (adm+ desf)	48 hours	0%	100%
Used area of land	1 ha	70%	30%

lei/ha		Expenses		Entrepreneurial-profit		Profit
Overall production *)		——		25.000		25.000
± Proportional variable expenses **)		15.596	–	15.596	–	15.596
= Prop.var.exp. / Gross margin **)	=	**15.596**	=	**9.405**	=	**9.405**
± Capital exp. Current assets						
External: 3.898,88 lei × 10,0 %	+	390	–	390	–	390
Own: 3.898,88 lei × 5,0 %	+	195	–	195	–	——
= Variable expenses I / Gross margin I	=	**16.180**	=	**8.820**	=	**9.015**
± Expenses on labour (production)						
External: 220,15 hour × 6,5 lei/hour	+	1.431	–	1.431	–	1.431
Own: 38,85 hour × 7,2 lei/hour	+	280	–	280	–	——
= Variable expenses II / Gross margin II	=	**17.891**	=	**7.109**	=	**7.584**
± Expenses on the used area of land						
External: 0,70 ha × 1000 lei/ha	+	700	–	700	–	700
Own: 0,30 ha × 1000 lei/ha	+	300	–	300	–	——
± Expenses on other proportional factors						
External: ____ × lei/____	+	0	–	0	–	0
Own: ____ × lei/____	+	0	–	0	–	——
= Variable expenses III / Gross margin III	=	**18.891**	=	**6.109**	=	**6.884**
on direct payments amounting to 200,00 lei/ha		*18.691*		*6.309*		*7.084*
Fixed and indirect expenses:						
± Amortisation, insurance, building maintenance, etc **)						
Technica 15.581 lei (A) × 9,49 %of CA	+	147.886	–	1.479	–	1.479
Buildings lei (A) × %of CA	+	0	–	0	–	0
± Capital exp. on fixed assets						
External: 5.453,35 lei × 10,0 %	+	545	–	545	–	545
Own: 2.337,15 lei × 5,0 %	+	117	–	117	–	——
± Expenses on admistrative labour						
External: hour × 6,5 lei/hour	+	0	–	0	–	0
Own: 48,00 hour × 7,2 lei/hour	+	346	–	346	–	——
± Other special expenses 23,0 lei/ha	+	23	–	23	–	23
± Other indirect expenses 15,0 lei/ha	+	15	–	15	–	15
= Overall expenses / Entrepreneurial profit/Profit	=	**167.823**	=	**3.584**	=	**4.821**
on direct payments amounting to 200,00 lei/ha		*167.623*		*3.784*		*5.021*
For comparison: the sum of the expenses on using own factors						1.237,12

*) Main production × Price + Secondary production + proportional direct payments

**) without interest, salary and lease

***) Purchase expenses × cost per year rate

Table 3

Economic efficiency indicators of the crop

* potato-small family farm

Economic efficiency indicators of the crop Potato -small family farm, U.m.: 1 ha

Name	Number / Quantity	Expenses on u.m.	Expenses	MB / Entrepren profit	Remunerating factors of prod. Capital (lei)	Labour (hours)	Land (ha)	Minimum-price
Main production (Production ×	15.000 kg ×	1,0 lei/kg		+ 15.000,0	+ 15.000,0	+ 15.000,0	+ 15.000,0	
Secondary production (with proportional direct p		lei		+	+	–	–	+
Variable exp. (without interest, salaries, lease)	10.483 lei		+ 10.483,0	– 10.483,0	– 10.483,0	– 10.483,0	– 10.483,0	+ 10.483,0
Gross margin (without interest, salaries, lease)				**+ 4.517,0**				**+ 10.483,0 => 0,70** / 1 kg
Exp. on current assets interest	5.242 lei ×	7,50 %	+ 393,1	– 393,1		– 393,1	– 393,1	+ 393,1
Production threshold I			**+ 10.876,1**	**+ 4.123,9**				**+ 10.876,1 => 0,73** / 1 kg
Labour salaries (external):	228,00 h ×	6,67 lei/h	+ 1.520,3	– 1.520,3	– 1.520,3		– 1.520,3	+ 1.520,3
Production threshold II			**+ 12.396,4**	**+ 2.603,6**				**+ 12.396,4 => 0,83** / 1 kg
Land use expenses:	1 ha ×	1.000 lei/ha	+ 1.000,0	– 1.000,0	– 1.000,0	– 1.000,0		+ 1.000,0
Other usage expenses		lei	+	+	+	–	–	+
Output- factors (short term)					**+ 1.996,7**	**+ 3.123,9**	**+ 2.603,6**	
/ Factors of production (Capital, hours, ha)					+ 5.241,5	+ 228,0	+ 1,0	
Production threshold III			**+ 13.396,4**	**+ 1.603,6**	**38,1%**	**+ 13,7**	**+ 2.603,6**	**+ 13.396,4 => 0,89** / 1 kg
Technique: amortisation, Insur	10.819 lei ×	9,49 %	+ 1.026,9	– 1.026,9	– 1.026,9	– 1.026,9	– 1.026,9	+ 1.026,9
Buildings: Amortization, Mainte	lei ×	%	+	+	–	–	–	+
Exp. On fixed assets interests	5.410 lei ×	6,40 %	+ 346,2	– 346,2		– 346,2	– 346,2	+ 346,2
Labour salaries (admin.):	48 h ×	7,20 lei/h	+ 345,6	– 345,6	– 345,6		– 345,6	+ 345,6
Other special fixed expenses		23,00 lei	+ 23,0	– 23,0	– 23,0	– 23,0	– 23,0	+ 23,0
Proportionale indirect expenses (without labour		15,00 lei	+ 15,0	– 15,0	– 15,0	– 15,0	– 15,0	+ 15,0
Output- factors (long term)					**+ 586,2**	**+ 1.712,8**	**+ 846,9**	
/ Factors of production (Capital, hours, ha)					+ 10.651,0	+ 276,0	+ 1,0	
Profitability threshold			**+ 15.153,1**	**– 153,1**	**5,5%**	**+ 6,2**	**+ 846,9**	**+ 15.153,1 => 1,01** / 1 kg
Production threshold III with direct payments		200 lei		*+ 1.803,6*	*41,91%*	*+ 14,6*	*+ 2.803,6*	*+ 13.196,4 => 0,88 / 1 kg*
Profitability threshold with direct payments		200 lei		*+ 46,9*	*7,38%*	*+ 6,9*	*+ 1.046,9*	*+ 14.953,1 => 1,00 / 1 kg*

Table 4

Economic efficiency indicators of the crop

* potato- agricultural company

Economic efficiency indicators of the crop — Potato - agricultural company — U.m.: 1 ha

Name	Number / Quantity	Expenses on u.m.	Expenses	MB / Entrepren profit	Remunerating factors of prod. Capital (lei)	Labour (hours	Land (ha)	Minimum-price
Main production (Production ×	25.000 kg ×	1,0 lei/kg		+ 25.000,0	+ 25.000,0	+ 25.000,0	+ 25.000,0	
Secondary production (with proportional direct		lei		+	+	–	–	+
Variable exp. (without interest, salaries, lease)	15.596	lei	+ 15.595,5	– 15.595,5	– 15.595,5	– 15.595,5	– 15.595,5	+ 15.595,5
Gross margin (without interest, salaries, lease)				**+ 9.404,5**				**+ 15.595,5 => 0,62** / 1 kg
Exp. on current assets interest	7.798 lei ×	7,50 %	+ 584,8	– 584,8		– 584,8	– 584,8	+ 584,8
Production threshold I			**+ 16.180,3**	**+ 8.819,7**				**+ 16.180,3 => 0,65** / 1 kg
Labour salaries (external):	259,00 h ×	6,61 lei/h	+ 1.710,7	– 1.710,7	– 1.710,7		– 1.710,7	+ 1.710,7
Production threshold II			**+ 17.891,0**	**+ 7.109,0**				**+ 17.891,0 => 0,72** / 1 kg
Land use expenses:	1 ha ×	1.000 lei/ha	+ 1.000,0	– 1.000,0	– 1.000,0	– 1.000,0		+ 1.000,0
Other usage expenses		lei	+	+	+	–	–	+
Output- factors (short term)			↓	↓	**+ 6.693,8**	**+ 7.819,7**	**+ 7.109,0**	↓
/ Factors of production (Capital, hours, ha)					+ 7.797,8	+ 259,0	+ 1,0	
Production threshold III			**+ 18.891,0**	**+ 6.109,0**	**85,8%**	**+ 30,2**	**+ 7.109,0**	**+ 18.891,0 => 0,76** / 1 kg
Technique: amortisation, Insur	15.581 lei ×	9,49 %	+ 1.478,9	– 1.478,9	– 1.478,9	– 1.478,9	– 1.478,9	+ 1.478,9
Buildings: Amortization, Mainte	lei ×	%	+	+	–	–	–	+
Exp. On fixed assets interests	7.791 lei ×	8,50 %	+ 662,2	– 662,2		– 662,2	– 662,2	+ 662,2
Labour salaries (admin.):	48 h ×	7,20 lei/h	+ 345,6	– 345,6	– 345,6		– 345,6	+ 345,6
Other special fixed expenses		23,00 lei	+ 23,0	– 23,0	– 23,0	– 23,0	– 23,0	+ 23,0
Proportionale indirect expenses (without labour		15,00 lei	+ 15,0	– 15,0	– 15,0	– 15,0	– 15,0	+ 15,0
Output- factors (long term)			↓	↓	**+ 4.831,3**	**+ 5.640,6**	**+ 4.584,3**	↓
/ Factors of production (Capital, hours, ha)					+ 15.588,3	+ 307,0	+ 1,0	
Profitability threshold			**+ 21.415,7**	**+ 3.584,3**	**31,0%**	**+ 18,4**	**+ 4.584,3**	**+ 21.415,7 => 0,86** / 1 kg
Production threshold III with direct payments		200 lei		*+ 6.309,0*	*88,41%*	*+ 31,0*	*+ 7.309,0*	*+ 18.691,0 => 0,75 / 1 kg*
Profitability threshold with direct payments		200 lei		*+ 3.784,3*	*32,28%*	*+ 19,0*	*+ 4.784,3*	*+ 21.215,7 => 0,85 / 1 kg*

Performances of the vegetable farm measured by intermediate management balances sheet

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Keywords: profitability, commercial trading, value added, results of the exploitation, current result, net result of the financial year

ABSTRACT

The annual financial statements prepared by the agricultural company provide information on potential cash balances concerning exploitation, financial and extraordinary activities. These balances, entitled Management of Intermediary Balances (MIB) are expressed by the indicators characterizing the operation and profitability of the farm: commercial margin, production of financial year, value added, the surplus/deficit gross working surplus, the results of the exploitation, the current result, gross and net results of the financial year. Each MIB reflects the state of financial results determined at a certain level, having function to illustrate the remuneration of production factors and financing the future activity.

INTRODUCTION

The presentation of the financial results in accounting is based on structuring an organization's activity into operation, financial and extraordinary activities, which, on the basis of this synthesis situation, allow the creation of certain values that characterize the economic behavior of the respective agent, called intermediary management balance sheets (SIG cascade) (Isfanescu, 2003). The need to determine SOG within SC OANCEA OMV SRL is good in determining the farm's capacity to make profit and eventually in determining its performance. The agricultural producer's major objective is both the increase in his possessions and the increase in the farm's value, to ensure its own development. (Alecu,2006) Achieving this objective is conditioned by performing a *profitable* activity, which allows the *remuneration* of the production factors and capitals used, regardless of their origin (Vasile, 2006).

MATERIALS AND METHODS

The paper synthetically presents the intermediary management balance sheets, as the main economic-financial indicators established according to crops (early potato, autumn cabbage and pickled cabbage) and total farm, with whose help we characterize the way in which the material, financial and human resources of SC OANCEA OMV SRL, village of Lunguletu, Dambovita county are used. An intermediary management balance sheet is calculated as the difference between two values. Indicators under the form of balance sheets, also called margins, SIG emphasis the stages in creating the intermediary balance sheet, in close connection to the revenues and expenses structure associated with the activities from SC OANCEA OMV SRL. Through successive deductions, we obtain indicators which characterize the profitability and management of the analyzed agricultural business, some being found directly in the profit and loss account, others being calculated in the case of intermediary management balance sheets (SIG).

RESULTS AND DISCUSSIONS

The profit and loss account reflects the company's *performance,* or its capacity to generate profit, expressed in its ability to generate future cash (revenue) *flows* by means of using the existing resources (expenses in the interval), allowing to establish the *efficiency* level in using new resources (Ristea, 2004). The intermediary management balance sheet cascade has the features of the company and they are *value indicators* of the production and marketing.

The commercial margin (MC) or gross margin is the first intermediary management balance sheet and it refers to the commercial activity performed by various economic agents. In the case of SC OANCEA OMV SRL, this indicator is null because the agricultural activity performed by the agricultural producer involves production, therefore obtaining finished products and not only trade (merchandise). This indicator becomes significant in the case of distribution (trading) companies within which it is important to be determined in detail, according to products or groups of products.

The intermediary balance sheet (PE) is an indicator with applicability in agricultural companies and it includes the finished agricultural products value meant to be sold, stored or used for the own needs. Consequently the intermediary balance sheet will include three elements: sold production, stored production (stocks variation) and own work capitalized.

Thus, within SC OANCEA OMV SRL, the intermediary balance sheet is composed of 1.230.000 lei per total farm, of 60,97% the intermediary balance sheet in early potato, 34,14% the intermediary balance sheet in autumn cabbage and 4,87% in pickled cabbage, in which 30% is the production sold by 31.12.2010 and 70% the stock variation.

Since it is not an intermediary management balance sheet, but an entry in the results account, *the turnover* is a global indicator of the sales resulting from the trading and production activity (obtained by adding the merchandise sales and the production sold). Because the agricultural producer does not sell merchandise, his basic activity being the agricultural production, the turnover level is the same as the sold production level, amounting to 1.188.000 lei at the end of 2010.

The added value (VA) expresses the creation or increase in value brought by the agricultural producer to the goods or services from third parties. This intermediary management balance sheet is a gross added value which makes the connection between micro and macroeconomic. The added value allows for the comparison between farms in order to better measure their contribution to agriculture. The agricultural producer who records a higher added value, implicitly makes a more important contribution. At farm level, the added value is an indicator which allows for measuring its economic power, which was determined by the difference between the global intermediary balance sheet (obtained by adding the gross margin and the intermediary balance sheet) and the consumption of goods and services provided by third parties for the respective production.

It is noticed that SC OANCEA OMV SRL achieved a money accumulation margin (VA) of 925.516 lei composed of 56.16% value added to the early potato, 40.89% value added to the autumn cabbage and 2.95% value added to pickled cabbage.

The money accumulation margin (VA) is of special interest because:

• it makes the connection between the micro and macroeconomic level.

• it represents a criterion in assessing the specific contribution of the farm to its production. The added value is a more synthetic indicator than the turnover, emphasizing the commercial performance of the company, respectively its capacity to sell and produce.

• it reflects the degree of using the factors of production.

The gross operation excess/deficit of the business (EBE) corresponds to the economic result of the farms generated by the operations independently from the financial activity, the depreciation method used and the creation of provisions or not, which makes it be consider as an essential indicator in the management analyses and in performing comparative analyses between agricultural trading companies. The gross operation excess within SC OANCEA OMV SRL amounts to 672,485 lei and it is composed of 60.56% operation excess for the early potato, 36.65% operation excess for the autumn cabbage and 2.79% operation excess for pickled cabbage. The role of the gross operation excess may be seen in three aspects:

- it is the measure of the agricultural company's economic performances: based on calculating it, the agricultural producer may decide or not to renew his fixed assets through depreciation,

covering risks from established provisions and ensuring his funding which involves financial expenses, and the difference will be distributed to the state (corporate tax), to the shareholders (dividends) and/or preserved through self-funding.
- EBE is independent from the financial policy (it is not influenced by revenues and expenses), the investment policy (it does not take account of the company's decisions on ways to calculate the depreciation), the individual policy (the company's decisions regarding the net profit allocation), the fiscal policy and the exceptional elements (it does not consider the corporate tax and the exceptional result)
- EBE is a fundamental financial source for the company.
- EBE is the first level of the analysis regarding the creation of the company's global treasury, therefore the starting point in the treasury flows picture.

The operation result (RE) assesses the economic profitability of the analyzed farm and corresponds to the normal and current activities of the company, including the operations performed in the previous balance sheets but associated with the current balance sheet. The activity corresponding to the financial and extraordinary operations is not considered. This result is used in comparing the agricultural companies' performances with various financial policies. This indicator was calculated based on the relation:

$$\boxed{RE = EBE+AVE-ACE-CAP}$$

In which RE- the operation result, AVE – other operation revenues, ACE – other operation expenses, CAP – expenses on depreciation and provisions.

Calculating the operation result for SC OANCEA OMV SRL, led to the following results: for total farm, its absolute value is of 639,267 lei, composed of 60.76% early potato, 37.47% autumn cabbage and 1.77% pickled cabbage.

The current result (Rc) is the result of all the current, regular operations of a farm, being determined both by the current operation result and by the result of the financial activity, also allowing the assessment of the agricultural company's financial policy impact on profitability. Because it is not influenced by extraordinary elements, this balance sheet allows for the analysis of the agricultural company's current result dynamics along several balance sheets.

Considering that the analysed agricultural company does not have financial revenues, and its financial expenses are reduced to the bank interests to the credit purchased for a means of transport, the current result is not much more different from the operation result and it represents the absolute value of 637,461 lei per total farm.

The lack of *extraordinary result* was reflected in the equality between the current result and the *gross result*, whose absolute value is 637,461 per farm and composed of 60.73% gross result of the balance sheet for the early potato, 37,50% gross result of the balance sheet for the autumn cabbage and 1,76% gross result of the balance sheet for the pickled cabbage.

By applying the corporate tax (16%) on the gross result of the balance sheet, we calculated the net result of the balance sheet amounting to de 535,467 lei per total farm, and composed of 60.73%, for the early potato, 37.50% for autumn cabbage and 1.77% for pickled cabbage.

CONCLUSIONS

The profit and loss account allows for the assessment of the company's performances, by means of establishing a connection between the economic activity intermediary balance sheets and the balance sheet flow, starting from the added value.

We notice that in creating the net result of the balance sheet, as well as the other indicators in the flow, the early potato crop makes the highest contribution, with over 60%.

Autumn cabbage makes a contribution of 37.5% to the net result of the balance sheet per farm, due to the fact that this crop is cultivated on only 6 ha of the total far area (15ha).

For the pickled cabbage production, its contribution to the SIG cascade is minor because the agricultural producer has stocks which he markets during the current year.

AKNOWLEDGEMENT

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TABLES AND FIGURES

Table 1

Intermediary management balance sheets SC OANCEA OMV SRL

No	Specification	Early potato	Autumn cabbage	Pickled cabbage	TOTAL FARM
1	Revenues from selling the merchandi	-	-	-	-
2	Expenses regarding the merchandise	-	-	-	-
3	Gross margin (1-2)	-	-	-	-
4	Sold production	750,000	420,000	18,000	1,188,000
5	Stick variation	-	-	42000	42,000
6	Own work capitalized	-	-	-	-
7	Intermediary balance sheet (4+5+6)	750,000	420,000	60,000	1,230,000
8	Seeds / Seedlings	116,250	30,000	-	146,250
9	Fertilizers	58,500	-	-	58,500
10	Pesticides	19,350	4,800	-	24,150
11	Other material expenses	33,088	5,230	32,767	71,085
12	Works and services performed by thi	3,000	1,500	-	4,500
13	Overall intermed consumptions and t	230,188	41,530	3,267	274,985
14	Added value (3+7-13)	519,813	378,470	27,233	925,516
15	Revenues from operation subsidies	3,000	1,200	-	4,200
16	VAT	82,995	60,428	4,348	147,771
17	Land tax	900	360	-	1,260
18	Buildings tax	-	-	-	-
19	Machines tax	1,071	429	-	1,500
20	Other taxes	-	-	-	-
21	Overall expenses on taxes	84,967	61,217	4,348	150,532
22	Salaries	25,893	61,000	3,530	90,423
23	Salary contributions	4,661	10,980	635	16,276
24	Overall personnel expenses	30,554	71,980	4,165	106,699
25	Gross operation excess/deficit	407,292	246,474	18,719	672,485
26	Other operation revenues	-	-	-	-
27	Other operation expenses	3,571	1,429	-	5,000
28	Expenses on depreciation and provisi	15,280	5,471	7,467	28,218
29	Operation result(25+26-27-28)	388,440	239,574	11,253	639,267
30	Financial revenues	-	-	-	-
31	Financial expenses	1,290	516	-	1,806
32	Current result (29+30-31)	387,150	239,058	11,253	637,461
33	Extraordinary revenues	-	-	-	-
34	Extraordinary expenses	-	-	-	-
35	Extraordinary result (33-34)	-	-	-	-
36	Gross intermediary balance sheet res	387,150	239,058	11,253	637,461
37	Corporate tax	61,944	38,249	1,800	101,994
38	Net intermediary balance sheet resul	325,206	200,809	9,452	535,467

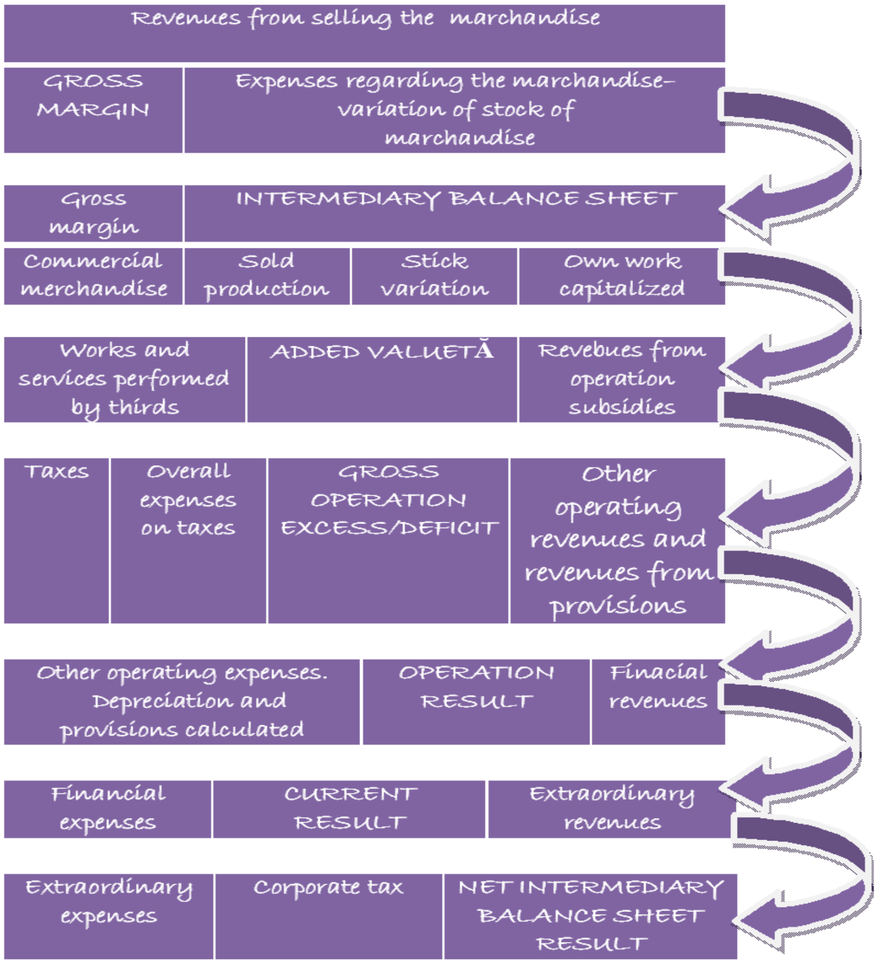

Fig. 1. The intermediary management balance sheet cascade

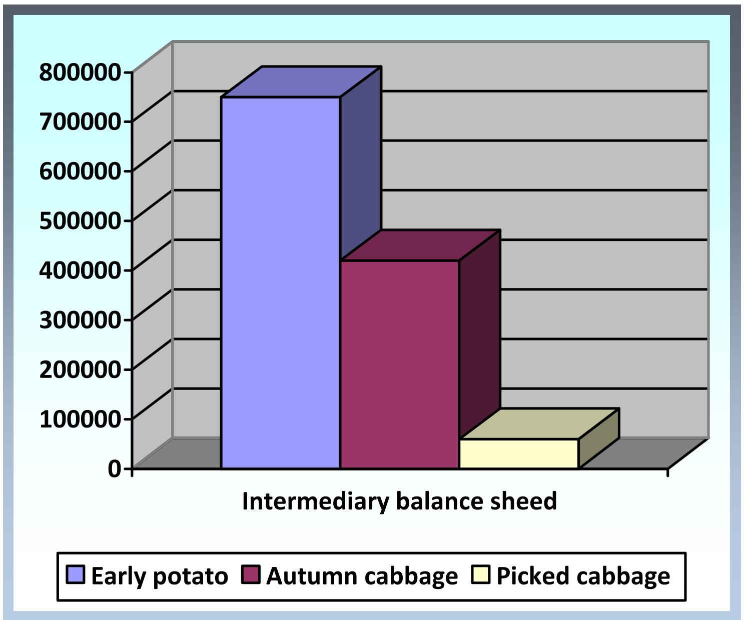

Fig. 2. The intermediary balance sheet

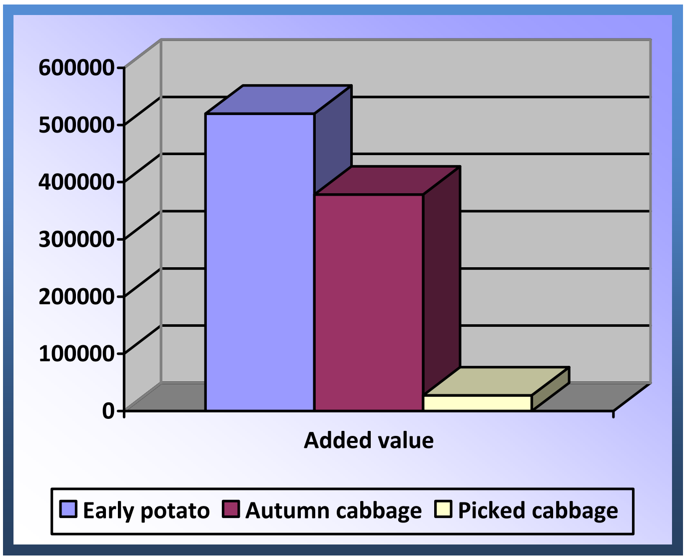

Fig. 3. The added value

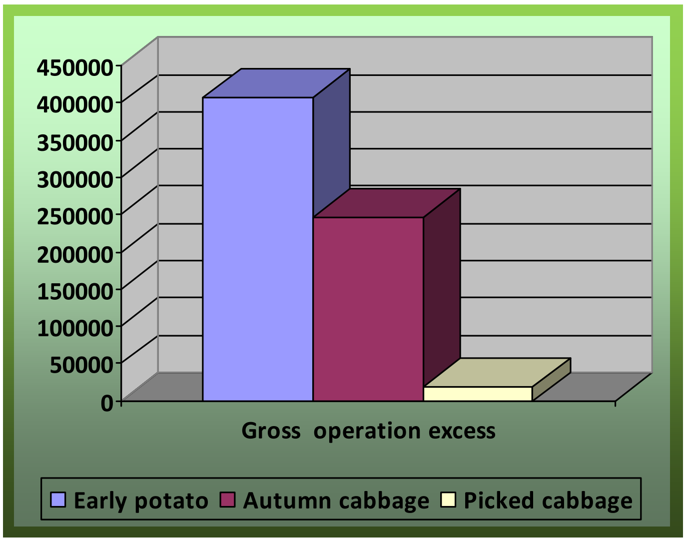

Fig. 4 Gross operation excess

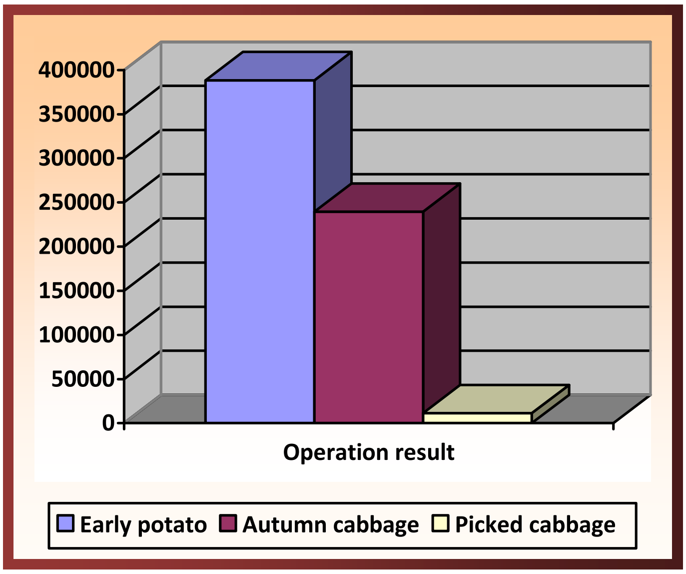

Fig. 5 The operation result

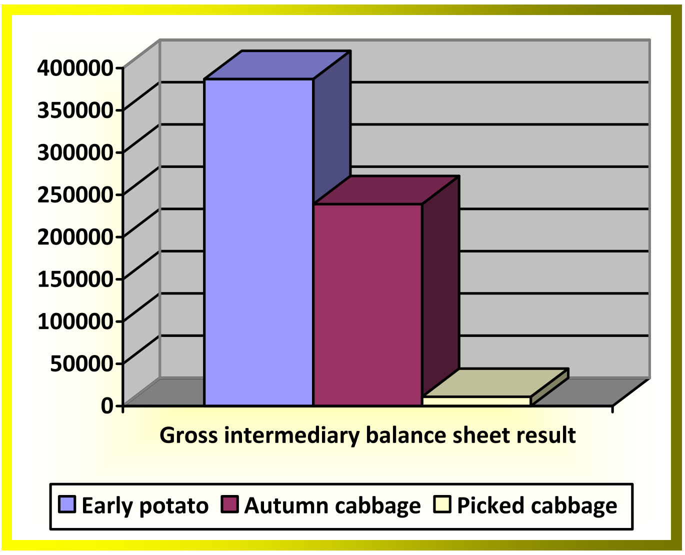

Fig. 6 The gross result of the balance sheet

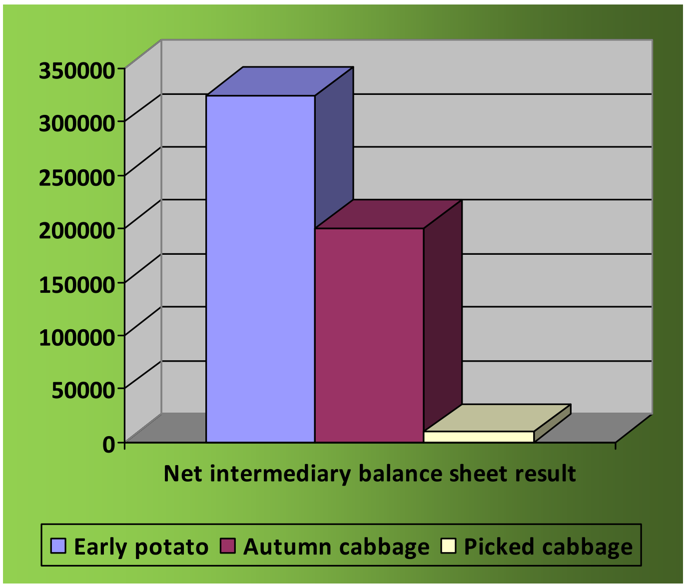

Fig. 7 The net result of the balance sheet

Determination of biogenic amines in bananas by high performance liquid chromatography

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Keywords: validation parameters, HPLC, biogenic amines, bananas.

ABSTRACT

This paper report an adaptation of a liquid chromatographic determination of biogenic amines in dry sausages for a vegetal matrix: bananas and an internal validation study. All nine biogenic amines (tryptamine, 2-phenylethylamine, putrescine, cadaverine, histamine, serotonin, tyramine, spermidine and spermine) were well separated. The range of linearity was from 0.5 to 7 µg/ml for all 9 amines and the correlation coefficients were between 0.9928 and 0.9994 for all standard curves. The detection limit and quantitation limit values range from 5 to 50 and 10 to100 µg/l, respectively. Relative standard deviation values of repetitiveness and reproducibility range from 0,71 to 3,62 and 1,4 to 3,93, respectively. Recovery was between 67 and 102% for all amines.

INTRODUCTION

Monitoring of biogenic amines in foods is important for health (Kalac et al., 2005a), some of these (histamine, tyramine, serotonin, cadaverine, putrescine) exerting powerful physiological effects or toxic in certain concentrations. Although present in relatively small quantities in most fruits and vegetables (Cirilio et al., 2003; Kalac et al., 2005b; Moret et al.,2005; Lavizzari et al., 2006), quantification of biogenic amines is of interest because of the existence of consumers who are at health risk categories. This would include both patients treated with painkillers and drugs used for the treatment of stress, depression, Alzheimer's and Parkinson's diseases, that act as a blocker of monoamine oxidase and diamine oxidase, the route of detoxification of these compounds (Bardocz, 1995), and infants and young children, knowing that fruits and vegetables are introduced early in their diet.

High performance liquid chromatography (HPLC) is the most common method of separation and quantification of biogenic amines (Onal, 2007).

The aim of this study was to adapt a HPLC method for determination of biogenic amines in dry sausages for a vegetal matrix: bananas and developing an internal validation study focused on the following performance characteristics: linearity, accuracy, precision (repetitiveness and reproducibility), sensitivity (limit of detection, limit of quantization).

MATERIALS AND METHODS

1. Samples

Bananas were obtained from Romanian retail stores and analyzed soon after purchase.

2. Reagents and standards

Tryptamine, 2-phenylethylamine, putrescine, cadaverine, histamine, serotonin, tyramine, spermidine, spermine and internal standard 1.7 diaminoheptane were purchased from Sigma-Aldrich. The 1 mg/ml stock solutions of biogenic amines and internal standard were prepared, which were kept in the refrigerator for a month. These solutions were used for preparation of standard solutions (100µg/ml) used for the calibration curves. All other reagents used were p.a. grade and solvents were HPLC grade.

3. The analytical procedure has been adapted in the Chemistry and Biochemistry Laboratory of the Institute HORTING following a previously published protocol (Eerola et al., 1993). A 5 g of sample, previously homogenized with a mixer, were added directly into a centrifuge tube. Then 250 µl internal standard stock solution and 10 ml perchloric acid 0.4

mol/l were added and the sample was homogenized using a SilentCrusher M equipment. The two phases were separated by centrifugation at 4000 rpm for 10 minutes with the device centrifuge EBA 21 and supernatant was collected into 25 ml flask through filter paper. The pellet was further extracted with 10 ml perchloric acid solution and the supernatants were combined and final volume was adjusted to 25 ml with perchloric acid solution.

The protocol for derivatisation of sample extracts with dansyl chloride.

To prepare dansyl derivatives 0.5 ml of the extract previously obtained was processed: 100 µl sodium hydroxide solution 2mol/l, 150 µl saturated sodium bicarbonate solution and 1 ml of dansyl chloride (10 mg/ml acetone) were added to the sample into a centrifuge tube. The mixture was thoroughly mixed with REAX control shaker for 1-2 minutes and then left at 40^0 for 45 minutes. After that sample was maintained at room temperature for 10 minutes, then was treated with 50 µl ammonia, to remove dansyl chloride excess, vortexed with REAX control shaker for 1-2 minutes, then maintained at room temperature for 30 minutes. Then 3.2 ml of ammonium acetate/acetonitrile (1:1 v/v) were added to the sample, the mixture vortexed with REAX control shaker, then filtered through 45µm filter in chromatography vials. Dansyl derivatives of calibration standard mixture were prepared together with samples as previously described. HPLC analysis was performed with a Finnigan Surveyor Plus liquid chromatograph (Thermo Electron Corporation) consisted of a quaternary pump, vacuum degasser, diode array UV VIS detector, an autosampler thermostat type Peltier. Chromatographic separation was performed using a BDS Hypersil C18 column (250 * 4.6 mm), 5µ particle size (Thermo Electron Corporation).

Mobile phase consisted of ammonium acetate 0.1 mol/l (solvent A) and acetonitrile (solvent B). We modified gradient elution program proposed by Eerola et al. (1993), (table 1). The flow rate of the mobile phase was 1ml/min, column temperature was set at 40^0C.

Dansylated derivatives of biogenic amines were UV detected at 254 nm. The control, data acquisition and processing software used ChromQuest 4.2. (ThermoFinnigan).

RESULTS AND DISCUSSIONS

Modifying gradient elution programme proposed by Eerola at al. (1993) we found that resolution of serotonin and the internal standard was good (figure 1 and figure 2), although Eerola et al., (1993) asserted that the overlapping of serotonin and internal standard peaks did not interfere with the quantization because the samples investigated contained no serotonin or only very small amounts.

The linearity of the method was tested by injecting seven standard solutions of biogenic amines. The range of linearity was from 0.5 to 7 µg/ml for all 9 amines and the correlation coefficients were between 0.9928 and 0.9994 for all standard curves.

The accuracy of the method was examined from the results of the recovery by means of standard addition procedure (table 2). For the recovery assays a known amount of biogenic amines was added to the sample (to achieve 1 µg/ml in extract).

Satisfactory recovery was obtained for all amines (67-102%).

Precision of the method was examined for two levels of precision: repetitiveness and reproducibility. To evaluate the repetitiveness of the method, five determinations of a banana sample were performed using the same reagents and apparatus. Reproducibility of the method was assessed by analyzing six times a banana sample by two analysts. A known amount of biogenic amines was added to the sample (to achieve 2 µg/ml in extract).

Precision of the method (expressed as relative standard deviation of repetitiveness and reproducibility) range from 0,71 to 3,62 and from 1,4 to 3,93, respectively (table 3 and table 4). Except for putrescine, relative standard deviation of repetitiveness values was comparable to those reported by Eerola et al., (1993).

Limit of detection (LOD) is given as the concentration of the analyte that gives an absorbance signal three times higher than background noise while limit of quantization (LOQ) is given as the lowest concentration of analyte that can be determined with an acceptable accuracy in terms of methods of analysis.

LOD and LOQ values range from 5 to 50 and from 10 to100μg/l, respectively (table 5). LOD and LOQ values registered, except for histamine, are comparable to those reported by Gosetti et al. (2007).

CONCLUSIONS

Adapted method allowed the separation of biogenic amines in bananas with good resolution, including good resolution of serotonin and internal standard (1.7 diaminoheptane).

Values of validation parameters recommend this method for determination of biogenic amines in bananas.

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TABLES AND FIGURES

Table 1

Gradient elution programme for the separation of biogenic amines in bananas.

Time (min)	Gradient	
	Ammonium acetate (A) (%)	Acetonitrile (B) (%)
0,01	40	60
15	40	60
20	30	70
25	5	95
30	40	60

Table 2

Recovery (%) of the method for the determination of biogenic amines in bananas (total samples = 3).

Biogenic amine	Recovery (%) ± SD
tryptamine	76.45± 0,46
2-phenylethylamine	94.03±1,85
putrescine	81.51±4,86
cadaverine	101.84±2,63
histamine	68.83±12,36
serotonin	77.03±7,55
tyramine	79.16±2,58
spermidine	77.00±3,61
spermine	67.16±4,81

SD= standard deviation

Table 3

Precision of the method (as relative standard deviation of repetitiveness)

Biogenic amine	x±SD RSD
tryptamine	1,701±0.049 2,88
2-phenylethylamine	1,741±0.063 3,62
putrescine	2,564±0.058 2,26
cadaverine	1,737±0.059 3,40
histamine	1,802± 0.027 1,50
serotonin	1,537±0.011 0,71
tyramine	1,687±0.057 3,38
spermidine	2,037 ±0.055 2,70
spermine	1,851±0.029 1,57

x±SD= mean±SD

Table 4

Precision of the method (as relative standard deviation of reproducibility)

Biogenic amine	x±SD RSD
tryptamine	1,704± 0.050 2,93
2-phenylethylamine	1,757±0.069 3,93
putrescine	2,576±0.059 2,29
cadaverine	1,748±0.066 3,77
histamine	1,806±0.031 1,72
serotonin	1,548±0.028 1,81
tyramine	1,698±0.058 3,41
spermidine	2,048±0.057 2,78
spermine	1,85±0.026 1,40

x±SD= mean±SD

Table 5

Sensitivity of the method for the determination of biogenic amines in bananas

Biogenic amine	LOD, µg/l	LOQ, µg/l
tryptamine	6	12
2-phenylethylamine	50	100
putrescine	22	44
cadaverine	30	60

histamine	35	70
serotonin	15	30
tyramine	6	12
spermidine	5	10
spermine	9	18

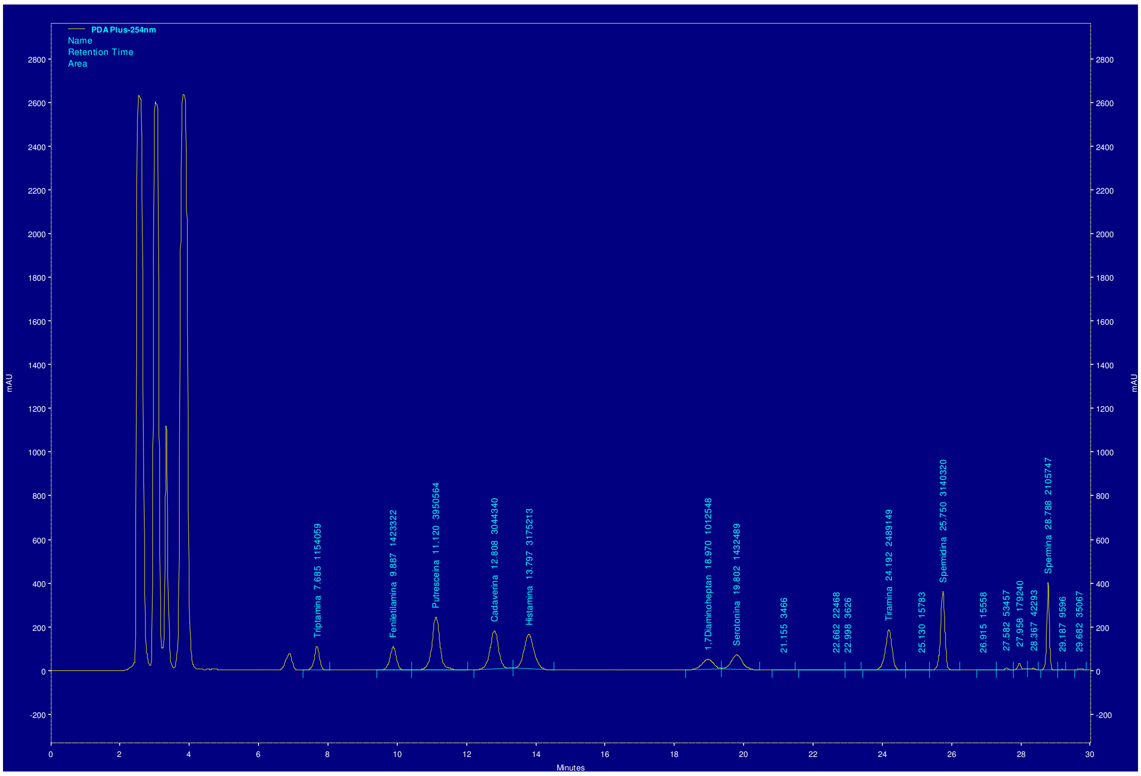

Fig. 1. Chromatographic separation of dansyl derivatives of biogenic amines (1.5 µg/ml) by gradient elution.

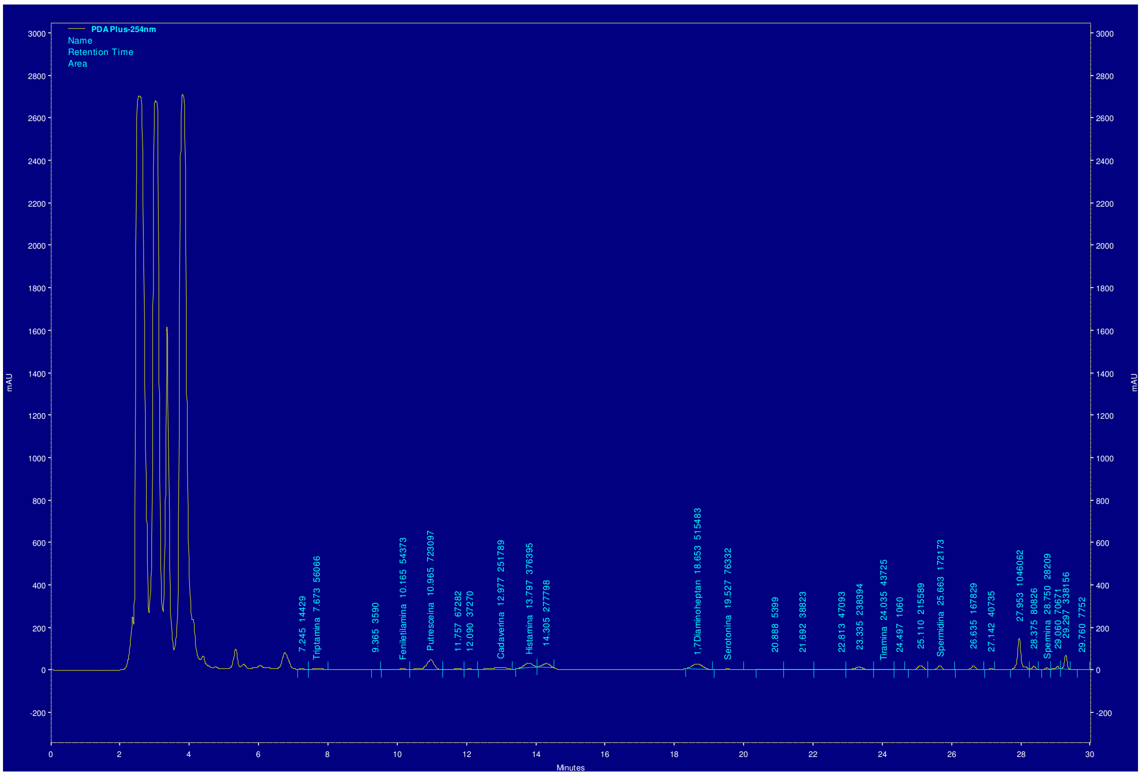

Fig.2. Chromatogram of biogenic amines extracted from bananas.

The diversity of local isolates *Bacillus thuringiensis* as a biological pest control agents *Plutella xylostella Linn* and *Crocidolomia binotalis Zell* toward cabbage crops in south Minahasa Regency

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ABSTRACT

The purpose of this study was to isolate the bacterium *Bacillus thuringiensis* from soil and find out the pathogenicity *B. thuringiensis* against the *pest Plutella xylostella* and *Crocidolomia binotalis.* The research was conducted in the laboratory Department of Plant Pests and Diseases Faculty of Agriculture Sam Ratulangi Manado. The method used is the method of sampling with three replicates for each location. Soil samples taken at each location as much as 100 grams, put in plastic bags and labeled with the date and location of the next below to the laboratory for the isolation. Caterpillars *P. xylostella* and *C. binotalis* collected from cabbage crop in plantations Rurukan subdistrict, Tomohon then kept in the laboratory with cabbage leaves to feed larval instar III to obtain required for testing. Laboratory studies include the isolation of bacteria from soil samples and purification of bacterial inoculum to obtain *B. thuringiensis* is pure and will be used in testing. Isolation results in getting the four isolates of *B. thuringiensis* isolates namely THMS, TCMS, TJMS and TSMS. These isolates showed characteristics of *B. thuringiensis*. Morphologically vegetative cells of *B. thuringiensis* rod-shaped chain with oval spores and crystals are located separately paraspora with spores. The four isolates are capable of causing the death of the larvae of *P. xylostella* and *C. binotalis*. The results showed that isolates TCMS and TSMS with the highest concentrations at 96 observation hours to be able to kill the larvae of *P. xylostella* to 96.67% followed TJMS isolates and a low of 73.33% of isolates THMS, while testing on the larvae of *C. binotalis* with the highest concentration at the observation hours to 96, isolates TSMS capable of killing up to 96.67% followed by 80.00% ie TCMS isolates and isolates the lowest THMS and TJMS ie 46.67%. Based on the test results, it can be concluded that the four isolates of THMS, TCMS, TSMS and TJMS can cause death for caterpillar *P. xylostella* and *C. binotalis*. Based on the conducted tests, besides having the mortality of the tested caterpillars, it was also able to cause abnormalities of growth and development of next stadia.

INTRODUCTION

Cabbage plays an important role for both producers and the consumers. The role of vegetables in the national economy has increased because in some horticultural centers they have managed to export some vegetables such as cabbage, potatoes and peppers (Lucky, 1992). Sprouts contain many vitamins and minerals that are needed by human body, can also help digestion of food and neutralize acidic substances (Pracaya, 1989). Nutrient composition per 100 g cabbage is 25 cal calories, 1.7 g protein, 0.2 g fat, 5.3 g carbohydrates, 64 mg calcium, phosphorus 26 mg, iron 0.7 mg, 8 mg sodium, niacin 0 , 3 mg, fiber 0.9 g, ash 0.7 g, 75 SI of vitamin A, vitamin B1 0.1 mg, 62 mg vitamin C and water (Cahyono, 2002; Rukmana, 1994; Schellhorn, 2001; Unjianto, 2004 ; Watada, 1987).

North Sulawesi is an area that has a sizable crop of vegetables in the eastern part of Indonesia. Cabbage crop area harvested in 2004 was 524 ha with a production of 10,480 tons. According to Cahyono (2002) in areas with rained conditions, and the maintenance of semi-intensive, crop plants can only produce about 25-35 tons per ha, while in intensive care by using technology intensification, crop plants can produce up to about 85 tons of fresh per ha, depending on their varieties. The low production of cabbages in North Sulawesi is caused by a system of farming that is still applying the conventional way and level of damage by plant pests, especially by *P. xylostella* and *C. binotalis* which is high enough (Korinus, 1995).

Until now the focus of pest control cabbage plants in Indonesia, especially in North Sulawesi, the farmers still perform excessively chemical control both in terms of dose and number of treatments. In terms of suppression of pest populations, the usage of insecticides work well, however, it should be kept in mind about the existence of undesirable side effects (Soeroto, et al., 1994).

As with other biological control (parasitoids and predators), the use of pathogens in the field can be done by ways of introducing pathogens into the pest population in the hope of pressing is more permanent. The use of pathogenic *Bacillus spp*. is hope to have developed in the future, because it is easy and cheap as well as its application is effective and environmentally sound.

B. thuringiensis is one of the biological agents that is entomopathogenic. The main characteristic of *B. thuringiensis* is its ability to produce protein toxin crystals Cry (δ-endotoksin) in the cells together with endospores when cells undergo sporulation.

δ-endotoxins produced by bacteria cells are capable of causing paralysis of the digestive tract of insect larvae, whereas endospores can cause septicemia in digestive tract of insect larvae (Andrews et al, 1987; Baumann et al., 1984; Baum & Malvar, 1995; Falcon, 1971; Sekar, 1988). *B. thuringiensis* has a specific host, not harmful to natural enemies of pests and other non-target organisms, easily biodegradable by the environment, and the pathogenity can be raised by genetic engineering techniques (Khetan, 2001; Lacey et al., 2001; Siegel, 2001). These characteristics lead to *B. thuringiensis* was chosen as an alternative bioinsecticide and began production on an industrial scale.

MATERIAL AND METHODS

A. Place and Time of Research

The research was conducted at the Laboratory of Plant Pests and Diseases Department of Faculty of Agriculture Sam Ratulangi University Manado. The duration of the study is a year (January to December 2010).

B. Research Methods:

a. Soil Sampling.

Soil used for the isolation of the bacteria *B. thuringiensis* in this study were drawn from the South Minahasa Regency that is forest ground, cloves plantation ground, coconut ground, vanilla, corn and bean farms, technical rice fields and rained rice fields , all fields which cultivated and uncultivated. Repetition of this activity is performed 3 times at different places.

Using a spade, as much as 100 grams of soil samples taken at depths of 15-20 cm from the ground. Soil samples is then inserted into a plastic bag and labeled with a description of where it was taken.

b. Isolation of *B. thuringiensis* from soil samples.

To obtain isolates of *B. thuringiensis*, a total of 1 gram of soil samples from each site suspended in 9 ml distilled water (sterile aquades) in a test tube, then diluted 101 times, 102 times and 103. Three serial dilutions of the end is heated in a water heater on temperature -80°C for 10 minutes. Further dilutions of each suspension was heated retrieved by using 0.1 ml volume of 1 ml sterile pipette and spread in cups with the cup method on NA medium (Nutrient agar). Cups after being wrapped in plastic are set in the inverted position incubated at room temperature for 48 hours.

Colonies that grew from the cupping techniques are then observed their morphology. Colonies showing the characteristics of *Bacillus*, is characterized by a sequential number by using markers on the outside of the cup. Colonies that have been marked with a marker (numbered) made into native preparants for the observed cell morphology using phase contrast microscopy at 1000 times magnification. Whenever it appears rod-shaped cells that contain the spores and the presence of inclusion bodies or protein crystals inside or outside the cell, then the colony is suspected as *B. thuringiensis*. Colonies suspected of being marked with the serial number on the plate and then purified by the method of the cup scratch NA. Two days later the colonies of the purification grew again examined under a phase contrast microscope. If the result is positive, it indicates the existence of *B. thuringiensis*. Colonies that are separate from the others then cultured on tilt agar. Isolates in order to tilt after growing colony morphology was observed again. If it is still found the contaminants in order to tilt bacteriophages, culture was purified again. Only isolates that have been actually used purely for testing toxicity to insects.

c. Identification

Identification is done by observing the morphology of colonies that grow. Colonies of *Bacillus spp*. has the following characteristics: circular forming colony, with a lobate edge, elevation colonies effuse, yellowish-white colony color. Colonies which allegedly marked with a marker on the outside, and morphology cell was observed with a microscope at high magnification (1000 x). Tests carried out under the microscope by first making the preparation wet on glass-preparation which is done by dripping a drop of distilled water on its surface using an ose needle and taken a small amount of then mixed with water droplets then covered with glass cover. Examination with a microscope can be performed after the cover glass surface dripping with immersion oil. Colonies are thought to consist of cells rod-shaped bacterium, have spores, and has a protein crystal. Colonies are numbered and reisolated on media or growing colonies that grew the same characteristics with the suspected colony which was inoculated again on the media side to be stock, then incubated at room temperature. Isolates that grew on the slanted media were reobserved their morphology. Pure isolates are stored as a stock for killing power testing.

a. Isolates testing of Lava

Pure isolates obtained from various soil samples in South Minahasa regency which has been stored in order to tilt tested its toxicity against the larvae of *P. xylostella* and *C. binotalis*. Stage activities to be carried out are the mass breeding of insects, the preparation of the suspension isolates, and toxicity testing of isolates against larvae.

- Bulk Breeding Insects

Larvae of *P. xylostella* and *C. binotalis* derived from cabbage plants in South Minahasa District, retrieved and maintained in the laboratory department of Plant Pests and Diseases, Faculty of Agriculture Sam Ratulangi University Manado; with fed cabbage leaves. At the bottom of the cabbage leaves was prepared the soil to form a pupa in particular places for pests *C. binotalis* . Clumps of soil that has been formed and contain pupae were separated and put in a netting cage. When the imago has emerged in the netting cage, then inside the netting cage was hung a cotton having drops of honey to feed the imago. Groups of eggs on the leaf surface both from the multiplication of *P. xylostella* and *C. binotalis* were placed in cups filled with cabbage leaves. Once the larvae of both insect pests have already entered the third instar, the larva is ready to be tested.

- Preparation of Suspension Isolates

Isolates which were going to be tested their toxicity were bred nutrient medium in order to count the number of spores. Besides, the entire colony in a single tube to be tilted (from one type isolates) were diluted 100 times, to be used in preliminary trials. In the preliminary test calculations based on the calculation results spore isolates have been used or considered as a standard. Counting spores was used hemocytometer. Colonies which will be used in preliminary tests have a particular protein crystal rhombus shaped (rhomboidal).

- Toxicity Test Isolates

1). Introduction. Preliminary test to determine the range of concentrations of *B. thuringiensis* that can kill larvae test *P. xylostella* and *C. binotalis*. From pure culture *B. thuringiensis* aged 8 days old *B. thuringiensis* determined four levels of concentration of *B. thuringiensis* by performing multilevel dilution (Ohba et al., 1981). Treatment of screening tests of killing power performed using the method feed test with immersion method leaves (leaf dipped method), by using pieces of cabbage leaves size 5 cm x 5 cm. Cabbage leaves dipped in each concentration for five minutes and then dried. Each leaf then put in a sterile test bottles (Hamilton and Atia, 1977). Each bottle is inserted both 10 head caterpillar *P. xylostella* and *C. binotalis*. Each concentration treatment was repeated three times. Mortality was observed every day. Larvae are declared dead if it does not cause a reaction to the touch and show symptoms of other deaths.

The calculation of the number of spores carried out by taking 0.5 ml suspension of the lowest dilution series with 2 drops of Tween 20 and then shaken until homogeneous. The used haemositometer has the measurement of 0.0025 mm 2 and in 0.1 mm so that the volume of each plot was 0.00025 mm 3. Calculation of spores carried on five fields of view consisted of ten plots haemositometer. This calculation is repeated several times and then searched the average then included in the formula the number of spores per ml. This can be searched in the following way;

$$X = \frac{n}{0.00025\ mm^2} = \frac{400}{1\ mm^3} = \frac{4x10^6}{ml}$$

Description:
X = number of spores per milliliter suspension
n = average number of spores counted on each plot

Observation of larval mortality of *P. xylostella* and *C. binotalis* is conducted 12 hours after application and thereafter every 24 hours. When there are deaths in the control formula corrected by Abbott as follows:

$$P = \frac{P'' - C}{100 - C} X100\%$$

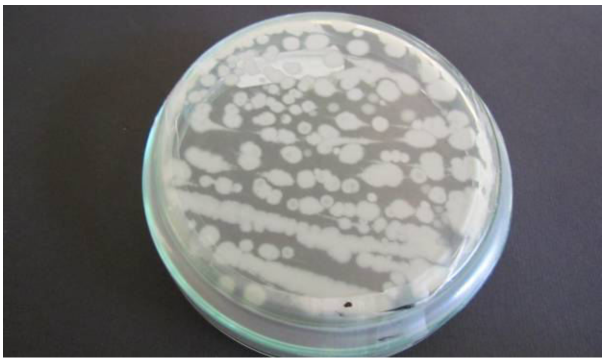
Description:
P = Percent corrected mortality
$P^{>}$ = Percent mortality observed
C = Percent control mortality

This formula is used when death according to the control less than 20%. When the mortality reached 20% then treatment should be repeated.

RESULTS AND DISCUSSIONS

A. *Bacillus thuringiensis* isolates

Isolation of bacteria from soil samples taken from the South Minahasa Regency that is on forest ground, cloves plantation ground, coconut ground, vanilla, corn and bean farms, technical rice fields and rained rice fields , all fields which cultivated and uncultivated. Based on the observation of morphological features and cell colonies, it is obtained four isolates as *Bacillus thuringiensis*. The four isolates were South Minahasa Forest ground (THMS), South Minahasa Cloves ground (TCMS), South Minahasa Corn ground (TJMS) and the Rice Fields of South Minahasa (TSMS). Bacterial growth on culture media showed that the morphology of the colonies to the four isolates were circular form, lobate colony edge, elevation colonies effuse, yellowish-white colony color Figure 1).



B. Mortality Caterpillars *C. binotalis* and *P. xylostella*

From the test results *B. thuringiensis* isolated from soil samples of isolates THMS, TCMS, TSMS and TJMS can lead to death in larvae of *C. binotalis* and *P. xylostella*. Percentage mortality of larvae of C. THMS isolates binotalis on treatment at the highest concentration was between 3.33% to 46.67% and the lowest concentration of test caterpillar mortality percentage between 3.33% and 7%. TCMS isolates at the last observation is at 96 hours after treatment to the highest concentrations can reach 80% and the lowest concentration of only 13.33%. In TJMS isolates at 96 hours after treatment the highest concentration reached 96.67% and lowest 46.67%. In testing without treatment or control of caterpillar mortality was 0%.

Testing isolates *B.thuringiensis* THMS, TCMS, TJMS and TSMS on larval *P. xylostella*, treatment isolates THMS concentrations at 96 hours of observation after treatment was 73.33% highest and lowest 30.00%. At TCMS treatment isolates the highest concentration reached 96.67% and lowest 66.67%, TJMS isolates, the highest concentration reached 90.00% and lowest 50.00%, while the isolates TSMS highest concentration reached 96.67% and lowest 66, 67%. In testing without treatment or control was 0% (Tables 1 and 2)

Table 1

Percentage Mortality of *P. xylostella* larvae instars III with treatment *B. thuringiensis* isolates THMS, TCMS, TJMS and TSMS

Isolates	Dilution	Concentration (spores/ml)	Percent Mortality of Silkworm In Hours To:				
			12	24	48	72	96
THMS	10^0	$6{,}24.10^7$	6,67	30,00	36,67	56,67	73,33
	10^{-1}	$6{,}24.10^6$	3,33	30,00	33,33	50,00	70,00
	10^{-2}	$6{,}24.10^5$	3,33	30,00	30,33	46,00	60,00
	10^{-3}	$6{,}24.10^4$	0,00	26,67	26,67	30,00	33,33
	10^{-4}	$6{,}24.10^3$	0,00	13,33	23,33	26,67	30,00
	Control	0	0,00	0,00	0,00	0,00	0,00
TCMS	10^0	$8{,}66.10^7$	3,33	36,67	56,67	80,00	96,67
	10^{-1}	$8{,}66.10^6$	0,00	33,33	53,33	76,67	93,33
	10^{-2}	$8{,}66.10^5$	0,00	20,00	46,33	73,33	80,00
	10^{-3}	$8{,}66.10^4$	0,00	13,33	43,33	66,67	70,00
	10^{-4}	$8{,}66.10^3$	0,00	13,33	23,33	26,67	30,00
	Control	0	0,00	0,00	0,00	0,00	0,00
TJMS	10^0	$6{,}34.10^7$	6,67	30,00	46,67	80,00	90,00
	10^{-1}	$6{,}34.10^6$	3,33	10,00	43,30	70,00	83,33
	10^{-2}	$6{,}34.10^5$	3,33	6,67	36,67	56,67	73,33
	10^{-3}	$6{,}34.10^4$	0,00	0,00	16,67	46,67	60,00
	10^{-4}	$6{,}34.10^3$	0,00	0,00	10,00	23,33	50,00
	Control	0	0,00	0,00	0,00	0,00	0,00
TSMS	10^0	$9{,}65.10^7$	13,33	46,67	63,33	83,88	96,67
	10^{-1}	$9{,}65.10^6$	13,33	36,67	53,33	80,00	93,33
	10^{-2}	$9{,}65.10^5$	6,67	26,67	43,33	76,67	83,33
	10^{-3}	$9{,}65.10^4$	3,33	13,33	40,00	66,67	76,67
	10^{-4}	$9{,}65.10^3$	0	6,67	30,00	46,67	66,67
	Control	0	0,00	0,00	0,00	0,00	0,00

Description: Mortality at 6 hours after treatment was 0%

THMS = Forest ground TCMS = Cloves ground

TJMS = Corn ground TSMS = Rice Field

Table 2

C. Larvae Mortality Percentage binotalis instar III with treatment *B. thuringiensis* isolates THMS, TCMS, TJMS and TSMS

Isolates	Dilution	Concentration (spores/ml)	Percent Mortality of Silkworm In Hours To:				
			12	24	48	72	96
THMS	10^{0}	$6{,}24.10^{7}$	3,33	16,67	26,67	40,00	46,67
	10^{-1}	$6{,}24.10^{6}$	0,00	13,33	26,67	33,33	46,67
	10^{-2}	$6{,}24.10^{5}$	0,00	13,33	20,00	30,67	40,00
	10^{-3}	$6{,}24.10^{4}$	0,00	10,00	16,67	16.67	26,00
	10^{-4}	$6{,}24.10^{3}$	0,00	10,00	13,33	13,33	16,67
	Control	0	0,00	0,00	0,00	0,00	0,00
TCMS	10^{0}	$8{,}66.10^{7}$	6,67	26.67	36,67	66,67	80,00
	10^{-1}	$8{,}66.10^{6}$	3,33	10,00	26,67	46,33	76,67
	10^{-2}	$8{,}66.10^{5}$	0,00	6,67	10,00	33,33	70,00
	10^{-3}	$8{,}66.10^{4}$	0,00	0,00	6,67	16,67	63,00
	10^{-4}	$8{,}66.10^{3}$	0,00	0,00	0,00	6,67	13,13
	Control	0	0,00	0,00	0,00	0,00	0,00
TJMS	10^{0}	$6{,}34.10^{7}$	3,33	6,67	23,3	30,00	46,67
	10^{-1}	$6{,}34.10^{6}$	0,00	3,33	6,67	23,33	43,33
	10^{-2}	$6{,}34.10^{5}$	0,00	3,33	6,67	16,67	20,00
	10^{-3}	$6{,}34.10^{4}$	0,00	0,00	3,33	16,67	23,33
	10^{-4}	$6{,}34.10^{3}$	0,00	0,00	3,33	13,33	16,67
	Control	0	0,00	0,00	0,00	0,00	0,00
TSMS	10^{0}	$9{,}65.10^{7}$	6,67	23,33	46,67	80,00	96,67
	10^{-1}	$9{,}65.10^{6}$	3,33	13,33	36,67	73,33	93,33
	10^{-2}	$9{,}65.10^{5}$	3,33	6,67	23,33	70,00	83,33
	10^{-3}	$9{,}65.10^{4}$	0,00	3,33	20,00	50,00	66,67
	10^{-4}	$9{,}65.10^{3}$	0,00	0,00	6,67	46,67	46,67
	Control	0	0,00	0,00	0,00	0,00	0,00

Description: Mortality at 6 hours after treatment was 0%
THMS = Forest ground TCMS = Cloves ground
TJMS = Corn ground TSMS = Rice Field

Testing the four isolates showed that the observation of 6 hours after treatment, the larvae will not experience death, but already beginning to show symptoms of infection. There are bite marks on feed and feces granules at the base of the bottle. This indicates that the test caterpillars have eaten feed containing bacteria. Behavior of the infected larvae is moving away from the feed and still not moving while in the control larvae remain attached to the feed and feed actively.

The behavior of unmoved caterpillars showed that larvae have been infected. The initial symptoms appear after the test larvae ate food that contains *B.t* is that the larvae begin to become less active and slow movements, feeding activity began to decline. This phenomenon is in accordance with what was proposed by Poinar and Thomas (1982), that the digestive tract is the organ that initially attacked by bacteria. This phenomenon is closely related to eating behavior and metabolic activity. Advanced symptoms are gastrointestinal paralysis occurred due to the crystal protein produced by the *B.t* Delta-endotoxins. Meurut Burgerjon and Mortonret (1971), that the protein crystals will be working actively in the larval digestive tract in alkaline pH is 9.0 to 10.5.

The infected larvae then die, the body changes color from brownish green to blackish brown both on the larvae of *C. binotalis* and *P. xylostella*. In the early death of infected larvae its body is soft, watery and foul smelling but after a few days the larvae begin to dry and then shrink.

Test larvae treated with low concentrations of the four isolates, at the beginning of treatment is still active and showed no reduction in feeding activity. Nevertheless the test larvae at 24 and 48 hours after treatment has begun to experience death.

The low percentage of mortality in the treatment of low concentration is related to the number of spores and protein crystals which were ingested by larvae at the time of testing. This is because the number of spores and protein crystals are attached to the leaves tend to be lower compared with the treatment of high concentration.

The number of spores that enter will determine the relationship between *B.t* with the host. For the occurrence of disease spores required a certain amount, depending on the type of pathogen and host species.

The number of spores that enter also determines the length of time it takes to kill. This is something to do with the activity of bacteria in the digestive tract that includes the formation of spores and protein crystals that dissolve crystals experiencing breakdown by protease enzymes in the gut of middle into fragments that are toxic (Estela et al. 2004). Toxic fragments causing leaks in the intestinal cells ephitelium middle. As a result of this leak, permeability of cells became disrupted and disrupts the transport of ions K, Na, Ca. According to Entwistle et al., (1973) when the toxicity is high enough, there will be paralysis of the intestinal wall; intestinal pH decline followed an increase in blood pH that can cause death of insects.

Different degrees of pathogenicity between strains of the test larvae are influenced by the activity of the cry protein crystal toxin. According to Khetan (2001), Cry toxin activity of protein crystals is determined by the number of genes that are owned by *B.t* cry, cry gene expression level differences, differences in the quality of the amino acid sequence of protein crystal toxin cry and intrinsic factors such as stability during fermentation.

The gene codes cry crystal protein toxin largely contained in the plasmid cells, whereas a small portion is also present in the chromosome cell. Special on *B.t* var. kurstaki, the cry genes present in plasmid cells (Khetan, 2001). According to Crlton and Gawron-Burke (1993), in bacterial cells include *B.t* often encountered phenomenon of plasmid loss of cells during cell division. Plasmids disappear spontaneously and sometimes the disappearance reate is fairly high, reaching more than 1% per cell division. More specifically, De Nap (2004) explains that in each bacteri cell, it is common to find the mechanism of plasmid elimination. Bacteria would do the elimination of plasmids if, within the cell, it contains the incompatible plasmid. l is a plasmid that cannot be consegrated into the offspring cells in the process of cell division (De Nap et al., 2004). Plasmid elimination mechanism may cause a difference in the number of cry genes in each strain. Strains that do not have low pathogenicity against larvae of *C. binotalis* and *P. xylostella* may indicate the possibility of some or all plasmids are incompatible, thus the number of the cry genes is little because the cry gene-containing plasmids were eliminated, while the strains which have high pathogenicity plasmid is likely have only little or even have no incompatible plasmids in the cell so that the number of cry genes is relatively more compared to the number of cry genes in strains that have the plasmid elimination.

CONCLUSIONS

A. Conclusion

1. Results of isolation of bacteria from a soil sample, it was found four isolates obtained *B. thuringiensis* isolates namely THMS, TCMS, TJMS and TSMS. *B. thuringiensis* is characterized by a chain rod-shaped cells with spores and crystals are located paraspora separately with spores.
2. The test of killng power of the four isolates has resulted in a fairly high mortality of larvae of *P. xylostella* and *C. binotalis* and the four isolates could be considered as a potential control agents against plant cabbage caterpillars.

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The techno-economy dynamic system on broiler farming industries in West Java Region

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ABSTRACT

The basic research concept about positive feedback interaction between transformation process of technology and economy path was done with a study case approach on broiler farming industries in West Java region. Technology path transformation as an internal aspect on micro level serves to promote the effectiveness optimality output toward, while economy path as an external aspect on the macro level serves functions to push efficiency leading of production going to input and output price stability. The aim of the research is to seek a systematic and holistic interpretation in determining problem solving model through mechanism of dynamics method system. Furthermore, this information can be used by the decision makers to formulate with appropriate strategies in facing changes of internal and external aspects. The research conclusions: Firstly, for knowledge contribution; the combination of technology and economy concept with regard to the positive interaction feedback is a contribution concept of techno economy knowledge. The mutual interaction is an issue that should be internalized in policy making process. Secondly, for policy contribution: i). in internal aspect, profile improvement of production resources competency among stakeholders need to be a part of policy on micro level, especially technology factor, ii). in external aspect, the price components of chicken meat as an output value, then raw materials and chicken feed as an input value, are macro level policy in economy factor on broiler farming industries determining.

INTRODUCTION

The basic concept of this research is the positive feedback interaction between transformation process of technological path and economy, with a study case approach in broiler farming industries in West Java Region. Technological transformation as an internal aspect on the micro level serves to promote effectiveness toward output optimality, while economy as an external aspect on the macro level functions to push production efficiency leading to the stability of input and output price. The interaction of both factors can reflect maximal profit, in the illustration 1,2 and 3

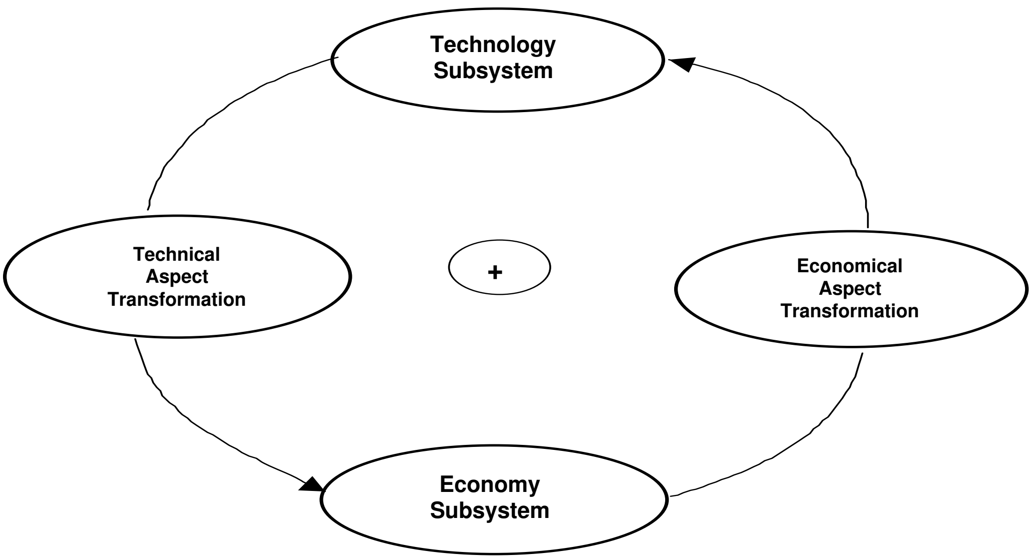

Illustration 1. Techno-Economy System

Generally, the system dynamics of industries is determined by the interaction between internal and external factors. The internal factors of broiler farming are factors directly generated within the industrial system and controllable by the businessmen using technological approach, such as the process of chicken rearing, prevention of chicken mortality, and supply of chicken meat.

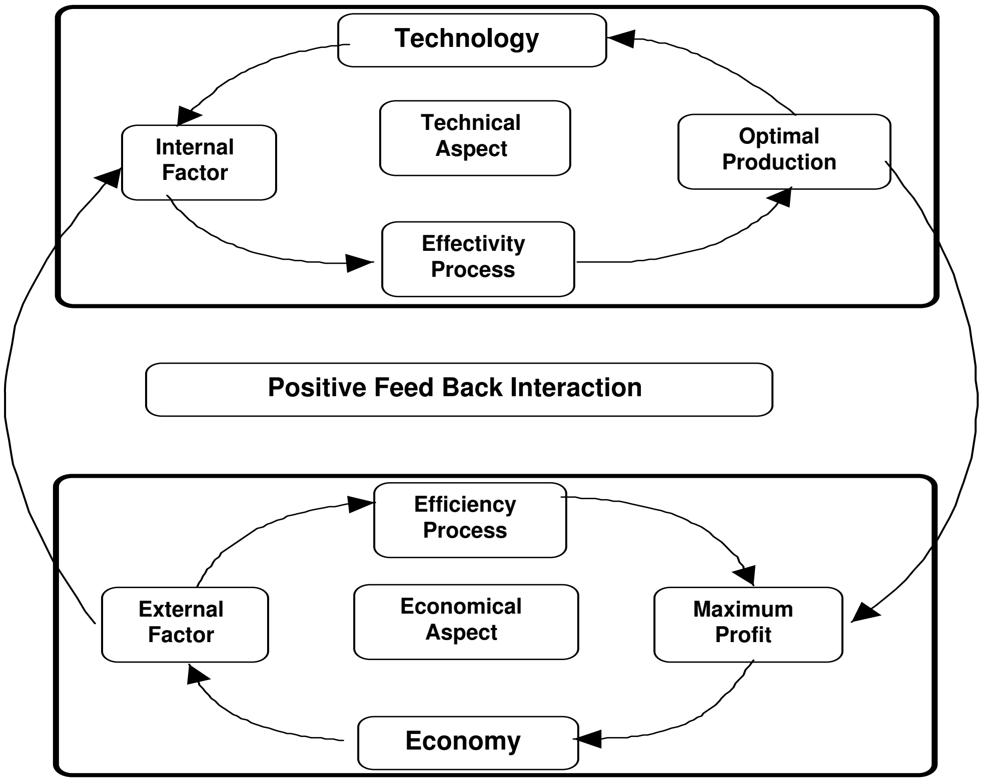

Illustration 2. Techno-Economy Transformation

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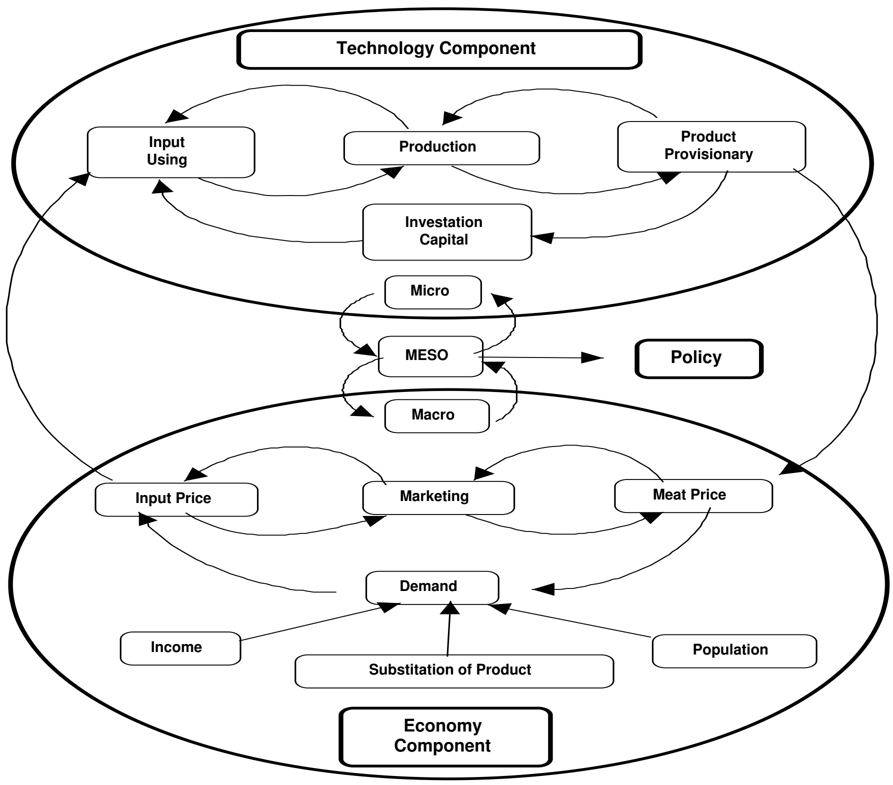


Illustration 3. Diagram of Techno-Economy Sympal Causal

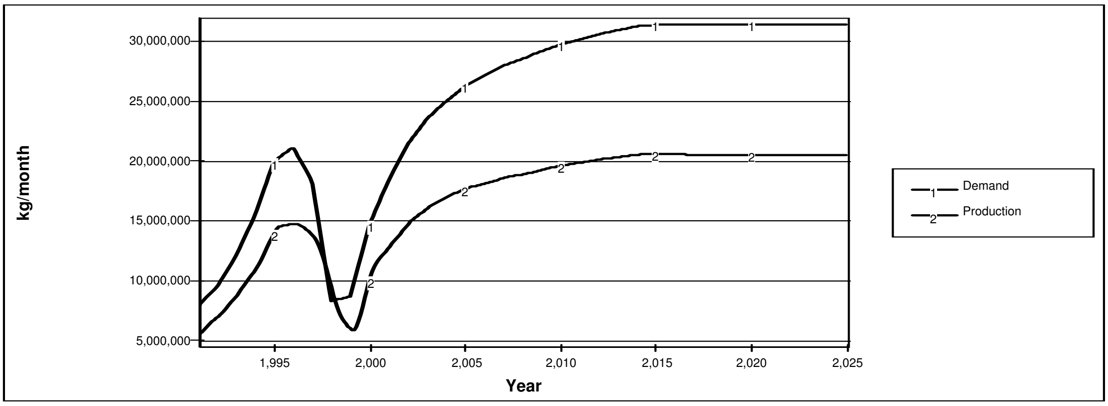
The external factors consist of factors which are directly uncontrollable by mechanism within business units, but they directly affect performance of business units, were included the demand of chicken meat, substitution goods, population, income, chicken meat price, Day Old Chick price, feed price, corn price, soybean meal price, and fish meal price.

THE OBJECTIVE OF RESEARCH

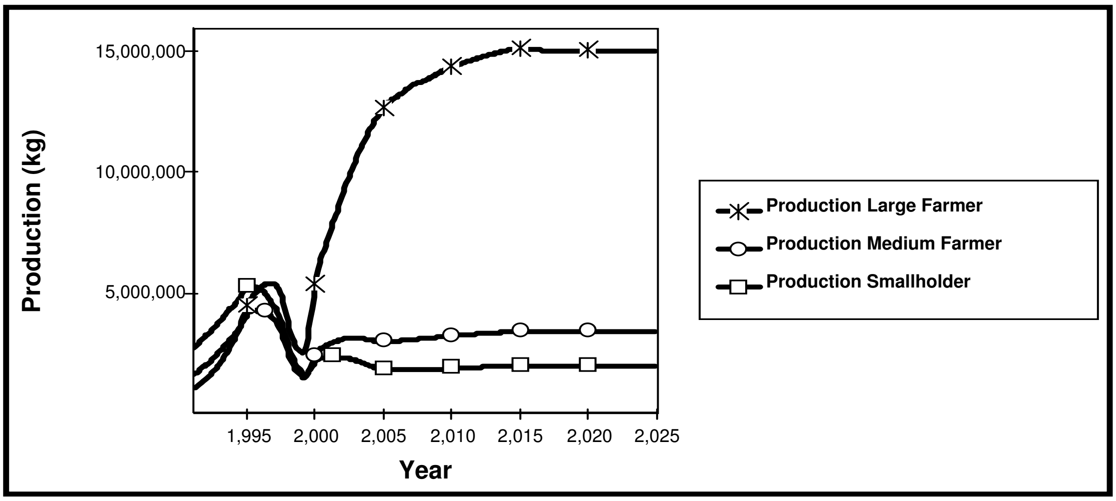
This research aims to seek a systematical and holistic interpretation in determining problem solving model through system dynamics method. Further, the information can be used by decision makers to formulate appropriate strategies in facing changes of internal and external aspects.

THE RESULT OF RESEARCH

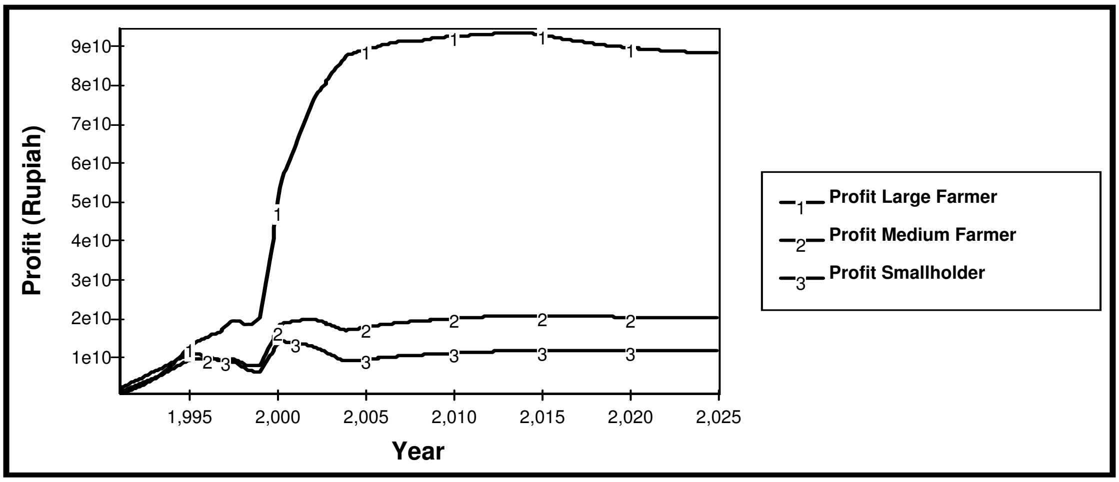
The increasing of chicken meat demand in West Java region was potential for dealing on broiler chicks, development, even for smallholder, medium or large farmer, as look as on these graphics 1,2,3 and Table 1.



Graphic 1. Simulation Product of Basic Model



Graphic 2. Broiler Meat Production



Graphic 3. The Profit of Broiler Farming Industries in West Java Region

Table 1

The Analysis of Broiler Meat Demand

Year Phase	1990-1996	1997 – 1999	2000–2003	2004-2025
Demand	Medium Increasing (8-20) jt kg	Decreasing (16-10) jt kg	Slowly Increasing (14-24) jt kg	Medium Increasing (25-31) jt kg
Production	(5-15) jt kg	(14-6) jt kg	(10-16) jt kg	(17-21) jt kg
	RP	RP	RP	RP
Chicken price	(1700-3050)	(3400-7850)	(9300-8425)	(8200-8175)
Ration price	(300-750)	(900-2150)	(2275-2100)	(2050-1975)
DOC price	(500-750)	(1000-2300)	(2200-1775)	(1775-1900)

CONCLUSION AND IMPLICATION

The results of this research come to conclusions as follow:

Firstly, the contribution to knowledge.

The combination of path of technological concept and economy with regard to positive feedback interaction is a contribution to concept of knowledge techno-economy of Economy as well as Technology i.e. the mutual interaction between both of them. The mutual interaction is an issue that should be internalized in the process of policy making.

Secondly, the contribution to policy i.e.:

i) From internal aspect, improvement in profile of production resources competencies among stakeholders need to be a part of policies on the micro level, especially technological factors,

ii) From external aspect, the components of price of chicken meat as an output value as well as raw materials and feed as input values are macro level policies of economy which are determinant of success in broiler farming industries.

Thirdly, the contributions to operations are:

i) Within the domain of knowledge, the development of the model of positive feedback with system dynamics method based on the concept of technology and economy approach is possible to be applied in industrial business,

ii) The profile of production resources competency in broiler farming industries needs to be improved through a training system using Training Centre and Teaching Farm method,

iii) Production process agricultural industry that serves as the supplier of chicken meat according to consumers preferences is able to be a standard of price control, and

iv) Stability of raw material price needs to be controlled by the government through efforts to boost domestic commodity in order to reduce import dependency. Therefore, the boiler farming industries should be local resource-based industries in the long run.

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