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CONTENTS

VEGETABLE GROWING

FLORICULTURE & DENDROLOGY

FRUIT GROWING & TECHNOLOGY

VITICULTURE & OENOLOGY

BOTANY & PHYSIOLOGY

OTHER FIELDS

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

VEGETABLE GROWING

THE BEHAVIOR OF SOME "MANGETOUT" PEA CULTIVARS IN THE SOUTH PART OF ROMANIA

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Key words: *Pisum sativum L., cultivars* "mangetout" pea, trellis culture

ABSTRACT

"Mangetout" pea is known in Romania more due to its existence in collections without rather than its extension in culture.

Les productive, this species is sporadic cultivated because of its particular technology. It can be found in areas where different species are cultivated. The professional farmers of these areas palisade the plants of mangetout pea in open fields with trellis of 140-150 cm height.

In countries such as: England and France, the mangetout pea finds the best conditions for development, and its regard as an early culture in private gardens.

With the aim to introduce and spread in culture this species in the near future, we decided to test the behavior of some cultivars from Western Europe and North America, in the conditions of the south part of Romania.

INTRODUCTION

This paper presents the yield production obtained by the cultivars Giganton, Oregon Sugar Pod and Sugar Snap in open field.

MATERIALS AND METHODS

The experiments, designed to study the behavior of Mangetout pea cultivars, were initiated by direct sowing in the field and nursery transplant.

We considered useful and necessary to introduce in the experiment variants obtained by planting seedlings because a progress in plant development determine a longer period of exposure to the most favorable conditions for growth and fructification of this species.

On the other hand, the variants obtained by direct sowing in the field results into a cheaper and simpler technology.

Combining the experimental factors – the assortment and the cultures establishment – we obtained a 2x3 bifactorial experiment with 6 variants, which is presented in table 1.

The biological material used in the experiment contained three sorts of "mangetout" pea (Giganton, Oregon Sugar Pod, Sugar Snap). The Giganton and the Oregon Sugar Pod cultivars are recommended for the consumption as whole pod, when the green seeds berries are in the rudimentary phase with a dimension of 1 to 2 mm.

The Sugar Snap cultivar is also recommended for consumption as whole pod but the green seeds must have 4 to 6 mm.

The special features of the three sorts of pea are presented bellow:

GIGANTON, Spanish cultivar characterized by:

- remarkable vegetative vigor, with the stem length over 150 cm, with many shoots on the middle and the top of the main stem;
- stipules and leaflets are larger, haves and laze green-grey color because of the thick waxy layer of pruin which covers them;
- the flowers are pink-violet, from middle to big, they are grouped in flower clusters with 4 to 6 points of fructification;
- the pods are large, without threads and unripe they can be consumed whole at the maximum length of 7 to 8 cm;

As a reason of quality production, the pods of this cultivar must be harvested when they have 3-4g. At a crop density of 14.8 plants/m^2 the yield of this cultivar was 215-230g pods/plant.

OREGON SUGAR POD, U.K. cultivar:

- characterized by a large vigor, it can reach 160 cm height and has many shoots;
- the flower clusters have 4 to 6 white flowers;
- the pod is smaller than that of the Giganton cultivar when it reaches the consumtion maturity;
- at the same density of the plants on m^2 the production of this cultivar was 206-290g pods/plant.

SUGAR SNAP native cultivar from U.K., it is different from the other two cultivars because its pod is all edible with big green seeds. It reaches 140 m and also has many shoots;

- the flower is white and the flower clusters have 4 to 5 points of fructification;
- the pod doesn't go over 6 cm at the maturity consumption and it has 5-6 berries with the diameter of 4-5 mm.

The specific crop technology of the experiment had the following particularities:

The seedlings were produced in plastic pots with the capacity of 250 ml, with only one seed per pot. It was used a soil mixture of 5 parts peat mirth forestry, 3 parts manure and 2 parts of sand.

The 13 – 14 days old seedlings with the height of 11 – 12 cm were planted on the field on March 25th.

The variants 4, 5 and 6 were sowed on the field on March 14th when the soil humidity permitted the experiment to be done.

The experiment was created after a plan with stripes of 2 rounds at 45 cm distance of each other, they were separated by spaces of 90 cm between the rounds. The experiment took place in a uncovered solarium with width of 540 cm, having 67.5 cm medium distance between the rounds and 10 cm between the plants on the round. The support system was mounted on the center of the stripes, it was made out of a thin string net with large eyes, hanged on the skeleton of the solarium which ensured the support height of 150 cm.

The plants' stems had over 25 cm when they were normally conducted to the trellis, to which they hanged themselves with their tendrils.

The harvesting was normally made at 3 – 4 days. The crop was ended in the third decade of June.

During the vegetation observations and determinations were made at the vegetative growth, blooming, tying and fructification.

RESULTS AND DISCUSSIONS

- The results concerning the vegetative growth of the plants were used to create the descriptions of the three cultivars mentioned before.
- The results concerning the phenophases, the production and the quality are shown in tables 2 and 3.
- The data from the table which presents the principals phenophases show the following:
  - At the V_1, V_2 and V_3 variants obtained by planting seedlings, the mass spring it took 5 – 6 days, this phenophases occured on March 12^{th} – March 13^{th}.
  - The 13 – 14 days old seedlings were planted on March 25^{th} in optimal conditions of temperature and humidity.
  - The first blooming was in the second semi decade of May and the first harvesting was on May 13^{th}.
  - The period of vegetation was of 61 – 62 days without big differences between the three sorts.
  - The harvesting ended on June 23^{rd} and the crop was eliminated at the end of June.
  - At the V_4, V_5 and V_6 (the variants sowed directly on March 14^{th}) the mass spring took place at the end of the second decade of March.
  - The first blooming was at the middle of March and the first harvesting took place on May 20^{th}. The vegetation period of plants was almost similar with those planted.
  - The harvesting ended on June 23^{rd} and the harvesting period was a week shorter than the one of the variants 1, 2, 3.
  - The results concerning the total production and the average weight of the harvested pods are presented in table 3 the harvested no. of pods per plant varied between 44.1 (Sugar Snap sowed directly) and 61.5 (Oregon Sugar Pod planted).
  - The planted variants obtained a bigger no. of pods harvested per plant (with 11 – 13 more pods) comparing with those sowed. From this point of view, the Oregon Sugar Pod cultivar produced 4 – 6 more pods per plant than the other two.
  - The average weight of the pods varied between 2.9g Oregon Sugar Pod directly sawded and 3.7g Giganton planted. From this point of view Giganton was on the first place followed by Sugar Snap and Oregon Sugar Pod.
  - The estimated plant production after the end of the harvesting varied between 136.7g Sugar Snap sowed and 216.8g Giganton planted.
  - This can be explained by the precocity of planted variants, which were more developed at the time of optimal conditions of t° and U% for fructification. The production on m^2 can be appreciated as good to very good because it varied between 3210g at planted Giganton (V_1) and 2023g directly sowed Sugar Snap (V_6). The production on m^2 at the planted variants surpasses with 35 – 40% the production obtained from the directly seeded variants.

The impeccable state of health of the crop and the fact that there were no empty spots on the crop contributed a hight level of production.
The production rezults recorded on the analyze of variation method.
We mention that the pods of the three sorts of mangetout with we work, were cooked after traditional kitchen recipes and they were very appreciated for their fines and savor.

CONCLUSIONS AND RECOMANDATIONS

1. The culture of mangetout pea can give good results in the South parth of Romania.
2. Mangetout pea needs a support system of 1.40-1.50 m height in order to ensure a good development of the plants.
3. The period of vegetation for experimental cultivars was similar to the one of early cultivar of pea with green berries destinated for industry (60 days).
4. The differences between the 2 periods of vegetation of the directly sowed variants and the planted ones were very small.
5. The assortment and the crop technology influenced the total production of harvested pods on plant, their average weight and the production of plants and m^2.
6. The sort Giganton was remarked from the other two cultivars from the total production point of view.
7. The crop technology influenced the yield, which was significantly increased for the planted variants.
8. The experimental data and the production results show that this crop can be done with very good results in the South part of Romania and both, the assortment and technology can be optimized for obtaining profitable production.

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Table 1.The Experimental variants, "Mangetout Pea", Daia, 2004

Crt. no.	Specification	
	Cultures establishment	Cultivars
1	Planting the seedlings	Giganton
2		Oregon Sugar Pod
3		Sugar Snap
4	Direct sowing in the field	Giganton
5		Oregon Sugar Pod
6		Sugar Snap

Table 2. The principal phenophazes, "Mangetout Pea", Daia, 2004

Crt. no.	Specification	Cultivars		
		Giganton	Sugar Snap	Oregon Sugar Pod
A. The seedling crop				
1	Sowing	March 7th	March 7th	March 7th
2	Mass spring	March 12th	March 12th	March 13th
3	Age of seedling	13 days	13 days	12 days
4	First blooming	May 7th	May 7th	May 7th
5	First haversting	May 13th	May 13th	May 13th
6	Vegetation period	62 days	62 days	61 days
7	End of harvesting	June 23rd	June 23rd	June 23rd
8	Crop elimination	June 30th	June 30th	June 30th
B. The directly sowed crop				
1	Sowing	March 14th	March 14th	March 14th
2	Mass spring	March 19th	March 19th	March 19th
3	First blooming	May 14th	May 14th	May 14th
4	First haveresting	May 20th	May 20th	May 20th
5	Vegetation period	61 days	61 days	61 days
6	End of harvesting	June 23rd	June 23rd	June 23rd
7	Crop elimination	June 30th	June 30th	June 30th

Table 3. Total production and average weight of harvested pods, "Mangetout pea", Daia, 2004

Crt. no.	Specification	Cultivars		
		Giganton	Sugar Snap	Oregon Sugar Pod
The planting plan 67.5x10cm;density 14.81plant/m²				
A. The seedling crop				
1	The average no. of the pods harvested per plant	58.6	61.5	55.8
2	The average weight of the pods-g	3.7	3.2	3.4
3	Yield g/plant	216.8	196.8	189.7
4	Yield g/m²	3210.0	2912.0	2807.0
B. The directly sowed crop				
1	The average no. of the pods harvested per plant	46.5	48.2	44.1
2	The average weight of the pods-g	3.3	2.9	3.1
3	Yield g/plant	153.4	139.7	136.7
4	Yield g/m²	2273.0	2068.0	2023.0

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BIOLOGICAL PECULIARITY AND SPECIFIC ECOLOGICAL REQUIREMENTS OF SOME "MANGETOUT" PEA CULTIVARS, CULTIVATED IN ROMANIA

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Keywords: mangetout pea, cultivars, crop technology, biological peculiarity

SUMMARY

The "mangetout" type of pea is a species of vegetable for the assortment diversification, well – known by the consumers of the advanced agricultural technology countries and cultivated on respective areas.
In the present paper, the results of tree cultivars: Giganton and Oregon Sugar Pod – mangetout pea and Sugar Snap – crispy pea are presented for the first time in Romania following the test in production conditions in the South of Romania.
The results presented in extensor, which are very interesting and unique, represent both a theoretical and a practical guide for those who wants to cultivate in the future the mangetout type of pea.

INTRODUCTION

In Romania, mangetout pea is known only as a collection's plant, cultivate on small areas.
There are countries where this plant is well known and the edible part may be:

- Young pods with rudiments of seeds;
- Pods more or less mature, with young seeds, fully – grown, of 5-6 mm in size.

For most of the mangetout pea cultivars has the stem show a high or medium-length of, so they need to be sustained.

MATERIAL AND METHODS

Cultivars
There were three cultivars used in this work: *Giganton, Oregon Sugar Pod* and *Sugar Snap*.
Giganton and *Oregon Sugar Pod*: are typical cultivars of mangetout pea; the edible part is represented by the young pods with rudiments of consumed the seeds.
Sugar Snap: from it are used pods with seeds when those reached diameter characteristic canning of green peas cultivars for it belongs to the cultivars group known in the literature under the name of *Snap Pea* (England), *Pois Croquant* or *Croquetout* (France), *Knackerbesen* (Germany).
Elements of crop technology
Trials were conducted in Daia (near Giurgiu), a city famous for pea culture destined for industry and fresh consumption.
The experimental crop was established under an uncovered tunnel, used like trellis for plants.
Some of pea plants were obtained from seeds sowed directly in the fields and some from nursery transplant.
For the first group of pea plants there were three variants (V_1, V_2, V_3), sown in the field at 15 march, and for the second group, with V_4, V_5, V_6 variants, the nursery transplant take place in open field at the age of 13-14 days of plants, when those reached 11-12 cm in height.
The crop set up for each variant was established in strips, with 45 cm between rows, 90 cm between strips and 10 cm between plants on the row.
The crop density was 14,81 plants/m^2. Plants were grown, on a trellis 150 cm high trellis.

Observations and measurements

During vegetation and harvesting, observations and measurements were made, regarding biological peculiarity of plants and of those parts of plants designated to fresh consumption. For each cultivar were made observation and measurements too, to establish the influences on fructification and production. of environmental factors, like temperature and humidity.

RESULTS

The main were characters and features established by observations and measurements are:

Giganton – Spanish cultivar;
Stem – high (150 – 155 cm); vigorous twigs, placed from the middle to the tip of the stem;
Leaflets and stipules – big, light grey, strongly pruinose;
Flowers – big, dark – red, 4-6/inflorescences;
Pods – big, flat; 8-9 cm in length; 1.5 – 1.6 cm in width.
The most suitable moment for harvesting is when green pods are 5-6 cm in length and 3-4 g in weight; now, they have the endocarp and the vascular bundle less cellulosed, with little and rudimentary berries inside.

Oregon Sugar Pod – British cultivar;
Stem – high (155 – 160 cm); very vigorous twigs;
Leaflets and stipules – middle to big, light green;
Flowers – big, white, 4 - 6/inflorescences;
Pods –medium to big, flat; 7-8 cm in length; 1.3 – 1.5 cm in width.
The most suitable moment for legumes consumption – the same with the previous cultivar's.

Sugar Snap – British cultivar;
Stem – middle high to high (130 - 135 cm);
Leaflets and stipules – medium, light green;
Flowers – white, 4-6/inflorescence;
Pods – medium to big, convex; 7 – 7.5 cm in length; 1.5 – 1.6 cm in width; inside, with 5 – 6 green seeds, 4-5 mm in diameter.

The optimum for pods fresh consumption harvesting is like for green bean; pods are better so long as the cross section isn't yet circular.

The pods weight is higher than the two previous cultivars because these are integrally harvested. Vegetation's period: 60 – 62 days and there are 1 – 2 days differences between cultivars.

First harvesting: 13 may – variants from nursery transplant; 20 may – variants sown in the field.

Influences of temperature on fructifications:
Up to 10 – 15 June, the temperature hadn't influenced the fructification, the yield percentage been over 90%. The growing of temperature over 30 – 32^{o}C during the day, have determinate a lower yield percentage, respectively 40 – 45 % and that limit the crop to the second half of June (20 – 25 June).

CONCLUSIONS

1. The culture of mangetout pea is possible even in the South of Romania, with good results of productions;
2. Crops obtained by nursery transplants are more productive than those obtained by sown in fields, because they are developing during longer a favourable period of temperature and this is than that for the variants obtained by sown in open field;
3. Among cultivars of mangetout pea with flat pods, **Giganton** was distinguished by their productivity: 58.6 pods/plant, respectively 216.8 g/plant to the nursery transplants variants;
4. *Croquetout* – **Sugar Snap** cultivars were distinguished too, by their productivity and high quality;
5. The climatic conditions for 2004 had a positive impact on the mangetout pea culture and its productivity;
6. It is necessary to continue the researches to go deeply in knowledge of the biological peculiarities dynamics and their influences on the mangetout pea behaviour in the South of Romania.

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The mean number of pods harvested/plant

Cultivars/ The crop set up	Giganton	Oregon	Sugar Snap
Nursery transplant	58.6	61.5	55.8
Sown in the field	46.5	48.2	44.1

The yield, g/plant

Cultivars/ The crop set up	Giganton	Oregon	Sugar Snap
Nursery transplant	216.8	196.8	189.7
Sown in the field	153.4	139.7	136.7

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THE MECHANIZATION TEHNOLOGIES OF THE VEGETABLE HARVESTS BY USING THE MOTOVEHICLES IN THE SMALL HORTICULTURAL EXPLOATATION

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Keywords: motovehicle, motohoe, the usage of the fuel, the usage of working people, organized work capacity.

ABSTRACT

The motovehicles are low-powered monoaxis tractor used for the mechanization of the works from the small area agricultural exploitations.

There were followed in the proper the achievement of some mechanical technologies of the tomatoes cultivation, and also of cucumbers, green beans and the autumn cabbage only by using a 3.7 kw - powered motohoe, from a private farming exploitations from the southern part of the country with an are of 0.8 ha. There were established and calculated the following appreciation indices for the achieved technologies: the hour capacity of working of the equipments, the specific fuel usage and the specific usage of the mechanized working force.

The usage of a 3.7 Kw motohoe and of the additional groups of equipment allows the mechanization of the majority of the low-fuel works but with a higher usage of the working force compared to classical tractors.

INTRODUCTION

The motovehicle are monoaxis tractors equipped with low- powered termical engines (0.7-14.7Kw) made for the mechanization of the agricultural and house works from the farming exploitation with reduced areas. They achieved a big expodation in the countries where the agriculture is split on small areas and the horticol products (vegetables, flowers, grapes and fruit) are produced. In such conditions, due to the dimensions of the plots and of their forms, the utilization of the classical tractors on two axes is not possible, nor economical.

From the constructive point of view there are two types of motovehicles: the classical ones and the motohoes . The classical ones have the mill (the basic tool) placed behind the wheels of the motovehicle and propelled with a construct rolling from the independent power source. The motohoes have the mill rotors placed instead of the moving wheels and their auctioning is done with a variable rolling according to the speed work.

The motohoes are very used presently due to the following advantages: a constructive simplicity, smaller weight, lower cost- payment, a deeper working capacity, a bigger working width, the possibility of doing the supportive works very close to the plants, etc.

Materials and methods

The experimental research have been made in private agricultural exploitation from Vidra, Ilfov – county, on a 0.8 ha area.

There was used a 3.7 kw-powered motohoe equipped with a termic engine provided with sparkle lightening.

For appreciating the mechanization technologies, there were established and calculated the following indices: the fuel consume per ha, the hour capacity of work and consume of the mechanized work force.

The fuel consume per ha, C, was calculated with the relation: - where: C – the hour consume of fuel (kg/h), w- the work capacity by hours.

The exact work capacity by hours was calculated by relation: w=0.1 BU; (ha/h)

Where B – the medium working width (m)

U – speed work (km/h)

The consume of the work force was calculated with the relation:
Where n – the number of workers.

The work speed and the fuel consume by hours were established according to STAS 6760/90

The mechanization technologies were determined for the following vegetable crops: tomatoes, cucumbers, autumn cabbage and green beans.

RESULTS AND DISCUSSION

On the basis of the experimental data, there were developed the mechanization technologies of the vegetable crops planted in the respective private agricultural exploitation. The research results are presented in the tables 1 and 2.

The planting work was made semi-mechanized, thus the rows were mechanically opened with the equipment made of the motohoe and the glade and the distribution of the seed in rows was made by hand.

The work of controlling the diseases and the damages was made with the pouring equipment foreseen with two lances with 15 m – long hoses and the workers entered the plant rows, the motovehicle being placed an the edge of the plot.

As the result of the information presented above, we can sum up the following:
- used motohoe can produce mechanically most of the works from the plant technologies, the rest of the works are done by the hand;
- the complete fuel consume varies between 91.0 kg/ha and 144.1 kg/ha according to the cultivated plant, the medium value being of 110.3 kg/ha (including the mechanization of the works to be watered);
- the highest value of the fuel consume is for the autumn cabbage plantation due to the watering works through the rows
- the total consume of the mechanized work force varies between 127.26 and 204.94 hours per person, the medium value for the four cultures being of 154.4 hours per person (ha).
- the working capacity by hours register low values due to the low values of the work width and speed.
- the working capacity by hours of the used motohoe is much smaller than the working capacity of a classical tractor of the wilted two axes and low power; it determines a bigger consume of mechanized work force;
- the fuel consume specific to the motohoe is smaller than equipments made of two-axed tractors.

CONCLUSIONS

As the result of the analysis of the experimental results and of the processing of the data, here are the conclusions:
- for a private agricultural exploitation wilted a dimension of 0,8 ha and specialized in the vegetable production, it is sufficient the using of a multifunctional motohoe with a power of 3,7 km which can mechanize the majority of the works with a minimum financial effort;
- in order to do the works from the plantation technologies, motohoe has to have an additional set of equipments made of: the mill of 100 cm width and 14 cm deep working, the glade with 18 cm deep working, watering equipment with two sprinkle lances and with the horizontal sprinkle grade; the water pomp for sprinkling with a debit of 25-30 m/h and the monoaxes trailer with 400 kg weight.

The total consume of the work force is bigger for the mechanization technologies that use the motovehicles compared to those which use the classical tractors, but their usage in an agricultural exploitation just like the one analyzed before, is not possible due to the small dimensions of the plots and of the access ways.

The fuel consume for the mechanization technologies that use the motovehicles is smaller than the registered one for those technologies that use two-axis classical tractors.

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Table 1. The mechanization technology for the autumn cabbage by using a multifunctional motohoe with 3,7 kW power

No	The title of the work	The equipment used	The work capacity (ha/h)	The fuel consume (kg/ha)	The consume of work force (h/ha)
1	The transportation and the spreading of the organic manure (30 t/ha).	Motohoe + trailer	0,050	13,20	20,00
2	The digging of the soil at 14 cm deep	Motohoe + mill	0,075	12,00	13,33
3	The soil preparing for planting (2 times)	Motohoe + mill	0,184	11,80	10,86
4	The cleaning at the soil preparing	Motohoe + Pouring equipment	1,200	0,50	0,83
5	The rowes opening for planting	Motohoe + glade	0,168	4,80	5,95
6	The mechanical weeding	Motohoe + mill	0,126	21,20	31,72
7	The eoening of the watering rows (5 times)	Motohoe + glade	0,168	19,20	23,80
8	The destroying of the diseases and of the damages (3 treatments)	Motohoe + Pouring equipment	0,750	3,00	14,00
9	The watering throw furrows (5 waterings with 400 m^3/ha)	Motohoe + Water pomp	0,080	37,50	62,50
10	The production transport	Motohoe + trailer	0,038	17,70	26,60
11	The technologic transport	Motohoe + trailer	0,189	3,20	5,29
12	**Total**			**144,10**	**204,94**

Table 2. The mechanization technology for the tomatoes by using a multifunctional motohoe with 3,7 kW power

No	The title of the work	The equipment used	The work capacity (ha/h)	The fuel consume (kg/ha)	The consume of work force (h/ha)
1	The digging of the soil at 14 cm deep	Motohoe + mill	0,075	12,00	13,33
2	The soil preparing for planting (2 times)	Motohoe + mill	0,184	11,80	10,86
3	The cleaning at the soil preparing	Motohoe + Pouring equipment	1,200	0,50	0,83
4	The rowes opening for planting	Motohoe + glade	0,168	4,80	5,95
5	The mechanical weeding	Motohoe + mill	0,126	21,20	31,72
6	Cleaning in the vegetation	Motohoe + Pouring equipment	0,750	1,00	1,33
7	The opening of the watering rows (3 times)	Motohoe + glade	0,168	14,40	17,85
8	The destroying of the diseases and of the damages (3 treatments)	Motohoe + Pouring equipment	0,080	22,50	37,50
9	The watering throw furrows (3 waterings with 400 m^3/ha)	Motohoe + Water pomp	0,750	13,00	4,00
10	The production transport	Motohoe + trailer	0,050	13,20	20,00
11	The technologic transport	Motohoe + trailer	0,170	3,45	5,59
12	**Total**			**107,40**	**148,96**

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IRON NUTRIENT DISORDERS IN SOIL – PLANT – ANIMAL - HUMAN SYSTEM

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Keywords: iron, deficiencies, symptoms, photos, favorizing conditions, human health, diseases

ABSTRACT

This paper deals with the iron alongside the full chain (every component) of the soil-plant-animal-human-system. First presents the main forms of Fe in soil and the form absorbed by roots. A special attention is payee to iron in plant: iron functions; causes and factors favorizing Fe deficiency and toxicity; visual symptoms of Fe deficiency – descriptions, how to avoid the confusions, 24 original photos (fruit trees, grapevine, flowers, and ornamental trees). Interesting considerations concerning Fe and animal and human health: functions in body, need of Fe, iron deficiency and recommended sources of Fe.

INTRODUCTION

Many papers have been published concerning different particular aspects of Fe in soil and plants (Bergman, 1992; Borlan et al., 1992, 1994; Budoi, 2000, 2004; Epstein, 1972; Marschner, 1993; Mengel and Kirkby, 1987, et al.), and in animal or human life, but none to make links alongside all the chain of the SPAH system: soil – plant – animal – human. It is one of the aims of this paper.

MATERIALS AND METHODS

This synthesis paper is based on author's experience of two and a half decades in agrochemistry, on expeditionary researches and on documentation. Many observations have been done in fields, orchards, vineyards, glasshouses, solariums etc. A Nikon Coolpix 4300 digital camera has been used in order to take pictures of plant Fe deficiencies.

RESULTS AND DISCUSSIONS

IRON IN SOIL. Total Fe: up to 5 % (Mengel and Kirkby, 1987). **Extractible Fe** (in 0.2N ammonium oxlate, Juste-Pouget method): from less than 50 ppm Fe (very small content) up to more than 300 ppm Fe (very high), especially in acid soils; From ICPA, 1987, ≤ 50 ppm means very small content and 51–100 means small content, so we can roughly consider 100 ppm Fe as critical content for plant deficiency, but this depends also of many factors (see below). **Fe from soil solution, Fe_s** (at pH 6–8,5): $6\cdot10^{-6}$–$6\cdot10^{-7}$ ppm Fe (Lindsay, 1974). **Root uptake:** as Fe^{2+}. For details regarding the iron in soil, see Budoi 2000, 2004.

IRON IN PLANT. Iron functions in plant. *1. In red-ox systems,* because of its easy exchanging of the valence: $Fe^{2+} \leftrightarrow Fe^{3+}$; it is component of some essential hemoproteins: catalaze, citoctomoxidaze, peroxidaze; component of feredoxine (with function in N_2 symbiotic fixation). *2. Chlorophile synthesis* and fotosynthesis. *3. Protein synthesis* and chloroplasts forming. *4. Atmospheric N_2 symbiotic fixation* through: feredoxine - component of the enzymatic complex nitrogenaze, and leghemoglobine from nodules. 5. Plant disease resistance.

Plants with high Fe needs and rich in Fe: lettuce, oat, orache, parsley, rice, spinach.

Factors and conditions favorizing Fe deficiency in plants: native low content of soils, such as sandy soils; calcareous soils or excessively limed acid soils; high pH and high concentrations of free carbonates and bicarbonates ions in soil; soil compaction; abundant precipitations and excessive irrigation; irrigation using calcareous, hard water, rich in Ca^{2+}, CO_3^{2-} and HCO_3^- ions; phosphorous overdosing (induced or secondary Fe deficiency); plant sensibility: acidophil species are the most exposed. The most frequent deficiencies there are in glasshouse cultures and ornamental plants in pots.

Factors and conditions favorizing Fe toxicity in plants: excessive soil acidity; anaerobic, reductive conditions, such as flooding or water stagnation, especially if combined with acid conditions; plant sensibility: calcarophyl species are the most exposed; use of residual materials rich in Fe, especially acid materials and those used on non alkaline soils; solution for foliar fertilization with to high Fe concentrations.

Visual symptoms of Fe deficiency on plants (see fig. 1 to 25). The visual symptoms appear first on young leaves – because of low Fe mobility in plant, and extend on plant or shoots from top to base. Interveinal uniform chlorosis of the leaves take place, as in Mn deficiency, but the main veins and even the fine veins remain green for a long time, given a reticular pattern (fig. 1, 2, 3, 7, 8, 9, 13, 14, 17), even cobweb like (fig. 9).

Fe deficiency symptoms can be confounded with Mn deficiency, but there are some *essential differences* that allow discriminate between the two nutrients:

a) In Fe deficiency only the veins remain green, unlike Mn deficiency where a narrow uniform band alongside the main veins remain green also; in severe Fe deficiency, full yellow chlorosis of the leaf, including the veins, can occur (fig. 24, 23, 12), and even whitish chlorosis can be observed on young leaves – "albino" or "albinos" chlorosis (fig. 8, 11, 17), unlike Mn deficiency where there are not, because the leaves necroses.

b) Usually in Fe deficiency there are no necroses, unlike Mn where there are necroses in points and spots even in moderate deficiency.

c) In Fe, necroses can be seen in very severe deficiency, but unlike Mn, they start from the tips and margins of the leaves as continuous burning, brownish color, advancing toward the middle vein; sometimes, the necroses can be seen only on a half side of the leaf, or more severe on a part of the middle vein, as in gerbera; in very severe Fe deficiency the plants dye (fig. 6), as in severe Mn deficiency.

d) In severe Fe deficiency the flowers do not fully open, have unnatural, untypical colors, the petals are discolored, dull, tarnished, lusterless (fig. 12 and fig. 22), unlike Mn deficiency.

e) In trees, premature defoliation of the shoots on the tips can be observed in Fe deficiency, which does not happen in Mn deficiency.

Visual symptoms of Fe toxicity on plants. Direct Fe toxicity is rare in field, but Fe excess can block P with specific symptoms. In rice, Fe toxicity determines reddish colors on older leaves, starting from the tip of the leaves.

Measures against Fe nutritional disorders. There are preventing measures and curative measures (for details, see Budoi, 2004). The visual identification of Fe deficiency allow to immediately take correction measures by foliar application of Fe containing solutions; the treatments have to be repeated 3-4 times at 7–10 days between two successively applications. The uniform application of the solutions on leaves and a very fine pulverization are essential conditions. Liming acid soils is the most efficient measure against Fe excess and Fe toxicity.

IRON IN ANIMAL HEALTH. The main aspects mentioned in the section "Iron and human health" (see bellow) are also valuable for animals. In athletic and hard working animals the blood cell recycling is greatly accelerated, and so the need of Fe – necessary of hemoglobin biosynthesis, is greatly increased. So, high attention in animal nutrition have to be paid to Fe, Cu and Co in athletic animals, such as racehorses, and in hard working animals, such as horses and oxen used by peasants and farmers for caring heavy teams (carts, chariots, wagons etc.). For the same reason, mentioned above, special attention for this 3 micronutrients is needed for the people involved in sports such as athletics, boating, cycling, fights (greco-roman, martial arts), weight lifting, box and others which imply physical effort and high consumption of energy.

IRON AND HUMAN HEALTH. Functions in body (PHL, 2002; Merck, 2004; Liu, 2002; Health News**,** 1996). Fe is found in *every cell* in the body: it is necessary for all bodily functions. Fe mainly functions in the *myoglobin*, in muscle, and in the *hemoglobin* – the pigment inside the red blood cells that binds with oxygen and carries it from the lungs to the body's tissues, including the muscles and the brain; nearly three quarters of the iron in the body is found in hemoglobin. Hemoglobin also helps remove carbon dioxide from blood to be exhaled. Fe is involved in *energy production*, and so prevents fatigue. It is responsible for *stress* and *disease resistance*, assists in the production of *thyroid hormones*.

Fe, together with Zn, is an *essential component of* the *brain* and is involved in *brain development*. Fe is a component of *enzymes* involved in *cell division* and *growth*.

Need of Fe (Decuypere, 2002). *Women and teenage* girls need at least 15 mg/day, whereas *men* can get by on 10. It is important that *children* get about 10 to 12 mg/day, preferably from their diet. Breastfeeding is the best insurance against iron deficiency in babies. *Vegetarians* need to get twice as much dietary iron as meat eaters.

Fe deficiency. Compared to other micro minerals, Fe deficiency is *the most common* (ASNS, 2004). *600 million people suffer from Fe deficiency* (Aggett, 1998). Most at risk of Fe deficiency are *infants*, *adolescent girls* and *pregnant women* (Decuypere, 2002). About *50 % of women* are Fe deficient, and women who are menstruating or pregnant are usually the worst (PHL, 2002).

Anemia – paleness (pale skin), *weakness* and *fatigue,* is the most common symptom of Fe deficiency. Anemia in pregnancy it can increase the risk of *premature and low birth weight babies* (also in the case of Zn deficiency), and in young children, a lack of Fe may be responsible for behavioral abnormalities and reduced cognitive performance (impaired *learning ability*), which may not be reversible with Fe supplementation (ASNS, 2004; Merck, 2004; Liu, 2004).

Other symptoms of Fe deficiency (ASNS, 2004; PHL, 2002; Liu, 2004): *irritability*, *breathing difficulties*, *brittle nails* (also in the case of Zn deficiency)*,* constipation, *difficulty in swallowing*; akathisia or *"can't sit down",* called also *"restless legs syndrome"*. If severely deficient in Fe, the *physical capacity to work* may be *reduced*, the *immune system* can be affected: an increase *susceptibility to infection* can result due to a decrease in white blood cells, which reduces the ability to produce antibodies.

Fe deficiency has impact on *neurological development* (Aggett, 1998).

Considering the adverse effects of excessive Fe intake, Fe supplementation should not be recommended for adult men or postmenopausal women unless they demonstrate the need for it (ASNS, 2004, Liu, 2004).

Recommended sources of Fe (Decuypere, 2002; PHL, 2002). *Vegetables:* broccoli, carrots, corn, kale, lentils, lima beans, mushrooms, peas, potatoes, spinach, squash (summer and winter), stinging nettle *(Urtica dioica)*, sweet potato, tomato. *Fruits and nuts:* raisins (recommended especially for children); avocado, bananas, blackberries, grapes, kiwi, prunes, strawberries, walnuts. *Meat:* heart, kidney, liver, poultry, oysters, red meat, raw clams. *Others:* wholegrain cereals, especially rye.

Iron from animal products is more readily absorbed than iron from plant foods. Curiously, although we tend consider spinach that's "good for you", the mineral is poorly absorbed from spinach and most other vegetables. In general, "heme" iron in animal products is better absorbed than "non-heme" or inorganic iron in plant foods. But the mix of foods eaten is the most crucial influence (Health News**,** 1996).

CONCLUSIONS

Soil quality is essential for plant nutrition and food quality for animal and human health. Plants with nutrient disorders – deficiencies and toxicities, will produce nutrient disorders and other diseases in animal and human body. Fe is essential for plants, animal and human life. There are many factors that can favorize or cause Fe deficiency or toxicity in plants and animals. It is important to know them in order to a better management of the soil-plant-animal-human system (SPAH) and harmonization of its components.

The interdisciplinary researches and studies are welcome, in order to elucidate different detailed aspects concerning the functions of this element, the factors involved in its availability in sol, mobility in plant, assimilability in plants and in animal body etc., as well as to a better information of the people concerning their diets, and finely their health.

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Pictures

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Fig. 1. Fe deficiency in **apple** tree–*Malus domestica* (original, © Gh. Budoi)

Fig. 2. Fe deficiency in **apricot** tree – *Armeniaca vulgaris*; interveinal yellow chlorosis on younger leaves of the shoots; the veins remain green; reticular pattern of the leaf (original, © Gh. Budoi)

Fig. 3. Fe deficiency in **blueberry** – *Vaccinium sp.,* because of a high soil pH: interveinal chlorosis; 06.06.2003 (original, © Gh. Budoi)

Fig. 4. Advanced Fe deficiency in **blueberry** – *Vaccinium sp.* (shoot); yellow interveinal area on younger leaves; berries shrivelling; 13.07.2003, 5 weeks later then fig. 3 (original, © Gh. Budoi)

Fig. 5. Advanced Fe deficiency in **blueberry** – *Vaccinium sp.*: plant, 13.07.2003, 5 weeks later then fig. 3; see shoot detail in fig. 4 (original, © Gh. Budoi)

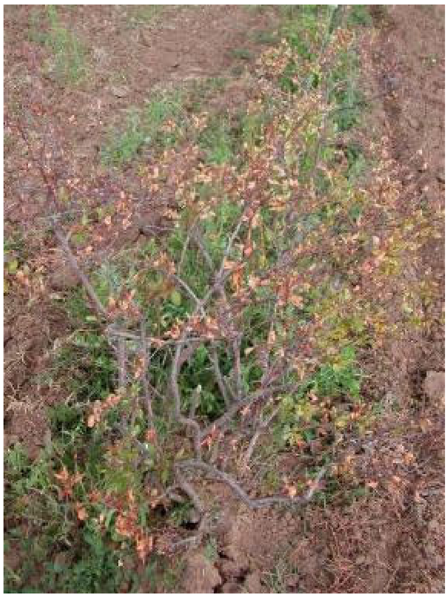

Fig. 6. Very severe Fe deficiency in **blueberry** – *Vaccinium sp.*: leaves scorched, plant died (original © Gh. Budoi)

Fig. 7. Moderate Fe deficiency in **grapefruit** tree – *Citrus paradisiaca* (original © Gh. Budoi)

Fig. 8. Severe Fe deficiency in **lemon** tree – *Citrus limon*: yellow whitish chlorosis on younger leaves, reticular pattern – cobweb like (original, © Gh. Budoi)

Fig. 9. Fe deficiency in **peach** tree – *Persica vulgaris;* left: incipient deficiency; right: advanced deficiency (original, © Gh. Budoi)

Fig. 10. Moderate Fe deficiency in **grepvine** – *Vitis vinifera* (original, © Gh. Budoi)

Fig. 11. Severe Fe deficiency in ***Bougainvillea glabra*** – bougainvillea (paper flower): "albinos" chlorosis of younger leaves (original, © Gh. Budoi)

Fig. 12. Severe Fe deficiency in ***Calibrachoa sp.*** – million bells, Mini Famous Violet hybrid (left) (original, © Gh. Budoi): flowers do not fully open, untypical color of petals, lusterless; younger leaves completely chlorosed, beginning of necroses. Right: normal flowers Mini Famous Violet (from Floriculture.com, 2005)

Fig. 13. Fe deficiency in ***Camelia japonica*** – camelia, on younger leaves (original, © Gh. Budoi)

Fig. 14. Fe deficiency in ***Coffea arabica*** – coffee tree, interveinal chlorosis on younger leaves; reticular pattern (original, © Gh. Budoi)

Fig. 15. Fe deficiency in ***Gerbera jamesonii*** – gerbera, interveinal chlorosis on younger leaves; older leaves unaffected yet or less affected (original, © Gh. Budoi)

Fig. 16. Fe deficiency in ***Hibiscus rosa-sinensis*** – hibiscus (original, © Gh. Budoi)

Fig. 17. Fe deficiency in ***Hydrangea hortensis*** – hydrangea, interveinal chlorosis on younger leaves, whitish discoloration (original, © Gh. Budoi)

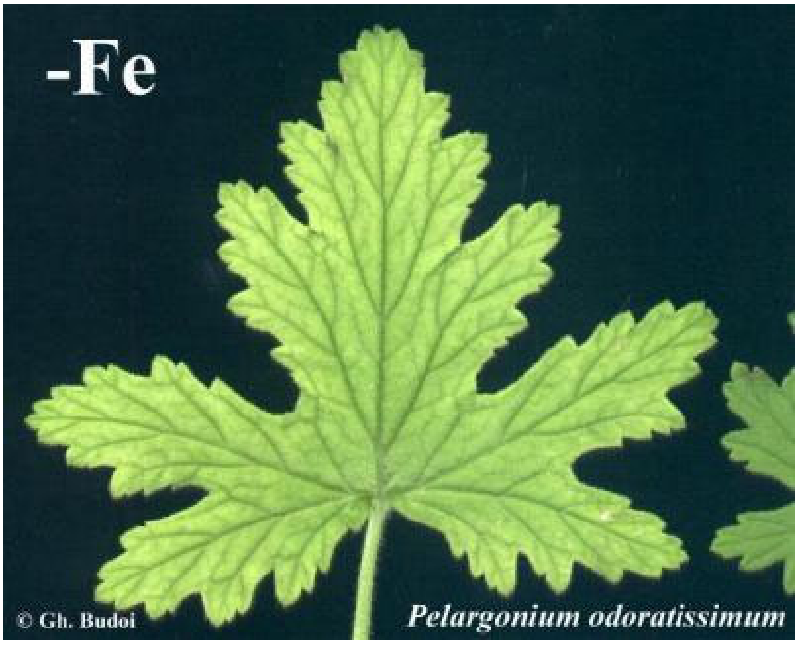

Fig. 18. Fe deficiency in ***Pelargonium odoratissimum*** – apple scented geranium, young leaf (original, © Gh. Budoi)

Fig. 19. Fe deficiency in ***Pelargonium peltatum*** – ivy geranium (original, © Gh. Budoi)

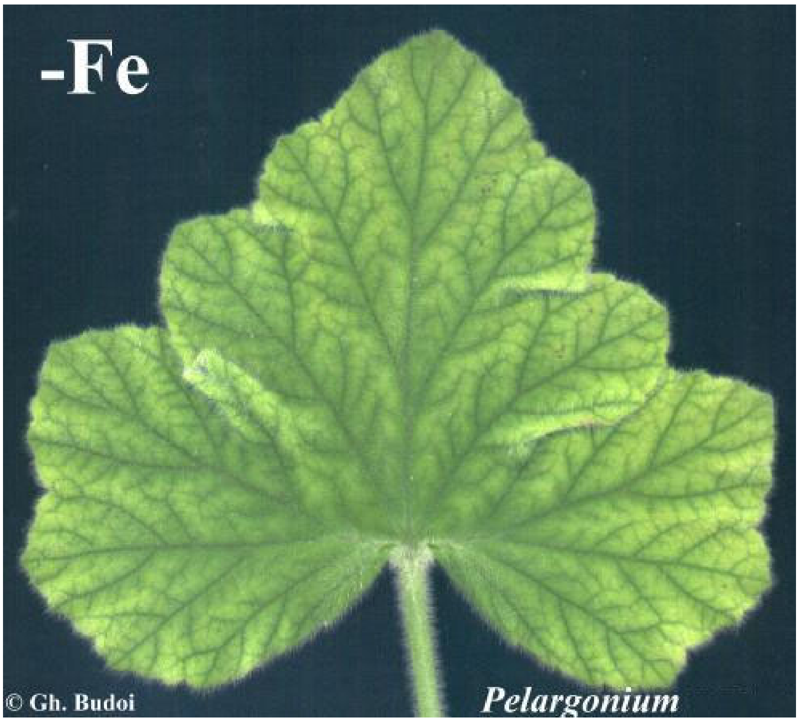

Fig. 20. Fe deficiency in ***Pelargonium tomentosum*** – pepermint scented geranium, young leaf (original, © Gh. Budoi)

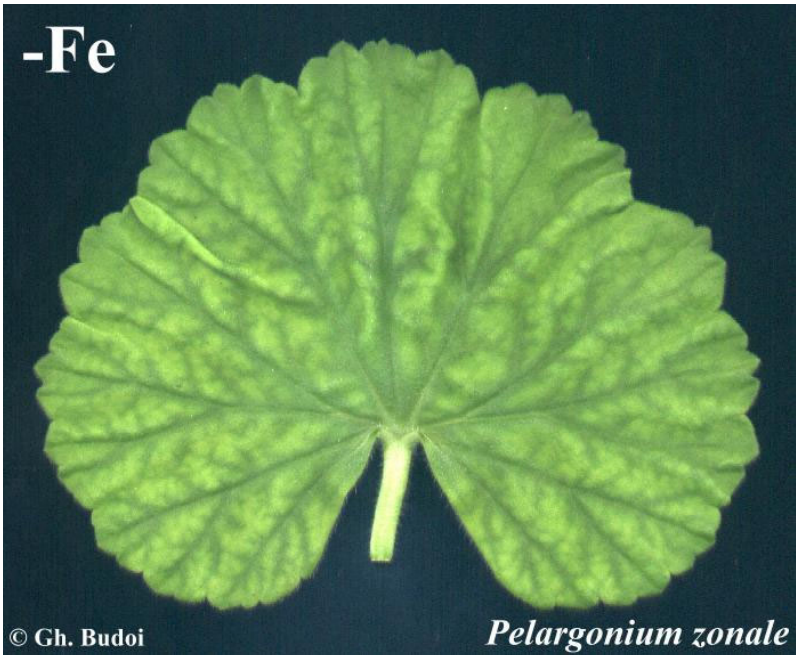

Fig. 21. Fe deficiency in ***Pelargonium zonale*** – common geranium, young leaf (original, © Gh. Budoi)

Fig. 22. Severe Fe deficiency in ***Petunia hybrida*** – petunia: severe chlorosis spread all over the plant; flowers do not fully open, untypical color of petals, discolored, lusterless (original, © Gh. Budoi)

Fig. 23. Severe Fe deficiency in ***Rhododendron indicum*** – azalea: severe chlorosis, the younger leaves even whitish-yellowish (original, © Gh. Budoi)

Fig. 24. Fe deficiency in ***Spiraea sp.*** – spireea (original, © Gh. Budoi)

Fig. 25. Fe deficiency in ***Quercus robur*** – oak (columnaris form): young leaves with different stages of deficiency, from interveinal green-yellowish chlorosis to full yellow chlorosis, includig the veins (original, © Gh. Budoi)

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MANGANESE NUTRIENT DISORDERS IN SOIL – PLANT – ANIMAL - HUMAN SYSTEM

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Keywords: manganese, deficiencies, toxicities, symptoms, photos, favorizing factors and conditions, human health, diseases

ABSTRACT

The paper deals with the manganese alongside the full chain of the soil-plant-animal-human-system (SPAHS). It presents the main forms of Mn in soil and the form absorbed by roots. Than, a special attention is payed to manganese in plant: Mn functions; factors and conditions favorizing Mn deficiency and toxicity; visual symptoms – descriptions, keys to avoid the confusions between Mn deficiency and Mg or Fe deficiency, relevant original photos of Mn deficiencies and toxicities in fruit trees, vegetables, field crops and ornamental plant species. Interesting considerations concerning Mn and animal and human health are also presented: functions in body, needs of Mn, mangnese deficiency and recommended sources of Mn.

INTRODUCTION

A lot of published papers presented specific aspects of Mn in soil and plants (Bergman, 1992; Borlan et al., 1992, 1994; Budoi, 2000, 2004; Budoi et al, 2004; Marschner, 1993; Mengel and Kirkby, 1987, Ţigănaş and Borlan, 1984, et al.), in animal and human life, but none dealing with all the chain of the soil-plant-animal-human system. It is one of the aims of this paper. The other is to present original photos concerning plant manganese disorders and new considerations for theirs visual diagnosis.

MATERIALS AND METHODS

The paper is based on author's experience of two and a half decades in agrochemistry, on expeditionary and experimental researches, and on documentation.

The pot experiments concerning Mn toxicity have been carried out in vegetable house on a mollic reddish brown soil that received 1000 ppm Mn before sowing; the detailed results are presented elsewere (Budoi et al., 2004). A Nikon Coolpix 4300 digital camera has been used in order to take photos of plant Mn disorders.

RESULTS AND DISCUSSIONS

MANGANESE IN SOIL. **Total Mn:** from < 200 up to > 1700 ppm Mn (Bajescu and Chiriac, 1984). **Active Mn**: 2–2600 ppm Mn (Ţigănaş and Borlan, 1984); critical deficiency level: 1 ppm Mn (exchangeable form). **Mn from soil solution, Mn_s:** 0,1–3,7 ppm Mn (Ţigănaş and Borlan, 1984), so 50–17000 times less total Mn; critical deficiency level: 0,05 ppm Mn; critical toxicity level: 1 ppm Mn (Borlan et al., 1994). **Root uptake:** as Mn^{2+}.

For details, see Budoi, 2004.

MANGANESE IN PLANT. Mn functions in plant. *1. In red-ox systems,* because Mn can easily exchange valence: $Mn^{2+} \leftrightarrow Mn^{3+}$. *2. Functions in enzymatic activity:* a) as enzymatic component of Mn–SOD (Mn superoxid dismutse), protect the chloroplasts from the destructive effect of the superoxide (O2–·); b) Mn is enzymatic activator and inhibator. *3. Photosynthesis functions:* one of the most important is in Hill reaction (water descomposition) and in the evolution of resulted O_2. *4. Functions in protein and lipid synthesis:* Mn is structural element of the ribosome; activate ARN polimerase; is implied in fat acid synthesis and oil deposition in seeds. *5. Division and cellular extension* and plant growing. *6. Plant disease resistance.* For details, see Budoi, 2004.

Factors and conditions favorizing Mn deficiency in plants. ***Plant conditions.*** As a rule, acidophyle species cultivated on neutral and alkaline soils are the most sensible to Mn deficiency. The cultures in glasshouse are the most disposed because the pH easily increase due to a high use of water, usually enriched in soluble salts; on the other hand, in glasshouse we use higher amounts of organic fertilizers than in fields.

The most sensible species to Mn deficiency are: from field crops: bean, fodder beet, oat, pea, peanuts, sorghum× Sudan grass hybrid, soybean, Sudan grass, sugar beet, winter wheat; from vegetables: cucumbers, lettuce, radishes, red beet, spinach; from fruit trees: apple tree, apricot tree, blackbery, peach tree, raspberry, strawberries, walnut tree; grapevine; from ornamental plants: *Chrysanthemum spp., Cyclamen persicum, Liridodendron tulipifera, Rosa spp., Saintpaulia jonantha, Salvia spp. et al.*

Soil factors and conditions. Calcareous soils or excessively limed acid soils induced Mn deficiency because Mn^{2+} is precipitated; its mobility in soil decrease more and more as the soil pH increase, and, consequently, its availability and root accessibility decrease. A pH above 7 can induce Mn deficiency. On peat soils and organic soils we can have Mn deficiency even from a pH of 6. In peat and organic soils, sandy soils and podzolic soils, the deficiency is caused by Mn^{2+} leaching. Sandy soils are native poor in Mn.

Oxidative microorganisms: such microorganisms, which intensively proliferate and have theirs maximum oxidative activity at neutral or alkaline soil reaction, oxidize Mn^{2+} to Mn^{4+}, which is unavailable for roots. Excessive oxidative soil conditions stimulate the oxidizing processes.

Climatic and technological factors and conditions. Abundant precipitations or irrigations, especially in area with low textured soils, lead to Mn^{2+} leaching in soil profile.

Factors and conditions favorizing Mn excess and toxicity in plants. ***Plant conditions.*** As a rule, calcifille species cultivated on acid soils are the most disposed to Mn toxicity. High sensibility have: bean, red clover, chrysanthemum et al.

Soil factors and conditions. Acid soils: decreasing of soil pH bellow 5.5 leads to a remarkable increase of Mn^{2+} mobility, potentially toxic. Anaerobic, reductive conditions, such as water stagnation or flooding, soil compaction, especially if combined with acid conditions, Mn^{4+} and Mn^{3+} being reduced to Mn^{2+}. High amounts of cellulosic crop residues incorporated in soil can accentuate reducing conditions, because, on one hand, a part of soil O_2 is consumed in residues decomposing processes and, on the other hand, the residues are a source of C for the reducing microorganisms, stimulating theirs proliferation and activity.

Technological factors and conditions: overdosing mineral fertilizers for soils; solutions with to high Mn concentrations, used for foliar application; the use of residual materials, such as residual mud, rich in Mn, especially acid materials, incorporated in non alkaline soils.

Visual symptoms of Mn deficiency on plants (see fig. 1 to fig. 11). First, the visual symptoms appear on young or recently matured leaves from the upper third of plants or shoots (fig. 1, 3, 7, 10, 11), because Mn has a low mobility in plant, but better than Fe; then the symptoms extend on plant or shoots from top to base.

First, interveinal chlorosis appear on the leaves, the main veins and a bending area alongside the main veins remaining green for quite a long time, as in Mg deficiency, but the main differences are: Mn deficiency symptoms first appear on younger leaves, unlike Mg in which the symptoms appear on older leaves; usually the width of the green bending area alongside the main veins are narrow and quite uniform in Mn deficiency – "narrow uniform green vein banding" (fig. 1, 3, 4, 8, 9, 11), unlike Mg deficiency, where usually the green bending area are larger toward the base of the veins and narrower toward the tops. And yet, sometimes, as can be in some varieties of sweet cherry tree (fig. 5), in Mn deficiency the green bending area alongside the main veins can be larger toward the base than toward the top, but the position of leaves on shoots discriminate for sure between Mn and Mg deficiencies. In other varieties of sweet cherry tree, the rule is confirmed (fig. 3, 4).

The most frequent confusions can be between Mn deficiency and Fe deficiency, in both cases the interveinal chloroses appearing first on younger leaves. The essential differences that allow discriminate between these two nutrients are:

a) In Mn deficiency a narrow uniform band alongside the main veins remain green for quite a long time, unlike Fe deficiency where only the veins, even the fine ones, remain green.

b) In Mn deficiency, even in a moderate one, the chloroses are followed by necroses in points and spots, unlike Fe deficiency where usually there are no necroses. Sometimes, as Mn deficiency advances, only the veins remain green, like in Fe deficiency, but the necroses signs appear in Mn deficiency (fig. 2). In *Gramineae*, the interveinal chloroses and necroses caused by Mn deficiency are the most frequent on the basal half of the leaf, unlike Fe deficiency where chloroses are uniform on the whole leaf; in these species, the interveinal chloroses caused by Mn deficiency are yellow-greysh, as irregular elongated spots or as points; later, in the chlorotic area develop irregular lesions and necroses, partially surrounded by distinct dark brown margins (grey speak" symptom); this does not happen in Fe deficiency.

c) In Mn deficiency there are no full yellow chlorosis of the leaves and neither whitish chlorosis, like in advanced or severe Fe deficiency, because the leaves necroses long time before.

d) Mn deficiency shows rust-colored, brown or dark brown necroses in points and spots spread over the leaf lamina, unlike very severe Fe deficiency where, if necroses exists, they start from the tips and margins of the lamina as continuous burning, brownish color, advancing toward the middle vein; Mn caused necroses are spread on both sides of the median vein of the lamina, unlike Fe caused necroses where they can be seen only on a half side of the leaf, or more severe on a half side separated by the median vein.

e) In Mn deficiency, the necroses area can sometimes perforate, unlike Fe necroses, if they exist.

f) In severe Mn deficiency the plant dyes, unlike Fe deficiency where usually the plant survives and only in very severe deficiency the plant can dye.

g) In Mn deficiency the color of petals are not affected, unlike severe Fe deficiency where the flowers have untypical colors, the petals are discolored, dull, tarnished, lusterless, and the flowers do not fully open;

h) Premature defoliation does not happen in Mn deficiency, unlike Fe deficiency – where premature defoliation of the shoots on the tips can be observed on trees.

i) The "marsh spot" symptom can be seen in Mn deficiency, as reddish, rust-colored, brownish or blackish spots on cotyledons of the legumineous seeds (peanuts, beans, pea), unlike Fe deficiency where there is no "marsh spot" symptom.

The visual identification of Mn deficiency allow to take in time correcting measures by repeated foliar application of Mn containing solutions (for details, see Budoi, 2000, 2004).

Visual symptoms of Mn toxicity on plants (fig. 12 to 17)**.** The symptoms appear first on older leaves (fig. 12, 14, 16), and spread from base of the shoots or plants to top. Because of Mn toxicity, MnO_2 accumulate into the superficial tissue of the leaves, especially on petiols and veins, and lesions as brown, dark brown or blackish spots and points appear (fig. 12, 14, 17); usually the spots are surrounded by chloroyic area. In grassy species, the brownish spots can be seen even on shoots. In fruit trees, the bark become rugged, lesions and protuberances appear on trunk, branches and twigs, the bark exfoliate, the glue exudations appear through bark pores and lesions. Detailed descriptions on Mn toxicity in barley, soybean, red-clover, cucumber, garlic and tomatoes have been presented recently in another paper (Budoi et al., 2004).

The most sensitive species to Mn toxicity are those from the *Leguminosae* family, especially in the first stages, like seedling stage, during and after rising. After rising, the *cotyledons* show severe light brown necrosis on the tops, they can be cracked, the necrosed tissue can fall (fig. 13). In severe Mn toxicity, the leaves are deformed, even goffered, dark brown or blackish spots are spread on older leaves (fig. 12, 17); severe growth stunting and delaying is induced, the plants having a bushy or „bonsai" pattern (fig. 15). The pods and leaves looks like being sprinkled.

Irregular papery or light brown necrotic lesions can be seen in cucumber older leaves (fig. 17), becoming then reddish-brown or dark brown.

Measures against Mn nutritional disorders. There are preventing measures and curative measures. For details concerning the measures on Mn deficiency see Budoi (2004). Liming acid soils is the most efficient measure against Mn toxicity.

MANGANESE IN ANIMAL HEALTH. Functions in body: See bellow "Manganese and human health".

Mn deficiency. Disturbance in bone formation; deformed bones; sterility.

MANGANESE AND HUMAN HEALTH. Functions in body. Apps et al, 1992, consider that the functions are not specific since other minerals (e.g. Mg) can perform in its place. Mn is essential for (PHL, 2002):

– proper *bone* and *cartilage formation*;
– *enzyme activation*, reproduction and growth, *sex hormone production*, and tissue respiration.

Mn is a component of the following important *enzymes* (Curry, 2004):

- *Mn-SOD* (manganese superoxide dismutase) – important in preventing damage to tissues caused by lipid oxidation; a similar protecting function is played in plant.
- *pyruvate carboxylase* – important in the breakdown of carbohydrates;
- *arginase* – important for synthesis of nitric oxide and ultimately the formation of urea for excretion in the urine (Murray et al., 2000).

Mn does function in enzyme reactions concerning blood sugar, metabolism, and *thyroid* hormone function (Decuypere, 2002).

Need of Mn (Decuypere, 2002). Adults: 2-5 mg/day; children 1-7 years: 1–3 mg/day, depending on age; infants 0-6 months: 0.3-0.6 mg/day.

Mn deficiency. Deficiency is rare in humans, perhaps because Mg can readily substitute for Mn in many reactions. The effects are likely to be on the skin and bones primarily (Apps et al, 1992).

Symptoms of deficiency are (Marks et al, 1996; PHL, 2002; Curry, 2004): ataxia – *muscle coordination failure*, dizziness, *ear noises, hearing loss*, growth retardation, impaired glucose tolerance, *poor reproductive performance*.

Recommended sources of Mn (Decuypere, 2002; PHL, 2002; Curry, 2004). *Vegetables:* beets, Brussel sprouts, kale, kelp, leafy green vegetables, lima beans, peas, spinach, squash (summer), sweet potato. *Fruits:* blackberries and strawberries, pineapple. *Nuts:* chestnuts, pecans, pine nuts/pignolias, walnuts. Whole grains and cereals.

CONCLUSIONS

Soil quality is essential for plant nutrition and food quality for animal and human health. Plants with nutrient disorders – deficiencies and toxicities, will produce nutrient disorders and other diseases in animal and human body.

Mn is essential for plants, animal and human life. There are many factors and conditions that can favorize or determine Mn deficiency or toxicity in plants and animals. As concern the Mn plant nutrition, there are factors and conditions related to soil, plant, clime and technology; they have been presented in details.

Important descriptions and new considerations have been made regarding the visual symptoms of manganese deficiency and toxicity, keys to avoid the confusions between Mn deficiency and Mg or Fe deficiency being presented. Relevant original photos of Mn deficiencies and toxicities have been showed. All these are extremely important for farmers, for the management of theirs technologies, as well as for teaching purposes.

The aspects presented in this paper have a contribution to a better knowledge and management of the soil-plant-animal-human system.

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Pictures

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Fig. 1. Slight to moderate manganese deficiency in glashouse "Cornichon" cucumber: interveinal chloroses and "narrow uniform green vein banding" on the leaves from the upper third of the plant; note that the older leaves are normal. Do not confound Mn deficiency with Squash Mosaic Virus (SqMV), or with Zucchini Yellow Mosaic Virus (ZYMV) in *Curcubitaceae* (original, © Gh. Budoi)

Fig. 2. Moderate to severe manganese deficiency in glashouse "Cornichon" cucumber: advanced chloroses – only the veins are green, and beginning of necroses; do not confound with Fe deficiency, where usually there are no necroses (original, © Gh. Budoi)

Fig. 3. Manganese deficiency in sweet cherry tree: younger leaves with interveinal chloroses, “narrow uniform green vein banding”; do not confound with Fe deficiency, where only the veins remain green (original, © Gh. Budoi)

Fig. 4. Manganese deficiency in sweet cherry tree: detail “narrow uniform green vein banding” (original, © Gh. Budoi)

Fig. 5. Manganese deficiency in sweet cherry tree: fully developped young leaf with nonuniform green vein banding (exception from the rule); do not confound with Mg deficiency, that first apear on older leaves (original, © Gh. Budoi)

Fig. 6. Manganese deficiency in kaki – *Diospyros kaki:* (original, © Gh. Budoi)

Fig. 7. Incipient manganese deficiency in lemon tree – *Citrus lemon*; fully developped young leave (original, © Gh. Budoi)

Fig. 8. Slight to moderate manganese deficiency in apple tree – *Malus domestica*; intereveinal chloroses on young leafe, “uniform green vein banding” (original, © Gh. Budoi)

Fig. 9. Moderate manganese deficiency in apple tree: advanced intereveinal chloroses, “narrow uniform green vein banding” (original, © Gh. Budoi)

Fig. 10. Moderate manganese deficiency in apple tree: leaves from the upper third of the shoot (original, © Gh. Budoi)

Fig. 11. Manganese deficiency in *Ficus australis (syn. Ficus rubiginosa)*: interveinal chlorosis on the leaves from the upper third of the shoot (original, © Gh. Budoi)

Fig. 12 – Mn toxicity in barley (1000 ppm Mn in soil): 15 days after rising; right: details of a leaf with MnO_2 deposition in the epidermis cells (originals, © Gh. Budoi)

Fig. 13 – Extremely severe Mn toxicity in soybean, 14 days after rising (1000 ppm Mn in soil): severe necroses on cotyledons (original, © Gh. Budoi)

Fig. 14 – Extremely severe Mn toxicity in soybean, older leaf, 30 days after rising (1000 ppm Mn in soil): necroses in spots and points due to MnO_2 deposition in the epidermis cells (original, © Gh. Budoi)

Fig. 15 – Extremely severe Mn toxicity in soybean, 48 days after rising (1000 ppm Mn in soil): extremely severe growing retarding, abnormal ramification, bushy or „bonsay” pattern, necroses on older leaves; on the right, plant already dyed (original, © Gh. Budoi)

Fig. 16 – Mn toxicity in cucumber; the older leaves first affected (original, © Gh. Budoi)

Fig. 17 – Mn toxicity in cucumber; detial of an older leaf with necroses (original, © Gh. Budoi)

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RESEARCHES CONCERNING THE ELABORATION OF SOME NEW METHODS FOR STUDYING CALCIUM DEFICIENCIES IN PLANTS

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Keywords: soil, calcium, ammonium oxalate, precipitation, plants, deficiency

ABSTRACT

The paper presents a part of the results belonging to a research project which aim is to elaborate new original methods for the study of the plant nutrient deficiencies. These consist in applying some chemical compounds in the culture medium (soil, substrate) in order to selectively block only the desired nutrient; consequently, the deficiency will start, at the desired species and vegetation stage, allowing to get visual descriptions in the species to whom these are missing. The researches have been carried out in the greenhouse in a monofactorial experiment, the test species being: winter wheat, flax, mustard, fodder rape, red clover and celery. The *in situ* blocking of the calcium was done using ammonium oxalate in the presence of ammonium chloride. As a consequence of precipitation of a part of the accessible calcium for plants, typical deficiency symptoms have been observed: young leaves failed exit from sheaths in winter wheat; stem bending down in flax; dying of the growing point in mustard or characteristic “clawlike” hooking of the young leaves in rape. There are also emphasized the experimental difficulties in the elaboration of a method for calcium blocking and the limits of the tested method.

INTRODUCTION

Plant nutrient disorders affect the yield level and, sometimes seriously, the quality of the agricultural products - with negative consequences for human health, and for the quality of life, generally. The knowing of the visual symptoms of nutrient disorders is indispensable to growers for a rapid diagnosis and for taking in useful time the corecting measures by fertilisation, a right fertilisation being a guarantee of a sustainable agriculture.

Many authors have been published descriptions of the visual symptoms of the nutrient disorders (Bergman, 1992; Borlan et al, 1992; Budoi, 2000, 2001, 2004; Marschner, 1993; Mengel, 1987, Scaife et al, 1995; Wallace, 1961). However, the descriptions of the nutrient deficiencies are missing or insufficient for many vegetables, flowers, field crops or fruit trees; this is the subject for many research projects leaded by important universities in the world (ex. North Carolina State University, 2003).

This paper presents a part of the results belonging to a research project (CNCSIS Grant) which aim is to elaborate new original methods for nutrient deficiency researches; this consists in the application of some chemical compounds in the growing area of plants (soil, substrate) which selectively block only the studied nutrient, starting the deficiency, at any species, in any vegetation stage, allowing to obtain visual descriptions in the species to whom they are missing.

This kind of methods would allow researches, at desire, in perennial species of any age, which is impossible by classical methods. Controlling the type, the moment and the intensity of disorders allows doing fundamental researches concerning plant physiology (photosynthesis intensity, specific biosynthesis etc.) in conditions of known nutritional stress.

MATERIALS AND METHODS

In 2004, a series of experiments was set up in the greenhouse of USAMV Bucharest, among them one experiment with the aim to elaborate some new methods to unleash, at wish, calcium deficiency in order to use them for studying the visual symptoms for the missing species, to describe the manifestation particularities and the most important of all, to obtain images for these species.

The experiment for calcium was a monofactorial type, the variants being represented by the combination plant + chemical reagent (used for immobilisation of the soil nutrient). A mollic reddish-brown soil, moderately leached, was used; the soil came from Moara-Domneasca, was formed on loess, had a middle-fine texture, silty-clay toward clayey-silty. The agrochemical soil properties are presented in table 1.

Details concerning the variants, culture plants, blocking chemical reagents, size of the pots, background fertilisation and that during vegetation, sowing and rising time, time of application of the chemical reagents for blocking the studied nutrient, time for taking observations and the observations are presented in table 2.

Even if the winter wheat is normally sowed in autumn and needs to pass through a vernalisation process during the cold period of the year (otherwise it does not bloom and it does not form seeds), it was used as a test plant because the aim of the research was only the vegetative aspect for this specie. As principle, the total applied quantities of chemical reagents have been calculated as a function of the quantity of nutrient that needs to be precipitated.

The volumes of the applied chemical solutions per pot have been established as a function of the reagents quantities necessary per pot and of the solutions' concentrations. The total volume was applied in several fractions so that after the dilution with the irrigation water to obtain diluted solutions which won't produce phytotoxic effects on plants.

RESULTS AND DISCUSSIONS

This paper is the first from a series which concern the 12 macro- and micronutrients (N, P, K, Mg, Ca, S, B, Cu, Fe, Mn, Mo, Zn) essential for plant's life. That is why it also presents, additionally to the experimental results obtained for calcium, the conceptual aspects which are the basis for the researches concerning the 12 elements in the series.

These aspects are evidently based on a proper documentation, but they especially represent the result of the scientific reflection on the tackled subject. Being a paper, which aim at the elaboration of some research methods, it first of all emphasizes a series of methodological aspects.

Elaboration of some new methods which allow to block (immobilize) the researched nutrient in soil by precipitation reactions into insoluble and inaccessible compounds for plants, and starting - and studying by this way – of the deficiencies is a scientific priority. Such methods eliminate the serious limits that present the classical methods of studying the deficiencies: a) the method of plant cultivation in nutritive solutions; b) researches by experiments in vegetation pots; c) researches by field experiments; d) expeditionary or fortuitous experiments. The paper presents in detail the limitations of the classical methods.

Difficulties in the elaboration of new methods which allow "in situ" blocking of the researched nutrient and deficiency starting. The fact that till now there weren't elaborated such methods shows the difficulty of their elaboration. The soil-plant system is extremely complex. In soil occur not only chemical reactions among the most complex, many of them yet unknown, but also processes typical for life.

The compounds used for blocking the studied nutrient have to accomplish some essential conditions that are not easy to be accomplished:

a) The substances have to be water-soluble in order to penetrate easily into the soil and to interact with the soluble forms of the nutrient in soil, which are directly accessible for plants.

b) To selectively block only the studied nutrient, without interference – without blocking other nutrients respectively, otherwise we will have multiple deficiencies.

c) The reactions have to occur "at cold" – that means at the environment temperature.

d) The form in which the nutrient has been blocked has to remain unmodified by the soil chemical and biological processes enough time that the deficiency manifests in all its plenitude.

e) To, eventually, exists the possibility to relieve (unblock) in soil the blocked nutrient using one or more suitable chemical compounds.

f) The blocking compounds applied during vegetation must not have by themselves inhibitory effects on plants neither till the blocking is realised, nor if they remain in free form.

g) The eventually secondary chemical products that result must not have phytotoxic effects.

h) One of the major difficulties is that the nutrients are found in soil and in other forms than the soluble one, forms that can become soluble and that it have to found solutions either to accelerate the transfer of the potential accessible forms into soluble ones or that the applied chemicals can directly interact with the forms potentially accessible for the plants.

As much as a higher number of these numerous difficulties are defeated (surpassed), as much valuable is the elaborated method.

In the realized experiment, the blocking of the soil calcium accessible for plants and the deficiency starting have been based on the precipitation reaction of the Ca^{2+} ions using ammonium oxalate in the presence of ammonium chloride:

$$Ca^{2+} + (NH_4)_2C_2O_4 \xrightarrow{+NH4Cl} CaC_2O_4 + 2NH_4^+,$$

resulting a crystalline, white precipitate of calcium oxalate, water insoluble, but soluble in mineral acids. Ammonium chloride is used in order to avoid precipitation of the Mg^{2+} ions.

In table 2, the observations on plants – the visual symptoms respectively, are presented in a synthetic manner. Among the observed symptoms, the following deserve to be emphasized:

– Fail of the young leaves to exit from sheaths in winter wheat, typical symptom, shows a calcium deficiency (fig. 1).

– "Stem bending down" in flax evidences slight calcium deficiency (fig. 2). In the case of a more severe deficiency, a stem "brake" and "bending down" underneath the inflorescence or flower of the herbaceous plants occurs.

– Dying of the growing point in white mustard (fig. 3) is a typical symptom for calcium deficiency.

– Spoon curving of the young leaves top and "clawlike" hooking of the younger leaves in fodder rape (fig. 5), typical symptoms in *Cruciferae,* show calcium deficiency.

The research emphasized the fact that in the case of calcium blocking *"in situ"* in soil there is a major difficulty, the greatest, which distinguish it from all the other nutrients: in common soils, the exchangeable Ca^{2+} is in the highest concentration as compared with all the other exchangeable cations, and in order to decrease it to concentrations which are favorable for deficiency, it have to precipitate large quantities of calcium; this involves to use so large quantities of chemical reagents that is difficult to avoid the phytotoxic and saline effects.

Because of this inconvenient, there isn't a reliable method, not even the above one described, that seems to be feasible to be applied for carbonatic soils, and even neither for soils without free carbonates, but totally base saturated.

Also, the scientific research evidenced the fact that even on slight acid soils, such as is the mollic reddish-brown soil used in the experiment, not all the tested species responded by typical calcium deficiency symptoms, because some of them, more sensitive to soluble salts, showed phytotoxicity visual symptoms. This was the case in red clover (fig.4), in which the plants were more liable to mildew because of their resistance weakening at the pathogen agents' attack. The celery showed neither phytotoxicity symptoms nor calcium deficiency till 2.08.2004, period when it received the same volume of ammonium oxalate in one application like the other species. But when, after 2.08.2004, the volumes of ammonium oxalate for one application have been doubled, in order to test the plant resistance at higher oxalate concentrations, the plants showed more and more severe necrosis on the older leaves.

CONCLUSIONS

– There are many difficulties to be surpassed in order to obtain a reliable method that can be used for selective *in situ* blocking of the desired soil nutrient.

– As much as a higher number of these numerous difficulties will be surpassed, as much valuable the elaborated method will be.

– The tested and presented method could be used with a rate of success on acid, base unsaturated soils, at least for species more tolerant to salts.

– Even if the obtained results are encouraging, there are still necessary thoroughly supplementary researches in order to perfect the method.

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TABLES

Table 1. Agrochemical properties of the mollic reddish-brown soil used in experiment

Agrochemical index	Value	Agrochemical index	Value
pH	6	P_{AL}, ppm P	34
Ah, mE/100 g	3,45	K_{AL}, ppm K	224
SB, mE/100 g	19	Humus, H, %	2,09
V_{Ah}, %	85	Ind. azot, IN	1,8

Table 2. The Experiment "– Ca": Researches concerning *in situ* blocking of the calcium in soil for calcium deficiency studies. Variants, treatments, observed visual symptoms

No.	Experimental variant: Test species	Experimental variant: Blocking chemical reagent	Sowing time	Rising time	Treatments for calcium blocking during vegetation and applying date	Observed visual symptoms	Date of taking images
1	Wheat (Flamura 85)	$(NH_4)_2C_2O_4$	7.6. 2004	12.6	13,7 ml $(NH_4)_2C_2O_4$ 2%+10 ml NH_4Cl 2%/pot at: 7.7.2004; 9.7; 13.7; 15.7; 16.7; 19.7; 21.7; 26.7	2.8.2004: young leaves failed exit from sheaths (fig. 1)	2.8
2	Flax (Nineta)	$(NH_4)_2C_2O_4$	-„-	12.6	–„–	15.7.2004: stem softening and bending down at the top part, typical symptom for Ca deficiency (fig. .2)	15.7
3	White mustard (Amog)	$(NH_4)_2C_2O_4$	-„-	14.6	–„–	15.7 and 19.7.2004: dying of the growing point, typical symptom for Ca deficiency in *Cruciferae* (fig. 3)	
4	Red clover (Flora)	$(NH_4)_2O_2O_4$	-„-	12.06	–„–	It wasn't observed typical symptoms –Ca; 2.8.2004: marginal scorching of the leaflets, untypical for –Ca (fig. 4)	15.7; 2.8
5	Rapeseed (Akela)	$(NH_4)_2C_2O_4$	-„-	12.6	–„–	19.7.2004: characteristic "clawlike" hooking of the young leaves, typical for Ca deficiency (fig. 5); 2.8.2004: idem 19.7.2004	19.7; 2.8
6	Celery (Snow white)	$(NH_4)_2O_2O_4$		Planted on 24.6	13,7 ml $(NH_4)_2C_2O_4$ 2%+10 ml NH_4Cl 2%/pot at: 9.7; 13.7; 15.7; 16.7; 19.7; 21.7; 26.7. 27,4 ml ammonium oxalate 2%+10 ml NH_4Cl 2%/pot at: 6.8; 9.8; 11.8; 13.8; 16.8; 18.8; 20.8; 23.8; 25.8; 27.8	Until 2.8 - no symptoms; 2.8: slight necroses on the edges of the young leaves; 12.8: withering and scorching of the older leaves; 16.8: for scorched basal leaves/plant; 27.8: scorched basale leaves, chloroses and marginal scorching of the leaflets; 6.9: many basal leaves scorched	2.8; 6.9

Notes: Characteristics for the used pots: type B_6 (Beta Plast no. 6); V util = 2,5 l/pot; M soil = 3,3 kg dry soil/pot
Background fertilisation at sowing or planting**:** equivalent to ***100 kg N/ha, 100 kg P_2O_5/ha, 100 kg K_2O/ha; 50 kg MgO/ha***: **7,33** ml sol. 10 % complex 16:16:16/pot + **3,43** ml solution 10 % $MgSO_4 \cdot 7H_2O$/pot (1,04 ml/kg soil)
Supplementary fertilisation during vegetation: at 21.7 and 6.8.2004 it was applied the equivalent of 100 kg N/ha = 33 mg N/kg soil = 0,72 ml urea solution 10%/kg soil = 2,4 ml/pot B_6

Pictures

Fig. 1. Ca deficiency in winter wheat: young leaves failed exit from sheaths (pot experiment; photo by Gh. Budoi)

Fig. 2. Slow Ca deficiency in flax: stem bending down (pot experiment; photo by Gh. Budoi)

Fig. 3. Ca deficiency in white mustard: dying of the growing point (pot experiment; photo by Gh. Budoi)

Fig. 4. Ammonium oxalate phytotoxicity in red clover plants: detail (pot experiment; photo by Gh. Budoi)

9.07.2004

02.08.2004

02.08.2004

Fig. 5. Ca deficiency in fodder rape: characteristic “clawlike” hooking of the young leaves, typical for *Cruciferae* (pot experiment; date of rising: 07.06.2004; photos by Gh. Budoi)

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COMPARISON BETWEEN *IN VITRO* AND *EX VITRO* GERMINATION ON WITLOOF CHICORY (*CICHORIUM INTYBUS* L.)

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Keywords: germination rate, dynamics, F1 hybrids

ABSTRACT

The main objective for this research was to determinate the influence of the *in vitro* and *ex vitro* culture medium on the witloof chicory seeds germination. For hybrids were studied: Bea, Turbo, Zoom and Totem. The *in vitro* culture medium was represented by the Quoirin&Lepoivre medium and the *ex vitro* one was a compost and perlite mixture. Both the germination rate and dynamics proved to be superior when the seeds were sown on the *in vitro* medium.

INTRODUCTION

This paper was meant to determinate the influence of the germination culture *in vitro* and *ex vitro* on the chicory seeds germination.

The objective was to determinate whether the initiation of an *in vitro* culture for this specie is better to be done on *in vitro* or *ex vitro* culture medium. For this comparation the best *in vitro* culture medium was chosen – Quoirin&Leproive proved that way by the previous researches and experiments.

The witloof chicory hybrids' behavior was studied by the germination rate and dynamics.

MATERIALS AND METHODS

The starting material consisted in seeds from four F1 witloof chicory hybrids. The seeds were acquired from Vilmorin, France (Bea, Turbo, Zoom) and Johnny's Selected Seeds, S.U.A. (Totem).

The experiment consisted in two germination variants: *in vitro* and *ex vitro*. Thus, for the *in vitro* variant the Quoirin & Lepoivre culture medium was used (agar - 0.5%, pH - 5.84), while for the *ex vitro* germination, the seeds were sown in nutrient mixture (composted manure and perlite = 2:1)

Before the *in vitro* culture initiation, the seeds were treated with a sterilizing agent consisted in a mercuric chloride solution (0.05%) for three minutes. This protocol included also two drops of a liquid detergent (for a better adherence to the seeds surface). After sterilization, the seeds were rinsed three times with sterile distillate water.

The seeds where sown on the *in vitro* culture medium in small test tubes and on *ex vitro* nutrient mixture in small multi-trays.

The seeds germination occurred in the same conditions for both variants studied. In the growing room, the conditions were constantly maintained at a temperature of 23±1°C day / 19±1°C night, the light intensity was 40 µE m-2 s-1 and the photoperiod: 16/8 hours.

The multi-trays used for the *ex vitro* germination were covered with a plastique film to maintain the optimum humidity level.

RESULTS AND DISCUSSIONS

The germination rate registered by the chicory hybrids on the Quoirin&Lepoivre medium (87.5%) was 24.5% better than on the *ex vitro* variant (63.09%).

It is thus justified the initiation of an *in vitro* culture for witloof chicory started from hybrid seeds sown directly on *in vitro* culture medium.

Bea and Totem registered a higher germination rate *in vitro*, 66.67% and respectively 42.86% supplementary compared to the germination rate on the nutrient mixture *ex vitro* (table 1, figure 1). Turbo presented also a better germination *in vitro*, even if the percent was only 19.05% higher than on the *ex vitro* variant.

The only hybrid whose seeds germinated better *ex vitro* was Zoom. In this case the percent was 30.95% higher than on the Quoirin&Lepoivre medium.

The germination rate reached 100% only *in vitro* for Bea, Turbo and Totem.

Analyzing the germination dynamics on both culture media (table 2) it was noticed that all Bea's seeds germinated *in vitro*, while *ex vitro* only 33%. In fact, all this hybrid's seeds germinated *in vitro* in the first 12 days all the seeds. On the nutrient mixture *ex vitro* the seeds started to germinate only after 8 days (figure 2).

Turbo also proved to germinate better and faster on Quoirin&Lepoivre medium (100% in 9 days), while *ex vitro* only 81% seeds germinated. Remarcable is also the germination uniformity for the *in vitro* variant. In this case all the seeds germinated after 7 days in a three days period.

The seeds placed on the compost and perlite mixture started to germinate faster (after 4 days), but the germination uniformity and speed was inferior. After 9 days Turbo registers 71,5% seeds germinated *ex vitro* and 100% seeds germinated *in vitro*.

Zoom is the only hybrid that had a better behavior *ex vitro*, compared with the *in vitro* culture medium; the germination rate was 81% in the first case and 50% in the latter.

Regarding the germination dynamics, in the first week 7.7% was registered in plus on the *ex vitro* variant (47.7%) compared to the seeds germinated *in vitro* after 7 days (40%).

The germination rate for the Totem's seeds was twice better in vitro (100%) than ex vitro (57.2%). In the first week 42.9% germinated *ex vitro* and 40% germinated *in vitro*, but the uniformity was much better *in vitro* (90% seeds germinated in two days).

CONCLUSIONS

1. The best germination rate was registered by the seeds belonging to Bea, Turbo and Totem (100%) on the *in vitro* culture medium (Quoirin%Lepoivre).
2. On the *ex vitro* culture medium (composte + perlite) the best germination rates were recorded by the seeds of Turbo and Zoom (80.95%).
3. Totem, Bea Turbo and *in vitro* germination was 42.49%, 66.7% and respectively 19.1% higher than the values registered *ex vitro*. Zoom germinated better *in vitro* than *ex vitro*.
4. In conclusion, when an *in vitro* culture for witloof chicory is initiated we recommend the direct germination on the Quoirin&Lepoivre culture medium. This medium promoted a high and uniform germination rate.

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Tables

Table 1. The witloof chicory (*Cichorium intybus* L.) hybrid seeds germination rate on the two culture media

Hybrid	*in vitro* (Quoirin&Lepoivre)	*ex vitro* (compost+perlite)	Average
Bea	100,00%	33,33%	66,67%
Turbo	100,00%	80,95%	90,48%
Zoom	50,00%	80,95%	65,48%
Totem	100,00%	57,14%	78,57%
Average	87,50%	63,09%	

Table 2. The witloof chicory (*Cichorium intybus* L.) hybrid seeds germination dinamics on the two culture media (%)

Hybrid	Variant	Days for germination											Germination rate
		4	5	6	7	8	9	10	11	12	15	38	
Bea	*in vitro*	-	-	10,0	30,0	30,0	-	10,0	-	20,0	-	-	100,00
	ex vitro	-	-	-	-	4,8	-	9,5	-	9,5	9,5	-	33,30
Turbo	*in vitro*	-	-	-	40,0	50,0	10,0	-	-	-	-	-	100,00
	ex vitro	4,8	9,5	9,5	-	42,9	4,8	-	-	4,8	4,8	-	80,95
Zoom	*in vitro*	-	-	-	40,0	-	-	-	-	10,0	-	-	50,00
	ex vitro	4,8	28,6	14,3	-	33,3	-	-	-	-	-	-	80,95
Totem	*in vitro*	-	-	-	40,0	50,0	-	-	-	-	-	10,0	100,00
	ex vitro	9,5	14,3	-	19,1	-	-	-	4,8	4,8	4,8	-	57,14

Figures

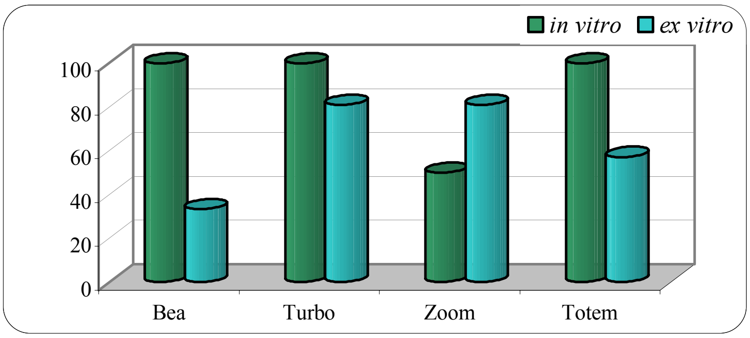

Fig. 1. The influence of the culture medium on the *Cichorium intybus* seeds germination

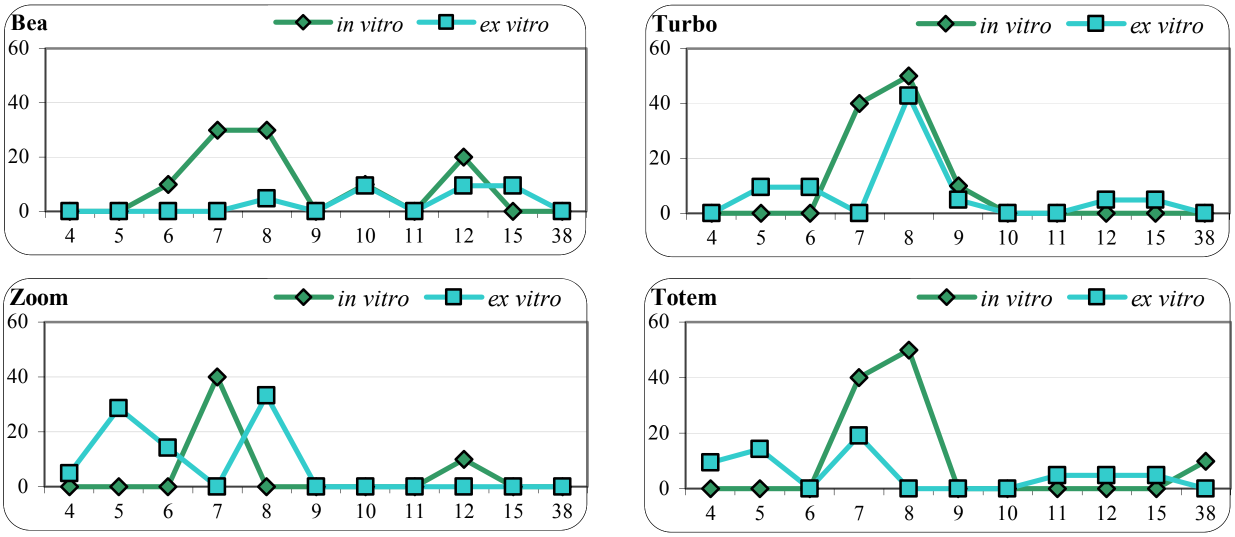

Fig. 2. *In vitro* and *ex vitro* germination dynamics of witloof chicory hybrids (*Cichorium intybus* L.)

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE EFFECT OF THE TREATMENT WITH AGROBACTERIUM RHIZOGENES ON THE GROWTH AND DEVELOPMENT OF THE TOMATO PLANT

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Keywords: the productive potential, *Agrobacterium rhizogenes*, the ecological culture, bonitat.

ABSTRACT

The productive by of the tilled plants has always been of great importance for farmers.

Among the measures which have offered results to the researches there is the treatment with *Agrobacterium rhizogenes* (AR), which determines the alteration of different features of the treated plants. These alterations influence the growth and development of the plants, alterations which may be considered positive or negative according to the species.

In conducting our experiment the AR wild type bacterium strain has been used for treating the seeds of the tomato plants. In order to observe the effect of the treatment there has been organized an experiment in the vegetable field ASAMV where an ecological technology has been applied.

As for as the biological material is concerned there have been used three breeds, of early tomatoes and there breeds of semi-early tomatoes each of these in two variants: treated and not treated ones. The differences in the vegetative growth of the plants have been observed by biometry measurements and for the evaluation of the fructification potential of the plants, for each variety, the bonitat method has been used The obtained results have shown that the effect of the treatment has been shown in the growth and the developments of the fructification potential.

So, for both groups of varieties (breeds) kinds the growth of the plants in cm.(height) has been diminished (thing) that is in agreement with the literature information from the referring to other species. The diminution of the plants height has been smaller for the early breeds (ie 5.2%) and higher for the semi – early (ie 14.8 %) ones.

The growth of the plants which have expressed eventually through the average value of the bonitat for the total of fructification points, this growth has been slowed more in the case of the early breeds, the average difference of the bonitat. For the treated variants has been of 24% while the semi-early breeds, under the influence of the treatment, have registered a growth of the bonitat of 2 % in comparison with the values registered for the non treated breeds. Furthermore it is necessary ,to test the efficiency of the treatment whith AR on other groups of vegetable species.

INTRODUCTION

For the domain of the tilled plants finding new, adeqatetechnical solutions to allow the growth of productivity has always been important.

The specialized literature offers a lot of information regarding the result of applying different methods that influence the manifestation of the productive potential of different species of plants used in human alimentation, in animal feeding, in therapy or of plants used for other purposes.

Such a method indicated by the specialists in the field, is the treatment of plants with AR which determines the alteration of certain features of the plants. In this regards, interesting results in certain cases especially valuable results, have been obtained for the decorative medicinal and aromatic plants.

During the research that has been done by USAMV in collaboration with the Genetics Department from the Bucharest University and NGO "Mother Terra", has been observed the influence of the treatment with AR on the fructification potential of field tilled tomatoes.

The experiments have been organized in the experimental field of the Vegetable Growing Department.

MATERIALS AND METHODS

As biologic material used for testing the influence of the AR treatment there have been chosen three breeds of early tomatoes (Nativ, Early, dubok) and three breeds of semi- early tomatoes(Novick, Boroa, sel Ajud). Each of these breeds has represented a variant of the experiment that had two sub variants:

1. AR treated and
2. non treated

The treatment consisted in the infection of the tomato seeds with AR. The seeds have been kept for 24 hours in AR suspension and then sowed into pots to obtain the transplant. The experiment has been installed by linear setting of the variants and sub variants

The plants have been taken care of according to ecological technologies while vegetating.

In order to spotlight the differences between the growth and development of the plants in different variants and sub variants there have been performed biometrical and bonitat measurement that have allowed us to evaluate the degree of development for each fructification point.

RESULTS AND DISCUSSION

The first observations made during the vegetation period have shown that the offspring of the treated seeds variants has been 10% higher than the non treated ones.

The observations made during the vegetation period shows that the influence of the treatment on the growth and development of the plants has been obvious.

From the above shown data one can notice that the growth of the plants has been unequally.

Influenced by the treatment so that the early breeds have had an average height smaller with only 5,2% in comparison with the non treated ones.

But the early breeds differentiated more, they being 14,8% smaller for the treated subvariants.

This phenomenon is known from specialized literature which signalizes the diminution in growth of certain species of plants treated to dwarfism.

The development of the plants has been differentiated also by the group of plants: the average value indices (the number of inflorescences on the plant, the number of fructification points on inflorescence) have been smaller for the treated variant. The biggest differences have been observed in the total bonitat of the fructification points for every plant which has been smaller for the AR treated plants up to 25% which means that breaking of the growth and development **process** and diminution of the fructification potential take place.

For the semi – early breeds the treatment has produced smaller differences for the development indices, and for the total bonitat for which there has been noticed a certain growth/increase not more than 2%.

Comparing the general growth and development of the tomato plants in the two subvariants the correlation (direct or indirect) between these processes for the AR treated variants and for the non-treated ones could not have been observed. The thorough analysis of the shown data in grid nr. 1 demonstrates the fact that the effect of the treatment manifests differently according to particular features of the biologic material undergoing the treatment.

We consider that it is necessary to continue the study/research of the effects of the AR treatment, using as biologic material other species of tilled/cultivated vegetables which are used in human alimentation and for the species where the indices are overlapped there should be held investigations regarding the alteration of nutritional qualities.

CONCLUSIONS

1. The AR treatment of tomato plants in seed phase, before sowing brought up the diminution of the growth of the plant as far as height is concerned, especially for the semi-early breeds.
2. The development of the plants (evaluated through the average value of the bonitat) has been influenced negatively for the early breed group and positively for the semi-early breed group.
3. We consider that it is necessary to continue this study by expanding the sortiments of tested species and, in the case of observing positive effects, investigations regarding the quality should be held.

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Table 1. Indices of growth and development for different breeds of tomatoes under the influence of the *Agrobacterium rhizogenes* treatment

		No. of inflorescence per plant	No. of fructification points per inflorescence	Average bonitat of fructification points	Height of plants (cm)
Treated	Naliv (t)	3,5	6,2	7,2	35,7
Non-treated		3,0	6,1	9,3	37,1
Treated	Early (t)	6,2	5,7	8,1	48,7
Non-treated		8,6	6,0	9,8	52,9
Treated	Dubok (t)	7,5	5,1	7,7	47,5
Non-treated		9,0	6,4	9,6	48,6
Treated	Average for the early breeds	5,7	5,6	7,6	43,9
Non-treated		6,8	6,1	9,5	46,2
Treated	Novicek (st)	5,3	5,8	9,2	37,5
Non-treated			9,8	8,3	54,2
Treated	Deboroa (st)	6,0	12,6	8,3	57,0
Non-treated		6,1	13,4	7,9	54,1
Treated	set adjud (st)	2,5	8,4	7,3	61,1
Non-treated		2,6	8,7	8,4	70,2
Treated	Average for semi-early breeds	4,2	8,3	8,4	51,8
Non-treated		5,3	10,6	8,2	59,5

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RESEARCH CONCERNING THE ADAPTATION OF THE PRECISION SEEDER SPC – 6 TO THE ONION CULTURE INITIATION BY DIRECT SOWING

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Keywords : onion, adaption, precision, distances between rows,

ABSTRACT

Some import precision seeders are well adapted to the initiation of vegetable crops, and for onion culture as well, but the price of them is inaccessible for most of the producers and farmers.

In these conditions, it is needed the use of local seeders, akin to precision seeder SPC-6, usually used by most of the Romanian producers for cultures initiation. But to carry out the distance between the rows, it is necessary to realize some constructive adjustments regarding the frame, which will be presented in the present work.

INTRODUCTION

The achievement of the onion culture initiated by direct sowing depends significantly on the quality of the sowing. For that reason, it is very important to use precision seeders which assume a regular distribution of the seed on the rows, a constant depth and a uniformity of the distances between the rows. Frequently, in production, universal seeders (SUP-21, SUP-29) which can be easily adapted for sawing this culture are used, but with some disadvantages.

- an irregular distribution of the seed on the rows, which involve future intervention, difficult and expensive, to thin the culture.
- it is not assured a constant depth and consequently, the plants rising is random.
- appear the necessity to increase the norm of the seeds per hectare, almost to double, comparing with the normal density.

MATERIALS AND METHODS

The seeds boxes of the SPC – 6 seeder are 26-27 cm width, which allow a minimum distance of 33-35 cm between rows. The recommended distance between the onion rows is 20-25 cm (figure 1 and 2). In these conditions is necessary to place the seeds boxes of the seeder on two lines, by fix them alternative on the frame and extensions (fig.3) with the purpose of realizing the desired distance of 20-25 cm.

The extensions were realized from steel pipes with the square section of 8 cm and the length of 133 cm. Their holding to the seeder frame was made by clips. Two supports were used to assemble a total number of five seeds boxes on the seeder at a distance of 22 cm between rows and 52 cm between two successive passes.

This scheme allows the culture initiation not only on plain ground, but also on raised furrow with 94 cm width. A wheel with 16 teeth was fixed on the axis of the crush wheel on the section and another with 22 teeth on the dispenser to realize the distance of 5,6 cm between the plants on the row (fig 1 and 2).

The dispenser disks of the distributors have 34 holes with a diameter of 1 mm. To assure the depth uniformity, on the seeds boxes were fixed depth restrictors.

RESULTS AND DISCUTIONS

The experiments were started in the spring of 2004, using experimental divisions on the area of Jud. Teleorman, where the soil was prepared from autumn (plain and shaped grund). The tractor U 445 with the universal seeder SUP-21 was used for the variants 1 and 2, and the tractor U 445 and modified precision seeder SPC-6 for the variants 3 and 4.

Soon after sowing, it was observed that for the variants 1 and 2 initiated with a common seeder appeared the necessity to thin the plants at 5-7 cm apart, but the work was abandoned in the default of funds. At the variants 3 and 4 initiated with the modified seeder this necessity didn't show.

For the variants 1 and 2 was used a quantity of 7.6 kg/ha of seeds and for variants 3 and 4 a quantity of 3.9 kg/ha, representing an economy of 80.000.000 lei/ ha. During the vegetation all variants were identically maintained.

At the harvest was observed that the bulbs obtained at variants 1 and 2 were very irregular in dimensions and for that reason the calibration was required. The yield obtained by the variants 1 and 2 was lower comparing with those obtained by variants 3 and 4 with 7 to/ha.

CONCLUSIONS

The precision seeder SPC- 6 can provide very good results for the initiation of the onion cultures, but with the prescribed modifications.

The repartition of the seeds boxes on two lines using extensions allow the sowing at a distance of 22 cm between rows comparing with 35 cm at the common seeders, which determine a better and efficient use of the land.

The use of the modified precision seeder SPC – 6 determined the reduction in the seeds norm/ha and in the same times the increase of yield quality and quantity.

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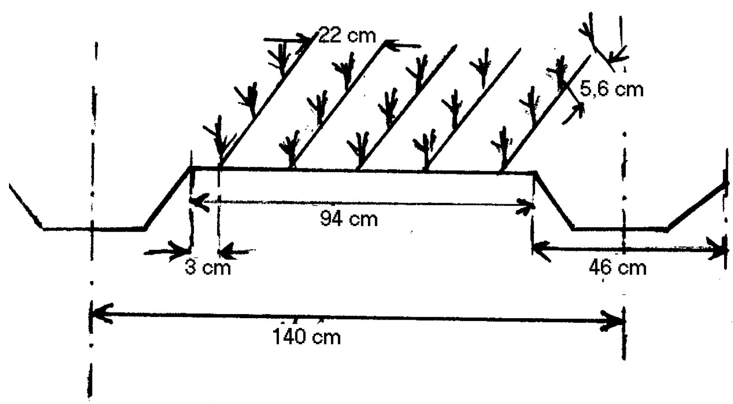

Fig. 1. The initiation scheme of the onion culture by direct sowing on shaped ground

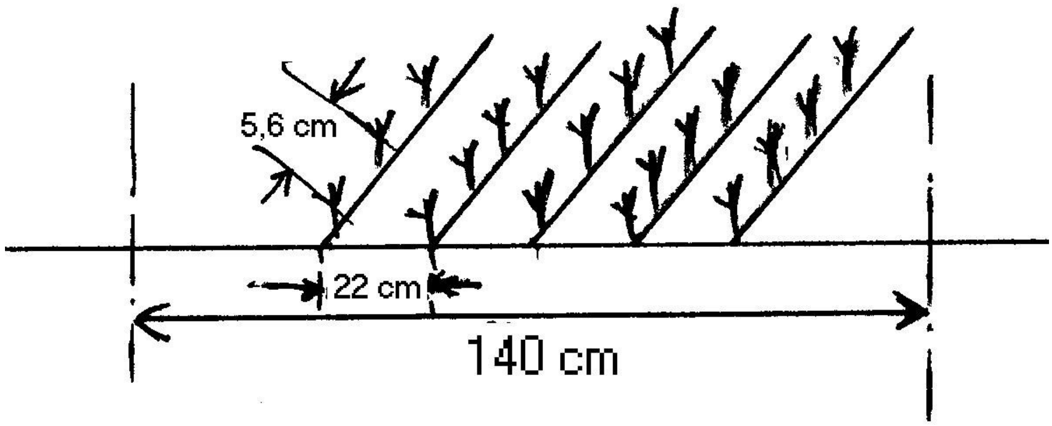

Fig. 2. The initiation scheme of the onion culture by direct sowing on the plain ground

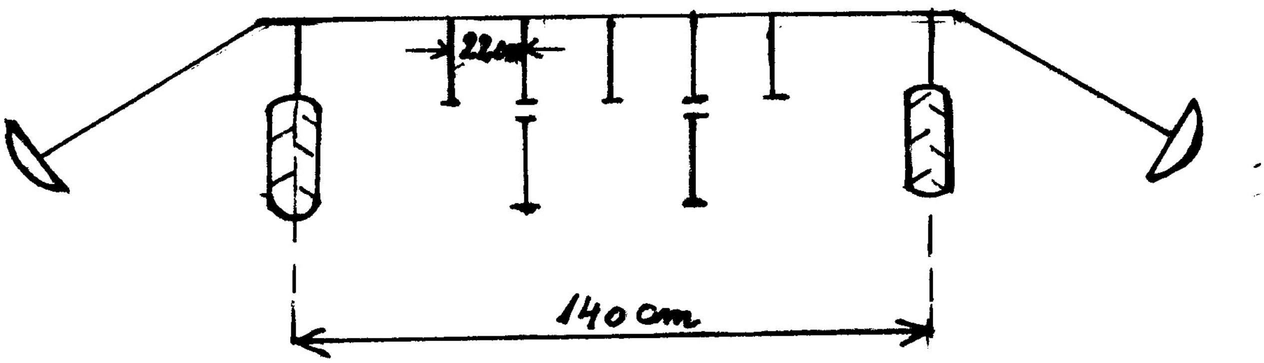

Fig. 3. The position of the seeds boxes on the frame of the modified precision seeder SPC -6

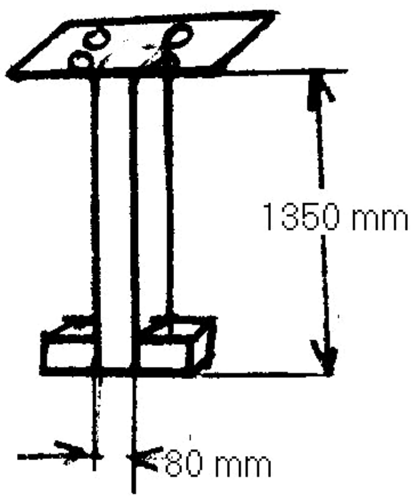

Fig. 4. The extensions of the seeds boxes

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE ESTIMATION OF THE PRODUCTIVITY OF SOME KINGS OF PUMPKIN GIVEN THE CONDITIONS OF THE ECHOLOGICAL CROP

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Keyword: Cucurbita maschata, ecolagical crop, productivity.

ABSTRACT

The cultivation of the pumpkin especially in food purpose brings a lot of advantages to the agricultural producers. Although this crop is well known in Romania, neither the cultivators nor the consumers have enough information regarding the real value of this plant. Through the experiments made by us, we tried to show especially the productive potential that the cultivated kings of pumpkin can have in the conditions of ecological technologies cultivation.

Among the comparative crops, there were tested five king of pumpkin which was part of the cucurbita maxima L and the cucurbita maschata L. species. The results we obtained allowed us to distinguish only two kings as being distinctly valuable.

Among the specific features of these kings of pumpkin, beside their very good culinary and taste qualities (proved by the organized tasting meeting) and their higher performance of using the Ware hause space, there was also registered a relative growth productivity: over 50 tones/hectares.

The vegetation period of these kings of pumpkin allows their framing in the category of the early time kinds taking into consideration that beginning with the growing and until the physiological maturity of the fruit (harvesting) they need 100-110 days.

INTRODUCTION

Having the origins in South America, the pumpkin is nowadays cultivated in all the countries from all the continents of the world: from polar to tropical zones. This king of spreading of the pumpkin cultivation reveals a high biological plasticity of this species and an important capacity of adaptation to the environment conditions.

The pumpkin can be characterized as very important plant from many points of view. Its fruit represents a valuable nutrient, dietetic and both the fruit and seeds are recommended in medical treatment.

From the farmer’s point of view, the cultivation of the pumpkin must be (in many cases it really is) preferable, because it can reevaluate some natural conditions that conditions of a favorability is assured especially when the appropriate kings (species) are used.

This being said, neither the farmers nor the consumers from Romania don’t have enough information regarding the real value of this plant, especially when we’re thinking about the obtained data within the present research.

This kind of situation was the basis for the justification of organizing some experiments to bring some new information regarding the cultivation of the pumpkin in the condition of ecological farms.

MATERIALS AND METHODS

The first purpose of the experiment was following the development of the productive potential for five kinds of pumpkin. The biological materials had in view the following kingsvitamina, sel Adelaide, sel. Sydney (crem-coloured), Sydney selection (orange _ colored) all of them are part of the Cucurbita moschata species. Also we used the “Big White“ kind which belongs to the Cucurbita maxima L. species.

Each kind was cultivated on a parcel of 30 meters, having 0.7 X 2 m distances between the rows.

The setting up and maintenance of the crop were done taking into account the recommendations for ecologies technological and the experimental field (USAMV – Bucharest) was set up on an uncultivated area for three years, which was covered with spontaneous vegetation.

Within the observation session which were made, there were taken into account the next aspects :

- the fertility of the cultivated soil (earth);
- the productivity of the species;
- the early time (the period from the raising to ripening of the fruit);
- the resistance to diseases and detrimental;
- the volumetrically weight (important for the efficient occupation of the staring spaces);
- the culinary and taste qualities.

RESULTS AND DISCUSSIONS

The results of the soil analyses where the experimental field was organized showed that the field can be considered of medium fertility.

The medium values of the determination were the next:

Ph 7
Calcium- 700
Magnesium – 170
Phosphorus – 175
Nitrates – 40

The humus percentage was 3.2%- which means that a content under medium, but with an outrun critical level.

Regarding the early time (period) the majority of the kinds of pumpkin can be grouped as early ones, the vegetation period, from rising to physiological maturity of the fruit being of 100-110 days.

More delayed was the Sydney Orange kind, whose fruit reached the exact color and size 15 days later, 115-125 days.

The period of mass maturisation is for almost 15 days, which allows the mechanized harvesting of the fruit.

The biggest productivity was registered for the Adelaide kinds 55t/hectare and Sydney – cream colored – of 51.5 t/hectare.

The observations regarding the resistance of the plants have shown that all the experimented kinds of pumpkin have a big resistance to the diseases and detrimental attacks.

We can also talk about a very high resistance of these kings giving the fact that in the adjoining plot of land were cultivated other plants from the Cucurbitaceae family, which were attacked by diseases and insects, especially during the doughtier period of the vegetation.

The determination of the volumetrically weight of the pumpkin fruit demonstrated remarkable differences regarding this matter. Thus, the biggest volumetrically weight was registered by the fruit of the Adelaide king 0.94 and then in decreasing order the Sydney (cream – colored) kind, Sydney, the " Big white ", with a volumetrically weight of 0.87.

This shows that the kinds of pumpkin with big volumetrically weight allow the storing warehouses to be used more efficiently: the same weight of the stored fruit needs the smallest space.

The estimation of the culinary and tasting qualities which were performed with the occasion of the organized tasting meeting, allowed the classification of the pumpkin kinds as the next decreasing order: Adelaide, Sydney – beige.

CONCLUSIONS

1. The pumpkin crop has the capacity to use any environmental conditions end to turn them efficiently tonards its benefits;
2. From 5 kinds of pumpkin tested in the comparative crop, the kinds that had the best productivity were: Adelaide and Sydney that registered a production for over 50/ he.
3. The vegetation period for these kinds of pumpkin was in the conditions of last year of 100-110 days, with a compact period of reaching maturity of almost 15 days.
4. All the tested kinds demonstrated themselves as being resistant to diseases and detrimental attacks.
5. The Sydney kind's and. Adelaide kind allows a more efficient usage of the storing warehouses than the kinds with a big and very big fruit.
6. For a better knowledge of the pumpkin kinds, the researches regarding the assortments of the existing kinds must be continued and it's best for the study of the assortment to have in view to distinguish of the food and therapeutic value of the fruit, too.

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Fig. 1. Vitamin kind

Fig. 2. Great white kind

Fig. 3. Adelaide kind

Fig. 4. Sydney cream colored kind

Fig. 5. Sydney yellow colored kind

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

RESEARCHES REGARDING THE INFLUENCE OF NITROGEN FERTILIZATION ABOVE GROWTH, DEVELOPMENT AND FRUCTIFICATION OF IH – 50 TOMATO HYBRIDS, CULTIVATED IN SOLARIUM

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Keywords: consumption, mineral, organic, cultivar, production

ABSTRACT

In the last years it has been noticed an extension, on a larger scale, of the solarium tomato culture. Due to the small amount of money required by this kind of vegetable technique and also minimal investment funds, more and more farmers choose this way of producing tomatoes over the traditional one. Another argument sustaining their option is that the level of production is higher, the tomatoes cultivated this way, are "done" 2 or 3 weeks earlier than the ones cultivated using traditional means. The high consumption of minerals used by the solarium cultivars, constrain the producers to fertilize the crop and combine organic fertilizers with mineral ones. The best results concerning the total production (39.87 t/ha) were obtained at variant fertilized just with usual manure.

INTRODUCTION

The references from the specialized literature suggest that, obtaining a rich crop, of superior quality, economically efficient and maintaining or even increasing the fertility of the soil is conditioned by a rational fertilize. (D. Indrea, 1992).

The high/large consumption of minerals used by the greenhouse cultivators, as well as the low quantity of humus found in the soil after the tomatoes are harvested, constrain the producers to fertilize the crop and combine organic fertilizers with mineral ones. This way is established a connection between the vegetation and nutrition factors, that act together on increasing the production. It was taken under consideration the influence of the nitrogen, knowing that this element is a key factor in increasing the level of production on most of the leguminous varieties.

MATERIALS AND METHODS

The culture has been initiated/started/developed in the agricultural sector of the U.S.A.M.V. – Bucureşti, inside of plastic-covered solariums.

The experiment was operated according to the specifications of the linear block method, with 4 variants (matching four different fertilization systems), each variant having 4 repetition cycles:
V_1 – fertilized with manure 80 t/ha, administrated in the autumn when the based fertilization take place.
V_2 – fertilized with manure 80 t/ha + 50 Kg s.a. N/ha.
V_3 – fertilized with manure 80 t/ha + 100 Kg s.a. N/ha.
V_4 – fertilized with manure 80 t/ha + 150 Kg s.a. N/ha.
For each variant, have been observed and analyzed 12 plants.
The biological material used was the Romanian tomato hybrid Isalnita 50 (IH-50), that has the following characteristics:
- The growth of the plants is undetermined
- The inflorescence's type is "ramified cyme", with 7-12 flowers'

- The fruit has a spherical shape, the base is almost flat and the color is red when the plant reaches maturity; it's firm and very resistant.
- It's immune to the attack of the pathogen agents (*Septoria, Clodosporium*);
- The hybrid is early (it's done by 25 of June), productive;
- The quality of the production is good, the tomatoes weighing around 80-90 grams.
The transplants were produced in a warm greenhouse; the planting day – 2 of April; the age of transplants are 56 days; the planting scheme 70/35 cm; the density resulted: 40.816 pl/ha. It was applied an usual technology for the tomatoes culture in solarium, with some specifications:
- the phased fertilization was different, depending on the experimental variant of fertilization. There were 2 fertilizations:
    - the 1st fertilization: the fruit production after the first inflorescence
    - the 2nd fertilization: the fruit production after the second inflorescence
- the radical elimination of axillaries shoots, repeated if necessary;
- the selective cut-off of the blooms, after 5 inflorescences;
- while the plants are growing, a process of peeling the plant, at the ground level, takes place.
- the harvesting began on the 4th of July, when the fruits reached the technical maturation. The harvesting was performed according to an established calendar on an interval of 6 to 8 days.
The plants were examined morphometrical and phenological, in order to determine the way that the plants responded to the process.
- *morphometrical and physiological indicators of the transplants*: the age of the plant, the number of leaves, the height of the plant, the mass of the plant, the radicular volume, the number of plants with the first inflorescence formed.
- *morphometrical and phenological indicators of the adult plants*: the height of the plant, the number of leaves per plant, the number of inflorescences per plant, the number of flowers per inflorescence, number of fruits per inflorescence, the average number of flowers per inflorescence per plant. The measurements were done on two distinct dates: 17.05 and 10.06.

RESULTS AND DISCUTION

The quality of the transplants at the planting day (table 1) was good, a fact that was confirmed by the well development of the plants. By using the Cycocel 0,1% in phase were the plant has 5 leaves, prevented the fruit to lengthening and the formation of the 1st inflorescence was induced after a relatively low number of leaves (7.1 leaves), all the young plants having their first inflorescence visible when it was planted.

Examining the dynamics of growth and development of the plants (see table 2) you can observe the differences determined mainly by the differential application of the fertilization system.

- Regarding the growth of the plants, V_3 registered the best results on both measurements, the height of the plant from this variant was superior to the V_1 with 26-28%, this aspect was reflected in the number of leaves (14.5 at the 1st measurement, 18.2 at the 2nd measurement) comparing to V_1 (13.8 at the 1st measurement, 15.4 at the 2nd measurement). Except for the V_2, which was inferior (when it was measured for the 1st time) to the V_1 in terms of height and number of leaves (12 leaves), all the other variants, were superior to the V_1, on both measurement dates.
- Regarding the evolution of the plants, in terms of formed inflorescences, the following things were found:
    - on the 1st measurement date (17.05.1999), V_3 registered a superior value (46.65 the largest number of plants that developed the 3rd inflorescence) comparing to the V_1

25%, and V_4 registered the lowest value 0% (the 3rd inflorescence wasn't developed).
- on the 2nd measurement date (10.06.1999), the plants on V_1 and V_3 had their 5th inflorescence totally developed. Regarding the V_1, the value was 91.6%, and the lowest results were registered on V_4 (only 66.6% of the plants had their 5th inflorescence developed).

A research was conducted on 10.06.2003 in order to determine the production potential: most of the plants had their 5th inflorescence developed and with this occasion the process of selective cut-off of the inflorescence was done.

There had been examinations and determinations for each level of production. The final results for the whole research where the following ones:

- The average number of flowers per inflorescence registered values between 8.36 (for V_3) and 6.42 (for V_1). The other examined alternatives registered intermediary values: 7.82 (for V_4) and 6.42 (for V_1).
- The average number of fruits per inflorescence registered considerably low values. The latter were influenced in a large extent by the stage of development especially on the 5th inflorescence. The highest values were registered on V_3 (3.76), and the lowest on V_4 (2.52); for the other two variants, this indicator registered values relatively similar: 2.98 (on V_2) and 2.82 (on V_1).
- The percent of fruits per inflorescence was influenced in a large extent by the stage of development especially at the 5th inflorescence, the following things were observed:
  - on V_3 (45%), V_1 (43.9%) and V_2 (42.8%) the level of production is relatively high. The data in table 3, shows that the V_3 and V_1 have similar values when it comes to the artificially hastened process of productivity.
  - On V_4, the value of 32.2% is dissatisfying and judging in this context, can be associated with a delay in productivity.

The influence of the fertilization system of the tomato hybrid IH – 50, cultivated in the solarium (fig. 1) its reflected, mainly, by the level and earliness of the production (figure 1).

- If we take into account the total production (t/ha) the best results were registered on V_1 (39.785 t/ha), while V_4 registered the lowest level (20.184 t/ha). V_2 also registered a high level (36.118 t/ha), very close to the highest point, while on V_3 the total production was pretty low (27.115 t/ha).
- If we take into account the artificially hastened process of production on V_3 and V_1 it represents 50% from the total production, respectively 54.95% on V_3 and 52.24% on V_1. The other studied variants, registered early production values of 49.86% (V_2) and 44.6% (V_4).

CONCLUSIONS AND RECOMANDATIONS

Tomatoes are the most needed vegetables out of season. Being cultivated in the greenhouse the market demand in the spring can be satisfied and the farmers benefit from being able to sell their products on a higher price.

Tomatoes obtained in the solarium present specific technological links, especially in what concerns the total elimination of the axillary shoots and the one of selective cut-off of the blooms (after 3-5 inflorescences, depending on the evolution of the plants).

The solarium technology implies also the need of finding other technological links to result in obtaining superior production values and a higher quality. The system of fertilization adopted is decisive in accomplishing these objectives;

Analyzing the whole situation, we can easily conclude that the dynamics of growth depends on the fertilization system, V_3 has superior values in all the fields: 140.3 cm tall (26% better than V_1), 18.2 leaves and a more advanced development stage than the other variants.

Of all the studied variants, the most productive (39.78 t/ha) proved to be V_1, on which has been applied only the organic fertilization with manure (80 t/ha).

Under the aspect of earliness the best results were obtained on V_3 and V_1, with values around 54.95% respectively 52.24% of the total production.

Taking into account all the observed aspects, it is recommended to use just the usual manure fertilization with 80 t/ha, administrated in the autumn and it is not recommended to use the supplementary fertilization with nitrogen.

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Table 1

The quality indicators of the transplants

Specia	Age (days)	No. of leaves	Height (cm)	Mass of the aeriane parț (g)	Radicular volume (cm3)	Observations
Tomato IH-50	56	7.12	24.6	12.1	4.4	100% of plant the first inflorescence is vizible
Tomato STAS	45-60	6-8	18-22	---	---	

Table.2

The dynamic of growth and development of the plants

Var.	Height (cm)	% from martor	No.of leaves	% of formed inflorescence				
				I - infl.	a II-a infl.	a III-a infl.	a IV-a infl.	a V-a infl.
17.05.1999								
V1-Mt.	58.0	100	13.8	100	100	25	-	-
V2	**57.7**	**99.4**	**12.0**	100	100	25	-	-
V3	**74.4**	**128.2**	**14.5**	100	100	**45.6**	-	-
V4	66.3	114.3	13.0	100	**58.3**	**0**	-	-
10.06.1999								
V1-Mt.	**111.3**	100	15.4	100	100	100	100	**91.6**
V2	121.4	109.1	16.4	100	100	100	100	100
V3	**140.3**	**126.0**	**18.2**	100	100	100	100	100
V4	130.7	117.4	14.8	100	100	100	100	**66.6**

Table 3

The production potential of Isalnița 50 tomato hybride (determinate on 10.06.2003)

Var.	I infl.			a II-a infl.			a III-a infl.			a IV-a infl.			a V-a infl.			Average /inflores-cenee/plant		
	1*	**2****	**3*****	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
V1-Mt.	8.7	3.3	37.9	6.3	4.1	65	**5.9**	3.0	50.8	**6.2**	2.7	43.5	5.0	1.0	20.0	**6.42**	2.82	43.9
V2	**7.7**	**2.8**	**36.3**	**6.2**	4.1	66.1	6.5	**3.4**	**52.3**	6.9	3.3	**47.8**	6.8	1.3	19.1	6.82	2.98	42.8
V3	**8.9**	3.7	41.5	**6.2**	**4.7**	**75.8**	6.8	3.0	44.1	9.5	**3.8**	40.0	**10.4**	**3.6**	**34.6**	**8.36**	**3.76**	**45.0**
V4	8.8	**4.1**	**46.6**	**7.4**	**3.7**	**50.0**	**8.6**	**2.1**	**24.4**	**10.3**	**2.6**	**25.2**	**4.0**	**0.1**	**2.5**	7.82	**2.52**	**32.2**

1* no. of flowers / inflorescence; 2** nr. of fruits / inflorescence; 3*** percent of fruits / inflorescence

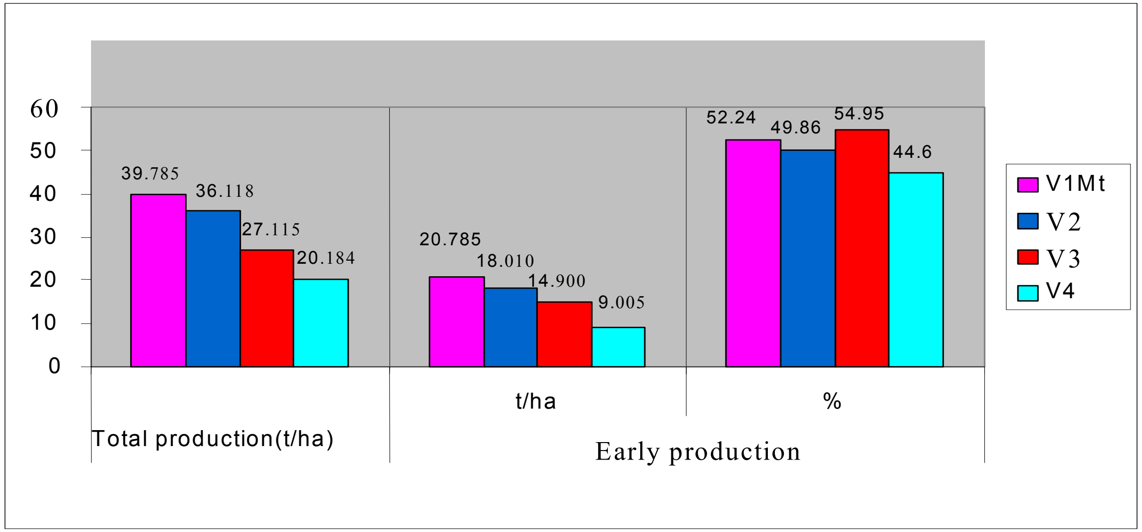

Figure 1 – The influence of the nitrogen fertilization above production

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

ASPECTS REGARDING THE VARIETY INFLUENCE ON ROOTING SYSTEM DEVELOPMENT IN LETUCE

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ABSTRACT

The current study carried out in the didactic field of the Vegetable-Growing Department of the Agriculture and Veterinary Medicine University of Bucharest, between 2003-2004, on 11 lettuce varieties (head, leaf and cos lettuce) followed the radiculary system's development and the size of the edible mass, in the greenhouse and in the high tunnel.

We have noticed that the radiculary system of the greenhouse plants has less developed compared to the high tunnel plants. The average edible mass differences were relatively close.

INTRODUCTION

The study was carried out between 2003-2004 in the didactic field of the Vegetable-Growing Department of the Agriculture and Veterinary Medicine University of Bucharest. The study was performed on eleven lettuce varieties of various origins, in order to know and determine the radicular system's size.

MATERIAL AND METHOD

The comparative study was carried out in the didactic field of the Vegetable-Growing Department of the Agriculture and Veterinary Medicine University of Bucharest, between 2003-2004, and it used eleven lettuce varieties of various origins.

Twenty plants of every variety were planted in each growing system (greenhouse and solarium). The lettuce varieties used in this study were the following:

Head lettuce: Jessy V1, Burpee's Bibb (V2), Burpee's Iceberg (V3);

Leaf lettuce: Everest (V4), Green Ice (V5), Ascona (V6), Gringo (V7), Piroga (V8), Salad Bowl Carthago (V9) and Crispy Frills (V10);

Cos lettuce: Little Caesar (V11),

The applied agro techniques followed the technology of lettuce growing for each growing system.

The seedling for crop establishment was produced in the hothouse. Transplantation was performed after 8-10 days from plant emergence in nutrient pots of 5/5/5 cm; at planting, the age of seedling was 30 days. Planting was made at a distance of 25 cm between rows and 20 cm between plants in a row; thus, the density was 200,000 plants per ha in Jessy V1, Burpee's Bibb (V2), Burpee's Iceberg (V3), Green Ice (V5), Ascona (V6), Gringo (V7), Salad Bowl Carthago (V9), Crispy Frills (V10) and Little Caesar (V11) to varieties. For Everest (V4), and Piroga (V8), the distance was 35 cm between rows and 25 cm between plants in a row, and the resulting density was 114,286 plants per ha. During the vegetation period, the tasks performed were specific for the lettuce crops; the plants were fertilized with Complex III (13-27-13) - 20 g/m^2.

The observations on plant growth in height, diameter and leaf number were made every five days for five plants per repetition. Yields were determined by weighting the lettuce at harvesting.

This study presents only the radiculary system's distribution aspects.

RESULTS AND DISCUSIONS

The results have shown that the root length and the edible mass where different for the greenhouse and the high tunnel.

The data is presented in the table below (Table 1). We notice that the root length and the edible mass of the greenhouse cultures where smaller then the high tunnel cultures.

We notice that the Ascone-V6 has the smallest root length (4.03 cm) while the Gringo V7 has the biggest root length (8.32 cm). The edible mass of the greenhouse cultures of the head lettuces was between 197 g (Jessy - V1) and 235 g (Burpee's Iceberg - V3). For the leaf lettuce, the Everest – V4 has the greatest edible mass, while the Crispy Frills has the smallest one (147 g). For the cos lettuce type, the edible mass was 311 g.

For the high tunnel lettuce cultures, we notice that the root length was greater than the greenhouse cultures. For the head lettuce, the Burpee's Iceberg – V3 had the smallest root length (11.8 cm), while the Burpee's Bibb – V2 had 20.1 cm. We also noticed that the greatest average edible mass was recorded for the Burpee's Iceberg – V3 (288 g). For the Burpee's Bibb – V2, although it has the greatest root length, the average edible mass was the smallest (193 g). For the leaf lettuce, the Everest V4 had the greatest root length (19.6 cm) and also the greatest edible mass (327 g). For the Cos lettuce, the Little Caesar had a 14.1 cm root length and an average edible mass of 236 g.

The figures below present the aspects regarding the root length for the greenhouse and high tunnel cultures.

Table 1. Root length and edible mass for the lettuce plants in greenhouse and high tunnel

Variants	Greenhouse		High tunnel	
	Root length	Edible mass	Root length	Edible mass
	cm	g	cm	g
V1 - Jessy	**4.93**	**197**	**14.7**	**227**
V2 - Burpee's Bibb	**5.32**	**163**	**20.1**	**193**
V3 - Burpee's Iceberg	**6.53**	**235**	**11.8**	**288**
V4 - Everest	**5.83**	**301**	**19.6**	**327**
V5 - Green Ice	**6.25**	**185**	**13.7**	**201**
V6 - Ascona	**4.03**	**177**	**15.8**	**195**
V7 - Gringo	**8.32**	**201**	**14.8**	**188**
V8 - Piroga	**7.22**	**217**	**14.1**	**236**
V9 - Salad Bowl Carthago	**5.85**	**215**	**13.4**	**285**
V10 - Crispy Frills	**7.73**	**147**	**15.1**	**217**
V11 - Little Caesar	**6.54**	**311**	**10.7**	**136**

Figure 1

The Head Lettuce Variety

Greenhouse

High Tunnel

V1 - Jessy

V2 - Burpee‘s Bibb

V3 - Burpee‘s Iceberg

Figure 2

The Leaf Lettuce Variety

Greenhouse High Tunnel

V4 – Everest

V5 – Green Ice

V6 – Ascona

V7 – Gringo

V8 – Piroga

V9 – Salad Bowl Carthago

V10 – Crispy Frills

Figure 3

The Cos Lettuce Variety

Greenhouse High Tunnel

V11 - Little Caesar

CONCLUSIONS

For the greenhouse plants, the root length is smaller compared with the high tunnel plants' root length. The Jessy variety presented a root length growth of 4.9 cm in the greenhouse culture and 14.7 cm in the high tunnel culture. The average edible mass was of 197 g in the greenhouse culture and 227 g in the high tunnel culture.

For the leaf lettuce there can be noticed a small increase in the root length, comparing between the greenhouse and the high tunnel cultures. The average edible mass differences between the greenhouse and high tunnel cultures are relatively small.

For the Little Caesar variety we noticed that for the high tunnel cultures, the root length were double compared to the greenhouse cultures (14.1 cm, respectively 7.2 cm). The average edible mass difference between the greenhouse and the high tunnel cultures was only of 35 g.

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THE INFLUENCE OF FITPOL-C ON THE LETTUCE SEEDLING CHEMICAL COMPOSITION

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Keywords: lettuce transplants, Fitpol C product, chemical analyzed.

ABSTRACTS

This study was made in 2003 at the USAMV- Bucharest and had as goal the possibility to use superabsorbant and nonpolluting products in nutritive mixture, in order to create the nutritive holes and to improve conditions for better development of hole transplants. We used salad transplants. In the nutritive mixture we had adding FITPOL C in different doses, 0% (Control), 0.25%, 0.50%, 0.75% and 1%.

The transplants obtained were chemically analyzed, using plasma analysis for each variant. Also, we made determination regarding the respiration intensity, SUT, water and chlorophyll contents. We had noticed some differences in the transplants' chemical content.

We have made correlations between the biomass, the mineral content and the FITPOL C product's concentration.

INTRODUCTION

In vegetable crops we use different nutritive mixtures to make nutritive cubes used to produce lettuce transplants. To improve the nutritive mixture's quality we use, in order to make nutritive cubes, some chemical products that contribute to the growth of the water content and to the decrease the apparent density, replacing peat.

In the current study we present an aspect of the experimental records, regarding the influence of applying the FITPOL C product, in different dosages in the nutritive mixture used to make the nutritive cubes, on the chemical composition of the lettuce transplants.

MATERIALS AND METHODS

The studies were conducted at the didactic vegetable field from U.S.A.M.V. Bucharest, on Jessy lettuce variety in collaboration with ICPA Bucharest.

In order to make the nutritive cubes we used the nutritive mixture made out of the following ratio: 55% manure; 35% celery earth; 10% sand;

To improve some cubes' physical properties, we have applied to the nutritive mixture the FITPOL C product - granules with 98% active substance, pH 6, water absorption capacity of 1:8 and zero toxicity.

The experimental variants were: V1 control; V2 – 25g/10 kg nutritive mixture; V3 – 50g/ 10 kg nutritive mixture; V4 – 75g/ 10 kg nutritive mixture; V5 - 100g/ 10 kg nutritive mixture.

We have chemically analyzed the lettuce transplants from the Jessy variety, before planting each variety. The transplant was 32 days old.

The experimental values obtained through chemical analysis, using the plasma analyzer, were statistically processed using the variation analyzing method (the multiple comparison Tukey test).

We have performed correlations between the FITPOL C product and other chemical elements.

RESULTS AND DISCUSION

After processing the values obtained with the plasma analyzer from the 32 days old lettuce transplants, we found out that there were some important statistical differences regarding the macro elements and microelements content based on the product's dose used in the mixture.

From the records presented in Table 1, it can be seen that the total content of dry substance was 14.76% on variant 3 and only 13.14% in variant 1. The water content was relatively close. The highest content of mineral substances can be seen on V2 (2.08%) and the lowest one in V5 (1.27%).

The *a* and *b* chlorophyll content, the total chlorophyll and the *a* and *b* chlorophyll ratio are shown in Table 2. From this table in can be seen that the highest total chlorophyll content has been recorded in variant 5.

Thus, from the data shown in table 3 we can notice that:

The potassium content accumulated in the lettuce transplants varied between 135,100 ppm, were there has been added in the nutritive mixture 0.75% of FITPOL C product, and 312,800 ppm for a 1% product value. The statistical differences are very important.

The natrium content in lettuce plants presented very significant statistic variations, ranging from 23,187 ppm on variant 4 to 0.447 mg on control variant.

The aluminum content presented the lowest value of 15.927 ppm on variant 4 (0.75% FITPOL C content) and the highest value in variant 2 with 32.383 ppm.

The B, Ca, Cu, Fe, Mg, Mn and Sr content in the lettuce transplants presented the lowest values in variant 4, where there has been added 0.75% of FITPOL C product, respectively 0.033 ppm B, 60.333 ppm Ca, 5.220 ppm Cu, 4.647 ppm Fe, 18.903 ppm Mg, 0.177 ppm Mn and 0.159 ppm Sr.

The highest content in B and Mn where recorded on control variant 1 (0.419 ppm) respectively 0.447 ppm. The highest Ca content (134.967 ppm), Mg (33.583 ppm), Mn (0.758 ppm), Na (52.697 ppm and Sr (0.330 ppm) was recorded on variant 5.

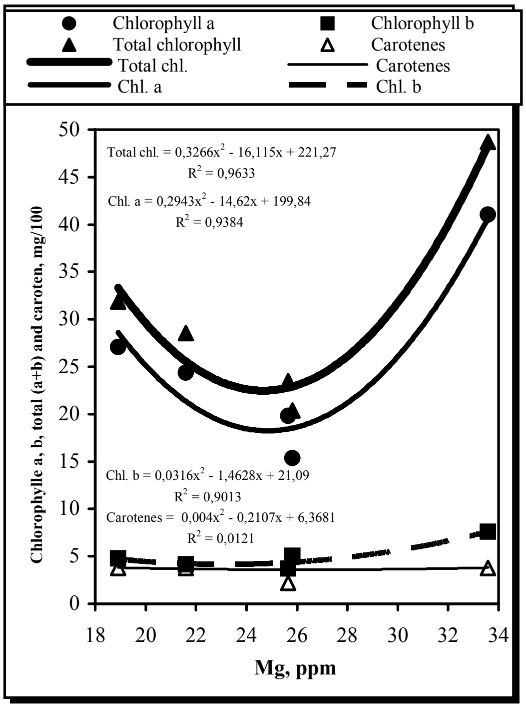
Table 1. The transplants content in SUT, Water and mineral substances

Variants	SUT %	Water %	Mineral substances (%)
V1	13.14	86.86	1.44
V2	14.23	85.77	2.80
V3	14.76	85.24	1.40
V4	14.22	85.78	1.42
V5	13.58	86.42	1.27

Table 2. The transplants contents in chlorophyll

Var.	Chlorophyll *a*	Chlorophyll *b*	Total chlorophyll	Report a/b	Carotene	Chlorophyll /Carotene
	mg/100 g					
V1	15.35	5.06	20.41	3.03	4.95	4.12
V2	24.38	4.18	28.56	5.83	3.75	7.62
V3	19.80	3.70	23.50	5.35	2.20	10.68
V4	27.10	4.76	31.85	5.69	3.80	8.38
V5	41.04	7.58	48.72	5.42	3.80	12.82

Fig. 1– Relations between chlorophyll a, b, total (a + b), carotenes and Mg content of lettuce transplants



We notice a positive direct correlation between Mg and *b* chlorophyll, the regression coefficient $\mathbf{R^2 = 0.9013}$ having a high value. In case of the *a* chlorophyll, although the regression coefficients are high, the values in the curve's first part are decreasing, which seems to be unusual.

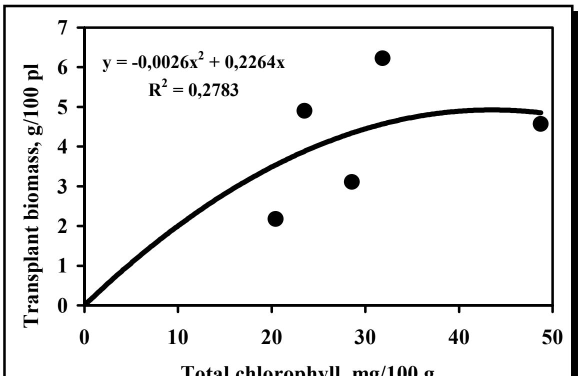


Fig. 2 – Relation between lettuce transplant fresh biomass and total chlorophyll content

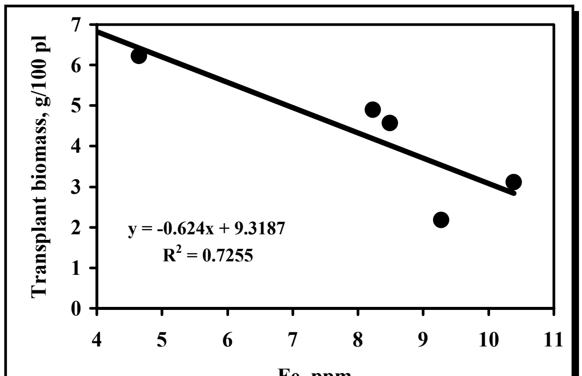


Fig. 3 – Relation between lettuce transplant fresh biomass and Fe content

Although the regression coefficient is low, because of greater data dispersion, the positive relation between total chlorophyll content and lettuce transplant biomass is obvious.

It is noticeable a tight reversed correlation, between Fe content and biomass lettuce transplant. That could be explained by the dilution of Fe in a larger biomass quantity.

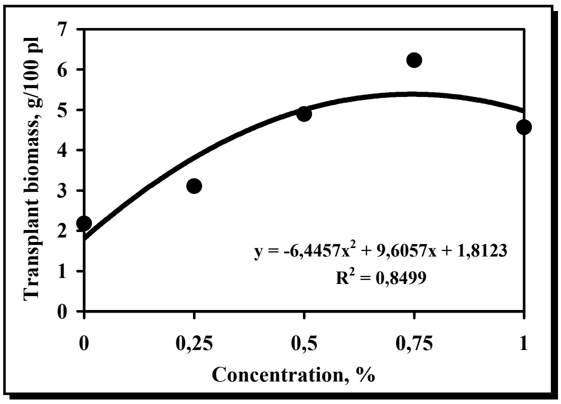


Fig. 4 – Relation between lettuce transplant fresh biomass and concentration of Fitpol C

Between the FITPOL C solution concentration applied to the nutritive mixture and the transplant's biomass, there is a positive, clear relation (fig.4), with a high regression coefficient (R^2 = 0.85), that shows the global favorable effect of the product. The maximum effect was reached at the 0.75% concentration.

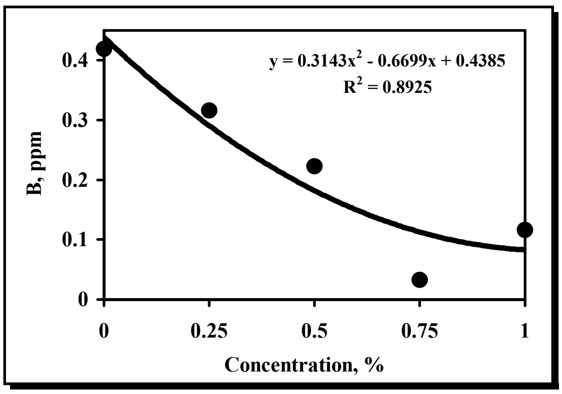


Fig. 5 – Relation between B content of lettuce transplant and concentration of Fitpol C

On the other hand, it is noticeable a close inverse relation the FITPOL C dose and the B content in the plant (fig.5), R^2 = 0.89.

There are a few explanations for this:

1) The polyelectrolyte improving the physical nutritive mixture's properties, especially permeability, favor the B washing with water;
2) The polyelectrolyte could absorb in hard accessible states the hydro soluble B from the nutritive mixture, making it inaccessible to the plants.

These two hypotheses deserve more future research.

CONCLUSIONS

The total dry substance did not show significant differences between variants.

Also, the water and mineral substances content was close, except in case of variant 2, where the mineral content was significantly higher.

The highest a and b chlorophyll content was recorded for variant 5, where a 1% of FITPOL C product has been added.

Significant differences in mineral content are obvious for all variants.

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Table 3. The Fitpol C effect on mineral elements of lettuce transplants

Variants	K	Na	Al	B	Ca	Cu	Fe	Mg	Mn	Sr	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
V1- Control	300.367	40.510	27.060	0.419	70.367	9.127	9.276	25.810	0.447	0.257	0.031
V2- FitpolC 0.25%	160.533	31.377	32.383	0.316	65.843	14.383	10.390	21.590	0.250	0.184	0.005
V2- FitpolC 0.50%	255.367	34.867	22.157	0.223	70.000	12.740	8.227	25.653	0.303	0.284	0.060
V2- FitpolC 0.75%	135.100	23.187	15.927	0.033	60.333	5.220	4.647	18.903	0.177	0.159	0.108
V2- FitpolC 1.00%	312.800	52.697	27.720	0.116	134.967	9.550	8.493	33.583	0.758	0.330	0.026
DL 5% Tukey	3.314	0.735	0.416	0.024	7.538	6.353	0.151	0.834	0.010	0.081	0.005
DL 1% Tukey	4.380	0.970	0549	0.032	9.954	8.389	0.200	1.101	0.014	0.107	0.006
Fischer Test significance	**	**	**	**	**	**	**	**	**	**	**

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STUDIES REGARDING QUALITY CHANGES ON TOMATO FRUITS DEPENDING ON THEIR POSITION IN BLOSSOM LEVELS.

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ABSTRACT

The study was carried in the Vegetable Crops greenhouse of the Horticulture Faculty of Bucharest on the Khatherine tomato hybrid, planted in the 1st culture cycle.

The tomato fruits were harvested at physiological maturity, from 5 inflorescences levels. We have determined the average mass of fruits, acidity, vitamin C content, dry soluble substance (DSS) content, total dry substance (TDS) content and mineral substances for each fruit on each of the 5 levels of inflorescences.

We have noticed that there were differences regarding the average mass of the fruits, acidity (0.24% for the 1st inflorescence and 0.35% for the 2nd inflorescence), vitamin C (19.2 mg/100g on fruits at 2nd level of inflorescence and 22.27 mg/100g for those at the 4th inflorescence level), DSS (45% at the 2nd inflorescence and 5% for level 1), TDS (5.79% at the 4th inflorescence and 6.54% for level 1) and mineral substances (0.99% for fruits at level 2 and 1.63% for fruits at level 1).

INTRODUCTION

Usually, the quality of tomato fruits is considered on the average harvested fruits. In the current study we have tried to differentiate the fruits' quality on the different inflorescence insertion levels.

MATERIALS AND METHODS

The study was carried in the Vegetable Crops greenhouse of the Horticulture Faculty of Bucharest on the Khatherine tomato hybrid, planted in the 1st culture cycle.

The tomato fruits were harvested at physiological maturity, from 5 inflorescences levels.

The fruits were harvested at physiological maturity, from 5 different plants, on levels, determining for each fruit the content of vitamin C, DSS, TDS and mineral substances. A statistical interpretation of the obtained data has then been made.

RESULTS AND DISCUSION

Based on the analysis made on the tomato fruits, we can asses that:

- The data regarding the average mass of the fruits are recorded in table 1, were the mass differences are obvious. Statistically there were important negative differences compared to the average, for fruits in the 1st inflorescence and very significant differences for fruits in the 3rd and 4th inflorescences.

Table 1: records of the average mass of tomato fruits.

Inflorescence level	Average fruit mass (g)	Difference		Statistical significance
		(g)	(%)	
V(0) Average	68.50	0.00	100.00	Mt
I_1	30.33	-38.17	44.28	OOO
I_2	70.00	1.50	102.19	*
I_3	75.00	6.50	109.49	***
I_4	98.67	30.17	144.04	***

DL5%= 1.350 DL5% in % = 1.9708
DL1%= 2.040 DL1% in % = 2.9781
DL01%= 3.250 DL01% in %= 4.7446

In case of acidity (table 2), we have noticed that there were relatively small differences between fruits in level 1 (0.24%) and fruits in level 3 (0.35%). Major statistic differences in comparison with the average have been noticed at the 3rd inflorescence.

Table 2: records of the acidity of the tomato fruits

Inflorescence level	Acidity	Difference		Statistical significance
	%	%	(%)	
MEDIA	0.31	0.00	100.00	Mt
I_1	0.24	-0.07	77.42	OOO
I_2	0.32	0.01	103.23	*
I_3	0.35	0.04	112.90	***
I_4	0.33	0.02	106.45	**

DL5% = 0.010 DL5% in % = 3.2258
DL1% = 0.020 DL1% in % = 6.4516
DL01% = 0.040 DL01% in %= 12.9032

From records in table 3 we can notice that the lowest content in vitamin C has been obtained in fruits from the 1st inflorescence (19.2mg/100g) while the highest content was obtained in level 3. It has been noticed very significant negative statistic differences for fruits in the 1st inflorescence and very significant for fruits in the 2nd, 3rd and 4th inflorescences.

Table 3: the vitamin C content of the tomato fruits

Inflorescence level	Vitamin C (mg/100g)	Difference		Statistical significance
		(mg/100g)	(%)	
Average	21.38	0.00	100.00	Mt
I_1	19.20	-2.18	89.81	OOO
I_2	21.86	0.48	102.26	***
I_3	22.27	0.89	104.17	***
I_4	22.18	0.80	103.75	***

DL5% = 0.100 DL5% in % = 0.4678
DL1% = 0.150 DL1% in % = 0.7017
DL01% = 0.240 DL01% in %= 1.1227

From records in table 4 insignificant statistic differences are noticeable between variants regarding the dry soluble substance content.

Table 4: The dry soluble substance content of the tomato fruits

Inflorescence level	DSS	Difference		Statistical significance
	%	%	(%)	
Average	4.70	0.00	100.00	Mt
I_1	5.00	0.30	106.38	N
I_2	4.50	-0.20	95.74	N
I_3	4.70	0.00	100.00	N
I_4	4.60	-0.10	97.87	N

DL5% = 1.030 DL5% in % = 21.9149
DL1% = 1.560 DL1% in % = 33.1915
DL01% = 2.490 DL01% in %= 52.9787

In table 5, the records show that the fruits harvested from the 1st inflorescence presented the highest content of total dry substance, in comparison with the other inflorescences or the inflorescences average.

Table 5: The total dry substance (TDS) content of tomato fruits

Inflorescence level	TDS	Difference		Statistical significance
	%	%	(%)	
Average	6.03	0.00	100.00	Mt
I_1	6.54	0.51	108.50	***
I_2	5.94	-0.09	98.55	OOO
I_3	5.84	-0.19	96.89	OOO
I_4	5.79	-0.24	96.06	OOO

DL5% = 0.010 DL5% in % = 0.1659
DL1% = 0.010 DL1% in % = 0.1659
DL01% = 0.040 DL01% in %= 0.6636

The mineral substances content presented significant statistical values for fruits in the 1st inflorescence (table 6); fruits in the 2nd, 3rd and 4th inflorescence presented content values lower that the ones in the 1st inflorescence.

Table 6: The mineral substances content of tomato fruits

Inflorescence level	The mineral substances content %	Difference		Statistical significance
		%	(%)	
Average	1.24	0.00	100.00	Mt
I_1	1.63	0.39	131.72	***
I_2	0.99	-0.25	80.00	OOO
I_3	1.22	-0.02	98.59	OOO
I_4	1.11	-0.13	89.70	OOO

DL5% = 0.000 DL5% in % = 0.0000
DL1% = 0.000 DL1% in % = 0.0000
DL01% = 0.010 DL01% in %= 0.8081

CONCLUSIONS

The following conclusions can be taken:

- there were differences regarding the average mass of fruits between the inflorescence levels;
- the acidity of fruits presented close values between the 2^{nd}, 3^{rd} and 4^{th} levels;
- the lowest content in vitamin C was recorded for the 1^{st} level fruits;
- the highest content in TDS and mineral substances was recorded for fruits in the 1^{st} inflorescence

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RESEARCH REGARDING THE INFLUENCE OF THE CONSTRUCTIVE AND FUNCTIONAL PARAMETERS OF THE ACTIVE PARTS (COMPONENTS) OF THE GREEN PEA HARVESTERS ON THE QUALITY OF THE CROP (HARVEST)

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Keywords: providing flow, grain purity, smashing degree of grains

ABSTRACT

The experience was realised at the S.C."Contec" S.A. tin (need) factory of Tecuci. The cultivated pea variety (sort) was Frilla. The green pea harvesting was realised in one phase (stage) with the help of the self-propelled combine FMC-879. The experience contained 15 variants, the experiments resulting from the combine trial at five speeds of beaters (170, 180, 190, 200, 210 revolution/minute with three providing flows (4,0, 5,0, 6,0 kg/s). The best results were obtained in the variant where the beater revolution was 190 revolutions/minute and the providing flow of 6 kg/second.

INTRODUCTION

Green pea is cultivated for its green grains that are the raw material for the tin factories, because they contain a great amount of proteins, essential amino acids, minerals, and can be conserved in a large variety of methods. Green pea is also important for tin factories because it has a large variety of species and different vegetation periods, thus permitting to space out the production on a long period of time. Spacing out the production can be done by cultivating different sorts of pea with different precocities or by sorting out the sowing period of certain pea specie.

Green pea plants are also important from an agrotechnical point of view because it is a good precursory plant for other cultures, and it leaves the soil rich in nitrogen due to the symbiosis with the nitrogen fixing bacteria.

In Romania, in the year 2003, the surface cultivated with green pea has been of 5000 hectares, and the average obtained production was of 4000 kg. /ha. The culture of pea is one of the cultures that can be entirely mechanised. Harvesting green pea can be done in only one phase (stage) with the help of self- propelled harvesters (combines).

MATERIALS AND METHODS

In this paper the study is focused on the influence of the providing flow of self-propelled green pea harvesters on the quality of the crop. The experiments have been realised at the tin factory S. C. "Contec" S. A. in Tecuci and consisted of harvesting the Frilla green pea specie in only one phase using the self- propelled harvester FMC-879.

The green pea harvester FMC-879 achieves harvesting the pea in only one stage pulling up the plants, threshing, separating the grains from impurities, collecting the grains in their own container and evacuating on the soil the stalks that resulted from the thresh.

The FMC- 879 harvester is equipped with a highly performant thresher conceived especially for the green pea, being made up of a counter beater of the rotative strainer type, and of a multiple beater. The multiple beaters are made up of a central beater and four (4) side beaters. The revolution of the multiple beaters can be adjusted from 170 to 210 r.p.m. The counter beater spins with a revolution of 35 r.p.m and is equipped with a cleaning brush that cleans the strainer while working.

The harvester's working process takes place as it follows: the green pea plants are pulled up by the collecting rotor's teeth, then they are taken over by two snail shaped conveyers that narrow the furrow, and by a conveyer with scrapers and are then introduced in the thresher where, because of the central beater and of the side beaters, the grains come off the pods and fall through the orifices of the counter beater of the rotative strainer type on to the two bent conveyers- separators. These turn from the inside of the harvester to the outside, and the bent conveyers-separators have the role of cleaning the pea grains of impurities. Because the pea grains are round shaped, they roll down and fall on a longitudinal conveyer. The impurities, long and flat shaped, adhere to the two conveyers-separators and are thrown out on the ground through the sides of the harvester; the longitudinal conveyer sends the grains of pea to a bucket type elevator that lifts them to the superior part of the harvester and with the help of a chain type conveyer the grains are unloaded in the container, while the un-threshed pods are reintroduced in the thresher. The pea stalks that resulted from the threshing process are evacuated on the ground through the posterior part of the harvester; the capacity of the container is of 1400 kilograms and it unloads by tipping.

In this experiment the focus has been placed on the influence of the providing flow of the FMC-879 harvester on the indexes of quality of work represented by the grain purity and their smashing degree. This experiment consists of 15 types of tests that result from putting the harvester to the test at 3 providing flows (4,0; 5,0; 6,0 kg/s) at 5 revolutions of the multiple beaters (170, 180, 190, 200, 210 r.p.m).

The experiments take place on trial parcels (lots) with a surface of 66 square meters (3,3 meters wide and 20 meters long). From these parcels there have been collected in the harvester's container the grains of pea, and on a tarpaulin placed in the back of the harvester, the stalks that resulted from the threshing process in order to calculate the flow of the harvester. From the quantity of grains collected in the container from the trial parcel samples have been taken to calculate using specific relations (equations) the purity and the smashing degree of the grains.

RESULTS AND DISCUSSIONS

Table no. 1 presents the results obtained from the experiments. Based on these results graphics that shows the influence of the providing flow of the harvester on the indexes of the quality of work have been realised.

Graphic no. 1 presents the influence of the providing flow of the harvester on the purity of the grains.

The result of the analysis of the graphic is that at all 5 revolution possibilities for the beaters the purity of the grains decreases as the providing flow of the harvester increases. The maximum grain purity has been obtained at the revolution of 170 r.p.m with a providing flow of 4,1 kg/s. The lowest grain purity has been obtained when the revolution was of 210 r.p.m and the providing flow of 6,1 kg/s.

At a constant providing flow, the grain purity varies inversely proportional to (in inverse ratio with) the aggrandisement of the revolution of the beaters. For example at a providing flow of 5,2 kg/s the following grain purity values have been obtained: 99,3% at 170 r.p.m; 97,7% at 180 r.p.m; 95,7% at 190 r.p.m; 93,9% at 200 r.p.m, and 92,6% at 210 r.p.m.

Analysing this graphic it can be observed that at all revolution variants the grain purity decreases as the providing flow of the harvester increases.

Graphic no. 2 shows the influence of the providing flow of the harvester on the smashing degree of the grains. The smashing degree of the grains varies between 1,23% and 8,7%.

The lowest value of the grain purity has been obtained at a revolution of 170 r.p.m and a providing flow of 6,0 kg/s. The highest value of the smashing degree of the grains has been obtained at a revolution of 210 r.p.m and a providing flow of 4,1 kg/s.

The result of the graphic is that the smashing degree of the grains lowers ass the providing flow of the harvester grows. Thus, the smashing degree of the grains varies inversely proportional to the providing flow. Because of the growth of the proving flow the pea grains are not stroke directly by the beaters' blades the pea stalks damping the blades' strokes, thus the smashing degree being reduced.

The smashing degree of the grains is also influenced by the revolution of the beaters, so that we can see in the same graphic that at the same providing flow the smashing degree of the grains increases as the revolution of the beaters increases. For example, at a providing flow of 5,2 kg/s the following smashing degree values have been obtained: 1,92 % at 170 r.p.m; 3,1% at 180 r.p.m; 5,1% at 190 r.p.m; 6,1% at 200 r.p.m, and 8,5% at 210 r.p.m.

CONCLUSIONS

The following conclusions have been drawn from the analysis of the experimental results:

1. The grain purity varies between 92,3% and 99,7%. The lowest purity degree was obtained at the maximum revolution of 210 r.p.m and a maximum providing flow of 6,1 kg/s. The highest purity degree was obtained at the minimum revolution of 170 r.p.m and a providing flow of 4,1 kg/s. It follows that the grains' purity varies inversely proportional to the providing flow of the harvester and to the revolution of the beaters. It also follows that the grains' purity decreases suddenly when the revolution of the beaters goes over 190 r.p.m.
2. The smashing degree of the grains varies between 1,23% and 8,7%. The lowest value was obtained at the minimum revolution of the beaters (170 r.p.m) and a providing flow of 6,0 kg/s. The highest value was obtained at the maximum revolution of the beaters (210 r.p.m) and a providing flow of 4,1 kg/s.
3. For an adequate exploitation and usage of the harvester it is recommended that the revolution of the beaters be fixed at 190 r.p.m and that the providing flow be of 6 kg/s

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Table 1.The results of experimental researches obtained at green pea harvesting variety Frilla

Nr. crt	Beater revolution (rot/ min) (rev/min)	Providing flow (kg/s)	Variant	Grain purity (%)	Smashing degree of grains (%)
1	170	4,1	V_1	99,7	2,41
2	170	5,0	V_2	99,3	1,92
3	170	6,0	V_3	99,1	1,23
4	180	4,0	V_4	97,9	3,7
5	180	5,0	V_5	97,7	3,1
6	180	6,1	V_6	97,4	2,7
7	190	4,0	V_7	95,8	5,9
8	190	5,1	V_8	95,7	5,1
9	190	6,0	V_9	95,3	4,6
10	200	4,2	V_{10}	94,2	7,6
11	200	5,1	V_{11}	93,9	6,1
12	200	6,2	V_{12}	93,8	5,8
13	210	4,1	V_{13}	92,9	8,7
14	210	5,2	V_{14}	92,6	8,5
15	210	6,1	V_{15}	92,3	7,4

Figures

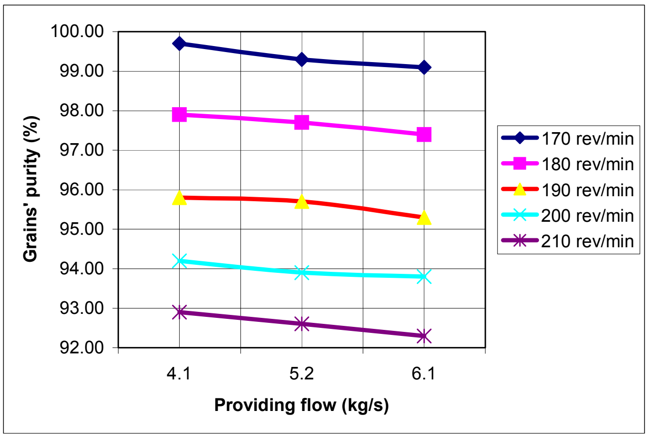

Fig.1 The influence of providing flow on purity of grains

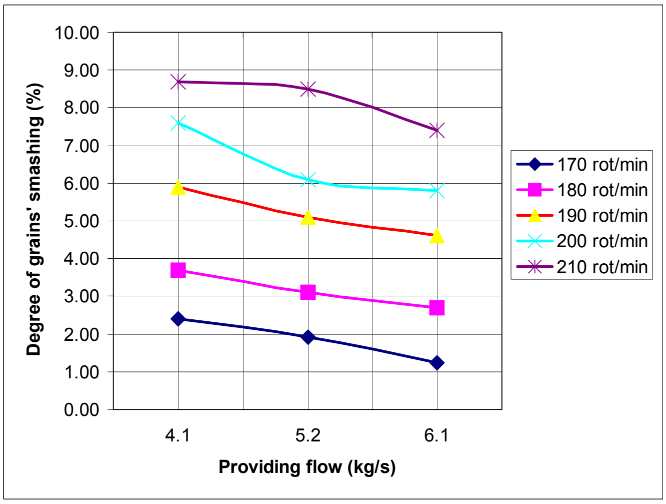

Fig.2 The influence of providing flow on degree of grains' smashing

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PRELIMINARY STUDIES REGARDING TOMATO FRUITS OBTAINED IN AN OUTSIDE NON POLLUTED ENVIRONMENT

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Keywords: *Lycopersicon esculentum*, variety, residue, quality

SUMMARY

Producing vegetables using other techniques than the traditional ones represent an alternative way to protect the consumer, to reduce the pollution of the environment, to decrease the rhythm of illnesses among people due to the consumption of products obtained with the help of chemical substances.

The preliminary results of this research show that by using natural products, for fertilization as well as for fortification, leads to tomatoes of very good quality, with a higher level of nutritive elements, dry and soluble substance, acidity, etc. Moreover, the fruits obtained in this system have a very low level of hard metals (Pb,Ni,Co,Cu,Zn,etc) and they do not contain triazinic herbicide residues. From the vegetative growing point of view, at the same hybrid cultivated in classical conditions and throughout non-polluting technologies, there have not been registered noticeable differences. Though, the production of fruits is lower in comparison with the one in classical culture.

INTRODUCTION

Vegetable crops in general, throughout their biochemical composition represent a very important source of vitamins and mineral salts for the human body. In particular, tomato fruits are nevertheless important because they are consumed during the whole year as fresh fruits, juices, tomato sauce.

The people's dedication to obtain less polluted vegetables dates from a long time, being an alternative way to obtain tomatoes in the conventional system, but in present time this aspect gains more field, as these kind of food is more appreciated.

Because of the UE adhering to and its issues, Romania has recently started to put accent on obtaining vegetable crops in ecological environment. Additionally, his kind of system offers a positive solution for soil and its biodiversity conservation, for our natural environment and population health protection.

This study supervises a tomato culture in an outside field; information regarding the growth of plants and fructification were obtained by measures, observations and determinations. No synthetically chemical product was use during this study nor for plant health protection or for productiveness. The results are good, though the production is smaller in comparison with the one obtained by the same hybrid in the conventional culture. Nevertheless, fruits are more valuable because of their higher level of macro elements, mineral salts, c vitamin, dry and soluble substance.

METHOD AND MATERIAL

The researches developed in Vegetable Crops Cathedra of Horticultural Faculty of Bucharest, being in the first year of the study.

The plot of land used for the study, of cca. 80 s.m. had been planted the year before with Brussels sprouts, pea and alfalfa. The hybrid used was Arletta and the control, in classical culture was also Arletta.

The nursery transplants were obtained in a green house and planted outside on the 30th of April using distances of 70cm/ 40cm. In the same time with planting local fertilization were applied 150g of manure per plant. During the vegetation growing process, fertilizations were applied as follows: twice with manure extract (Balascuta, 1993) for plant fortification, twice with fresh stinging nettle (Urticaria dioica) extract, twice with Microfert 0, 5% - a product accepted in eco cultures limited at 0.5 %concentration.

The general care of the culture was done by replanting empty places, sprinkling and weeding by manual prasile and plivit. Special care was applied as follows: prune all the suckers off, defoliating the base of the plants and bearing plants, palisare, carnire. It is necessary to be mentioned that all the tomato plants were sustained with 5 inflorescences for a better fructification process. The measures and determinations on plants were the following: the high growing, the high (cm) until the first inflorescence, the number of leaves between inflorescences, the fruits percentage for each inflorescence, the production of tomato fruit and the average weight of fruits. Also, determinations were made on fruits regarding the total dry and soluble substance, C vitamin, mineral substances, minerals hard metals and macro elements. Moreover, were determinated the triazinice, simazice, propazinice herbicide residues.

RESULTS AND DISCUSSIONS

The dates and information obtained in field were processed and results are as follows in the graphics and lists below, in order to establish connections between different factors.

Regarding height growing plants, must be said that tomato plants grew very well especially in the first part of vegetation process. Because of high temperatures in the second period, plants had a slower rhythm of development, causing the sustain of plants with 5 inflorescences only.

The results show (Table 1) that the height for the two hybrid plans in the research had similar numbers like: Arletta 1.6 m and the martor 1.7 m.

The height before the first inflorescence was of 19 cm for Arletta in biological system and 20.2 cm for Arletta in classical culture, proving a nursery characteristic.

The number of leaves before the first inflorescence shows the precocious character of the hybrid measuring 10.2 cm for Arletta and 10.3 for martor. The number of leaves between inflorescences did not vary much, being between 2.4 and 2.5 leaves.

Table 1 Biometrical indicatory

Variant	The average no. of leaves before the 1st inflorescence	The distance until the 1st inflorescence	The average no. of leaves between inflorescences	Plants height (m)
Artetta	10.2	19	2.4	1.6
Control	10.3	20.2	2.5	1.7

The tomato plans had 5 inflorescences and the percentage of fructification was different (Table 2, fig. 1).So, at the first inflorescence it was between 69,9% at control and 70,2% at Arletta in biological system.

At the other inflorescences the fructification percentage grew because of the better environment conditions, reaching 95% at Arletta and 94,6% at control. In the fifth inflorescence the fructification percentage was lower because of the excessive high temperatures which affect the pollen germination.

Fig. 1The fruits fructification percentage for each inflorescence

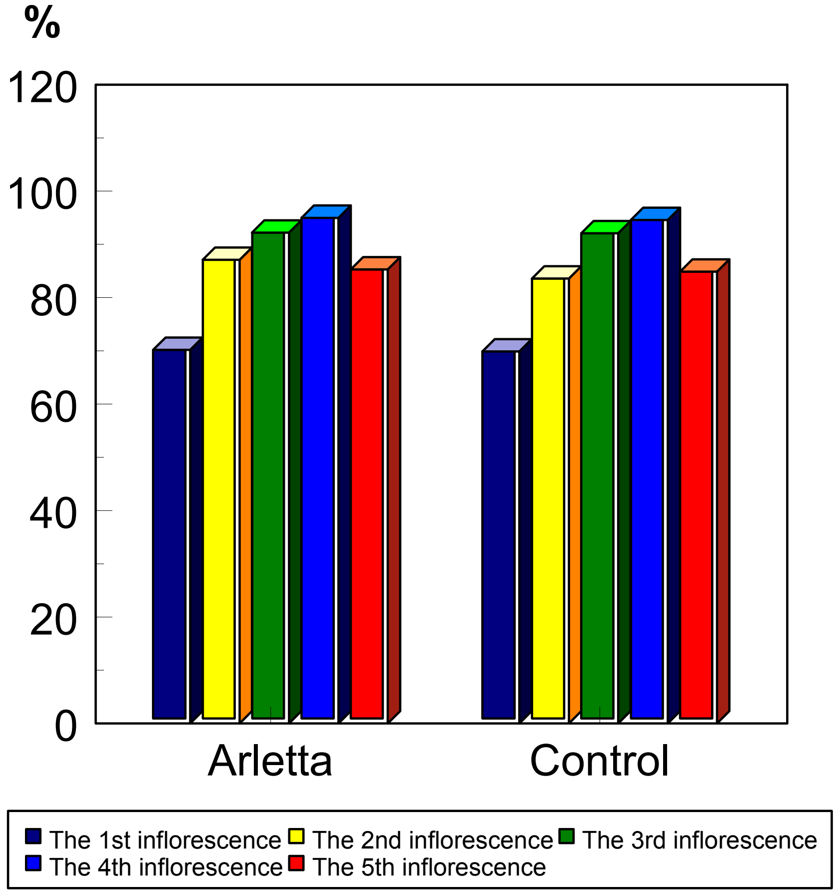


Table 2 The fruits fructification percentage for each inflorescence

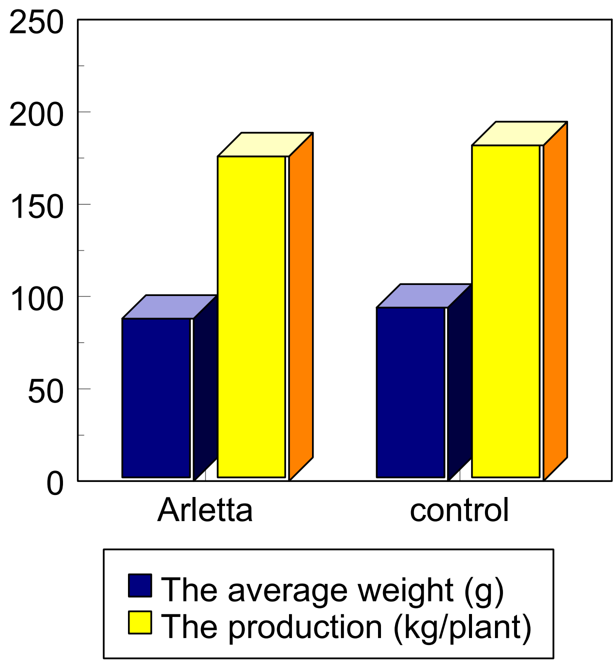
Variant	The 1st inflorescence	The 2nd inflorescence	The 3rd inflorescence	The 4th inflorescence	The 5th inflorescence
Arletta	70.2	87.1	92.2	95	85.3
Control	69.9	83.6	92.1	94.6	84.9

The fruit average weight had lower rates than the control, as well as the production had. (Table 3, fig. 2)

Table 3 The fruit average weight and the tomato production

Variant	The average weight (g)	The production (kg/plant)	The difference from Control
Arletta	88	1.76	-0.06
Control	94	1.82	-

Fig. 2 The fruit average weight and the tomato production



The chemical and physical properties of tomatoes obtained in a biological culture system are superior to those obtained in a conventional system (Table 4); The C vitamin level, dry and soluble substances are slightly higher.

Table 4 The chemical and physical properties of tomato fruit

Variant	pH	Acidity % (oxalic acid)	C vitamin %	SUS %	SUT %	Mineral substances (%)
Arletta	5	0.22	30.3	5.2	5.96	1.77
Control	5	0.2	25.3	4.5	5.3	1.46

The hard metals level (Table 5), for the tomatoes obtained in a biological culture system is lower, as follows: the plumb has values between 1.24mg/ kg for Arletta and 3.35mg/kg for control; the cooper has values between 5.4 and 7.3mg/ kg for the biological products and 9.7mg/ kg for martor. The zinc level for the same hybrid cultivated in different conditions is from simple to double, Cadmium and Cobalt have low rates, for Arletta is situated under detectible limit. The Nickel and Manganese level is of 2.3-1.35mg/ kg for biological fruits in comparison with 2.6mg/ kg and 6.3 – 8.4mg/ kg at control.

Table 5 The hard metals level for biological tomato fruits (mg/kg)

Variant	Pb	Cu	Zn	Cd	Ni	Mn	Co
Arletta	1.24	5.4	16.6	0.189	1.2	6.3	Udl
Control	3.35	9.7	33.9	0.280	2.6	8.7	0.36

The macro elements level (Table 6) is different between variants fruits obtained without synthesis chemical have a higher level of macro elements as those obtained in conventional system have a lower level.

Table 6 Macro elements level for the biological tomatoes (%)

Variant	Nt	P	K	Na	Ca	Mg
Arletta	0.8	0.38	4.13	0.05	0.15	024
Control	2.19	0.3	3.84	0.05	0.10	0.19

Triaminic herbicide residue for the biological tomato fruits are non detectable (Table 7)

Table 7 Content of residue in some tomato fruits

Variant	atrazina	simazina	propazina
Arletta	Udl	Udl	Udl
Control	Udl	Udl	Udl

Udl = under detectable limit

CONCLUSIONS

From the preliminary researches effectuated in outside tomato culture, using an alternative technology, without chemical products, can be drawn some conclusions as it follows:

- the culture must be closely watched for an early discovery of lack of nutrition problems;
- applications of only natural products for both plant fortification and illness preventing;
- the growing process develops at an optimum level, being sustained by the manure fertilization applied while planting;
- the percentage of fructification process is very satisfactory;
- the fruits obtained using this technique are of superior quality because of they contain high macro elements level, dry and soluble substance level, C vitamin, acidity and hard metals level;
- the weight and production of fruits are lower but the balance is rehabilitated by their high quality.

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Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE USE AS FERTILIZER OF MANURE TREATED WITH ZEOLITE ON TOMATOES AND PEPPER FIELD CULTURES

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Keywords: zeolite, tomatoes, pepper

INTRODUCTION

The ecological approach of specific problems in a farm must involve the prevention of soil and underground water pollution which can be affected by the infiltration of liquid wastes from manure platforms and the use of this organic fertilizer on some cultures, mainly vegetables.

In the case of manure stocked in traditionally made platforms, liquid wastes infiltrate the soil and in time they reach underground water which will be contaminated.

To avoid this kind of contamination in countries with high technologies, manure is stocked in a superficial septic pile. The pile is build from impermeable material, in which liquid wastes are fixed by introduction in these platforms of some strong absorbent materials (zeolite).

These materials, fix the liquid wastes contributing to the growth of total contain in nitrogen of the fertilizer obtained from the treated manure, in contrast with the total contend in nitrogen of classical manure.

In this way is prevented the contamination of soil and underground water, and the fertilizer obtained (with zeolite) has a high contain in total nitrogen, that has good effects on soil fertilization on which this organic fertilizer is applied.

This work presents the behavior of some vegetable species – tomatoes and pepper in cultures made in Stefan Voda, county of Calarasi. This experiment is a component of a project financed by The World Bank, entitled "**Complex Technology for Valorification of Manure in Zootechnical Farms for promoting sustainable agriculture in Romania**".

MATERIAL AND METHOD

The experiment took place in the village of Stefan Voda, county of Calarasi, on cernoziom – fertile soil, very suitable for planting summer - autumn tomatoes and pepper (table 1). For tomatoes it was used Campbell and Ace VF cultivars, with determined growth, well known for their good productivity and quality in the southern part of Romania.

For pepper it was used Opal, a romanian variety created at ICLF Vidra, which now is one of the most appreciated cultivars of pepper in the south-eastern part of Europe.

The fields where the experiment took place were organic enriched with fertilizer with 5%zeolite and manure, applied in doses of 20 t/ha.

The transplants were produced in alveolar plates at SC COX Fetesti, using an american technology of high performance.

The tomatoes were planted on the 11th of May 2004 at 70/30 cm (4.8 plants/m^2) and the pepper was planted a week later at 70/20 cm (7.14 plants/m^2).

Their maintenance was made concordant with the technologies used for these two cultures that have an economical importance in the southern part of Romania.

During this experiment observations and determinations were made especially in the cropping period.

Natural aluminosilicate argyles are very well known as remarkable adsorbents and absorbents (pores volume vary between 0.2 – 0.5 cm^3/cm^3). They can fix a great number of elements, from aqueous and/or gaseous systems, releasing them in retard system. Considering this arguments we can anticipate that this argyles can be used as adsorbents and absorbents in animal farms and after the adsorbtion/absorbtion process this organic material can be used as biofertilizer and bioprotectors.

RESULTS

Soil samples were taken at 0-20 cm deep from the entire surface with Mitsecherlich probe and analyzed from the point of view of agrochemical characteristics. Table 1 shows that the soil has a low basic pH = 7.25, and the contend in soluble salts is low, which is characteristic to soils with low level of salts.

The content in ammoniac nitrogen place this soil in the low level category, nitric nitrogen is in high quantity and this soils have middle and good levels of this element, phosphorous and potassium were found in small quantities, these soils being characterized also as low level in these elements.

The fertilization mixture has a pH=6.9, and a high content of soluble salts and mineral elements.

The manure used for fertilization has a low basic reaction and a high content in soluble salts, but a low content in mineral elements.

The water used for irrigation has a low content in all analyzed elements, but correspond to standards.

The results obtained following the observations and determinations at tomatoes show that:

- The quality of tomatoes (table 2), shows that the value of nitrates in tomatoes did not exceed150ppm, the contain in phosphorous and potassium is similar to the values presented in literature, so the vegetables have a good quality.
- Total production of summer – autumn tomatoes (table 3) was influenced in a positive way by the use of fertilizer treated with zeolite: Campbell – 7.57 kg/m^2, Ace – 7.21 kg/m^2.
- The content of nitrates in pepper is under the maximum level of admission and phosphorous and potassium presents normal values, they don't affect the quality of vegetables (table 4).
- The quantity of glucides and the contain in vitamin C of pepper fruits are much bigger when it was used fertilizer treated with zeolite, than when it was only manure.
- The production of pepper was much bigger at V_2 method (5.230 kg/m^2), than it was at V_1 method (5.070 kg/m^2) (table 5).

CONCLUSIONS

1. By treating manure with zeolite 5%, we obtain in shorter time an organic fertilizer much richer in nitrogen then manure.
2. The treatment of manure platform with zeolite 5% has completely removed the lost of liquid wastes – contamination source of soil and underground water.
3. The use of fertilizer treated with zeolite didn't determine the appearance of fitotoxicity phenomenon at summer – autumn tomatoes and pepper. So this fertilizer can be appreciated as an efficient fertilizer alternative to manure.

4. The entire production of summer – autumn tomatoes was influenced in a positive way by the use of fertilizer treated with zeolite, in the case of both cultivars productivity increasing.
5. The production of pepper also was influenced in a positive way using fertilizer treated with zeolite.
6. Further research is necessary to understand the technological and economical approach in the preparation and in the use of organic fertilizers treated with zeolite.

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Table 1. Agrochemical characteristics of soil, fertilization material and of the water used for irrigation

Nr. crt.	Specification	pH	Contain in soluble salts %	Contain ppm			
				NH_4^+	NO_3^-	P	K^+
1	Soil	7.25	0.06	18.2	58.2	15.3	17.3
2	Manure	7.8	0.29	1.5	40.0	6.7	5.3
3	Organic fertilizer with zeolite	6.90	0.34	59.2	25.4	29.7	25.7
4	Water	7.00	1.02	Urme	1.3	0.5	1.2

Table 2. Quality of tomatoes

Cultivar	Fertilizers	Contain in mineral elements (ppm)			Biochemical components		
		NO_3^-	PO_4^{3-}	K^+	Acidity %	Glucide %	Vitamin C mg/100g
Campbell	Manure	126.5	150.2	134	0.42	2.67	18.25
	Organic fertilizer with zeolite	128.7	150.3	130	0.41	2.23	18.00
Ace	Manure	117.3	165.8	98	0.43	2.68	17.36
	Organic fertilizer with zeolite	118.6	167.9	102	0.40	2.54	17.00

Table 3. Production of tomatoes

Cultivar	Fertilizers	Average number of fruits/plant	Average weight of fruits g	Production	
				kg/plant	kg/m^2
Campbell	Manure	13.4	155.6	1.549	6.893
	Organic fertilizer with zeolite	14.2	119.9	1.702	7.576
Ace	Manure	14.6	101.3	1.478	6.686
	Organic fertilizer with zeolite	15.4	103.4	1.592	7.211

Table 4. Quality of pepper fruits

Method	Fertilizers	Contain in mineral elements ppm			Biochemical components		
		NO_3^-	PO_4^{3-}	K^+	Acidity %	Glucide %	Vitamin C mg/100g
V 1	Manure	87.3	152.3	170	0.14	2.2	13.2
V2	Organic fertilizer with zeolite	75.2	160.1	250	0.12	2.5	17.8

Table 5. Total production of pepper

Method	Fertilizers	Average number of fruits/plant	Average weight of fruits (g)	Number of plants/m^2	Production	
					kg/plant	kg/m^2
V 1	Manure	6.3	117.4	6.80	0.743	5.070
V2	Organic fertilizer with zeolite	6.4	120.2	6.82	0.769	5.230

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RESEARCHES CONCERNING THE INFLUENCE OF THE FERMENTATION TEMPERATURE AND THE PRESSING ON VOLATILE COMPOUNDS OF WINE FLAVOUR

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Keywords: Sauvignon variety, ethyl capronat, ethyl caprilat, ethyl caprinat, fat acids, fat alcohols, acetate β-phenyl-ethylic

ABSTRACT

The fermentation of mist in different temperature system shoes the biggest influence on flavour volatile compounds and on organoleptics characters of wine, too. The pressing like a technological operation in primary vinification, lead at the intensify of volatile compounds of the wine flavour. Fermentation temperature had an important influence on volatile compound contents of the wine and also on their quality.

INTRODUCTION

Alcoholic fermentation like any microbiological process must be controlled and conducted for spread in optimal condition (Gheorghită M. 2002).

Fermentation temperature have an important place in the preserve of specifically primary flavour at grape variety an also in formation of secondary fermentation flavour.

The fermentation of the must in different levels of temperature and the pressing reveals an important influence on volatile composition and on organoleptical characters of obtaining wines, too. (Felicia Stoica 2003; Elena Heroiu 1998).

MATERIALS AND METHODS

For to study the influence of the fermentation temperature on the flavour volatile compounds was used Sauvignon varieties, knew as semi flavour grapes for Drăgăşani vineyard.

It was study five experimental variants, next was determinate the volatile compounds which can to influence the flavour of obtaining vines.

RESULTS AND DISCUSSION

Sauvignon grapes variety accumulated at harvest 204g/1 glucides, 4,4 g/1 H_2SO_4 acidity and the free volatile terpene content is 2800 µ grams/kg berry grape.

The duration of fermentation depends by the fermentation temperature.

The experimental variants set was realized on Sauvignon must and the dry fermentation was realized thus:

V_1 – 4 days at 28°C
V_2 – 4 days at 24°C
V_3 – 7 days at 19°C
V_4 – 8 days at 15°C
V_5 – 5 days at 11°C.

From table nr. 1 can be see that from the point of view of volatile composition of wine and organolcptic too, V_4 variants which was fermentated at 15°C is framing in optimal values, fallowed immediately by V_3 variants which was fermentated 7 days at 19°C.

The obtaining wine through must fermentation at 28 °C was the worst from organoleptic point of view (Table 1).

The present dates which reveals the influence of the fermentation temperature in the realization of the composition parameters an the specifically quality of white wines give the conclusion that the low thermic values are most favourable to obtain a superior wine with strong flavour and freshness.

It can be shoes that the highest alcohol superior contents was realized at the V_1 variants who was fermentated 4 days at 28°C.

The ester content is highest on the fermentation temperature lower from 28°C at 15°C. (V_4 vatiant was fermentated 8 days).

The obtaining wine from the must fermentated at lower temperature is the must rich in these compounds.

The most part of the volatile organics acids has a contents which lower in the same time with the lower of the fermentated temperature level from 28°C to 11°C (Table 2).

The lower fermentation temperature changes the yeasts metabolism with carry on at fat unsaturated acids transformation with longer chain in fat acids with shorter chain. (C_6, C_8,C_{10}, C_{12}).

V_3 variant has a higher content in caproic acid, caprinic acid and caprilic acid.

In accordance with the estherification mechanism it can suppose that this wine will be the richest in the esters adequate with these acids.

In accordance with the actual researches, the ethyl capronat, the ethyl caprilat and the ethyl caprinat has the most important role in new white flavour wine and is responsible with their fruitiness and freshness.

The pressing of the Sauvignon varieties grapes lead at the obtaining of some wines with highest contents in superior alcohols and lower in esters contents like the dates from Table 3.

The dates from table reveal the higher contents in superior alcohols (n-propanol, isobutanol, 2-methyl 1-butanol, hexanol, β phenyl-ethanol) and lower contents in esters (isoamil acetate, ethyl capronate, ethyl caprilate, ethyl caprinate, ethyl lactate, acetate phenyl-ethylic) at the pressing wines.

The presence of the superior alcohols in certain quantity is necessary for stresses the flavour compounds and reveals charming olfactive sensation.

When the superior alcohol quantity is to big, they affect in wrong way the olfactive sensation because this compounds in pure state have an unpleasant odor.

The assemble of must which are obtaining without pressing, the grapes with the must obtained from the first pressing lead at the obtaining of some wines with superior freshness and flavoured characteristics.

The proportions at the superior alcohols and the esters in these wines are favourable for a fine and fruitiness flavour because the wine contents bigger ester quantity responsible for fruitiness (C_6, C_8. C_{10}).

The pressing wines has a higher hexanol contents with gives a herbal character and lower in alcohol J3 phenyl-ethylic with roses odor.

CONCLUSIONS

After this studies it can be shoes that:

1. Fermentation temperature had an important influence on volatile compound contents of the wine and also on their quality.
2. Through must fermentation at the lower temperature it was obtaining the wines with superior characters from flavour point of view.
3. The assemble of must which are obtaining without pressing the grapes with the must obtained from the first pressing lead at the obtaining of some wines with superior freshness and flavoured characteristics.

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Table 1

The influence of fermentation temperature on volatile compounds contents (mg/1)

No.	Chemical composition	Fermentation temperature				
		28	24	19	15	11
1	n-propanol	0,170	0,153	0,148	0,153	0,162
2	izobutanol	5,22	4,90	4,75	4,20	4,30
3	n-butanol	0,390	0,285	0,367	0,548	0,440
4	izoamil alcohol	108,3	95,9	83,3	67,9	70,3
5	hexanol	0,640	0,620	0,696	0,787	0,740
6	β fenil ethyl alcohol	13,9	13,1	15,6	12,9	12,3
7	izoamil acetate	0,203	0,356	0,370	0,500	0,470
8	ethyl caproat	0,290	0,318	0,355	0,358	0,330
9	ethyl caprilat	0,590	0,615	0,740	0,797	0,425
10	ethyl succinat	0,188	0,251	0,197	0,740	0,190
11	ethyl caprinat	0,045	0,090	0,138	0,160	0,142
12	β fenil ethyl acetate	0,290	0,263	0,683	0,612	0,600
13	ethyl laurat	0,271	0,252	0,347	0,370	0,357

Table 2

The influence of different fermentation temperature on volatile acids contents in dry white wine (mg/1)

No.	Volatile organic acids	Variants				
		V_1	V_2	V_3	V_4	V_5
1	propionic acid	0,69	0,68	0,40	0,44	0,38
2	izobutiric acid	11,50	4,76	4,16	4,53	3,75
3	n-butiric acid	3,60	3,50	1,63	0,98	0,84
4	izovalerianic acid	1,77	1,74	1,10	0,96	0,87
5	n-valerianic acid	0,98	0,55	0,73	0,28	0,25
6	caproic acid	1,35	1,37	3,73	1,68	1,59
7	caprilic acid	1,70	2,08	2,64	1,69	1,57
8	pelargonic acid	0,05	0,117	0,117	0,101	0,15
9	caprinic acid	0,98	0,76	0,84	0,76	0,30
10	ethyl succinat acid	1,98	1,83	1,29	0,59	0,87
11	lauric acid	0,35	0,43	0,58	1,01	0,42
12	2 hidroxicaproic	19,90	21,70	14,88	14,40	7,50

Table 3
The influence the pressing on the volatile compounds in Sauvignon varieties (m-g/1)

No.	Chemical composition	Obtained wines			
		Ravac	Ravac + PI	Press I	Press II
1	n-propanol	0,165	0,240	0,283	0,858
2	izobutanol	3,150	3,880	5,630	7,960
3	2 metil 1butanol	14,900	15,260	15,30	22,900
4	3 metil 1 butanol	64,400	66,860	69,500	73,300
5	hexanol	0,780	0,930	1,290	2,300
6	β fenil ethanol	15,900	19,000	18,200	16,300
7	izoamil acetate	0,453	0,460	0,260	0,245
8	ethyl capronat	0,580	0,678	0,440	0,304
9	ethyl caprilat	0,872	1,321	0,665	0,320
10	ethyl lactat	5,970	5,700	3,300	3,100
11	ethyl caprinat	0,460	0,520	0,260	0,243
12	ethyl succinat	0,194	0,320	0,208	0,340
13	ethyl laurat	0,436	0,342	0,360	0,245
14	β fenil ethyl acetate	0,981	0,830	0,530	0,203

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RESEARCH CONCERNING EARLY POTATO CROPS AROUND BUCHAREST AREA

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Keywords: *Solanum tuberosum,* solarium, field, density, Ostara, Agata, Kondor, Impala

ABSTRACT

The research was made to the Department of Vegetable Growing of Horticulture Faculty belonging to the University of Agronomic Sciences and Veterinary Medicine of Bucharest, in 2004. The purpose was to find the most favourable technological and economical variants between varieties and culture density so that to be obtained high and early yields. Biological material used represented by the early potato varieties: Agata, Ostara, Kondor, Impala. Culture systems were: covered solarium with transparent polyethylene and open field, who represented control variant. There we are used three densities of culture: 15/60, 20/60, 25/60.

INTRODUCTION

Early vegetable productions are the most valuable. High cost, sometimes by 5 to 7 times higher than normal for growing fresh food after winter period. It is known that vegetables represent a valuable source of vitamins, minerals and principle actives who invigorate the body and improve the capacity of concentration. In additions to high cost, early yields offer the possibility to the growers to cultivate on the same field other species after potato yield, that means on the same field, on one year, we can obtain two cultures. For example: early potato and winter cabbage represent a good option.

Potato represents a high biological potential, production being directly proportional with attention that is it accorded. Sometimes potato is considered the food of paupers, but always the potato growing is made by the richest.

In this experience we attempted to find the most propitious combination between density, variety and culture system, who provide earlier and higher yields.

MATERIALS AND METHODS

In 2004, there were planted potatoes in two solarium(125 m^2/each) 17 March with potatoes who had developed buds. There we are four varieties and three densities, the experiment used the following variants: $\mathbf{V_1}$ Agata: variety Agata, solarium, density 20/60; $\mathbf{V_2}$ Agata: variety Agata, solarium, density 15/60; $\mathbf{V_3}$ Agata: variety Agata, solarium, density 25/60; $\mathbf{V_4}$ Impala: variety Impala, solarium, density 20/60; $\mathbf{V_5}$ Impala: variety Impala, solarium, density 15/60; $\mathbf{V_6}$ Impala: variety Impala, solarium, density 25/60; $\mathbf{V_7}$ Ostara: variety Ostara, solarium, density 20/60; $\mathbf{V_8}$ Ostara: variety Ostara, solarium, density 15/60; $\mathbf{V_9}$ Ostara: variety Ostara, solarium, density 25/60; $\mathbf{V_{10}}$ Kondor: variety Kondor, solarium, density 20/60; $\mathbf{V_{11}}$ Kondor: variety Kondor, solarium, density 15/60; $\mathbf{V_{12}}$ Kondor: variety Kondor, solarium, density 25/60.

In open field, the control variant was planted on 24 March with potatoes who had developed buds. In this case we used four varieties and three densities, with the following variants: $\mathbf{V_{1Mt}}$ Ostara: variety Ostara, field, density 20/60; $\mathbf{V_{2Mt}}$ Ostara: variety Ostara, field, density 15/60; $\mathbf{V_{3Mt}}$ Ostara: variety Ostara, field, density 25/60; $\mathbf{V_{4Mt}}$ Agata: variety Agata, field, density 20/60; $\mathbf{V_{5Mt}}$ Agata: variety Agata, field, density 15/60; $\mathbf{V_{6Mt}}$ Agata: variety Agata, field, density 25/60; $\mathbf{V_{7Mt}}$ Kondor: variety Kondor, field, density 20/60; $\mathbf{V_{8Mt}}$ Kondor: variety Kondor, field, density 15/60; $\mathbf{V_{9Mt}}$ Kondor: variety Kondor, field, density 25/60; $\mathbf{V_{10Mt}}$ Impala: variety Impala, field, density 20/60; $\mathbf{V_{11Mt}}$ Impala: variety Impala, field, density 15/60; $\mathbf{V_{12Mt}}$ Impala: variety Impala, field, density 20/60.

There were made two recovered and irrigation when was necessary. Only to the control variant there were made treatments for controlling Colorado beetle *(Leptinotarsa decemlineata)* and mildew *(Phythophthora infestans)*. To the solarium culture weren't recorded diseases and pests because of early culture.

Harvesting was made a 09 06 2004 to the solarium culture and on 24 06 2004 to the control variant.

RESULTS AND DISCUSSION

After the performed measurements, we concluded that 15/60 density had the highest yield to the variants appertained to the same variety.

To draw a parallel between two systems, we observed that in solarium, Agata and Ostara had the highest productions(figure 1) and the control variants Kondor and Agata were the most(figure 2).

In solarium(table 1), the best results were obtained to V_2 Agata and V_8 Ostara (58,369t/ha and 59,091t/ha), white the lowest results were to the Kondor variety(V_{12} Kondor 19,642 t/ha).

In open field(table 2), variety had different results; the greater yields were recorded to Kondor and Agata (V_{8Mt} Kondor 43,999 t/ha and V_{5Mt} Agata 42,74 t/ha), and the lowest to Impala (28,31t/ha).

CONCLUSIONS

Comparing production obtained in solarium on 9 06 2004 with those obtained in open field, two days later, we observed a very high difference. This difference show that potato culture in solarium is a profitable yield.

Even if variants with 15/60 density had the greatest productions; the rate between the quantity of material that we planted and yield it is in the advantage of variant with 20/60 density.

In solarium, to the Kondor variety, vegetable growing were high white the productions were low, so that the culture wasn't profitable.

In the following years, research will continue for determination the most economical and technological variant, between variety and density so that to by obtained great and early productions.

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Tables

Tabel 1 Yields obtained in solarium

Experimental variants	Harvesting date	
	14/05/2004	09/06/2004
V1 Agata	18,916	52,68035
V2 Agata	19,185	58,36965
V3 Agata	17,19	41,79582
V4 Impala	9,81	42,19427
V5 Impala	15,111	49,35126
V6 Impala	8,79	35,65199
V7 Ostara	15,99	52,63868
V8 Ostara	18,222	59,09194
V9 Ostara	14,31	45,86408
V10 Kondor	9,49	27,77765
V11 Kondor	10,222	29,15148
V12 Kondor	6,53	19,64248

Tabel 2 Yields obtained in field

Experimental variants	Harvesting date	
	11/06/2004	24/06/2004
V_{1Mt} Ostara	20,222	33,944
V_{2Mt} Ostara	21,48	34,592
V_{3Mt} Ostara	18,266	27,577
V_{4Mt} Agata	16,55549	38,5555
V_{5Mt} Agata	26,296	42,74
V_{6Mt} Agata	15,51	31,866
V_{7Mt} Kondor	19,66659	39,33318
V_{8Mt} Kondor	21,4444	43,999
V_{9Mt} Kondor	14,88874	27,333
V_{10Mt} Impala	16,611	29,83323
V_{11Mt} Impala	19,5185	31,185
V_{12Mt} Impala	13,0665	28,31

Figures

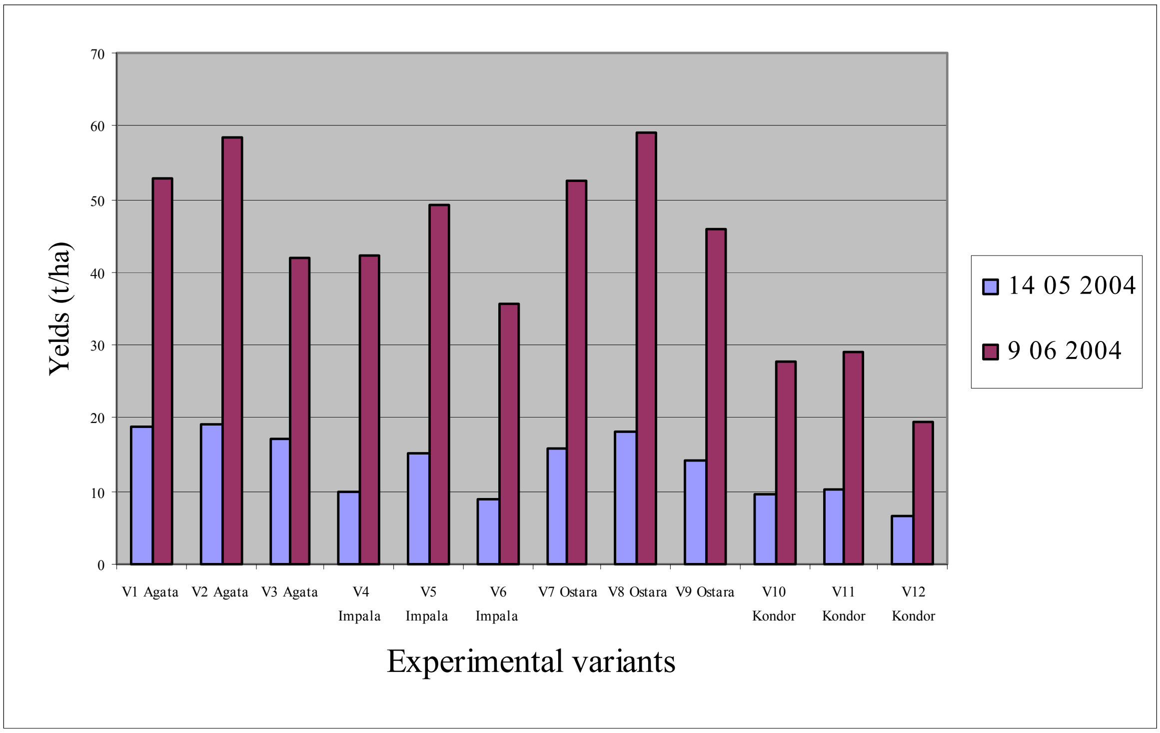

Figure 1 Yield evolution to the potato crop in solarium

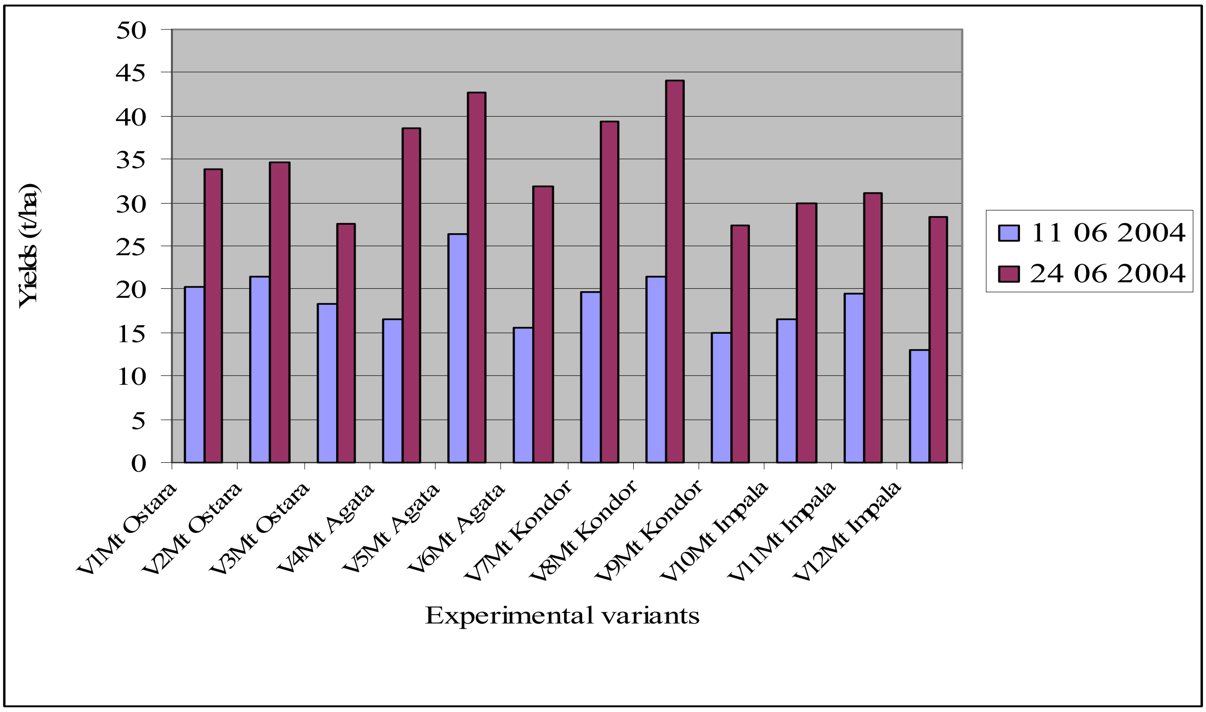

Figure 2 Yield evolution to the potato crop in field

Lucrări stiintifice U.S.A.M.V.B., Seria B, Vol. XLVII, 2004

PYRAMID EFFECT ON CERTAIN MORPHOLOGICAL ELEMENTS REGARDING SALAD PRODUCTION (*CORA* VARIETY)

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Keywords: pyramids, active water, salad, germination, production,

ABSTRACT

The ecological agriculture presumes above others measures a reduction in using chemical products of synthesis. Above all methods, used by the ecological agriculture, physical methods hold an important place.

The pyramid effect was less studied but enough mentioned in literature, with favorable effects both for vegetable kingdom and animal kingdom.

INTRODUCTION

By growing garden lettuce, *CORA* variety, in P.V.C. foil protected pyramids on which we applied normal or active water through the pyramid effect, we prospected for aspects connected to vegetative growth and productions obtained by comparing them to witness values whose variants were cultivated in the open field. We wrote down high values of the analyzed elements. These values by far outran the witness and we could notice the favourable influence of both pyramids and active water.

Among all physical energizing elements, the pyramid effect is the least studied, although mentioned in the literature.

This represents a practical possibility for getting production gains using the ecological technology.

MATERIAL AND METHODS

The experiments were carried out within the research field for leguminous plants in Banu Mărăcine – as part of University of Craiova, where we located the experience using Cora variety.

The crop was accomplished by direct sowing in association with monthly/early radishes representing precultivated crops for tomatoes with the precise purpose of a rational and intensive use of the land. (figure IA; l B) By the experiment were studied two factors:

- A with: a_1- irrigation with water that was kept in a pyramidal tank;
  a_2- irrigation with normal water;

- B with: b_1 - culture in pyramid covered with polyethylene;
  b_2 - culture in pyramid uncovered;
  b_3 - culture in open field

Through variants dominance and specific we traced the influence of pyramids protected or not in combination with the use of normal or active water and in relation to crops grown in the open field.

The experimental variants were placed within three repetitions (figure 2). The surface of one variant/repetition extends to 5.3 square meters and water energization was accomplished in the experimental tank (figure 4) for 24 hours before practical use.

The technology used for cultivation was the usual one with the following elements specific to research:

- Sowing was carried out in March, 3rd, 2004
- The surface of one variant/repetition was of 5.3 m^2.
- Harvest time: May, 10th , 2004
- Variety: *Cora*

RESULTS AND DEBATES

Some aspects connected to plant growing were followed through the vegetation period in two important moments of the crop, germination and harvesting for consumable use. The second test also determined the production adjusted in kg/m^2.

The values are displayed within graphics number l and 2.

For the first test (graphic 1) the values of morphological elements (leaves and roots) objectified by the average of the total weight show the favourable influence of the analyzed factors on the tested elements in relation to the witness (Ve).

The percentage gains were situated between 25.7-119.0% for the plant weight, between 20.6-107.9% for the foliar system and between 12.5-162.5% for the radicular system.

Values were also recorded for the foliar surface. These values exceeded the witness values by 15.51-100.81%.

For the second phase (graphic 2) the salad weight ranged between 112-192g/pl exceeding the witness by 9.8-71.4%.

Variants productions ranged between l.12kg/m^2 for *V&* (Mt) and 1.22-1.92 kg/m2 for variants numbered 1-5 exceeding the witness by 8.9-71.4%.

Noticeable differences were obtained for V, (PAAE);V_2 (PAAO)and V_3(PNAE)

CONCLUSIONS

1. the process of growing lettuce plants was influenced both with regards to the total weight and component parts.
2. the most obvious action could be seen in the case of protected pyramids which were irrigated with active water.
3. the protection with polyethylene foil influenced the earliness.
4. using water kept for 24 hours in a pyramidal tank for irrigation purposes led to the

intensification of growing processes and gains up to 71.4% were recorded for the average weight and production.

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Table 1
Specific of variants

Variant	The specific of variants	Abbreviations
V_1	Culture in pyramid covered with polyethylene and irrigated with water that was kept in a pyramidal tank.	P.C.P.W.
V_2	Culture in pyramid covered with polyethylene and irrigated with normal water.	P.C.N.W
V_3	Culture in pyramid uncovered and irrigated with water that was kept in a pyramidal tank;	P.U.P.W
V_4	Culture in pyramid uncovered and irrigated with water that was kept in a pyramidal tank.	P.U.N.W
V_5	Culture in open field and irrigated with water that was kept in a pyramidal tank.	O.F.P.W.
V_6 (witness)	Culture in open field and irrigated with normal water.	O.F.N.W

Figure 1
Pyramidal tank and pyramid used in the experience

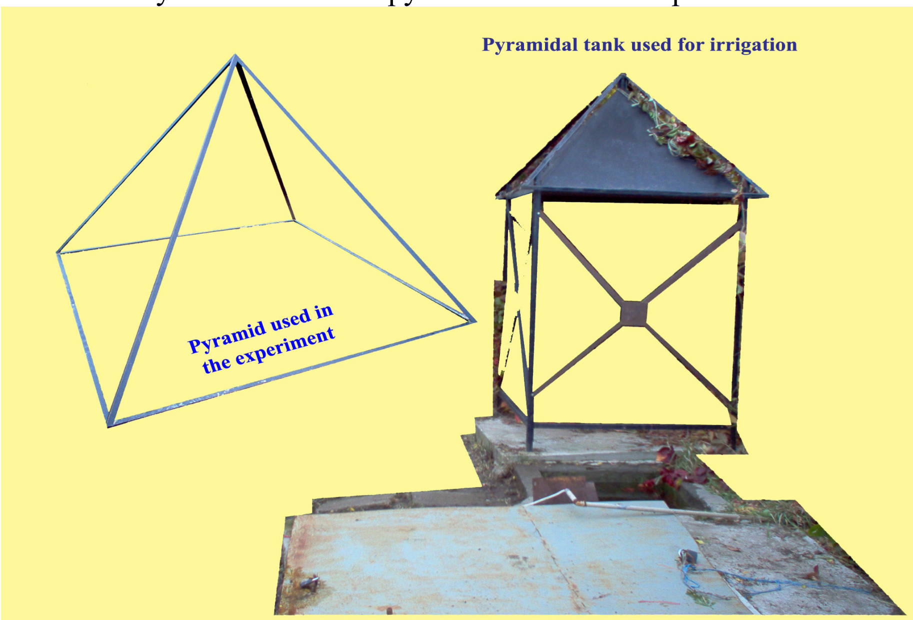
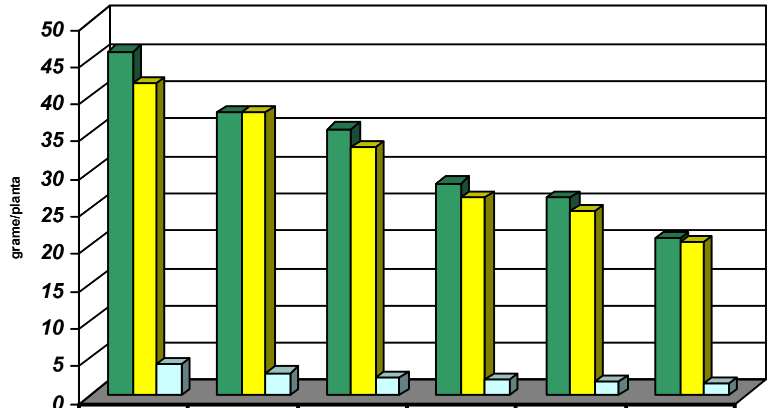


Diagram 1

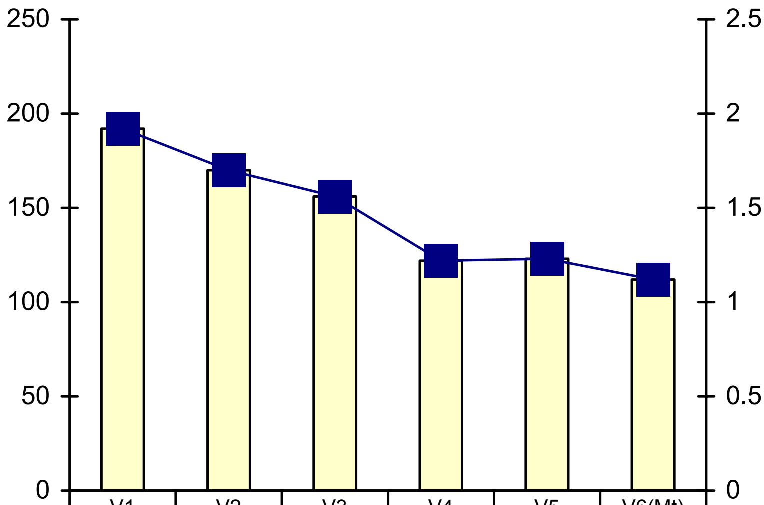
The influence pyramid effect concerning some morphological elements at early radishes cherry belle (stage 1)



	V1	V2	V3	V4	V5	V6(Mt)
total weight	46	37.8	35.6	28.4	26.4	21
leaves weight	41.8	37.8	33.2	26.4	24.6	20.4
roots weight	4.2	3	2.4	2	1.8	1.6

Diagram 2

The influence pyramid effect concerning leaves weight and production at garden lettuce Cora variety (stage 2)



	V1	V2	V3	V4	V5	V6(Mt)
leleaves weght (g/plant)	192	170	156	122	123	112
production (kg/square metter)	1.92	1.7	1.56	1.22	1.23	1.12

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE DIFFERENCE WETTING INFLUENCE ON HUMIDITY DYNAMICS, YIELD AND ECONOMIC EFFICIENCY ON CUCUMBERS CROP IN SOLARIUM

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Keywords: watering by drop, watering on beds, cucumbers crop in solarium

ABSTRACT

The paper presents the influence of two drippng watering methods on cornichon cucombers in the solarium.

It can by remarked the favorable effect of the driping watering method, which reduced the water consumtion per plant by 43.6% and the increase of watering efficiency by 61%compared to the beds watering method.

The production obtained showed distinct significant differences (8.6 t/ha) for the dripping watering method and an increase of the method incame by 37%.

The hybrids that were studied reacted in a different manner to watering methods the most influenced beeing Pasarebo F_1 and Pasamonte F_1 for which were the production was incresed by 18-19% for the dripping watering method compared with the bed watering method.

INTRODUCTION

Irrigation represents a very important technological measure having as effects: the obtaining of large vegetable yields, regardless of the quantity of precipitations; the utilizations

the quality of the products; prolongation of the vegetations period of the plants and the better spacing out of the productions and other.

Each of the methods practiced in the vegetable growing differentiated by the water distributions technique at plants, the quality of water administrated (given and the moistened soil volume, presents beth economical and technological advantages as well as disadvantages, and the extension of the modern methods of irrigations: (micro aspersion, dripping) was caused by the studies concerning the growing of the production, the water and the energy economy, the labor economy and the reduction of the environment pollution risk.(R.D. Bliesner, J. Keller 1990, Davidescu D, Velicica Davidescu 1992). The purpose of the research was the effectuation of the irrigation method on beds (traditional) to a modern method (dripping) applied to cucumbers in the protected culture in solariums covered with polyethylene.

MATERIAL AND METHOD

The experiments took place in the didactic and research department of the Vegetable crops Department chair in USAMV-Bucharest, 2003.

In the solarium covered with polyethylene (125 sm), there were applied the two irrigation methods: on beds (with the width at the field terrain level of 0,45 and the distances between them of 0,7m) and through dripping (TSX510-T-TAPE dripping tube, 26mm in diameter and the distance between the drippers being 20cm long).

There were experimented the F1 cucumber hybrids: Salinas, Componist, Melody, Pasarebo, Pasamonte.

The experiments were mounted in subdivision parcels with 4 repetitions. The planting of the nursery transplants in the second decade of April with a density of 42.000 plants per hectare.

During the vegetation the wettings were applied according the experimental variants, with wetting norms resulted from previous experimental calculus based on the specific elements and in the moments indicated by the determinations concerning the humidity of the soil.

During the whole period when the wettings were applied, in order to examine how the humidity of the soil remains there were harvested humidity samples in two depths of 10-20 cm and 20-40 cm. The humidities were caused on the central row of plants, in two points 1 and 2, on the surfaces where the two wetting methods were applied. The first determination was made on the 1st of April 2003. With the respective there was indicted the dynamics of the soil humidity on the respective depths.

RESULTS AND DISCUSSIONS

Results regarding the ensuring of the water necessary of plants

The wetting norm was calculated based upon the following elements:

- apparent density - A p=1.5 t/m^3
- water capacity on the field - CC=27.52%
- the withering value coefficient – WC =7.95%
- the extreme limit – EL = 22.47% (the extreme limit was established as being 75% of the active humidity interval
- the active soil depth H = 0.35m

Using respective data there was calculated a irrigation norm of **m=26,5 l/m2**.

Data used on table 1 shows that using watering by drop it diminishes the water input relative the watering on beds with: 43.63% per plant, 36.13%sm, 39.49% for entire period of culture. Results that to the cucumbers culture crop in solarium the watering by drop gets a growing of the water efficiency with 61%.

Results regarding the dynamics of soil humidity

From dynamics humidity analysis results on the both irrigation methods water capacity on the soil maintained between the extreme limit and water capacity on the field (fig 1,2,3 and 4).

Results regarding the production

Depending on the biological potential of the experimented hybrids, the production achieved on plant varied between 1.400 and 1.960 kg in the wetted on beds variant and between 1.650 and 2.250 kg in the wetting by dripping variant. Even trough it does not modify the dimensions of the fruits, the method does influence the cucumber production by the increasing of the fruit number on per plant (Ruxandra Ciofu and colab., 2003).

In comparison with the mean of the experiment to which - in the conditions of the year 2003-there were obtained productions of 62.067 t/ha, at the wetting by dripping variant there were obtained in mean for all of the studied hybrids 66,349 t/ha, by comparison with 57.785 t/ha, in the wetting bed. In the two wetting methods there was registered a difference of 8.564 t/ha, with a growth of 15% in the variant of irrigation by dripping. The greatest influence was noticed at the Pasarebo (19%) and the Pasamonte (18%) hybrids, and the smallest at Componist (only 1%).

It ensues from the statistic interpretation of the production results that between the two wetting methods the differences regarding the production are distinctly significant, in favor of the wetting by dripping method which brings about significant differences, towards the experience mean also (table 2).

Results regarding the economic efficiency

The irrigation method influences the level at the economic efficiency indicators, as results of the expenses production modification resulted from the different water consumption and of the obtained harvest, which can be seen in the value at the incomes(table 3).

The total expenses are reduced with 612000 lei per ha in the case of irrigation by dripping as a results of the water economy by comparison with the wetting on the drill. Adequately, the cost will be reduced with 1082 lei per kg. The profit is 84% at the wetting by dripping method by comparison with 47% in the case of the wetting drill method.

CONCLUSIONS

1. The wetting method used for the cucumber culture in the solarium influences the water consumption which can be reduced with 61% in the case of wetting by dripping by comparison with the irrigation on the drill.
2. In the case of the irrigation by dripping the humidity dynamics of the soil during the vegetation period registers a greater degree comparison with the one realized at the irrigation on the drill.
3. The total cucumber production increases very significantly with approximate 8.5t/ha in the case of the irrigation by dripping representing a growth of 24% as compared to the drill wetting, the differences being specific to the cultivated hybrids.
4. The irrigation by dripping influences favorably the economic efficiency of the cucumbers cultivated in the greenhouse, the rate of the profit being superior with 37% as compared to the wetting by drill.

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Tables

Table 1. The necessary water for growing cucumbers in solarium comparative for the two watering methods

Specification		UM	Beds irrigation	Dripping irrigation	Differences	
					(l)	(%)
Water consumption for one wetting	per entire surface	l	1490	470	1020	31.54
	per m^2	l/m^2	23.80	8.6	15.2	36.13
	per plant	l/plant	5.50	2.4	3.1	43.63
Overall use for 11 watering		l	13090	5170	7920	**39.49**

Table 2. Statistics interpretation of the yield – cucumbers crop in solarium

Nr crt	Variant	Production t/ha	The difference given by the variant		
			3	2	1
1	Dripping irrigation	66.349	4.282*	8.564**	-
2	Beds irrigation	57.785	-4.282^0	-	-
3	Average experience	62.067	-	-	-

DL 5% =3.015 t/ha
DL 1% = 5.847 t/ha
DL 0,1% = 11.314 t/ha

Table 3. The influence of wetting method over economic efficiency parameters

Market production	UM	Wetting method		Differences	
		Bed	Drop		%
Production price	thousand lei	1184490	1360175	175685	114
Total expenses	thousand lei	479196	478584	612	96
Cost	lei/kilo	8239	7211	1082	86
Profit	thousand lei	705294	881591	176297	124
Profit rate	%	147	184	37	-

Fig.1. The dynamics of soil humidity for the 0-20cm depth for solarium grown cucumbers, where watering on rows and by drip was used. Point 1

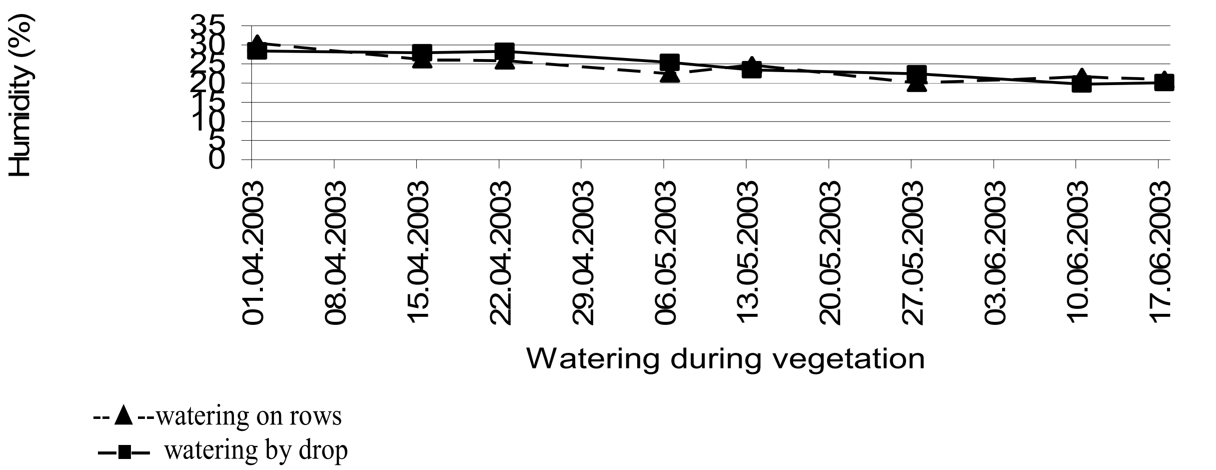


Fig.2. The dynamics of soil humidity for 0-20 cm depth for solarium grown cucumbers, where watering on beds and by drip was used. Point 2.

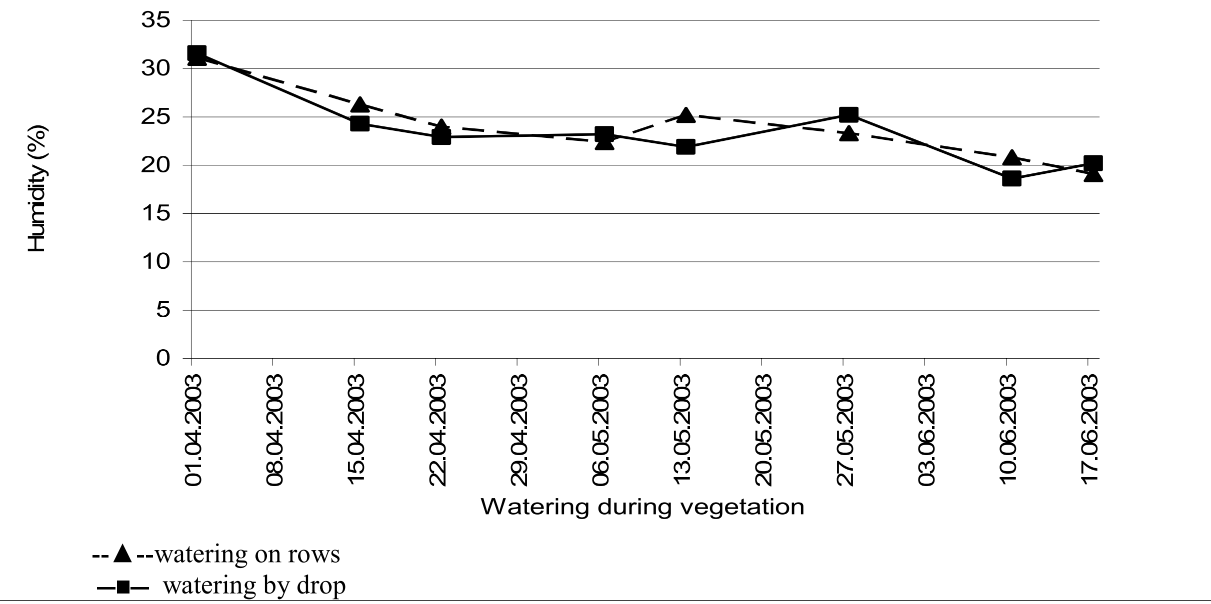


Fig.3.The dynamics of soil humidity for 20-40 cm depth for solarium grown cucumbers, where watering on beds and by drip was used. Point 1.

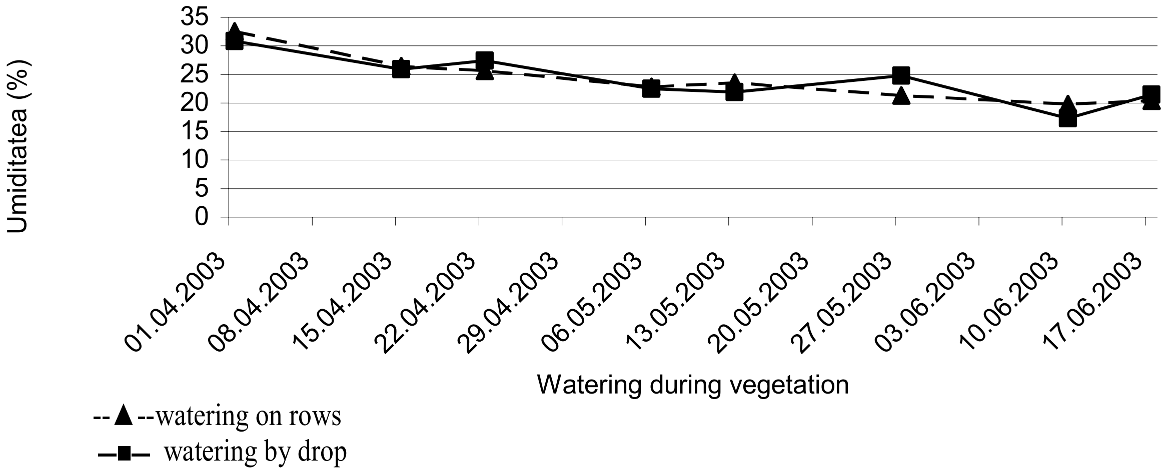
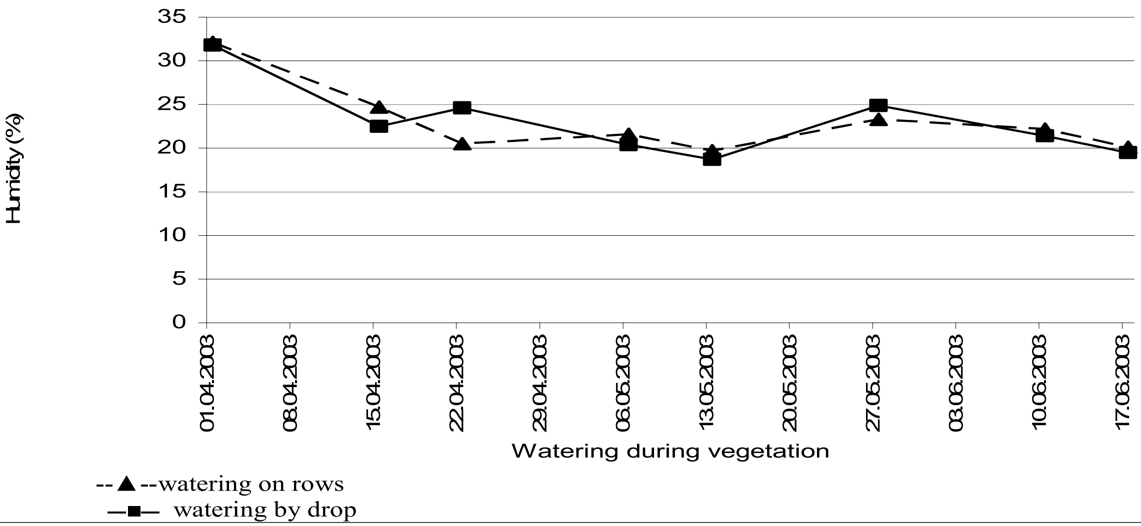


Fig. 4. The dynamics of soil humidity for the 20-40cm depth for solarium grown cucumbers, where watering on beds and by drip was used. Point 2



Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE DYNAMICS OF DIFFERENTIAL HUMIDITY AND ITS INFLUENCE OVER PRODUCTION AND ECONOMIC EFFICIENCY IN SOLARIUM GROWN TOMATOES

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Keywords: watering by drop, watering on bed, hybrid tomatoes in solarium, economic indexes.

ABSTRACT

The paper presents the effect of the watering methods (dripping and beds watering) on water use efficiency, production and economics of tomato growth in solarium.

The results highlighted the superiority of the dripping method, which compared with the bed watering method, generated de reduction of water consumption by 44% per plant and by 69% for vegetation period and an increase of water use efficiency by 31%.

The dripping watering method largely influenced the production obtained, a the differences between the two methods being very significant (11.8t/ha).

The studied hybrids had specific responses to the watering method, the biggest difference was obtained for Celaya F_1. The watering methods influenced the economic indexes. The dripping method for watering induced an increase by 33% of the income, and the decrease of the costs by 21% and increase of the net income by 41.3% compared with the watering method.

INTRODUCTION

The watering methods used in vegetable crop differ from one another by water distribution technique, quantity of distributed water and of moisten soil. Each method has its technological and economic advantages and disadvantages, and the interest in increasing production, saving water, energy, labour force, and in decreasing pollution risk has determined the extension of modern watering techniques.

Taking into consideration the fact that plants react differently to each watering technique, the purpose of this paper was developing a comparative study of two watering methods: traditional (on beds) and modern (by drop) used for growing tomatoes in protected solarium covered by polyethylene canvas.

MATERIALS AND METHODS

The experiments were conducted within the didactic and research sector of the Department of vegetable crop of USAMVB Bucharest in 2003.

In the polyethylene covered solarium ($125m^2$) we have applied the two watering techniques: on beds (0,45 m wide and 0,7 m distance between them) and by drop (drop pipe type TSX 510 – T – TAPE, 26mm diameter and a distance of 20 cm between them).

We have used the F1 tomatoes hybrids: Arletta, Celaya, Baghera, Marion, Horabel, Hector.

The experiments were conducted on subdivided parcels with 4 repetitions.

The planting was conducted during the second decade of April with a density of 48,700 plants per hectare.

During vegetation the watering methods were applied according to experimental variants, to watering rules inferred from previous experimental calculations conducted on the basis of specific elements and in the moments shown by figures regarding soil humidity.

During the entire watering process we have collected humidity probes in two points 1 and 2 on two depths of 0-20 cm and 20-40 cm to follow the way soil humidity is preserved. The humidity level was determined on the central plant bed, on both surfaces were the two watering methods were applied. The first humidity level was determined on 1.04.2003. With the obtained data we have drawn up the soil humidity dynamics on the respective depths.

RESULTS AND DISCUSSIONS

Results regarding ensuring water requirements for plants

The watering norm was calculated on the basis of the following elements:

- apparent density – Ad = 1.52 t/m^3
- water capacity in the field – CC = 27.55%
- withering coefficient – CO = 7.8%
- minimum level – PM = 22.61% (the minimum level was established to 75% of active humidity interval)
- active soil depth – H = 0.4m

The following watering norm has resulted: m = 30l/m^2

The data regarding water consumption for growing tomatoes are given in table 1.

The results highlighted the superiority of the dripping method, which compared with the row watering method, generated de reduction of water consumption by 44% per plant and by 69% for vegetation period and an increase of water use efficiency by 31%.

Results regarding the dynamics of soil humidity

The data regarding the dynamics of soil humidity for the 0-20 cm depth are shown in figure 1 (point 1) and figure 2 (point 2), and for the 20-40 cm depth in fig. 3 and fig. 4.

By analyzing humidity dynamics we infer that for both watering techniques the water level in the soil remained between the minimum level and the field water capacity.

Results regarding production

The watering method has influenced the production of tunnel grown tomatoes, with specific differences for each hybrid. Depending on the biologic potential of the hybrids used, the production obtained per plant ranged between 0.515 and 1.000 kg for plants watered by beds, and between 0.772 and 1.230 kg for those watered by drop. (Ruxandra Ciofu and co., 2003).

By comparison to the average level of the experiment conducted in 2003, when productions of 40.897t/ha were obtained, for the watering by drop method we have obtained an average production of 46.825t/ha for all hybrids used, and for the watering by rows method only 34.979t/ha. A difference of 11.830t/ha was recorded between the two watering methods, with a 34% growth when watering by drop. The highest influence was recorded for the Celaya hybrid (49%), and the lowest for Horabel (20%).

By statistically interpreting production results (table 2) it comes out that the production differences between the two methods are very significant in favour of the watering by drop method, which determines also distinct relevant differences as compared to the average level of the experiment.

Results regarding economic efficiency

The consequence of the watering method over water consumption reflected by production costs and obtained crops, which influence overall production price, is revealed by the level of the economic efficiency parameters (table 3).

Overall spending for watering by drop method is reduced by 7.000 lei per hectare due to water saving, as compared to watering on the bed. Subsequently the cost is reduced by 5.170 lei per kilo. Profit rate reaches 63.4% for watering by drop method as compared to 22.1% for watering on beds.

CONCLUSIONS

1. The watering method applied for solarium grown tomatoes influences water consumption, which can be reduced by almost 69% when watering by drop as compared to watering on beds.
2. When watering by drop soil humidity dynamics during vegetation period records a higher level of uniformity compared to the one obtained when watering on beds.
3. Overall tomato production is significantly raised by approximately 12t/ha when watering by drop, which is a 34% increase as compared to watering on beds, the differences are specific for each hybrid grown.
4. Watering by drop positively influences economic efficiency for solarium grown tomatoes, as the profit rate is higher by 41.3% as compared to watering on beds.

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Table 1
The necessary water for growing tomatoes in solarium comparative for the two watering methods

<table>
<tr><th colspan="2" rowspan="2">Specification</th><th rowspan="2">UM</th><th rowspan="2">Watering on beds</th><th rowspan="2">Watering by drop</th><th colspan="2">Differences</th></tr>
<tr><th>1</th><th>%</th></tr>
<tr><td rowspan="3">Water use for watering</td><td>per entire surface</td><td>1</td><td>1510</td><td>470</td><td>1040</td><td>31.12</td></tr>
<tr><td>per m^2</td><td>l/m^2</td><td>24.20</td><td>12.05</td><td>4.20</td><td>49.75</td></tr>
<tr><td>per plant</td><td>l/plant</td><td>4.90</td><td>2.16</td><td>2.74</td><td>44.08</td></tr>
<tr><td colspan="2">Overall use for 13 watering</td><td>1</td><td>1963</td><td>6110</td><td>13520</td><td>68.87</td></tr>
</table>

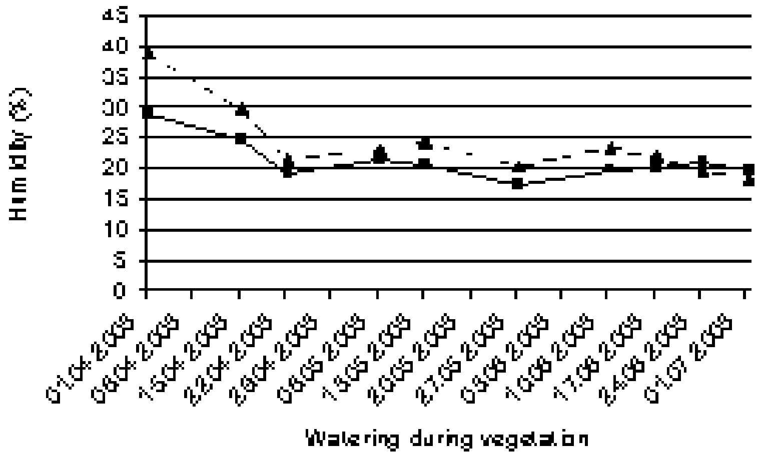
Table 2
The statistic interpretation of production results for tunnel grown tomato hybrids (multiple comparisons – the Duncan test; DL5%=2,789t/ha; DL1%=4,868t/ha: DL0,1%=10,335t/ha)

Nº	Variant	Production	Differences as compared to the variant on place:		
			3	2	1
1	V2 by drop	46.815	5.918**	11.836***	-
2	V1 by bed	34.979	-5.918^{00}	-	-
3	Average level of the experiment	40.897	-	-	-

Table 3
The influence of watering method over economic efficiency parameters

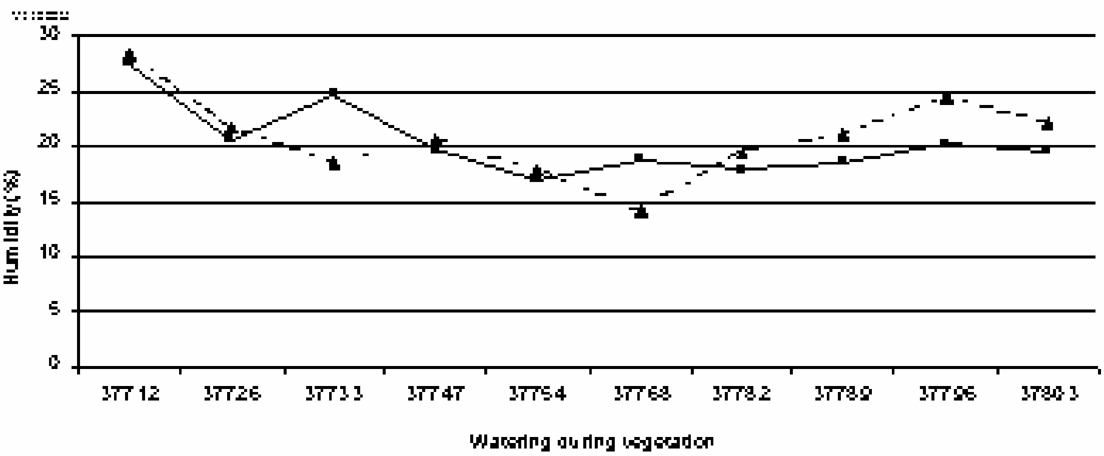
Parameters	UM	Watering method		Differences	
		Bed	Drop		
Production price	thousand lei	874475	1170375	295900	133
Overall spending	thousand lei	716000	715993	7	99
Cost	lei/kilo	20460	15290	5170	74
Profit	thousand lei	158475	454382	295907	286
Profit rate	%	22.1	63.4	41.3	

Fig.1 The dynamics of soil humidity for the 0-20cm depth for solarium grown tomatoes, where watering on bed and by drop was used. Point 1



▲ watering on bed
■ watering by drip

Fig.2 The dynamics of soil humidity for the 0-20cm depth for solarium grown tomatoes, where watering on bed and by drop was used. Point 2



▲ watering on bed
■ watering by drip

Fig.3 The dynamics of soil humidity for the 20-40cm depth for grown tomatoes, where watering on bed and by drop was used. Point 1

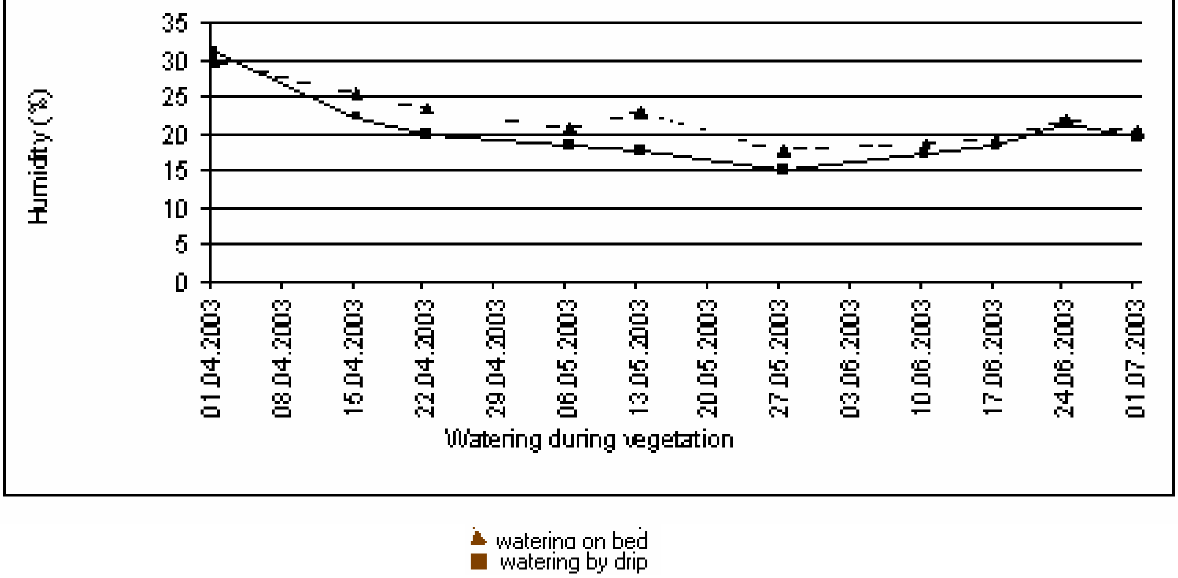
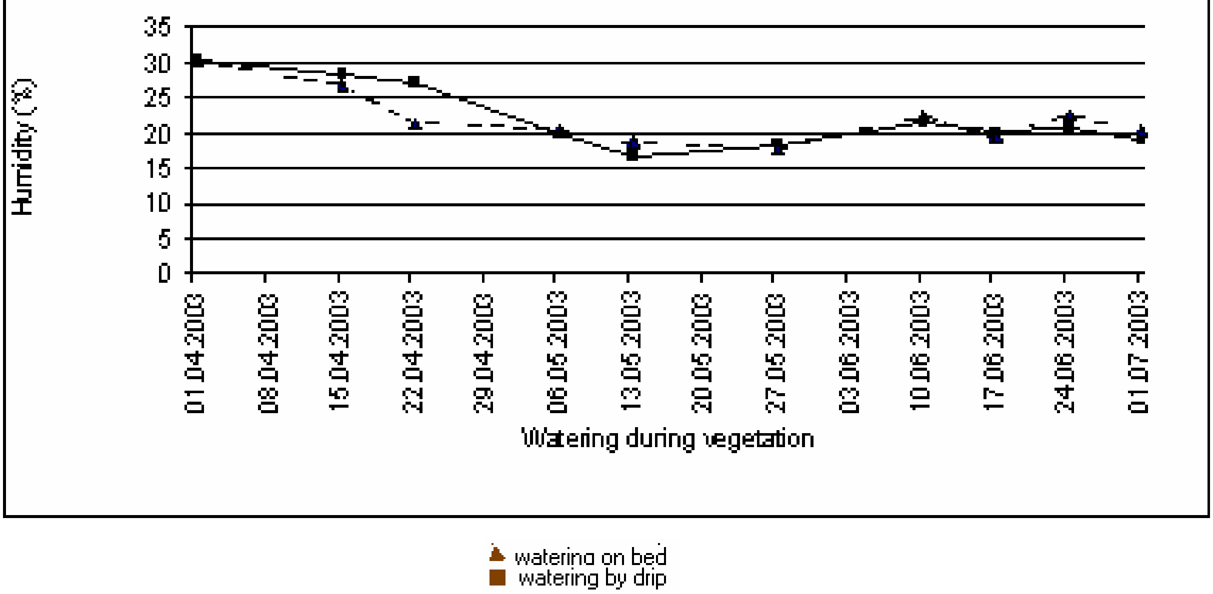


Fig.4. The dynamics of soil humidity for the 20-40cm depth for solarium grown tomatoes, where watering on bed and by drop was used. Point 2



Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE INFLUENCE OF ORGANIC FERTILIZATION TO THE PEPPER YIELD, CULTIVATED IN AN UNHEATED GREENHOUSE

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Keywords: greenhouse, compost, fertilization

ABSTRACT

The research was made in an unheated greenhouse of Vegetable Department of Horticulture Faculty of University of Agricultural Sciences and Veterinary Medicine, in 2004.

The influence of compost types and organic mixtures on peppers was investigated. Nikita and Cleor cultivars were used under the following variants: V_0control – hybrid Cleor, non-fertilized, V_2 - hybrid Cleor, fertilized with litter compost, V_3 - hybrid Cleor, fertilized with chopped branch wine compost, V_4 - hybrid Cleor, fertilized with mushrooms compost, V_5 - hybrid Cleor, fertilized with vegetable waste compost, V_6 - hybrid Nikita, fertilized with vegetable waste compost, V_7 - hybrid Nikita, fertilized with mushrooms compost, V_8 - hybrid Nikita, fertilized with chopped branch wine compost, V_9 - hybrid Nikita, fertilized with litter compost, V_1control – hybrid Nikita, non-fertilized. The experimental design was organized as three repetition plots.

On 15 April 2004 we planted the peppers (3,7 plants/m^2). The organic composts were applied once (fundamental fertilization rate 30t/ha). The growing and developing dynamics of the studied plants, soil and compost analyses, and yield and yield quality were measured.

Variants fertilized with mushrooms compost (4.28 kg/ha to Nikita and 5.24 kg/ha to Cleor) and chopped branch wine compost (3.67 kg/ha to Nikita) had the best results.

INTRODUCTION

The present paper wants to demonstrate how many types of composts may influence the rate of plant growing, the amount of yielding and the quality of harvesting. Organic fertilizers improve the soil organic matter, increase biological activity and have appreciable quantity of nutrients, which are avaible to the plants for a long period of time.

MATERIALS AND METHODS

The research was made in an unheated greenhouse of Vegetable Department of Horticulture Faculty of University of Agricultural Sciences and Veterinary Medicine.

There were used four types of composts: litter compost (leaves, barks, grass clippings), chopped branch wine compost, mushrooms compost and vegetable waste compost. The amount of compost was the same for all variants (excerpt variants control), 30 tons/hectar.

The culture was started on 12 April 2004. We had planted two pepper hybrids, Nikita with blocky yellow fruits and Cleor with long green fruits. Density, for both hybrids was 37000 plants/hectare (distance between rows being 60 cm and between plants 45 cm).

The experiment included ten variants with three repetitions for each variant, resulting the following experimental variants:

V_0 control – hybrid Cleor, non-fertilized
V_2 - hybrid Cleor, fertilized with litter compost (30 tons/hectar)
V_3 - hybrid Cleor, fertilized with chopped branch wine compost (30 tons/hectar)
V_4 - hybrid Cleor, fertilized with mushrooms compost (30 tons/hectar)
V_5 - hybrid Cleor, fertilized with vegetable waste compost (30tons/hectar)

V_6 - hybrid Nikita, fertilized with vegetable waste compost (30 tons/hectar)
V_7 - hybrid Nikita, fertilized with mushrooms compost (30 tons/hectar)
V_8 - hybrid Nikita, fertilized with chopped branch wine compost (30 tons/hectar)
V_9 - hybrid Nikita, fertilized with litter compost (30 tons/hectar)
V_1 control – hybrid Nikita, non-fertilized

RESULTS AND DISCUSSIONS

Determinations were made during the entire period of vegetation, by biometric measurements such as: plant height, flower number, fruit number, fruit length and fruit weight. Measurements were made by 10 to 10 days.

Experimental data were processed after statistical mathematical methods according to the monofactorial experimental model, using variance analysis.

In first period of vegetation (4 May, 14 May), to the hybrid Cleor variant fertilized with litter compost (V_2) and variant fertilized with mushrooms compost (V_4) had the highest growth (17.8 cm, 18.8 cm) To the hybrid Nikita, variant fertilized with mushrooms compost (V_7) and variant fertilized with chopped branch wine compost (V_8) had the same rate of growing (12.3 cm, 12.4 cm) (Table 1.).

In the last period of growing, V_4 (fertilized with mushrooms compost) had the highest value 119.2 cm. The second variant with tall plants was V_3, with 117.7 cm, fertilized with chopped branch wine compost (Fig.1).

To the hybrid Nikita, in the last period of growing two variants had the same value V_7 and V_8 with 65.6 cm and 64.1 cm; the lowest value was measured to the $V_{1control}$ with 58.3 cm (Fig. 2).

The average number of fruits/plant had the highest number to the variants fertilized with mushrooms compost (V_4) with 8.8 fruits/plant and variant fertilized with vegetable waste compost (V_5) 7.3 fruits/plant the average weight/fruit had the highest value to the V_4 with 161.3 g/piece. Average length of fruits had the highest value to the V_3 and V_4 with the same length, 20.2 and 20.1 cm. (Table 2).

Hybrid Nikita had 13.5 fruits/plant to V_7, the most productive variant and the least productive being V_9 with 10.2 fruits/plant.

The results of experiences show that variant fertilized with mushrooms compost, Cleor, had very high yield 1.42 kg/plant and 5.24 kg/m^2 in comparison with $V_{control}$ (Fig. 3).

Analyzing the production to Nikita, we can observe that V_7 has the best average yield 4.29 kg/m^2. The second was V_8 with 3.67 kg/m^2 (Fig. 4). The differences between variants to Nikita weren't as height as the differences encounter to Cleor.

CONCLUSIONS

Variants fertilized with mushrooms compost have the tallest plants, to both hybrids Nikita (64.6 cm) and Cleor (119.2 cm). Variants fertilized with chopped branch wine compost, V_3 and V_8 have a high rate of growing, 117.7 cm to Cleor and 64.1 cm to Nikita (Table 1).

Average number of fruits/plant was 8.8 to V_4, hybrid Cleor and 7.3 fruits/plant to V_5, fertilized with vegetable waste compost. To the hybrid Nikita, V_7 fertilized with mushrooms compost and V_8 fertilized with chopped branch wine compost the most number of fruits/plant with a mean 13.5 and 12.1(Table 2).

To the long pepper, V_4 has an average weight of fruits by 161.3 g/piece, the highest value in comparison with the other variants. To the bell pepper, V_7 fertilized with mushrooms compost has 85.9 g/piece (Table 2).

Average length of fruits has the same value for to variants cultivated with Cleor, V_3 and V_4 with a mean 20.2 and 20.1 cm. The same situation is encounter to Nikita where two variants have the highest length 8.5 cm (Table 2).

Analyzing the production to Cleor, the most productive was V_4 with 5.24 kg/m^2, seconded by V_5 with 4.16 kg/m^2. A rich yield was obtained to V_7 and V_8 with 4.29 kg/m^2 and 3.67 kg/m^2.

Fruit quality was analyzed; on 20august 2004. The highest quantity of ascorbic acid have V8 with 98.3 mg/100g, V1 85.3 mg/100g and V6 82.9 mg/100g(Table 6).

The best results were realized to variants fertilized with mushrooms compost: high growing, many fruits/plant, and good yielding.

The research will continue in future to confirm the results obtained in this year.

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Table 1. The influence of compost fertilization to the growing pepper, cultivated in unheated greenhouse (cm)

Variants	4-May	14-May	24-May	4-Jun	14-Jun	24-Jun	4-Jul
V_{0contr}	15.1	19.7	29.6	52.2	60.7	86.8	112
V_2	18.8	25.3	38.8	58.4	69.8	92.8	115.8
V_3	17.4	20.3	36.4	53.3	64.8	91.2	117.7
V_4	16.8	22.1	37.4	54.7	66.1	92.6	119.2
V_5	17.2	18.8	30.8	48.5	56.3	71.3	86.4
V_6	12	15.6	23.7	32	38.4	50	61.6
V_7	12.3	14.6	24.3	30.7	39.5	52.5	65.6
V_8	12.4	14.3	24.2	31.8	38.2	51.1	64.1
V_9	11	14	22.2	29.7	37.1	49.7	62.3
V_{1contr}	12	14.6	23.8	28.6	35.1	46.7	58.3

Table 2. Synthesis of experimental data

Variants	Average number of fruits/plant	Average weight/ Fruit (g/piece)	Average length of fruits (cm)	Average yield (Kg/plant)	Average yield (Kg/m^2)
V_{0mt}	7	138.31	19.6	0.97	3.58
V_2	4.4	157.7	18.8	0.7	2.57
V_3	6.8	146.9	20.2	1	3.7
V_4	8.8	161.3	20.1	1.42	5.24
V_5	7.3	153.9	19.4	1.12	4.16
V_6	11.2	80.2	8.3	0.89	3.32
V_7	13.5	85.9	8.5	1.15	4.29
V_8	12.1	82	8.4	0.99	3.67
V_9	11.2	81.8	8.5	0.92	3.38
V_{1mt}	10.5	79	8.1	0.83	3.06

Table 3. The variant analyst from experiences about influence of organic compost fertilization on pepper yield cultivated in greenhouse, Cleor

Variability cause	SP	GL	S^2	Probe F
Repetitions	20.82	2		F=20.87
Variants	1132.98	4	282.24	
Error	108.54	8		

Table 4. The variant analyst from experiences about influence of organic compost fertilization on pepper yield cultivated in greenhouse, Nikita

Variability cause	SP	GL	S^2	Probe F
Repetitions	2.76	2		F=12.75
Variants	110.49	4	27.62	
Error	17.33	8		

Table 5. The influence of compost fertilization on pepper yield cultivated in unheated greenhouse

<table>
<tr><th>Variants</th><th>Yield (t/ha)</th><th>Relative yield (%)</th><th>Yield difference (t/ha)</th><th>Significance</th><th>DL</th></tr>
<tr><td>V_{0mt}</td><td>35.8</td><td>100</td><td>Non-fertilization</td><td></td><td rowspan="4">5%=6.34
1%=10.10
0.1%=15.15</td></tr>
<tr><td>V_2</td><td>25.7</td><td>71.78</td><td>-10.17</td><td></td></tr>
<tr><td>V_3</td><td>37.0</td><td>103.35</td><td>1.12</td><td>x</td></tr>
<tr><td>V_4</td><td>52.4</td><td>146.43</td><td>16.58</td><td>xxx</td></tr>
<tr><td>V_5</td><td>41.6</td><td>116.20</td><td>5.75</td><td>xxx</td><td></td></tr>
<tr><td>V_6</td><td>33.2</td><td>108.49</td><td>2.6</td><td>x</td><td rowspan="4">5%=2.77
1%=4.03
0.1%=6.05</td></tr>
<tr><td>V_7</td><td>42.9</td><td>139.28</td><td>12.3</td><td>xxx</td></tr>
<tr><td>V_8</td><td>36.7</td><td>119.15</td><td>5.9</td><td>xxx</td></tr>
<tr><td>V_9</td><td>33.8</td><td>110.45</td><td>3.2</td><td>xx</td></tr>
<tr><td>V_{1mt}</td><td>30.6</td><td>100</td><td>Non-fertilization</td><td></td><td></td></tr>
</table>

Table 6. Pepper fruit quality

Variants	Water (%)	Dry matter (%)	Ash (%)	Soluble dry matter (%)	Ascorbic acid (%)	Glucose (%)
V_{0mt}	93.96	6.04	0.48	5.00	78.2	3.55
V_2	94.27	5.73	0.46	4.04	59.3	2.19
V_3	93.59	6.41	0.48	4.50	69.1	3.77
V_4	93.96	6.04	0.46	4.00	77.7	2.39
V_5	93.31	6.69	0.50	4.60	71.6	2.33
V_6	94.44	5.56	0.47	4.00	82.9	3.05
V_7	93.69	6.31	0.51	5.10	76.9	2.39
V_8	94.43	5.57	0.43	4.25	98.3	1.51
V_9	94.72	5.28	0.47	4.00	61.3	3.41
V_{1mt}	94.41	5.59	0.43	4.30	85.4	2.51

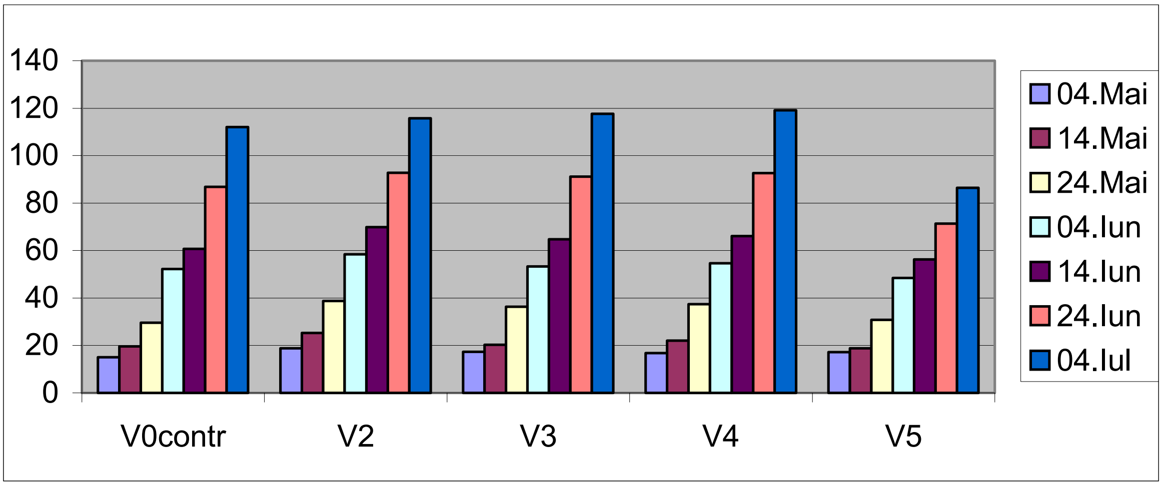

Fig. 1. The influence of compost fertilization to the growing pepper, hybrid Cleor

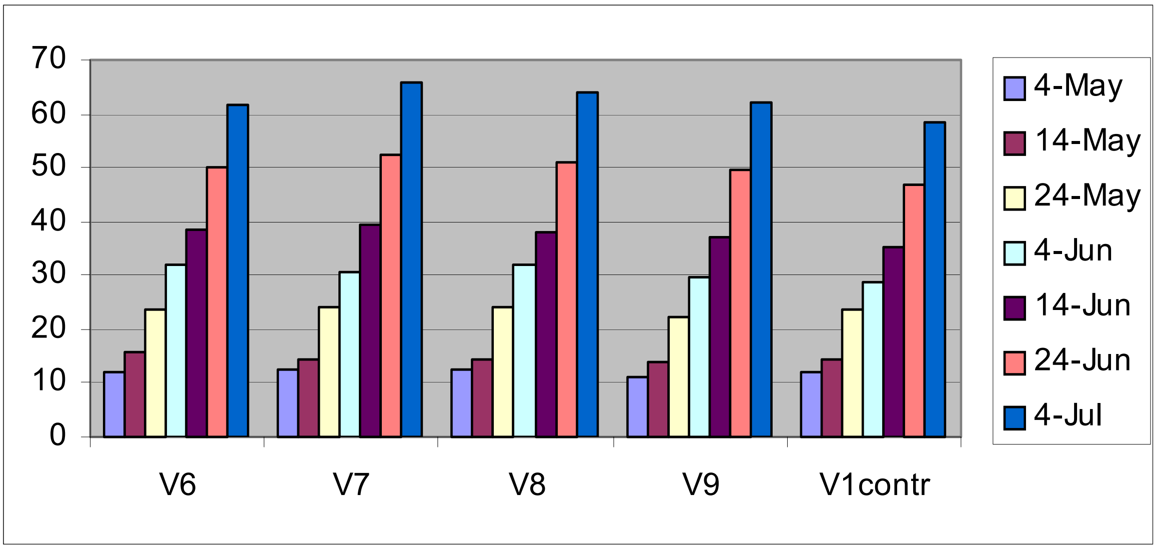

Fig. 2. The influence of compost fertilization to the growing pepper, hybrid Nikita

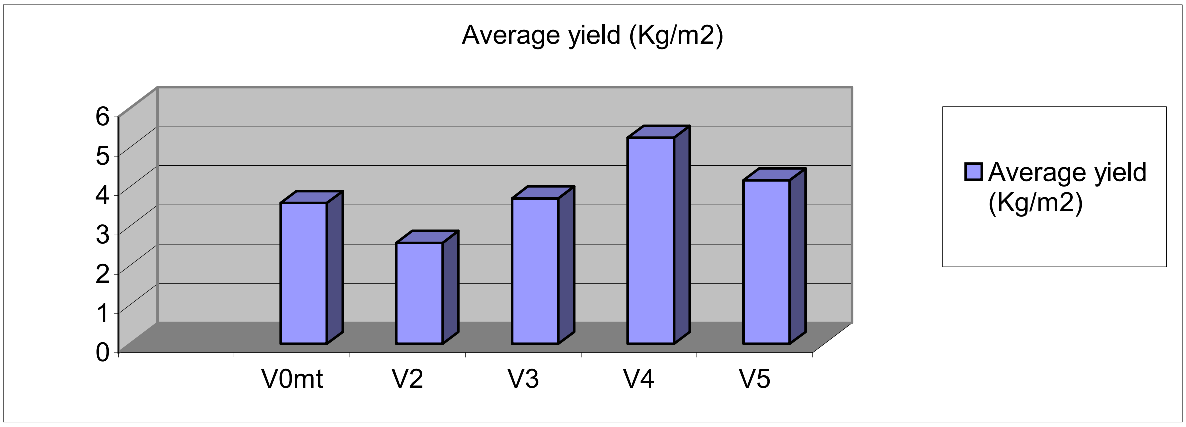

Fig 3. Average yield Kg/m^2, hybrid Cleor

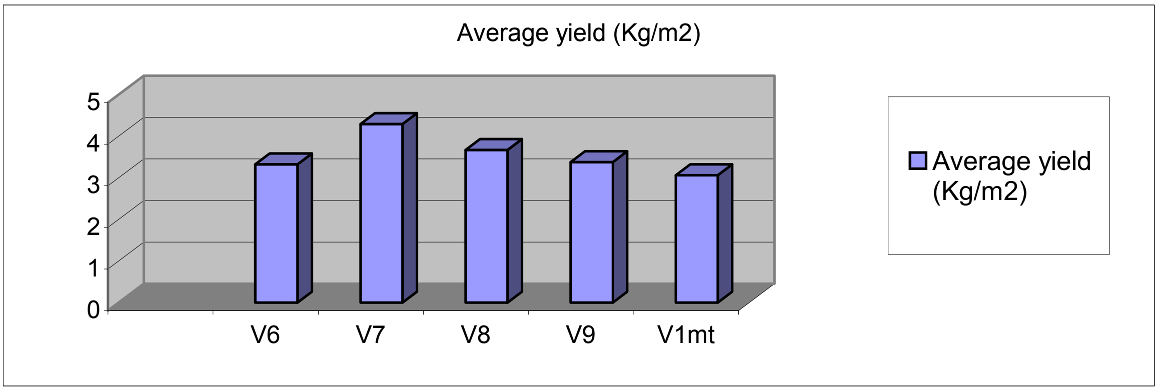

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Fig 4. Average yield Kg/m^2, hybrid Nikita


V2 CLEOR


V7 NIKITA

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

STUDIES ABOUT THE BIOLOGICAL AND TECHNOLOGICAL CHARACTERS OF SOME F1 ASPARAGUS HYBRIDS IN ORDER TO KNOW THEIR ADAPTABILITY IN OUR COUNTRY

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Keywords: Asparagus officinalis, studies, hybrids, characters, adaptability, our country

ABSTRACT

The asparagus is worldwide considered as a very important therapeutically and industrial crop. As an early vegetable it is successfully cultivated from North and South America to Europe and Asia, been considered as a very productive and profitable agricultural business. Romania is a country where the asparagus crop is still not very spread. One of the purposes of this experiment was to argument the importance of this crop among the traditional vegetables cultivated by the Romanian farmers. Between 2002-2004 the behaviour of the five asparagus hybrids have been studied concerning their level of adaptation to environment conditions in our country. From this five hybrids, Andreas is French and the others are Californian: Atlas F1, Grande F1, Apollo F1 and UC 157 F1. The objective of the experiment in 2003 and 2004 consisted in examination the biological development of the French hybrid in comparison with the Californians ones. After two years of experiment,no significant difference were noticed.

INTRODUCTION

Although the economic profitability is very long (10-15 years) and no very many maintenance work is required, in Romania the asparagus crop is not so preferred by the farmers as a consequence of a low demand on the market. Creating a demo plot in a very traditional area for vegetables growing, followed by yearly presentations was considered as a important and convincing step in the extension of this species.

MATERIALS AND METHODS

The material used in this experience is represented by five asparagus hybrids: Andreas F1, Atlas F, Grande F1, Apollo F1 and UC 157 F1.

Andreas F1-French hybrid, from Darbonne company. This hybrid is cultivated for the white spears production. It is 100% male and with medium to large diameter of the spears. The most important character is his adaptation level to the continental frost.

Atlas F1 is a di-hybrid cross that has a very wide range in adaptability with excellent spear yields. It's tightly headed, tapering spears are green, medium to large diameters, and slightly purple at the tip and butt. Atlas F1 is very tolerant to Fusarium and Rust and is free of Asparagus Latent Virus II.

Grande F1 is an early, di-hybrid cross with medium to large diameter, very tightly closed, tapering tips. Its green spears have a slight purple cast at the tips. It is suited for early spring production and is used for both green and white spear productions. Grande F1 has a high tolerance to Fusarium and Rust and is free of Asparagus Latent Virus II.

Apollo F1 is an early, vigorous clonal hybrid with spears that taper to a tight, rounded tip. Its green colour turns slightly purple at the tip and butt of the spear. Apollo F1 has a high tolerance to Fusarium and Rust and is free of Asparagus Latent Virus II.

UC 157 F1 is a tried and true clonal hybrid that has set the standard for yield and all of the spear quality characteristics of fresh green asparagus. The green spear quality characteristics of fresh green asparagus. The green spears are smooth, tight tipped and medium in spear diameter. UC 157 F1 is tolerant to Fusarium and Rust and is free of Asparagus Latent Virus II.

The last five hybrids are created by Asparagus Seed and Transplant, Inc from California who is testing their hybrids in various countries of the world: Hawaii, Peru, Filipina, Taiwan, Chile.

The seeding was made directly in the field in April 2002, using a mixing soil. The seeding depth has been 5-6 cm, the distance between rows 25 cm and between the plants of the rows 3-4 cm. From each hybrid were seeded 30 seeds.

The spring of the plants started after 20 days and the percentage of the emerged ones was 98%. After the spring, at 10-12 cm height, they were transplanted in the field at 10 cm distance. Than, for a good growth and development of the plants, the soil was fertilized with N (100 g), and we applied five periodical irrigations until the autumn beginning, in relation with the plants consumption.

Not significant attacks of fungus or pest were noticed, no fitosanitary treatments were applied. Until the fine of the vegetation season, the plants were normally developed with 3-4 shoots, 30-50 cm height.

Since Autumn 2002, we maintained the soil and in April 2003 the plants have been planted in the field according to the scheme of planting : distance between rows 1,5 m and between the plants of the rows 0,5 m. We organized a field with five rows, one row for each hybrid, with 26 plants per row.

RESULTS AND DISCUSSION

The results show that, after first year of experiment the French hybrid Andreas had a good growth of the shoots (higher, number and diameter). Concerning the Californian hybrids the results were very similar to Andreas, the hybrids Atlas and UC 157 being the most developed.

After the first winter all the plants survived.

After the second year of the culture, the results regarding the development of the plants show that hybrid Andreas and the Californians ones were similar, the highest hybrid being Grande with 127,69 cm. Regarding the number of the shoots, Atlas is the most developed with an average of 6.4, and regarding the diameter of the shoots, the same Atlas shows the best results.

CONCLUSIONS

After two years of the culture, the hybrid Andreas and the Californians had a very good level of the growth and development. The climate conditions in our country are different from the Californians, but, we must specify that Californian hybrids had a good adaptation. After two years of plantation, all the plants are alive, and the spring of the shoots in springtime was very good, and than, the development was normal. The conclusion is the Californian hybrids can be successfully cultivated in our country. For the future year we will analyze the first production of the spears for all this hybrids. We will compare the production with the first year of the French hybrid and the four

Californians: Apollo, Grande, Atlas and US 157. The next year, we shall perform the quality analyzes of the spears.

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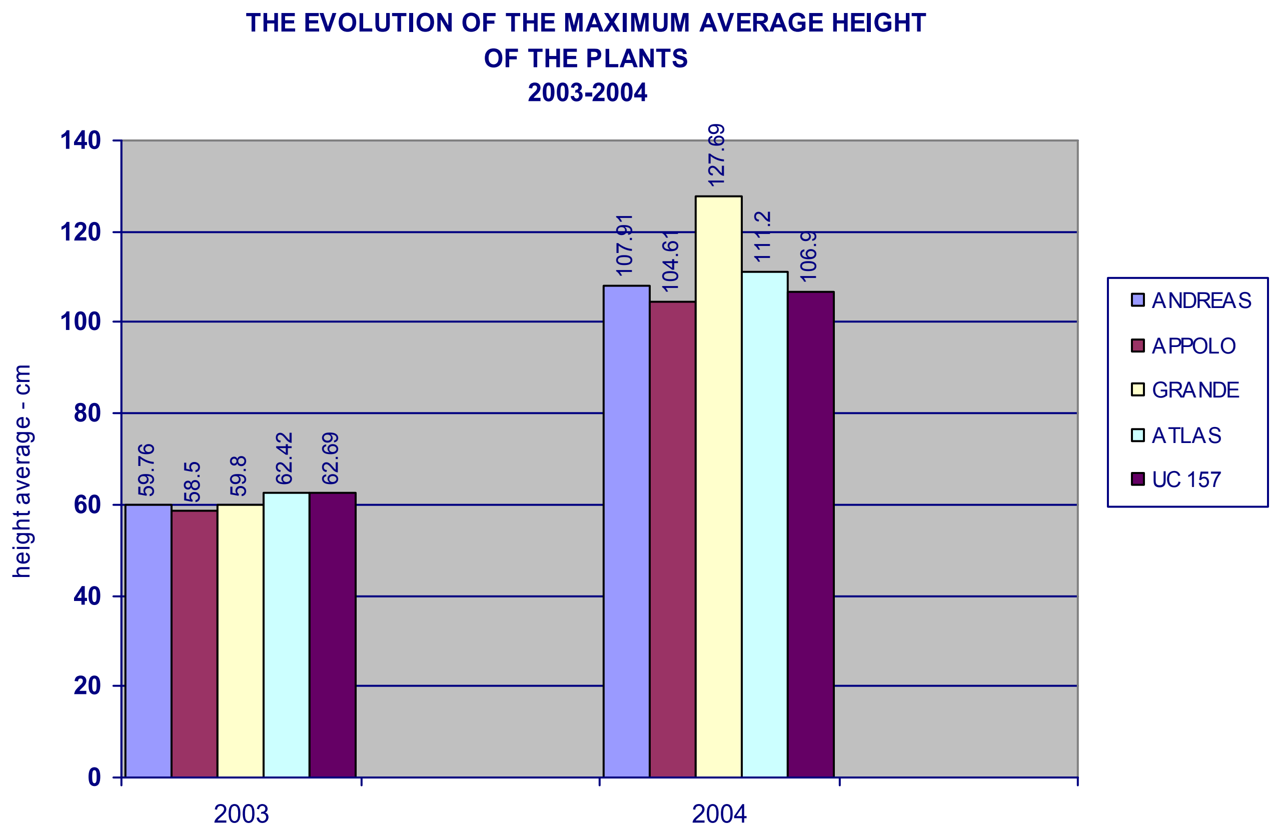
Tables and Figures

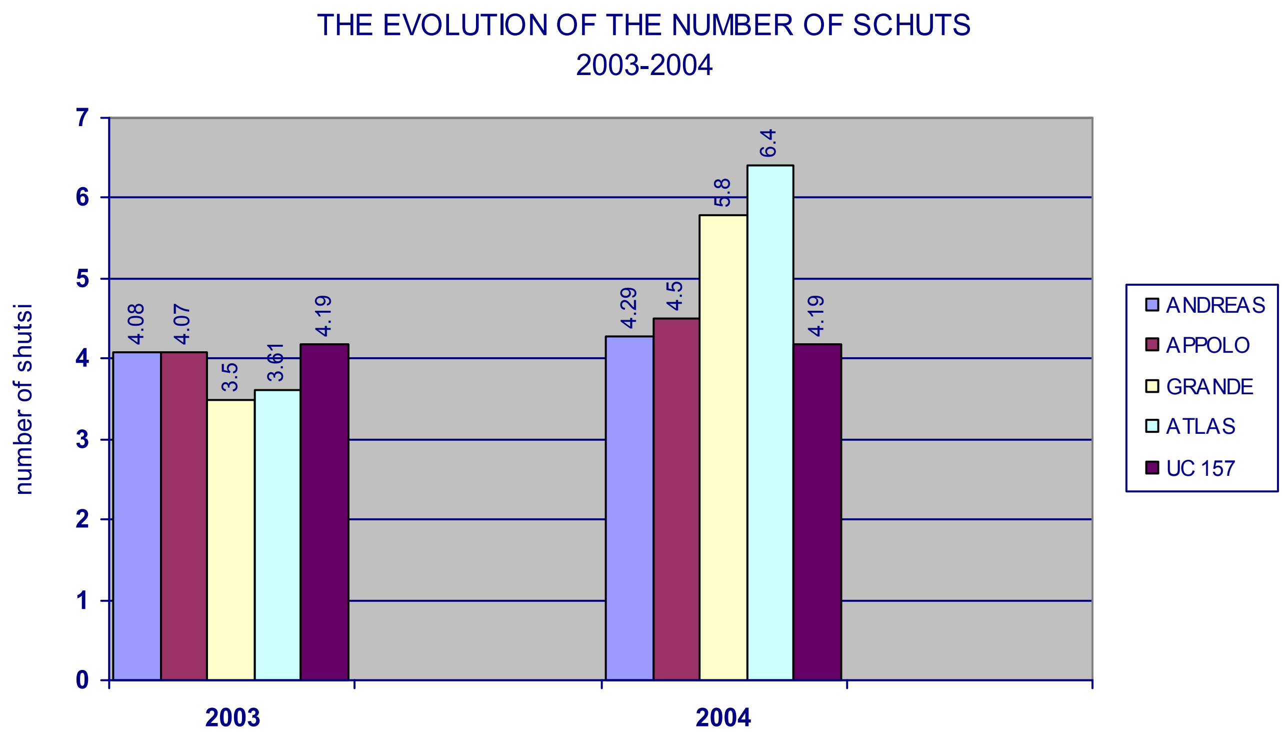
Fenological examinations – first year

Hybrid	Maximum average height (cm)	Number of shoots (average)	Diameter of shoots (average-cm)
Andreas	59,76	4,08	3,53
Appolo	58,50	4,07	3,15
Grande	59,80	3,50	3,07
Atlas	62,42	3,61	3,19
UC 157	62,69	4,19	3,57

Fenological examinations – second year

Hybrid	Maximum average height (cm)	Number of shoots (average)	Diameter of shoots (average-cm)
Andreas	107,91	4,29	5,79
Appolo	104,61	4,50	5,88
Grande	127,69	5,84	5,46
Atlas	111,20	6,40	6,04
UC 157	106,90	4,19	5,53

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2003
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ANDREAS
APPOLO
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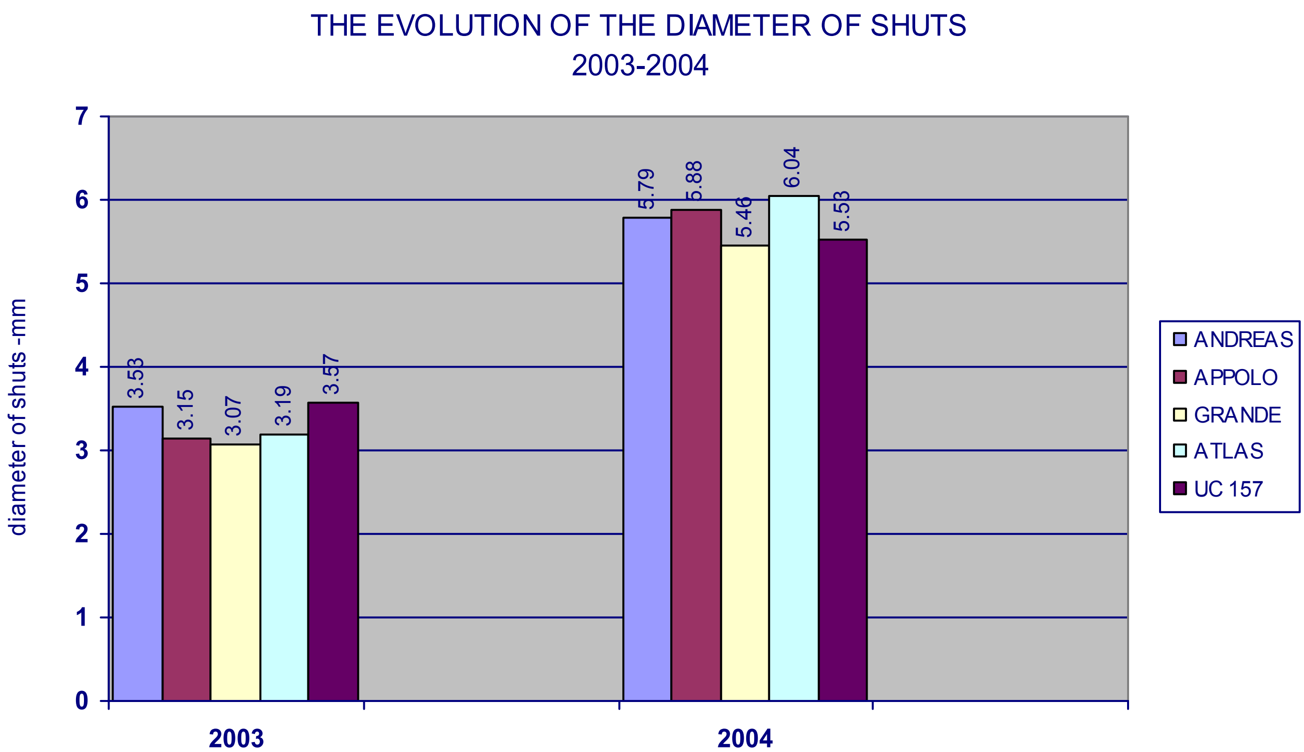
ATLAS
UC 157


THE EVOLUTION OF THE DIAMETER OF SHUTS
2003-2004
diameter of shuts -mm
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3
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Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

FLORICULTURE & DENDROLOGY

THE BEHAVIOUR STUDY OF SOME OF THE PERENNIAL HERBACEOUS FLOWER SPECIES IN THE ENVIRONMENTAL CONDITIONS OF CRAIOVA

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Keywords: phenophases, morphologic characteristics, decorative qualities

ABSTRACT

We observed for this study the behavior of 10 species of perennial herbaceous flowers in the environmental conditions of Craiova. The species are: *Chrysanthemum maximum L., Coreopsis tinctoria Nutt., Gaillardia hybrida Hort., Geum coccineum Sibth., Lupinus polyphyllus Lindl., Penstemon barbatus Nutt., Phlox paniculata L., Physostegia virginiana Benth., Primula auricula L., Rudbeckia bicolor Nutt.* We determined the main phenophases: the vegetative growing, the blooming period and the decorative period and the main morphologic characters and decorative qualities: the height and the diameter of the bush, the dimensions of flowers or inflorescences, type and colour of flowers; considering all those characteristics we established the using way for each and every of the flower species.

INTRODUCTION

The perennial herbaceous flower plants which occupy the same place for many years develop in our environment in the period of spring-summer-autumn and they are characterized by bright and various colours, rich blooming and different blooming periods.

The present study contains data regarding the main phenophases, the morphologic characters and the decorative qualities of an assortment of perennial herbaceous flower species in the environmental conditions of Craiova.

MATERIALS AND METHODS

The biological material was formed of 10 species of perennial herbaceous flowers.

The observations and determinations were done in the period 2000- 2003 in the didactic field of the Floriculture discipline in Craiova.

The field has a clay- sand texture. The climate is a temperate one, with less rough winters and hot summers. The average annual temperature is 10.9 Celsius degrees and the average rain fall is 550 mm/ year.

For the determination of the main phenophases it was noticed: data of the appearance of growing top, the beginning and the end of the blooming. We calculated: the number of days from the beginning of the appearance of growing top to the beginning of the blooming, the period of blooming.

The main morphological and decorative characters observed were: the height and the diameter of the bush, the dimensions of the flowers or inflorescences, the type and colour of the flowers.

RESULTS AND DISCUSSIONS

During the four years of experiments, we observed the appearance of the growing top beginning with the month of February (*Primula auricula, Lupinus polyphyllus*), to the month of March for the majority of other species.

For the species, the climatic conditions of every year determined a discrepancy from a year to the other of the vegetation start, but every year the limit species were *Primula auricula* and *Phlox paniculata*. For the majority of species the appearance of the growing top took place 6-15 days earlier on 2001 and 2002 compared to 2000 and 2004 because of the high temperature during the months of January- March.

By observing the average of the 4 years we can tell that- between species- the number of days from the appearance of the growing top to the blooming start vary in very wide limits: between 34-59 days (*Primula auricula, Geum coccineum, Gaillardia hybrida*), between 75-92 days (*Lupinus polyphyllus, Penstemon barbatus, Chrysanthemum maximum, Rudbeckia bicolor*) and over 100 days (*Phlox paniculata, Physostegia virginiana*) (fig. 1).

Regarding the blooming period, those species divide in: short blooming period plants, 20- 49 days (*Chrysanthemum maximum, Coreopsis tinctoria, Lupinus polyphyllus, Physostegia virginiana, Primula auricula*); medium blooming period plants, 50-100 days (*Penstemon barbatus, Geum coccineum, Phlox paniculata*); and long blooming period plants, over 100 days (*Rudbeckia bicolor, Gaillardia hybrida*) (fig. 2).

As for the morphological characters and the decorative qualities, we observed that the average height of plants had values between 13 cm (*Primula auricula*) and 80-91 cm (*Phlox paniculata, Physostegia virginiana, Lupinus polyphyllus, Rudbeckia bicolor*), the other species having a medium height of 50 cm (*Coreopsis tinctoria, Penstemon barbatus, Chrysanthemum maximum, Gaillardia hybrida*).

The diameter of the bush varies between 16 cm (*Primula auricula*) and 64 cm (*Lupinus polyphyllus*), the other species having values between 38-59 cm (fig. 3)

The decorative element is represented by solitary flowers in *Geum coccineum* and by different types of inflorescences in the other species: flowerhead in *Chrysanthemum maximum*, *Coreopsis tinctoria, Gaillardia hybrida, Rudbeckia bicolor*, raceme in *Lupinus polyphyllus*, ear in *Physostegia virginiana*, umbella in *Primula auricula*.

The colour of the flowers is a great advantage for these species as they came in a wide range of colours: red (*Geum coccineum, Penstemon barbatus*), yellow (*Coreopsis tinctoria, Rudbeckia bicolor*), white (*Chrysanthemum maximum*) or a mixture of colours (*Lupinus polyphyllus* - white, pink, yellow, mauve; *Phlox paniculata* - white, pink, red) (table 1).

We considered in establishing the using ways of these species of the height of plants, type and colour of flowers, period and duration of blooming, and the environmental conditions. (table 1)

As regarding the height of the observed species, the only low height is *Primula auricula* (13 cm) which can be used for borders in the spring and for flower beds, flower bands; the medium height species (50-70 cm) - *Coreopsis tinctoria, Chrysanthemum maximum, Geum coccineum, Penstemon barbatus, Gaillardia hybrida* can be used for flower bands, flower beds, solitary plants or groups of plants on greenwards; the high plants (80-100 cm) - *Phlox paniculata, Physostegia virginiana, Rudbeckia bicolor, Lupinus polyphyllus* can be used in flower bands and solitary plants or groups of plants on greenwards. (table 1).

Except the regular decorative arrangements (flower beds), the plants can be also used in irregular shapes which may suggest natural decors.

Compared with the annual plants, those species have longer flower stalks and resist longer in water giving the possibility of being used as decorative plants (cut flowers) in a room (*Chrysanthemum maximum, Lupinus polyphyllus, Physostegia virginiana, Phlox paniculata*).

CONCLUSIONS

1. The appearance of the growing top was observed beginning with the month of February (*Primula auricula, Lupinus polyphyllus*) till the month of March for the majority of species; the number of days from the appearance of the growing top until the beginning of the blooming varies into wide limits (34-92 days) from a year to the other, considering the species and climatic conditions;
2. In Craiova conditions those species have flowers as following: early in the spring (*Primula auricula*) and the majority during summer (*Coreopsis tinctoria, Lupinus polyphyllus, Physostegia virginiana*). To some of the species the blooming period is extended until autumn time (*Gaillardia hybrida, Rudbeckia bicolor*);
3. The decorative period (beginning - end of blooming) is between 25-112 days for the environmental conditions of Craiova;
4. We recommend the assortment of the flower species studied for: flower bands, borders (*Primula auricula*), flower beds (*Gaillardia hybrida, Phlox paniculata, Primula auricula*), solitary plants or groups of plants on greenwards (*Lupinus polyphyllus, Physostegia virginiana, Rudbeckia bicolor*), as cut flowers (*Chrysanthemum maximum, Lupinus polyphyllus, Physostegia virginiana, Phlox paniculata*);
5. We recommend the culture of those plants for the following advantages: rusticity, a various range of heights and colours, long blooming period, easy propagation.

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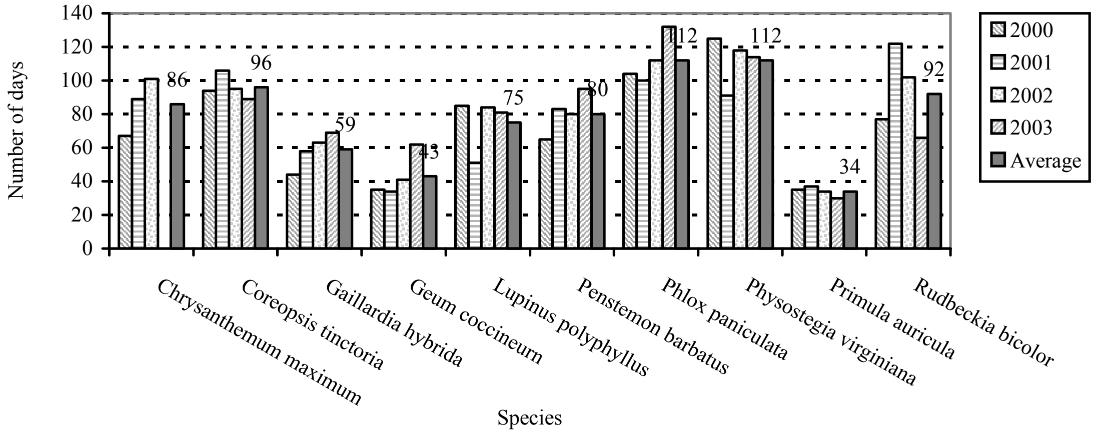

Fig. 1. Number of days from the appearance of the growing top to the beginning of the blooming

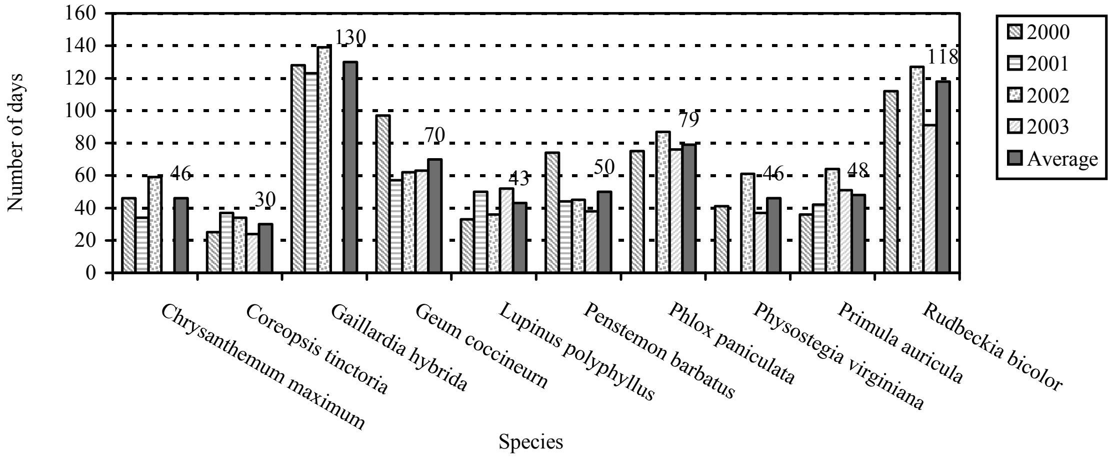

Fig. 2. Number of days from the beginning to the end of the blooming

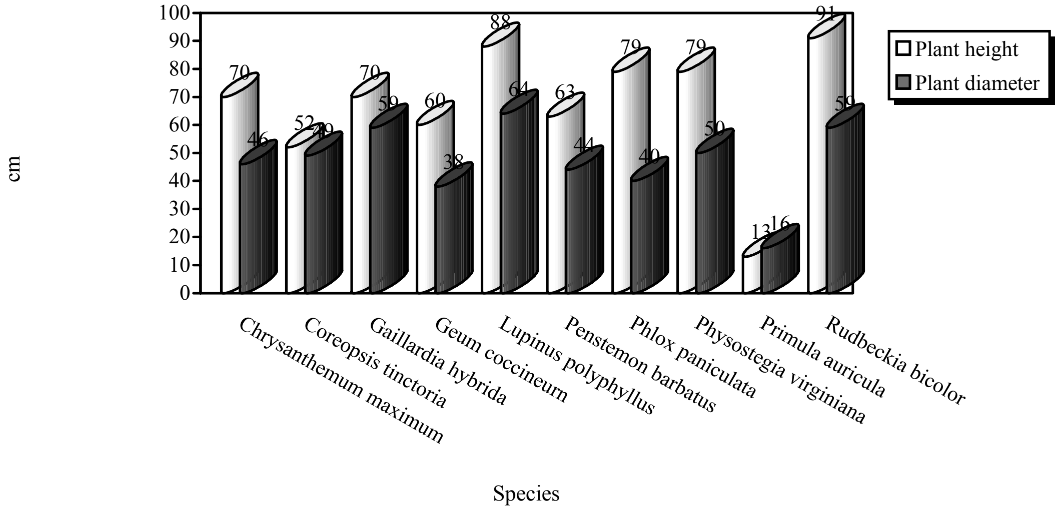

Fig. 3 The main morphological characters of the perennial herbaceous flower species

Table 1 The using way of some perennial herbaceous flower species

No.	Species	Plant height (cm)	Plant diameter (cm)	Flower/Inflorescence		Period of blooming	Blooming duration (days)	Use
				Kind	Colour			
1	Chrysanthemum maximum L.	70	40	flowerhead	white	V - IX	43	cut flowers, flower bands
2	Coreopsis tinctoria Nutt.	50	50	solitary flower	yellow	VI - VIII	20	borders, flower bands, cut flowers
3	Gaillardia hybrida Hort.	70	60	flowerhead	yellow, red	V - IX	128	flower bands, cut flowers
4	Geum coccineum Sibth.	60	40	solitary flower	red	V - VIII	106	flower bands, groups
5	Lupinus polyphyllus Lindl.	100	60	raceme	white, pink, yellow, blue	VI - IX	55	flower bands, groups, cut flowers
6	Penstemon barbatus Nutt.	70	50	raceme	red	V - VIII	84	flower bands, cut flowers
7	Physostegia virginiana Benth.	90	40	ear	white, pink	VII - VIII	75	flower bands, cut flowers
8	Phlox paniculata L.	80	50	panicle	pink, white, red	V - IX	75	flower bands, groups, cut flowers
9	Primula auricula L.	10	10	umbella	yellow with white	III - V	36	borders, flower bands
10	Rudbeckia bicolor Nutt.	90	60	flowerhead	yellow	VI - IX	112	flower bands, cut flowers

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ASPECTS OF *IN VITRO* MICROPROPAGATION OF *ROSA HYBRIDA*, *FUCHSIA HYBRIDA* AND *PELARGONIUM PELTATUM*

VIORICA BALAN, GABRIELA POPA, CRENGUTA PLOCON

Key words: *Rosa hybrida*, *Pelargonium peltatum*, *Fuchsia hybrida*, growth regulators, organogenesis, adventitious shoots.

ABSTRACT

The aim of the present study was to develop an efficient system to regenerate adventitious shoots from in vitro stem sections of ***Rosa hybrida, Fuchsia hybrida*** and ***Pelargonium peltatum*** at high frequencies by manipulating growth regulator requierments and culture conditions.

Three different variants of culture medium with various concentrations of 6-benziladenine (BA), Kinetin (Kin) and α- naphtalenacetic acid (NAA) were used for each species.

The best results were obtained when excised explants from *Rosa hybrida* and *Pelargonium peltatum* were incubated on Murashige and Skoog (MS) (1962) induction medium with 1mg/l BA and 1 mg/l Kin respectively (V3).

The optimum in vitro media for *Fuchsia hybrida* was MS standard medium plus 3 mg/l BA (V1).

INTRODUCTION

Propagation at the commercial scale of economically important ornamental crops by using *in vitro* techniques, is an alternative method which become to complete the multiplication through conventional methods.

During the years, many authors have reported the development of adventitious shoots from different explant types of *Rosa hybrida* (Burger et al., 1990; Ishioka and Tanimoto,1990; Dubois and De Vries,1995*)* ***Fuchsia hybrida*** (Abou-Haidar and Burger,1981) and ***Pelargonium (***Casselis and Carney, 1987; Horn, 1988; Reuther, 1988**)**.

At the Station of Research and Developement for Growing Tree, Baneasa, we have successfully proliferated shoots of many species of ornamentals.

The aim of this study was to develop an efficient system to regenerate adventitious buds from *in vitro* stem explants of *Rosa* spp, *Pelargonium* spp. and *Fuchsia x hybrida* by manipulating growth regulator requirements.

MATERIALS AND METHODS

Plant material

The starting explants were microcuttings of ***Rosa hybrida*** and shoot tips of ***Fuchsia hybrida*** and ***Pelargonium peltatum***, which were collected from plants in greenhouse before flowering.

Culture establishment and shoot multiplication

Explants were surface sterilised under the laminar flow hood by soaking stem segments in a solutions of 0.5 % mercury chloride for 3 min. followed by three rinses in sterile distilled water.

Explants were inoculated, in aseptic conditions, on the shoot proliferation medium. Three variants of culture media with Murashige & Skoog (1962) standard formula with different phytohormonal balance have been used for each species (table 1). All media components were mixed and adjusted to pH 5.7 before autoclaving at 121^{o}C for 20 min.

Cultures were incubated at 23^{+}_{-} 2^{o}C in a growth room under a 16 h light photoperiod. Subculturing was carried out every 4 weeks.

Table 1

Hormonal composition of culture media

	Variants	Growth regulators (mg/l)		
		BAP	**KIN**	**NAA**
Rosa hybrida	V_1	2.0	-	0.1
	V_2	-	1.0	-
	V_3	1.0	-	-
Pelargonium peltatum	V_1	-	2.0	0.2
	V_2	1.0	-	1.0
	V_3	-	1.0	-
Fuchsia hibryda	V_1	3.0	-	-
	V_2	-	2.0	-
	$\mathbf{V_3}$	2.0	-	0.1

BAP, benzyladenine; Kin, kinetin; NAA –1-naphthaleneacetic acid

We used 52 explants of *Rosa hybrida,* 51 explants of *Pelargonium peltatum* and 58 explants of *Fuchsia hybrida* , for each variants.

The influence of hormonal supplement added in the culture media on proliferative competence of the explants was investigated.

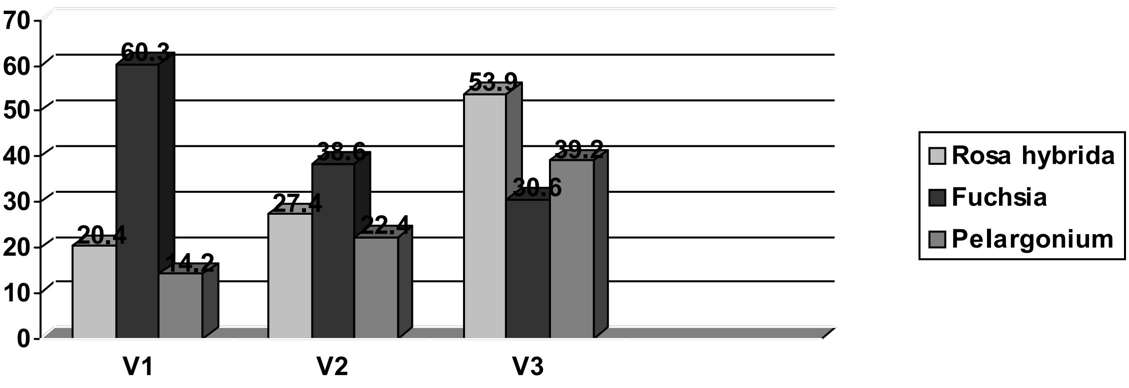
RESULTS AND DISCUSSION

After 4 weeks of in vitro culture, adventitious buds were observed on explants of all three species tested. Inducing of organogenesis and plant regeneration from stem explants of ***Rosa hybrida***, ***Pelargonium peltatum*** and ***Fuchsia hybrida,*** depends by the type and concentration of growth regulators used.

Regarding the regeneration percentage of the explants, the best results were recorded for ***Rosa hybrida*** (53,8 %) on V3 media with 1.0 mg/l BAP, ***Pelargonium peltatum*** (39,2 %) on V3 media with 1.0 mg/l Kin and for ***Fuchsia hybrida*** (60,3 %) on V1 media supplemented with 3.0 mg/l BAP (Fig 1).

Figure 1

Influence of hormonal suppliment on the regeneration percentage of *Rosa hybrida*, *Fuchsia hybrida* and *Pelargonium peltatum* explants



These results quide us to select the optimum medium for inducing of organogenesis and regeneration of ***Rosa hybrida***, ***Fuchsia hybrida*** and *Pelargonium peltatum* plants with high efficiency (Table 2).

Table 2

Optimum media for inducing organogenesis and regeneration of *Rosa hybrida*, *Fuchsia hybrida* and *Pelargonium peltatum* plants

	Type of explant	No. of explans	Composition of culture medium
Rosa hybrida	**Uninodal cuttings**	**52**	**Macro-microelements MS; Vitamins MS; BAP 1mg/l; Sucrose 2 %; Agar Sigma 7 %; pH 5.6.**
Fuchsia hybrida	**Stem section**	**58**	**Macro-microelements MS; Vitamins MS; BAP 3mg/l; Sucrose 3 %; Agar Sigma 7 %; pH 5.7.**
Pelargonium peltatum	**Stem section**	**51**	**Macro-microelements MS; Vitamins MS; Kin 1mg/l; Sucrose 3 %; Agar Sigma 7 %; pH 5.8.**

We observed that addition of auxin (NAA) in the culture media did not have a semnificative influence on proliferative capacity of the explants tested.

After 3 weeks of in vitro culture, the shoot buds developed into 1-3 cm long shoots which were excised from morphogenetic culture and transferred to a medium with auxins to promote rooting.

CONCLUSIONS

1. The influence of hormonal supplement added in the culture media on proliferative competence of the explants of *Rosa hybrida*, *Fuchsia hybrida* and *Pelargonium peltatum* was investigated.
2. Basal salts medium for all ornamentals tested was Murashige & Skoog (1962) standard formula;
3. In this experiment we have demonstrated that optimum media for inducing adventitious bud regeneration depends on the different concentrations of cytokinins in the culture media and the type of explants used.

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Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

RESEARCH CONCERNING THE SUBSTRATE PH MODIFICATION USED IN ORNAMENTAL PLANTS CULTURE

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Keywords: substrate, pH variation, acid reaction, ammonium chloride acidifying substance.

ABSTRACT

The technology of producing ornamental plants in containers and pots used the substrates of culture obtained frequently from mixed mineral and organic materials (compost, peat, manure, sand, perlite, etc.). Among the chemistry of the substrate in our nutrient contents, pH represents a very important agrochemical index, because the cultivated species are very numerous and their exigencies concerning the pH value in substrate are very different, it is obligatory to maintain in progress vegetations the pH value between the limits requested by each species. The research aim was to find solutions of maintaining the pH substrate during the vegetation period, in natural limits for each species of plant, by testing easy technical solutions which do not disturb the plant cultivated in the container.

INTRODUCTION

The substrate in which culture replaces the soil must have a series of physical and chemical characteristics which permits the natural development rooting systems of plant (Ansorena, 1994; Conover, 1996; Lemaire et al.,1989).

The optimum pH interval varies for most plants between 6.8 and 7.2 but there are species which require an acid pH with values between 4.5 – 6.5 (*Camelia, Rhododendron, Picea, Pinus, Betula, Populus,* etc.). Even if initially, by choosing the substrate components correctly, pH has the proper values for a species, through the technology of culture with water used for irrigations, with manures used for fertilizations but also with the organic matter decompositions from the substrate or by specific activity of plants rooting system, can appear the modifications of pH values (increase) which can disturb the natural development of plants (Costea et al., 1998; Davidescu et al., 2001).

The research aims were to establish the effect of increasing applied doses of ammonium chloride concerning the modification of substrate initial pH. The substrate was analyzed by the determination of pH 1, 3, 7, 10 and 14 days after the application of the ammonium chloride, as acid reaction substance.

MATERIALS AND METHODS

Taking into consideration a substrate of culture composed of forestry compost, leaves compost and sand in volumetric ratio 2: 2: 1 with the following characteristics (Davidescu et al., 2004; Madjar et al., 2004):

Bulk density 0.68; Moisture 31.5%; Humus content 6.42%; Carbon content 3.72%; pH reaction 7.82; Salt contents 0, 115%; Nutrients: $N\text{-}NH_4$ 5.5 ppm, $N\text{-}NO_3$ 5.75 ppm, $P\text{-}PO_4$ 8.6 ppm, K 130 ppm.

As substance with acidifying character was tested ammonium chloride which was applied to the substrate, from container with capacity 1.2 L, in doses of 1.5 g, 3 g, 4.5 g, 6g by mixing and was homogenized in solid phase.

Ammonium chloride was selected for testing because it is a salt with acid reaction in soil or in substrate which in the presence of water resulting hydrochloric acid and the hydrogen ions increase.

Each variant had four repetitions R1, R2, R3 and R4.

The moments for analytic determinations (pH and agrochemical characteristics) were established 1 day, 3 days, 7 days, 10 days and 14 days after the ammonium chloride incorporation to the substrate.

RESULTS AND DISCUSSIONS

pH variation depending on the amount of applied ammonium chloride in substrate

At 3.0g, 4.5g and 6.0g NH_4Cl applied doses per 1.2 L substrate, the pH decreasing rhythm does not present the significant difference in the first 3 days, the pH decrease is close regardless of the amount of acidifying substance introduced.

After 7 days of 3.0 g NH_4Cl dose application, the pH decreasing is higher than that of variant with 4.5 g and 6.0 g NH_4Cl, the variant maintaining the difference also after 10 and 14 days of application (Table 1, Fig. 1).

Ammonium chloride quantities influence about pH modification at the 5 moments of analysis

According to Table and Figure 2, the substrate pH was insignificantly influenced by increasing the doses of ammonium chloride.

Difference of pH units depending on the amount of applied acidifying substance

At 1.5 g NH_4Cl dose, the slow acidifying power in the first 3 days increased beginning from day 7 and decrease after 10-14 days with 1.15 pH units after 10 days and 1.25 pH units after 14 days according to 7.82, pH control (Table 3, Fig.3).

CONCLUSIONS

1. Ammonium chloride is a salt resulted from neutralization reaction between a strong acid (HCl) and weak base (NH_3), with acid physiological reaction. It has the equivalence acidity of 126.
2. The substrate was composed of forestry compost, leaves compost and sand (2: 2: 1) with a high organic matter content and buffer capacity which annulled the acidifying power after ammonium chloride was applied.
3. The ammonium chloride acidifying power was manifested only in the first and the third day after application, the pH decreasing with 0.41, respectively 0.45 units according with the pH control, 7.82
4. Only at 1.5g NH_4Cl/1.2L substrate dose the substrate was acidified and pH decreasing with 1.15 units after 10 days and with 1.25 units after 14 days of ammonium chloride application.

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Tables

Table 1. pH modification under ammonium chloride applied effect

g NH4Cl/L substrate	pH values				
	1 day	3 days	7 days	10 days	14 days
1.24	7.46	7.26	7.1	6.85	6.55
1.24	7.49	7.28	7.04	6.77	6.51
1.24	7.52	7.34	7.15	6.8	6.55
1.24	7.49	7.35	7.08	6.29	6.68
2.48	7.42	7.5	6.95	7.23	7.14
2.48	7.23	7.53	7.22	7.43	7.21
2.48	7.39	7.56	7.29	7.49	7.21
2.48	7.45	7.46	7.24	7.43	7.23
3.72	7.4	7.51	7.29	7.56	7.39
3.72	7.43	7.54	7.35	7.66	7.47
3.72	7.4	7.53	7.31	7.56	7.48
3.72	7.43	7.52	7.3	7.55	7.44
4.96	7.38	7.48	7.31	7.63	7.5
4.96	7.34	7.53	7.3	7.51	7.52
4.96	7.4	7.5	7.35	7.52	7.55
4.96	7.38	7.55	7.37	7.58	7.58

Table 2. pH values at the 5 moments of analysis

Substrate variant	pH 1 day	pH 3 days	pH 7 days	pH 10 days	pH 14 days
Control	**7.82**	**7.82**	**7.82**	**7.82**	**7.82**
NH4Cl 1.5	7.49	7.3	7.09	6.83	6.57
NH4Cl 3.0	7.37	7.51	7.17	7.39	7.19
NH4Cl 4.5	7.41	7.52	7.31	7.58	7.44
NH4Cl 6.0	7.37	7.51	7.33	7.56	7.53

Table 3. Difference of pH units

NH4Cl applied g/L substrate	pH difference values				
	1 day	3 days	7 days	10 days	14 days
1.24	0.36	0.56	0.72	0.97	1.27
1.24	0.33	0.54	0.78	1.05	1.31
1.24	0.3	0.48	0.67	1.02	1.27
1.24	0.33	0.47	0.87	1.53	1.14
2.48	0.4	0.32	0.87	0.59	0.68
2.48	0.59	0.29	0.6	0.37	0.61
2.48	0.43	0.26	0.53	0.33	0.61
2.48	0.37	0.36	0.58	0.39	0.59
3.72	0.42	0.31	0.53	0.26	0.43
3.72	0.3	0.28	0.47	0.16	0.35
3.72	0.42	0.29	0.51	0.26	0.34
3.72	0.39	0.3	0.52	0.27	0.38
4.96	0.44	0.34	0.51	0.19	0.32
4.96	0.48	0.29	0.52	0.31	0.3
4.96	0.42	0.32	0.47	0.3	0.27
4.96	0.44	0.27	0.45	0.24	0.24

Figures

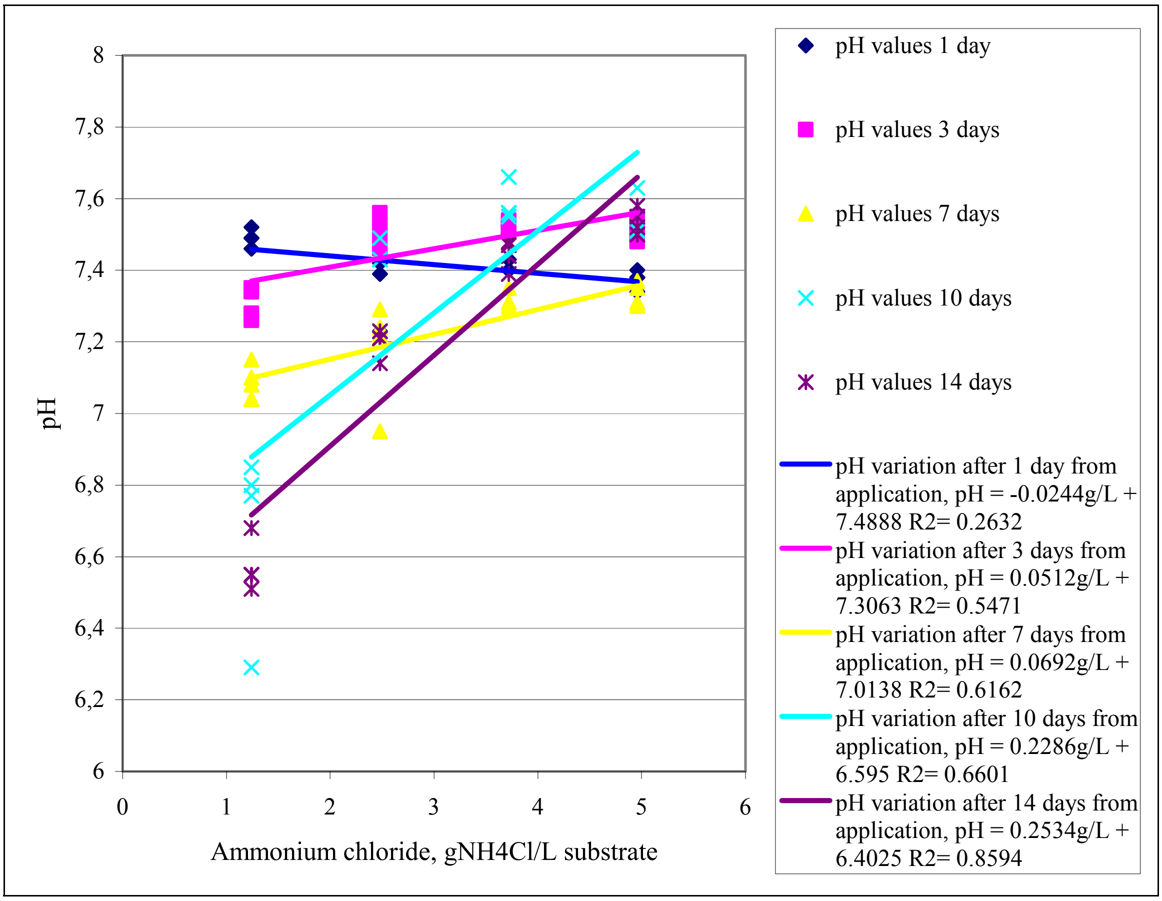

Fig.1. pH variation depending on the amount of applied ammonium chloride in substrate

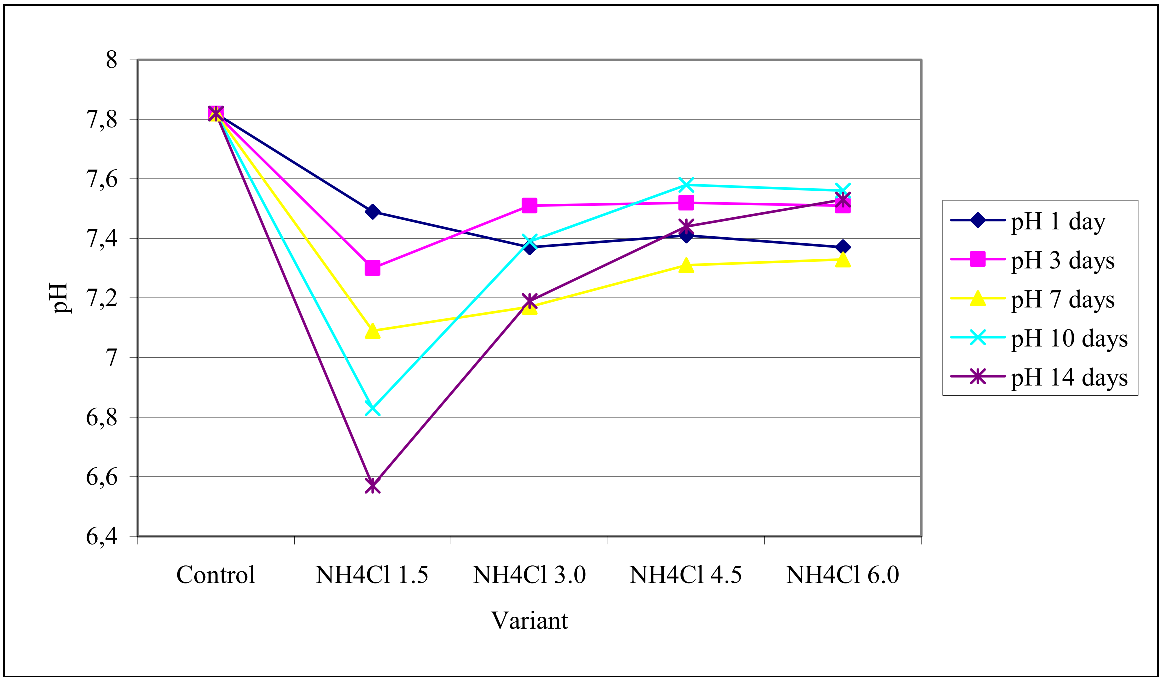

Fig.2. The influence of sulphur amount about pH modification at the 5 moments of analysis

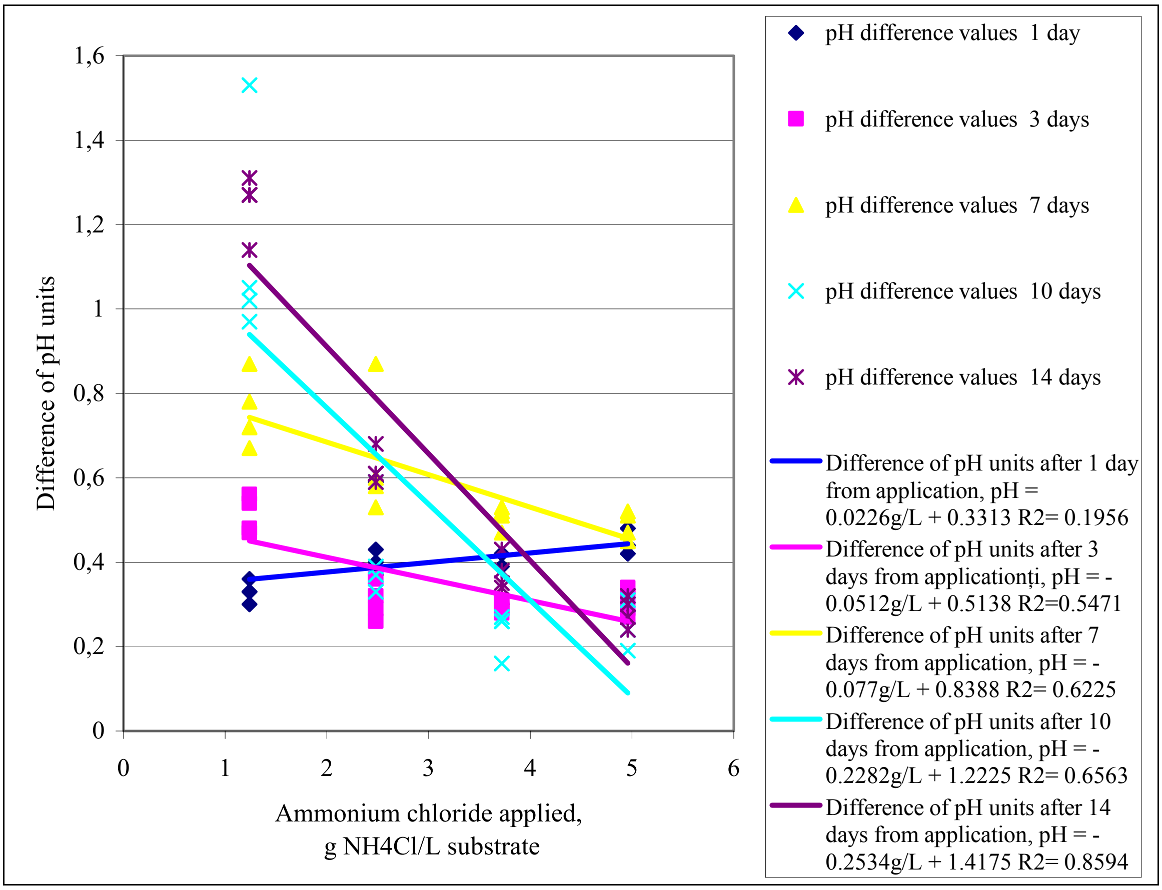

Fig.3. Difference of pH units depending on the amount of applied ammonium chloride

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THE STUDY AND PROPOSALS FOR SOLVING OF SOME PROBLEMATICS IN RELATION WITH THE GREEN AXIS OF BUCHAREST - THE ANALYSES OF THE TRANSOM: BANEASA AIRPORT - VICTORIA SQUARE, AS FIRST STAGE OF THE STUDY -

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Keywords: green urban space, analysis, integration, revitalization, reorganization, modernization and maintenance.

ABSTRACT

The paper presents a proposal for the union at the landscape level of the Bucharest's two green poles (North and South) and the social revitalization of the quarters. The objectives of this study are the analyses and the possibility for a coherent development of an important green strip within the capital, which can become part of the urban space with the view to a future enhancing of the green space ratio for each inhabitant, according to European standards (at the present 3,73 m^2/inhabitant referred to 12-18 m^2/inhabitant in accordance with the European standards) (Table 1.).

INTRODUCTION

The study's aim is the reconfiguration of North-South urban axis as a green line. The clipping of this axis in the town tissue, beganed in the Bucharest's modernization age, assuming the French model, and it was from the beginning bonded with the creation of promenade paths, places related with the old tradition in the use of Bucharest's territory. Thus, Kiseleff Avenue, along with the parks that are developing upon his course, becomes the new space for promenade and social contact for the high society of the city. To South, Magheru-Balcescu Avenue becomes the new town center, the axis doubling Mogosoaia Bridge (now Victoria Avenue), and the old important thoroughfare of the city.

Problematic: subsequently, the axis' development toward South, by dint of Dimitrie Cantemir Avenue, does the connection with Southern part of the city, this line doubling also a traditional thoroughfare – Serban Voda Avenue. The issues concerning this ax can be seen from the beginning, it being fractured, unequally utilize and appropriate by the citizens. The urban interventions from 1980's, respectively the destruction of the Unirii Square – vital center of town, and the fulfillment of the Victoria Socialismului Avenue, creates a new fracture, not only to the North-South axis level, but for the entire city. From this moment, the Bucharest South, transformed in "a concrete field", destined to mass the new countryside working people brought into town to serve the new socialist industry, remain absolutely detach of the city, inclusively to the common transport level, the entire zone becoming dependent on subway transportation. On the other hand, this thronging of an enormously population toward South causes also an exacerbation of the daily social life. In the same time, the North, although planted, green, enjoyable, turn into a unapproachable place, due to the insertion of embassies, institutions and other “interdicted” zones for the average people. Even today this zone maintains an atmosphere with a restrictive character. The Bucharest’s inhabitants regroup its selves around the Universității Square that becomes the proper center of town.

After 1990, the South begins to slowly create it self a new life, still detach of the city, while the North, tries to reanimate his spaces. Some spots continue to bring back the Bucharesters to the old routes for promenade: The Romanian Peasant Museum, The Kiseleff Park, The Herastrau Park, The Village Museum, The Baneasa Wood. These spaces remain punctual, broken one of another, being unable to render the old dynamism of the place. Thus we can speak about an inadequate function of the North-South axis, that can be actually seen as a radiography of the city. The axis’s North, important as weight of the green space in the urban ensemble, it is rarely used for promenade, whiles the South, having a strong social effervescence, has a lack of green spaces that can integrate the population’s social activities. In this context, our project propose it self to attain some interventions destined on a hand to bring back to life the North and on the other hand to arrange the South in such manner that it can answer to the multiples social pressures.

In a first stage, we tackled the reconstruction of the axis between Baneasa and Victoria Square. Our intervention comprises on aside the vegetation’s restoration, a reorganization of the urban landscape upon the axis’ course, and on another side the proposal regarding his social revitalization.

MATERIALS AND METHODS

The study relies on a complex analysis based on: surveys, setting in evidence the street fronts, the urban bulk, the vegetation’s analyses (volumetrically, chromatic) and it has been done due to measurements, observations and the consultation of the existing documentation (infrastructure and superstructure).

Starting from the main access in Bucharest (from the North), the route of the green axis has been divided in transoms, on each transom occurring peculiarities that were subordinate to a general approach which conferred finally the composition’s unity.

The plans which underlay the surveys were draw out from the capital’s general topographic plan. Based on these plans were elaborated the aggregate solutions that generated subsequently the detail proposals for each illustrative place: Baneasa Airport, Peco Baneasa, Vila Minovici (Miorita Fountain), Piata Presei Libere, The Arch of Triumph and Victoria Square. Between these axis’ key points, all the spaces that follow the Bucharest’s old routes for promenade are solve through revitalization and reorganization solutions.

RESULTS AND DISCUSSIONS

The synthetic and morphological analysis of the green axis that crosses the capital shows major dysfunctions regarding the vegetation elements and the build structures, the use of the green spaces in the social background and the administration of these locations. The first transom studied presents a certain unbalance to the level of the mature vegetation’s fitosanitary quality, of the landscape ensembles’ degradation and of the green space’s functional issues.

CONCLUSION

The analysis' results had shaped the guiding line of the solution. The conclusion referring to the first transom studied is that new complementary functions has to be developed for the existing green space, which can reinstate the old habits of promenade on aside and new steps for the maintenance and the rehabilitation of the green zone, massif planted, must be done on another part. To accomplish these general objectives, our project proposes the reconstruction of landscape structure on the route studied, adapting the old functions to the current requirements. We seek to harmonious combine the old and the new in a modern social context. The route looks for the restructured spaces' continuity and coherency, binding the transom's key points. Thus the vegetation's rehabilitation was conceived through the reconstruction of the initial vegetal structure (completions, cuts, maintenances) and also through the introduction of a new complementary vegetal elements, based mostly on wooden vegetation (trees and shrubs) and elements for volumetrically and chromatic contrast. The benefits brought by this axis development as the continuance of the massif green space from North, will conduce to the equilibration and the raising of the urban life's quality (it is well known that the Bucharest's North it is much better equipped unlike the rest of the axis – Table 2.). The creation, the reorganization and with the same importance the maintenance of the very consequence green zones for the town's life lead to the formation of a natural filter for the high pollution, an important element in the climate adjustment from the city's center, the enlargement of the entertaining space for the population and list but not last conducts to the embellishment of Bucharest.

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Tables

Table1. The coefficients of the green urban space in different countries in Europe

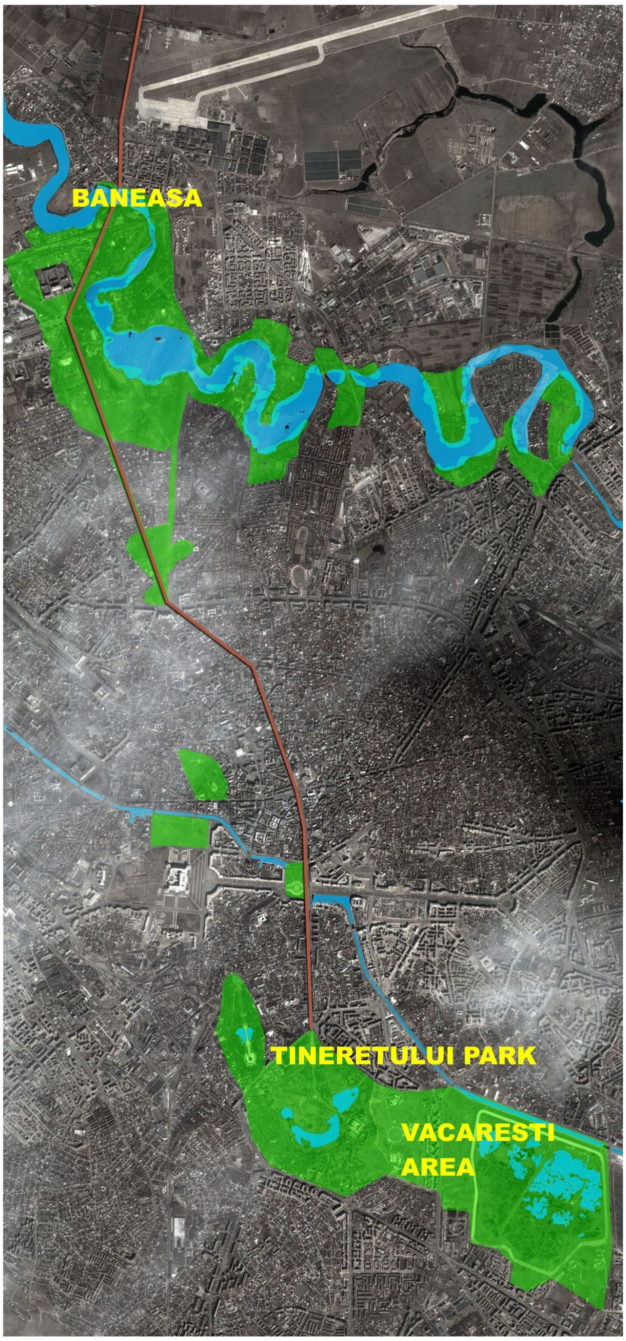
Town	General green space (m^2/inhabitant)	Parks and gardens (m^2/inhabitant)
London	9	9
Paris	10	10
Wien	73	13
Bucharest	18	3,7

Table 2. The norms of the green urban space in Bucharest

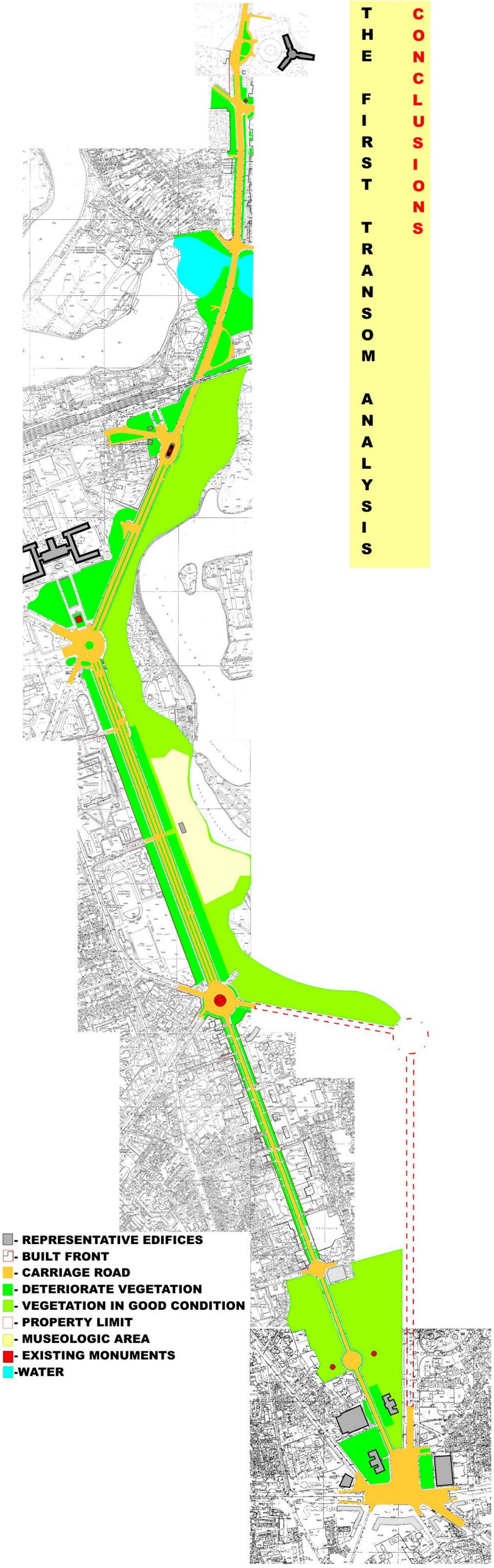
Sector	Green space (m^2/inhabitant)
Sector 1	11,8
Sector 2	2,70
Sector 3	2,60
Sector 4	4,50
Sector 5	1,40
Sector 6	0,84

Pictures

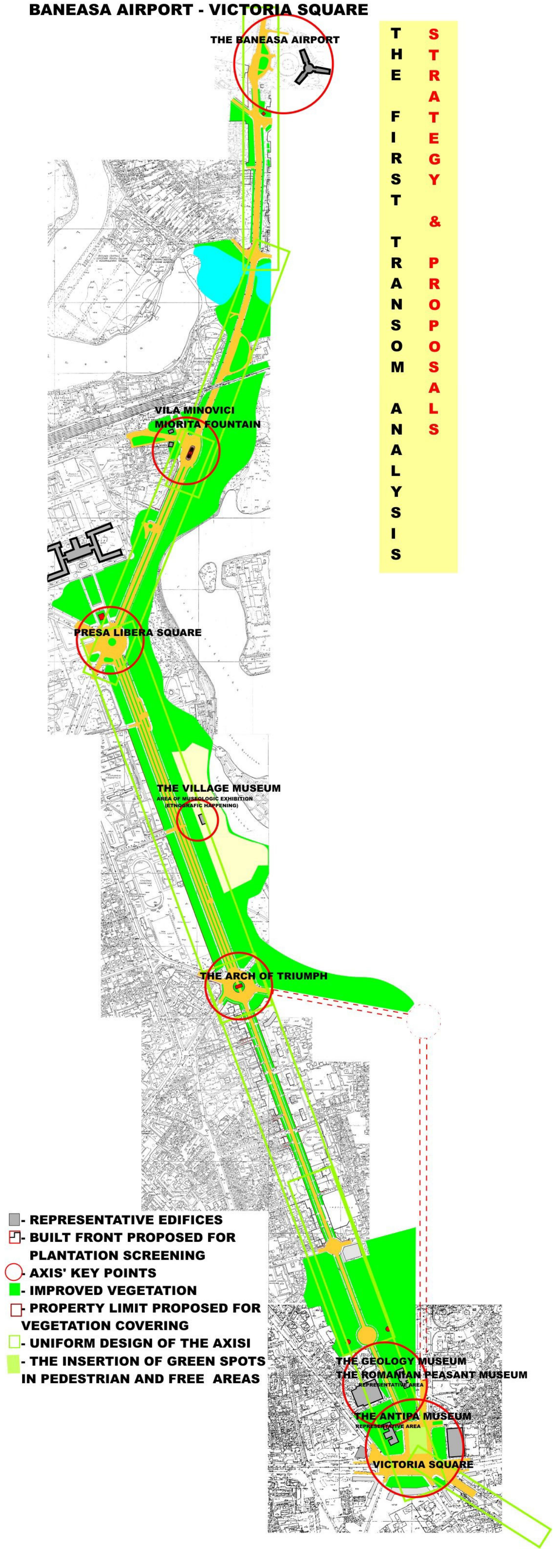
THE N-S GREEN AXIS OF BUCHAREST -view from satellite

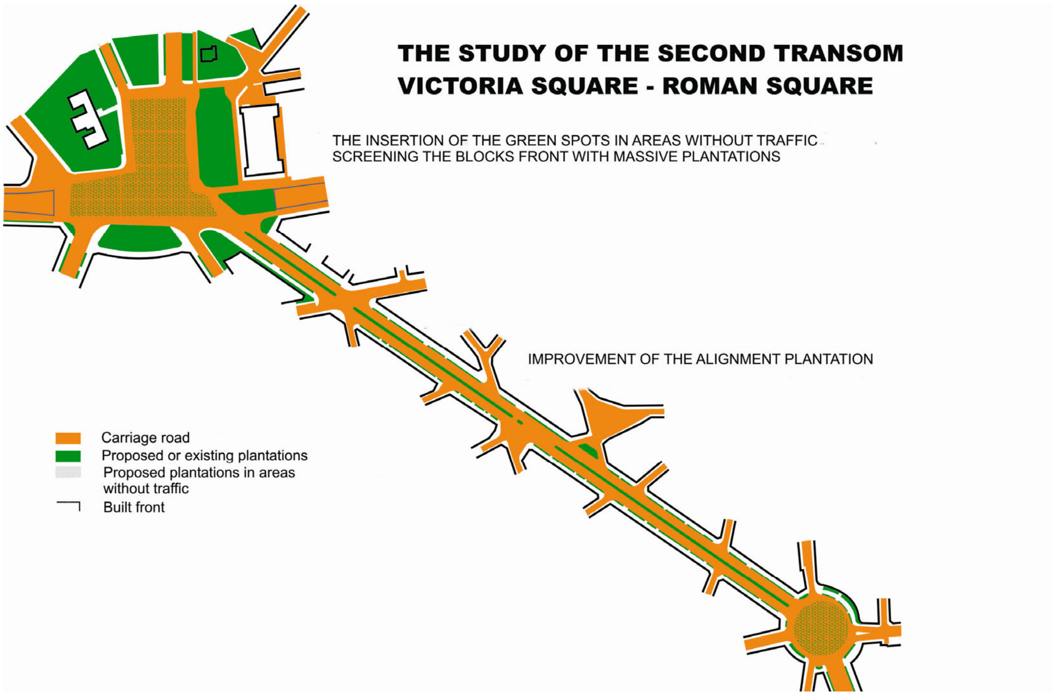


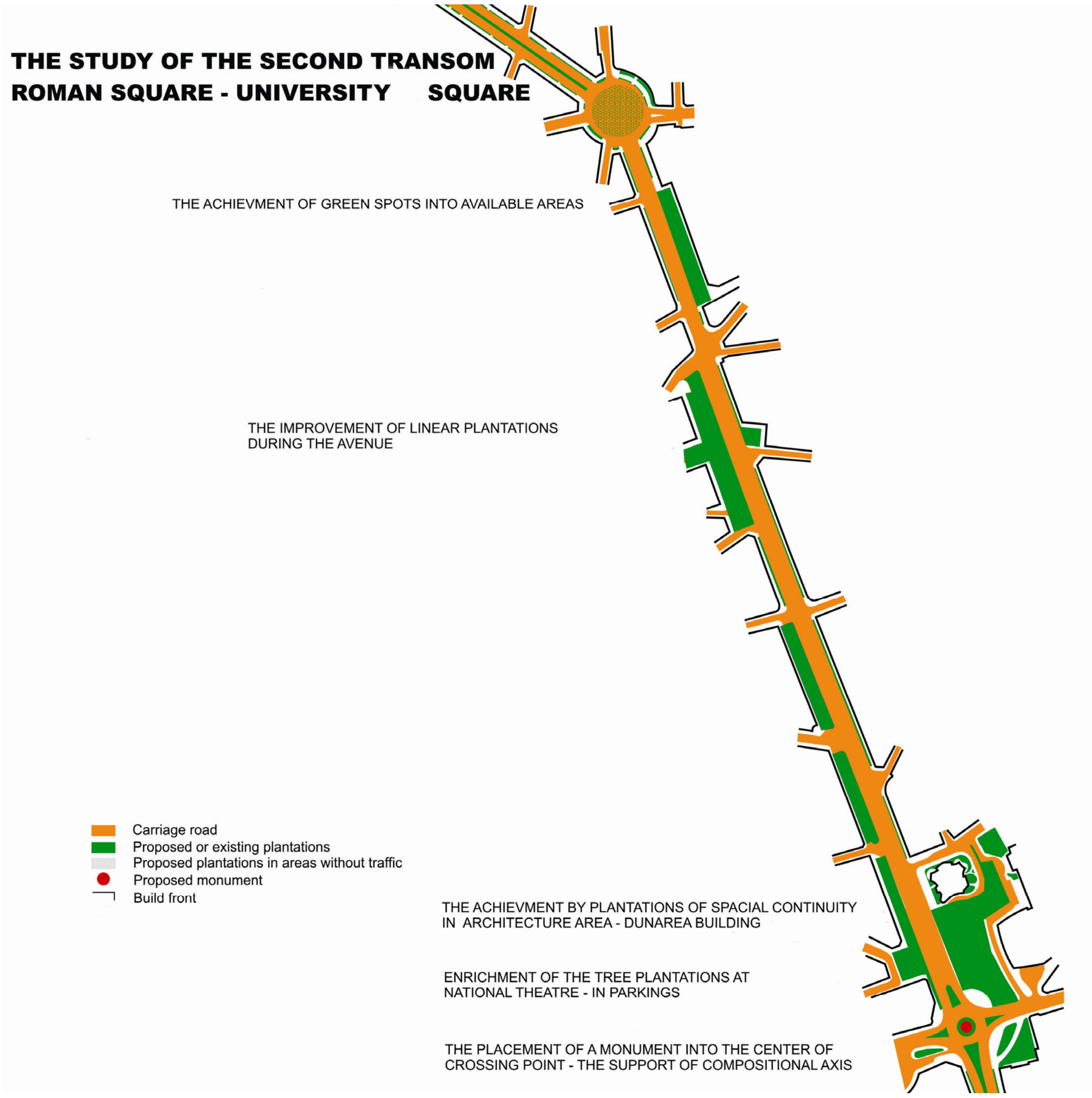
BANEASA AIRPORT - VICTORIA SQUARE

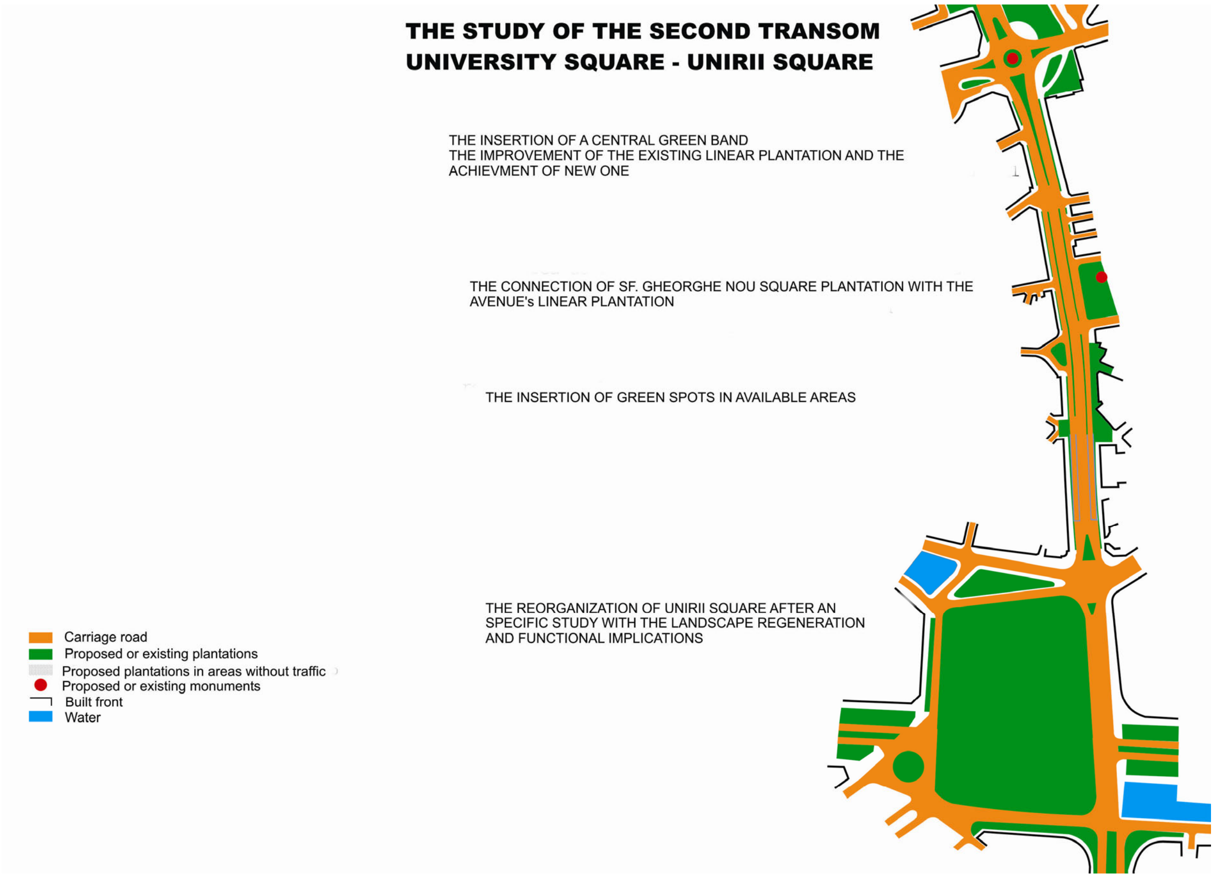


BANEASA AIRPORT - VICTORIA SQUARE




THE STUDY OF THE SECOND TRANSOM
VICTORIA SQUARE - ROMAN SQUARE
THE INSERTION OF THE GREEN SPOTS IN AREAS WITHOUT TRAFFIC
SCREENING THE BLOCKS FRONT WITH MASSIVE PLANTATIONS
IMPROVEMENT OF THE ALIGNMENT PLANTATION
Carriage road
Proposed or existing plantations
Proposed plantations in areas without traffic
Built front


THE STUDY OF THE SECOND TRANSOM
ROMAN SQUARE - UNIVERSITY SQUARE
THE ACHIEVMENT OF GREEN SPOTS INTO AVAILABLE AREAS
THE IMPROVEMENT OF LINEAR PLANTATIONS
DURING THE AVENUE
Carriage road
Proposed or existing plantations
Proposed plantations in areas without traffic
Proposed monument
Build front
THE ACHIEVMENT BY PLANTATIONS OF SPACIAL CONTINUITY
IN ARCHITECTURE AREA - DUNAREA BUILDING
ENRICHMENT OF THE TREE PLANTATIONS AT
NATIONAL THEATRE - IN PARKINGS
THE PLACEMENT OF A MONUMENT INTO THE CENTER OF
CROSSING POINT - THE SUPPORT OF COMPOSITIONAL AXIS


THE STUDY OF THE SECOND TRANSOM
UNIVERSITY SQUARE - UNIRII SQUARE
THE INSERTION OF A CENTRAL GREEN BAND
THE IMPROVEMENT OF THE EXISTING LINEAR PLANTATION AND THE ACHIEVMENT OF NEW ONE
THE CONNECTION OF SF. GHEORGHE NOU SQUARE PLANTATION WITH THE AVENUE's LINEAR PLANTATION
THE INSERTION OF GREEN SPOTS IN AVAILABLE AREAS
THE REORGANIZATION OF UNIRII SQUARE AFTER AN SPECIFIC STUDY WITH THE LANDSCAPE REGENERATION AND FUNCTIONAL IMPLICATIONS
Carriage road
Proposed or existing plantations
Proposed plantations in areas without traffic
Proposed or existing monuments
Built front
Water

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HELLENIKON METROPOLITAN PARK AND URBAN DEVELOPMENT IN ATHENS

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Keywords: negotiation, landscape, ecology, recycling

INTRODUCTION

The transfer of Athens airport from Hellenikon to the Mesogeia plain, in 2001, made available a large piece of prime land close to Athens, ten kilometers from the Acropole and very close to the Saronic Coast. The planning and management of this extensive area, of some 530 hectares, is a unique opportunity for Athens to reclaim a green area badly needed to improve the quality of the city's environment.

The programme makes provision for housing, offices and social services (infrastructures, hotels, conference centers) on one hundred hectares of the site as well as a vast park which will include green areas, cultural, sports and leisure facilities along with the infrastructures associated with these different sectors. The restoration of some existing buildings, amongst which 1930's modernist villas and the terminal designed by Eero Saarinen in 1960, will also have to be considered as well as the integration of a number of existing or planned facilities or infrastructures. The economic feasibility of the whole operation must be ensured in relation to the income accrued from the urban development of the site, which should also secure an allowance for regeneration of additional zones within the metropolitan area of Athens.

Athens is usually regarded as the prestigious laboratory for science/ western civilization and the arts; urban planning, the birth and evolution of architectonic styles, all documented, observed, reinvented and canonized throughout Europe and beyond; is this really all we can reduce Athens to? Apparently subordinated to Athens' major urban axis and local grid systems, the little details of street corners, houses, and not in the end life events and people form now the real flavor of Athens. The city doesn't live because of its temples of because of its "famous" avenues, but because of small shops and taverns, a general image, complementary to that of its antique monuments, formed by a multitude of non-hierarchical spots. We do not look for an overwhelming, logo-like finished image of the park. In the true spirit of Athens the park should grow with fabulous, unmistakable details and places, without any need for a controlled total spatiality. Therefore we provide a solution of organizing actions and details, "modules" for the future park, that are enough flexible to adapt to any result of the people of Athens exercising their aims on the park… first we let them speak.

TASK

The design is conceived of as an adaptable development- scenario. The implementation is structured in two 5-year phases, the second resulting in determining the patterns the park will take. Afterwards the park will develop slowly, as plants grow, needing mainly maintenance costs and works. The phases are conceived as steps of rebalancing the influences on the site; from the total belonging to the public sector, an image and an acting body characterized by big size and generality, towards accomplishing a galaxy of specific clusters in the park. This allows for a constant readjusting of strategy: the implementation of a next step can be fine-tuned to accommodate the site's response to a previous one.

The phases will represent also acts of the process of becoming-park that will make it interesting and democratic now, not "upon completion". The principles of ecology, of not spreading waste and debris outside its area are at the basis of constructing the park - there will be areas where it grows over rubble. So, for the people, depositing waste will be fun, they will be part of the designing team by this. There will be moulds of rubble form the people's efforts to clear their spaces to build houses, and dunes of earth for the excavations for the foundations. With professional assistance they will be able to develop local relief that will become their fancy picnic spot after years. Residuum and waste will be used in a humus factory for helping covering the moulds with improved soil; and the waste-recycling factory will recover plastics and paper for geo-membranes that isolate the growing plants from corrosive deposits underneath. Thus the inhabitants of Athens will act from the contemplation of the airport emptiness to beginning to make their mental paths in the park, passing by the relief they're building or they wish to build. The designer only provides solutions for the details - modules that will be put in place for making retaining walls, pavilion coverings, benches and pavements, solutions for planting the resulted landscape.

PHASE 1

The beginning of the urbanization process will be coordinated by a set of Urban Regulations tailored for each zone of the park to receive a maximum of material resources and give an output of equally maximal social and economic energies into the surroundings areas and the city as a whole, and, again, with a minimum of material output – as waste/debris will be processed on the site. Imposed regulations will only attempt to limit ground occupation to a set value and control density. The zones delimitation is set as to benefit as much as possible from the existing infrastructure and conditions. We consider zones with urban/building potential those well related with access roads and public transport, as well as zones that would most probably naturally merge with the neighboring residential areas, while preserving the areas with existing vegetation and setting them as first woodlands in Hellenikon would ensure the aim that the area becomes predominantly green in the future.

ZONING

0. THIS ZONE REPRESENTS, IN FACT, THE ENTIRE SITE.

As a first step a major in scale but minor in effort plantation will be sawn over the entire surface, consisting mainly of species with good adaptability on poor soils, rapid growth and invading tendencies. Following the logic of evolution of all the degradation-recycling processes, parallel with the progressive acquisition and occupancy over the space, under the influence of a sum of internal to the site and external pressures, we propose the covering of the zones ordained to become major woodlands with species that are typical for the Mediterranean climate.

While planting there will be paid attention to the coexistence of the three groups of local vegetation:

- trees and shrubs specific to Mediterranean flora
- decorative trees and shrubs
- annual plants

This vegetal structure will cover rapidly the areas destined to become green, will be harmonious with the existing vegetation, and on the way of its growth towards full maturity, it will completely blend in the basic ideas of the scheme: minimum control for obtaining its own paths of development, starting from minimal resources.

During Phase 1 of the project, inside Zones 1,2,3 and the Negotiation Zones mainly there will be planted a shattered "witness" plantation, its area being progressively extended as different zones receive a more defined character. Internal and external pressures on the site will induce the changes on the Negotiation Areas. To insure a compositional value of this plantation there will be used dominant tall species, same as the existing ones in the area: *Pinus halepensis, Quercus coccifera*. There will be planted also species with rapid growth and expansion tendencies as *Cupressociparis x leylandii, Larix deciduas, Pinus strobes, Pseudotsuga menziesii, Populus sp., Ailanthus altissima, Physocarphus opulifolius*, etc. This vegetation will gradually occupy the entire territory, will be an expansive woodland, starting from an initial group set by planting small trees with proper soil containers for each, that will pursue their scope of spreading up by auto-seeding and root multiplying. Therefore a complex of species of both the same age and of different size and ages will be obtained, to ensure a future covering with vegetation of the whole site. In the meanwhile the underbrush will be realized by using species as *Tamarix tetrandra, Spiraea sp., Laburnum anagiroides, Lonicera fragrantissima, Buddleia davidii*, etc., also species with rapid growth.

The "witness" plantation will provide a basis for future extension either by preserving part of it or by simply using it as first soil stabilizer and upgrade. Its traces left on the land can be read and analyzed in the project's later phases; plant-growth and resistance monitored; failures recorded and corrected; successes repeated, if not exacerbated. This 'finger-printing' of the witness-plantation during the development-phases will hence guide and direct further interventions. Not only in what is planted but how the public might experience it – the witness plantation will function in a lesser scale as a circuit for wildlife, due to the site's total inclusion in the city, but it will become a circuit for people – a witness circuit.

1 . THE MAIN URBAN DEVELOPMENT AREAS (MUDA)

Located around the newly built Olympic plaza and surrounding the former (airport) terminal building, the MUDA's are situated to best use existing infrastructures and to develop mainly around and in connection with existing buildings. This way the existing building-stock can be assimilated and re-used/ rehabilitated (where sustainable) or disposed off during the development and reconfiguration of the main zones/ site.

2 + 3. TENTACLE - DEVELOPMENT OF RESIDENTIAL AREAS.

The housing neighborhoods will extend gradually into the site, to a greater or lesser degree, depending primarily on existing pressures. The MUDA zones 1-3, are conceived of as an (inevitable) extension of Athens proper with some foreseeable amendments. While zone 1 will be a development area with precise Urban Regulations, we could say that the result may take various forms depending on the "first actors" making steps towards developing it. Its proximity and good relation – improved with the replacement of that section of Poseidons ave. with an underground tunnel – with the sea, as well as good public transport connections, plus the existence of infrastructure in the area, might recommend it as a good for residential development. Nevertheless the same features, plus the most rapid connection with the center from entire Hellenikon might make it a successful service area.

Its dynamics will also depend a lot, but also feedback influence on the neighboring outside-Hellenikon areas. Zones 3a and 3b will most probably develop as mostly office/service areas, due to their proximity with Vouligamenis ave. that brings both good connection with the city center but also noise and pollution. Nevertheless small-scale "fingers" from the neighboring residential quarters might also grow. In the meanwhile Zone 2 is most expected to continue the residential pattern of the zone neighboring it from the west, adding the existing the bulk necessary to constitute a quarter of its own. Therefore the1-3 zones are intended to pass from public authority to the land-market, private property, aside from those for infrastructure becoming the private sector's tasks. Potentially, Zones 1-3 are a source of income for Hellenikon and for the ecology of Attica, both on short term but also on long term if they prove viable in terms of urban functioning.

4. GREEN ZONES

Aside from seeding the entire territory with easy-adaptable plants, two other major green zones will be set aside, densely planted, carefully managed and maintained. This areas overlap on the existing green structures – as weak and inconsistent they might be now, because the places where greenery developed so far are indeed the most protected from the entire site.

The proposed zones for massive plantation will also comprise mainly species concordant with the existing vegetation, but they will also have a distinctive configuration, becoming specific ecosystems. This will be obtained by massive planting with rustic trees and shrubs, with blossom and fruiting capacities, leading to the constituency of a specific fauna (bringing birds like *Sylvia melanocephala, Galerida cristata, Miliaria calandra, Falco tinnunculus*, and also small mammals and reptiles). The representative vegetal species in the ecosystem's composition are *Malus sp., Prunus sp., Olea oleaster*, snowberry, gooseberry, thimbleberry, raspberry, *Cerasus sp*., etc.

In contrast to the basic mode of constituting vegetation - that of the "witness" plantation - the major green zones will base an artistic view from the landscape point of view, leaving their landmarks on the adjacent urban areas. They will ensure that after the 10-years span of Phase 1 and Phase 2 at least some of the park will approach maturity and final form.

The green zones will be left unassigned of program until later phases. Functions will be assigned as the vegetation matures and patterns of use become discernable within neighboring areas, and as further (leisure) activities are found to require accommodation. The green zones will be the most important task of the Park's authority during the first Phase of the development, their success bringing credibility in the future of Hellenikon as a green area.

5. BUFFER-BELTS.

Empty Pockets. Possibly the core of the proposal, these areas would form the borders/ contours for neighboring zones. The buffers could first function as building-site-centers and dumping-grounds for surrounding areas: the supervised dumping and sorting of the waste resulted primarily from demolition activities. These belts would undergo later landscaping wherein the waste/ debris would provide the base and relief.

They principally act as non-aedificandi areas, their principal role being to grow - not as pieces of the city, with buildings and functions but as a relief that slowly fills - in the emptiness of the airport-site. We do not wish to impose functions and ideology on them, believing that the simple act of transforming the topography, when people come from contemplating the flatness and emptiness to model the future small relief details (that would make clusters and intimate places for them) would be an enough stimulus for the future philosophical assuming of the area.

During Phase 1 of the project there will be no permanent structures newly build inside Zones 5 a, b, c, and d. The areas will be left for debris and earth from excavations to be placed on them, the resulting moulds becoming the basis for a relief. Specialized site-working units will carry the heavy works on the zones. Nevertheless the units choice for creating one relief or another will be influenced by the people that give the "material" (debris, earth) for the moulds themselves.

We believe the situation will be fun, since considerations as "one's view from the kitchen window", versus "preserving a straight path from A to B without necessarily hiking some dunes", or even "some laziness of the workers – considering the even spread on the entire zone they administrate would be easier", are factors that might collide. For easier planting considerations – aside the strict safety ones, limiting maximum slopes and heights of the dunes, depending upon their consistency and the machinery at work - one single rule for depositing will be in place: earth deposits will be placed in different areas than rubble, permitting easier and faster planting afterwards. Zone 5 will be opened to the public only with the guidance of the site-working units, its management and operational costs belonging to the Park Authority. The buffer-belts would have a compensating function as to mediate between later developments in neighboring areas and ensure a coherent development of the whole.

6. NEGOTIATION AREAS

Space Reserves (like fat-reserves in whales/ found in-between (zones 2, 3) relieved of urban regulations of their own, these areas are conceived both as buffers (between the main development-areas) and, reserves- possible extensions in which case they can assume a central role as main development areas, and become the center of the areas they previously separated. If taken on, the negotiation areas might refer to the most permissive regulations (according to the investor’s interest) of any of the areas they split.

SIMULATIONS

Given the proposed 5-year Urban Regulations, simulations show how Hellenikon might evolve under different socio-economical circumstances, thus leading to different results in the park organization and build-park relations.

The natural rule of urban sprawl (that first actors interested in the area set its characteristics, at least for 5-10 year span) is the logic at the base of each simulation. However we believe that the strength of the physical and organizational character of Athens with leave its mark also on Hellenikon, thus no matter the scenario or the reality behind the development of its areas, the urban/not park ones will look and act like other pieces of Athens.

PHASE 2

Phase 2 is conceived for definitely setting the direction of the transformation of Hellenikon in a major green area. The results of the Phase 1 developments in either build, forest, or buffer areas will already have filled the future park with the necessary character of a multitude-of-clusters development. In organizational terms, the park will already have set its major actors, and an implied dynamics. But Phase 2 will have also a compensation meaning, namely rebalancing the ratio between organized buildings and organized greenery. The regulations will provide the framework either for pursuing only park formation during Phase 2, or, in the case of partial lack of success of the building activities during Phase 1, future finger-growth of the adjacent residential areas into Zone 5. The empty, unoccupied areas inside Zones

1, 2, and 3, will be transformed into green spaces with public character – squares, playgrounds, etc, belonging under the Park's Authority

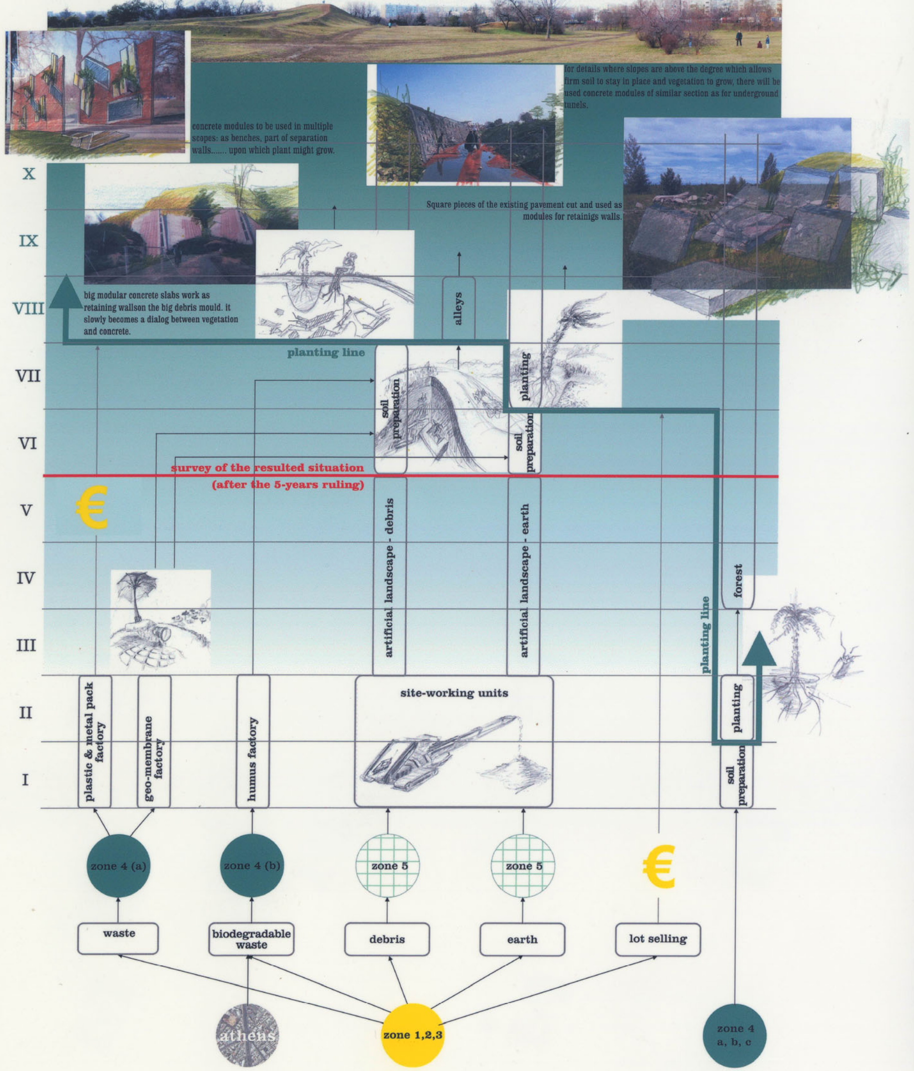
The debris moulds will be stabilized - either by mechanical compression and setting the slopes with smaller angles than 45 degrees, or using reinforced concrete modular slabs. The moulds will be afterwards covered with a mixture of earth and humus, isolated from the debris with geo-membranes, allowing grass-type planting afterwards. Trees will be planted in soil containers around their roots in special holes made in the debris moulds. The earth from excavation dunes will be covered with a mixture of earth and humus, and planted only with grass for the first year, and then the resulting soil will be covered again with the some mixture, following the planting with resistant species, such as *Pinus halepensis, Quercus coccifera*, and species with rapid growth (*Cupressociparis x leylandii, larix deciduas, Pinus strobes, Pseudotsuga menziesii, Populus sp., Ailanthus altissima, Physocarphus opufolius*, etc.). In respect with the resulted configuration of the moulds, the left areas will be prepared for accommodating sport fields, services and water basins; the left surfaces of the airport runaways may be a perfect base for additional water surfaces.

PHASE 3

After the 10 years comprising Phase 1 and Phase 2, the major directions of development of the park will already be settled, ensuring its organic evolution. Phase 3 will comprise everything that follows: maintenance, periodical new plantation, and introduction of new services in relation with user's needs, fashions, and technical innovations.

The project aims to set the axis for development of the Hellenikon area. However we believe that the people of Athens, and the organic style in which Athens grew over centuries of tumultuous history. We cannot predict how Hellenikon will look viewed from the sky - its history of this kind is now over; but we can say how it will look for the visitor, for the user of the park, it will be a piece of Athens, with nice individual corners linked by the same logic of solving the details. Paraphrasing Reyner Banham: "At the least one would find out what people want; at the most, one might discover the hidden style of 21st century Greece".

The park will display an environment of dialogue between concrete and vegetation



1

Athens as prestigious laboratory for science / western civilization and the arts; urban planning, the birth and evolution of architectonic styles, all documented, observed, reinvented and canonized throughout Europe and beyond; is this really all we can reduce Athens to? Its carefully catered to vestiges of a glorified past??

Apparently subordinated to Athens' major urban axis and local grid systems, details of street corners, houses, and not in the end life events and people form now the real flavor of Athens. The city doesn't live because of its "famous" avenues, but because of small shops and tavernas, a general image, complementary to that of its antique monuments, formed by a multitude of non-hierarchical spots.

We do not look for an overwhelming, logo-like finished image of the park. In the true spirit of Athens the park should grow with fabulous, unmistakable details and places, without any need for a controlled total spatiality. Therefore we provide a solution of organizing actions and details, "modules" for the future park, that are enough flexible to adapt to any result of the people of Athens exercising their aims on the park... first we let them speak.

The design is conceived of as an adaptable development-scenario. The implementation is structured in two 5-year phases, the second resulting in determining the patterns the park will take. Afterwards the park will develop slowly, as plants grow, needing mainly maintenance costs and works. The phases are conceived as steps of rebalancing the influences on the site; from the total belonging to the public sector, the Greek state in fact, an image and an acting body characterized by big size and generality, towards accomplishing a galaxy of specific clusters in the park. The process will be coordinated by a set of Urban Regulations imposed for each phase that will be strong enough to set a framework for the development, but permissive enough to leave the spirit of Athens to act.

The phases will represent also acts of the process of becoming-park that will make it interesting and democratic now, not "upon completion". The principles of ecology, of not spreading waste and debris outside its area are at the basis of constructing the park - there will be areas where it grows over rubble. So, for the people, depositing waste will be fun, they will be part of the designing team by this.

There will be moulds of rubble form the people's efforts to clear their spaces to build houses, and dunes of earth for the excavations for the foundations. With professional assistance they will be able to develop local relief that will become their fancy picnic spot after years.

Residuum and waste will be used in a humus factory for helping covering the moulds with improved soil; and the waste-recycling factory will recover plastics and paper for geo-membranes that isolate the growing plants from corrosive deposits underneath.

Thus the inhabitants of Athens will act from the contemplation of the airport emptiness to beginning to make their mental paths in the park, passing by the relief they're building or they wish to build.

The designer only provides solutions for the details - modules that will be put in place for making retaining walls, pavilion coverings, benches and pavements, solutions for planting the resulted landscape.

"At the least one would find out what people want; at the most, one might discover the hidden style of 21st century Greece" (Reyner Banham).

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ZONE 1 - mixed functions zone
Build (platforms included) to area percentage = max. 60%
Total floor to area ratio = max.3
(resulting a maximum height of the buildings of 6 floors)
-Polluting functions are not permitted
- Expansion of the mentioned perimeter
by allotments is not allowed
Buildings to be retained with the
existing use:
-Agora
ZONE 4 - woodland
ZONE 4a
A protective forest will be planted around the
waste-recycling platform
ZONE 4b
ZONE 4c
Buildings to be retained with
Meteorological station
Radar
Airport catering
WASTE RECYCLING PLANT
HUMUS PLANT
ZONE 3(b)
ZONE 4(b)
ZONE 5(a)
ZONE 4(c)
ZONE 3 (a)
ZONE 5(d)
ZONE 5(c)
ZONE 2
ZONE 5(b)
ZONE 1
ZONE 4(a)
ZONE 3
Build (platforms included) to area percentage = max. 45%
Total floor to area ratio = max 3 (resulting a maximum
height of the buildings of 5 floors)
-Polluting functions are not permitted
- Expansion of the mentioned perimeter by
allotments is not allowed
ZONE 3a
Buildings to be retained with the existing use
-Church
Buildings to be retained with new uses to be proposed
-The Saarinen building
ZONE 3b
There is no compulsory preservation of any of the
existing from this area
The minimum area of an allotment to be appropriated
in this area will be of 400 square meters; the minimum
width of an allotment must be of 12m.
The first person (physical or juridical) that will take
possession of a given piece of land will establish
the maximum length of the future neighboring
allotments on the given street the sidewalks on this area
will be of a minimum 1.5 m in width, followed by a
green strip of 1,5m width as well towards the street
The owners will provide the necessary parking spaces for
each allotment inside the area of the allotments
The earth resulting from building excavations in this area
will be necessarily deposited on either 5b(earth)
The rubble and debris from the demolition of buildings
and infrastructure from the area will be necessarily
deposited on either 5a(debris)
ZONE 5
Buildings retained with the same functions:
-Stalom utilities
-No building permits for permanent
constructions will be issued for this zone.
-As far as the operational period of the
first regulation set (5 years) there will be
no planned investment for planning in
this zone; spontaneous vegetation may
appear in places and will be subject for future
re-assessment for either preservation or use
as soil rehabilitation.
-Site-working units specialized in manipulating
the debris and excavation earth resulted from the
works on the entire site will be formed in order to
stock the mentioned materials and execute a relief
on this area of the future park. The units will be
located in the mentioned locations (see plan) -
existing buildings or temporary new structures
- each operating on the adjacent area.
-Each unit will have in operation the necessary
machines to perform the works. In the 5a zone
there will be heavyweight machinery at work,
for erecting a higher relief.
-Existing tall vegetation will be preserved
and protected following an expertise (healthy,
strong plants), with the exception of that from
the zone 5a.
NEGOTIATION ZONES
Buildings retained with the same functions:
-Slalom
For the negotiation zones the most permissive rules from the adjacent regulation-areas will apply, given the specific investing interests
All the costs for infrastructure and network extensions are to be supported by the investors themselves
site-management units
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0
100
2
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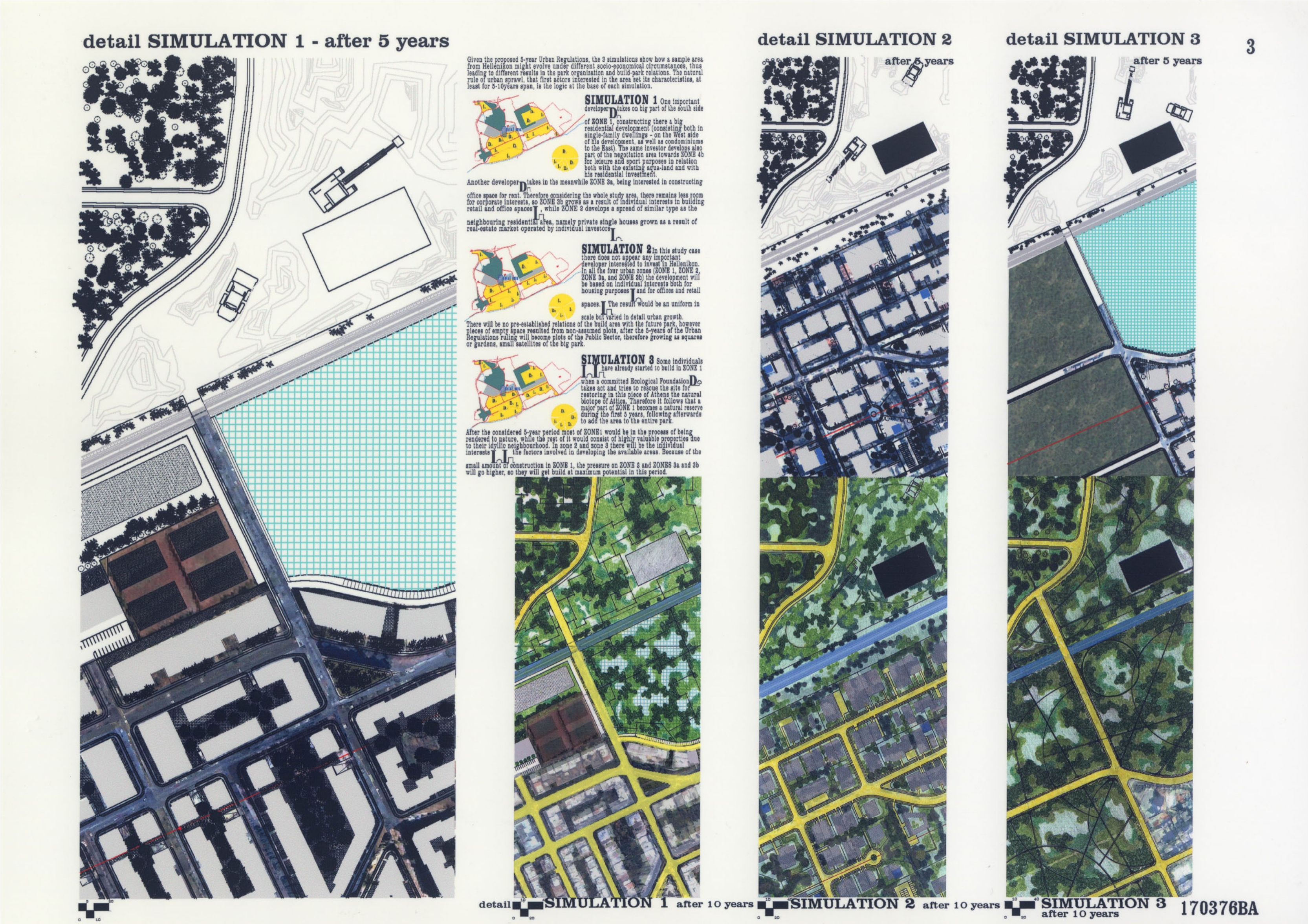

detail SIMULATION 1 - after 5 years
Given the proposed 5-year Urban Regulations, the 3 simulations show how a sample area from Hellenikon might evolve under different socio-economical circumstances, thus leading to different results in the park organization and build-park relations. The natural rule of urban sprawl, that first actors interested in the area set its characteristics, at least for 5-10years span, is the logic at the base of each simulation.
SIMULATION 1 One important developer D takes on big part of the south side of ZONE 1, constructing there a big residential development (consisting both in single-family dwellings - on the West side of his development, as well as condominiums to the East). The same investor develops also part of the negotiation area towards ZONE 4b for leisure and sport purposes in relation both with the existing aqua-land and with his residential investment.
Another developer D takes in the meanwhile ZONE 3a, being interested in constructing office space for rent. Therefore considering the whole study area, there remains less room for corporate interests, so ZONE 3b grows as a result of individual interests in building retail and office spaces I, while ZONE 2 develops a spread of similar type as the neighbouring residential area, namely private single houses grown as a result of real-estate market operated by individual investors I.
SIMULATION 2 In this study case there does not appear any important developer interested to invest in Hellenikon. In all the four urban zones (ZONE 1, ZONE 2, ZONE 3a, and ZONE 3b) the development will be based on individual interests both for housing purposes I and for offices and retail spaces. I The result would be an uniform in scale but varied in detail urban growth.
There will be no pre-established relations of the build area with the future park, however pieces of empty space resulted from non-assumed plots, after the 5-years of the Urban Regulations ruling will become plots of the Public Sector, therefore growing as squares or gardens, small satellites of the big park.
SIMULATION 3 Some individuals I I have already started to build in ZONE 1 when a committed Ecological Foundation D takes act and tries to rescue the site for restoring in this piece of Athens the natural biotope of Attica. Therefore it follows that a major part of ZONE 1 becomes a natural reserve during the first 5 years, following afterwards to add the area to the entire park.
After the considered 5-year period most of ZONE1 would be in the process of being rendered to nature, while the rest of it would consist of highly valuable properties due to their idyllic neighbourhood. In zone 2 and zone 3 there will be the individual interests I I the factors involved in developing the available areas. Because of the small amount of construction in ZONE 1, the pressure on ZONE 2 and ZONES 3a and 3b will go higher, so they will get build at maximum potential in this period.
detail SIMULATION 2
after 5 years
detail SIMULATION 3
after 5 years
3
detail SIMULATION 1 after 10 years
SIMULATION 2 after 10 years
SIMULATION 3 after 10 years
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phase 2 rules

If more than 70% of the permitted surface to be build according to Phase 1 ruling has been constructed, no further building exception being park services is allowed.
If less than 70% of the mentioned surfaces have been constructed, there will be opened for construction some more areas, adjacent to the zone which proved the most successful from this point of view during Phase 1. The total of these newly opened areas may not sum more than 10% of the surface of the reference area (the most successful in Phase 1). The urban building parameters (total floor to area ratio and build floor to area percentage, dimensions for sidewalks, etc) will be those of the reference zone with which the new site merges. The rest of the site will be no longer under marketed in either form (sold or lease). The empty, unoccupied areas inside Zones 1, 2, and 3, will be transformed into green spaces with public character squares, playgrounds, etc, belonging under the Park's Authority. Cutting portions of the woodland will be forbidden, excepting the necessary cases for implementing infrastructure networks, communication networks, or building services specific to park and leisure activities. Buildings and infrastructure related to the park may not overcome 5% of the surface of Zone 5.
The debris moulds will be stabilized - either by mechanical compression and setting the slopes with smaller angles than 45 degrees, or using reinforced concrete modular slabs. The moulds will be afterwards covered with a mixture of earth and humus, isolated from the debris with geo-membranes, allowing grass-type planting afterwards. Trees will be planted in soil containers around their roots in special holes made in the debris moulds.

4

simulation 1

regulations for 5 - 10 years

After Phase 1 the building process in Zones 1, 2, 3 will stop. The slalom basins together with the adjacent newly made sport and leisure fields will form an activity pole in the park. Complementary in the south side of Hellenikon another water surfaces will be proposed on the basement of the former airport runaways, resulting the park functioning between two major poles, in its North and in its South.

simulation 2

After Phase 1 the building process in Zones 1, 2, 3 will stop. Considering the fragmented, small scale form of most of the developments, the limits of the park will have a fractal value, a major importance being in the design and development of the left pockets in between the individual properties that will work as a galaxy of small green areas/ playfields, small gardens subordinated to the major park.
In the south side of Hellenikon another water surfaces will be proposed on the basement of the former airport runaways, resulting the park functioning between two major poles, in its North and in its South.

simulation 3

Due to the realization in major part of Zone 1 of a dendrological park, the park authority will permit the building of further constructed areas in Zone5 adjacent to Zone 3b, and adjacent to Zone 2 - to the South.
The rest of the Zone 5 areas will be prepared for becoming park in agreement with the general specifications of Phase 2 ruling.
The final configuration of the park will result strongly developed in the North side of Hellenikon, the rest functioning as green fingers, or proximity parks for the new residential areas.

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RESEARCHES REGARDING THE INFLUENCE OF ZEOLITES TUFF UPON *HIBISCUS ROSA-SINENSIS* AND *FICUS ELASTICA* GROWTH AND ORNAMENTAL CHARACTERS

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Keywords: *zeolite, ficus, hibiscus, substrate, fertilizer*.

ABSTRACT

Zeolites are volcanic rocks which composition and size pore depend upon the minerals involved. These natural minerals can adsorb harmful toxic elements, catalyze dehydratation-rehydratation and can be used in different purposes, for instance in agriculture, industrial products, radioactive waste, water treatment. In horticulture they are used in nurseries, greenhouses, floriculture, tree and shrub transplanting, vegetables, medium for hydroponics growing. As well as potting medium, they increased the soil retention capacity for nutrients and water. This study deals with the utility of zeolites tuff to ornamental plants pots. The Mirsid zeolites tuff used in waste water purification from leather industries become ammonium-enriched and then they are added to the nutritive substrate. By disintegration of their crystal lattice they liberate the ammonium ions which are used as nutrient source. We used zeolites tuff with particle size 0.5-3 mm, added in mixture of potting substrate of ornamental plants (*Ficus elastica* Roxb*.*, *Hibiscus rosa-sinensis* L.). Our results showed that vegetative growth and ornamental characters were comparable with those fertilized with NPK.

INTRODUCTION

The effect of the volcanic tuffs on the plants is known from ancient times, being observed the luxuriant growth of the vegetation on the former active volcanoes sides. The natural zeolites, used for the first time in Japan, have been extended later in other countries, in the crop's technologies of different plants, operated as soil's aerators and neutralizer of acid soils, control the liberation of the nutritive elements from the fertilizers, influence the soil's enzymatic processes etc.

After 1960, owing to the practical results obtained by the Japanese farmers using the zeolite volcanic tuffs, the scientists all over the world were interested to study the properties of these rocks and their influence on the mechanism of improving soils fertility. In Romania, zeolite effects were studied since 1931, when Cernescu used permutites, absorbent clays and zeolites type chabazit to improve soil features.

This paper presents the preliminary results of tests made by adding zeolite tuffs in the growth substrate of two flower species cultivated in flowerpot. They were *Hibiscus rosa – sinensis* and *Ficus elastica* usually used for inner decorations.

MATERIAL AND METHODS

The experiences have been set up inside the didactical green house of the University of Agronomy Sciences and Veterinary Medicine of Iasi (Romania) and have aimed to settle the possibilities of replacing partially or completely the chemical fertilizers, which are energy consumers and generating residues in soil and plant, with native stuffs (materials), cheap, unpolluting and easy to process and administer. By using in parallel the conventional and unconventional fertilizers we have studied the influence of these ones on the evolution of the growth substrate fertility and the ornamental features of the flower plants.

The experimental variants recorded were: the plant crop, the type of fertilizer and the dose of N g active substance/kg substrate (g a.s./kg substrate)

The biological material for testing were plants obtained from rooted cuttings of two bushes flower species cultivated in pots: *Hibiscus rosa-sinensis* L. (fam. *Malvaceae*) and *Ficus elastica* Roxb. (fam. *Moraceae*), very well-known and wide-spread as inner plants (3, 5).

Hibiscus rosa-sinensis is native of China, Japan, India, it impresses by the flower's beauty of different shades (red, pink, orange, yellow), simple or double. When the plant benefits of the best conditions, it can blossom the whole year.

Ficus elastica is native of India. It is appreciated for its large leaves, oval – elliptical, bright-green. It decorates also through its elegant port, with a stalk more or less ramified.

Being warm zones native plants, in the temperate continental climate of Romania, those two species have been grown as pot plants, requiring to be protected totally or partially. In the warm season they could be kept on terraces, in balconies and gardens etc.

The crop substrate consisted of: garden soil, oligotrophical peat, sand and compost (dung or manure) in different v/v ratios 1:2:1:1 for *hibiscus* and 1:1:0.5:0.5 for *ficus*.

Two fertilizers were tested: a conventional one NH_4NO_3 34% a.s. and an unconventional one – ground zeolite tuff, from Mirsid (Romania), with a N content of 18 mg/g. They had two granulation forms: I with particle size of 0.5-1.5 mm and II of 1-3 mm. The nitrogen fertilization has been associated with the administration of super-phosphate 20% a.s. and potassium salt 30 % a.s., achieving the ratios mentioned before (4).

During the experiments, some morphological and ornamental features of the plants were determined: the height, the colour and the number of leaves, the number of flowers.

The colour of the leaves has been determined with the Munsell colour's atlas (Munsell Colour Charts for Plants Tissues), the colour being expressed through those three variables: the shade (the spectral outstanding colour, the value (luminosity) and the chrome (saturation or intensity) (6).

RESULTS AND DISCUSSION

Comparing the zeolite tuff fertilizer effect with ammonium nitrate one, we have found for both species that the nutritional plants regimen has been improved, by administering progressively the nitrogen doses and fertilizing constantly with phosphorus and potassium (1, 2).

For *Ficus elastica* species the tuff sort II, has determined values of the assimilated nitrogen content of 15.9 ppm (year 1) and respectively 16.8 ppm NH^+_4+NO^-_3 (fig. 1 and 2), statistically very significant higher than the control. Taking into account the factor "dose", the evolution of the assimilated nitrogen content has been maximum by using maximum doses of fertilizers, respectively 18.3 ppm (year 1) and 19.1 ppm (year 2) NH^+_4+NO^-_3 (tab.3 and 4).

In interaction, the two factors-type of fertilizer and dose-had a favourable effect concerning the assimilated nitrogen content from the crop substrate. Therefore, for both experimental years, the optimal fertilizing formula was 1.5:1:1 (tab. 1 and 2). Using the tuff type sort II in this fertilizing variant, it has achieved in year 1 a value of 21.0 ppm NH^+_4+NO^-_3 of the mixture, statistically significant higher than the control, so that in year 2, the same variant, the same type of tuff, reached in substrate 23.0 ppm NH^+_4+NO^-_3 (very significant), a value close to the conventional fertilizer using (NH^+_4+NO^-_3), respectively 24.5 ppm assimilated nitrogen.

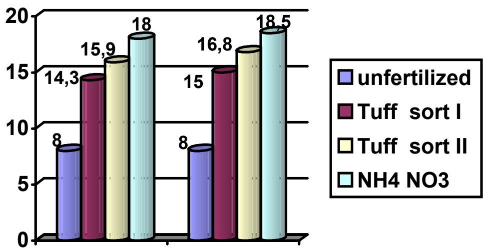

Fig. 1 - The influence of the fertilizer type on the assimilated nitrogen evolution (NH^+_4+NO^-_3 ppm) for *Ficus* plants

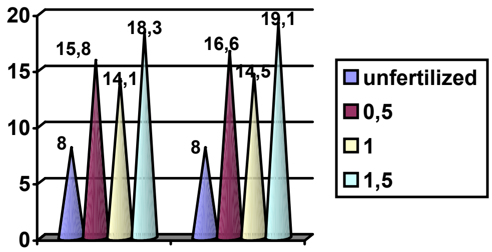

Fig. 2 - The influence of the fertilizer dose on the assimilated nitrogen evolution (NH^+_4+NO^-_3 ppm) for *Ficus* plants

Table 1. The influence of the interaction type of fertilizer x dose on the assimilated nitrogen evolution (NH^+_4+NO^-_3 ppm) for *Ficus elastica*, year 1

Variant	NPK 0.5:1:1				NPK 1:1:1				NPK 1.5:1:1			
	NH^+_4+NO^-_3 ppm	%	Differ.	Signif.	NH^+_4+NO^-_3 ppm	%	Differ.	Signif.	NH^+_4+NO^-_3 ppm	%	Differ	Signif.
Unfertilized	8.0	100.00	-		8.0	100.00	-		8.0	100.00	-	
Tuff sort I	15.5	193.75	7.7	xxx	14.0	175	6.0	xxx	19.5	243.75	11.5	xxx
Tuff sort II	19.5	237.50	11.0	xxx	15.5	193.75	7.5	xxx	21.0	262.50	13.0	xxx
NH_4NO_3	20.5	256.25	12.5	xxx	19.0	237.50	11.0	xxx	24.5	306.25	16.5	xxx

DL 5% 1.1 ppm DL 1% 1.5 ppm DL 0.1% 2.1 ppm

Table 2. The influence of the interaction type of fertilizer x dose on the assimilated nitrogen evolution (NH^+_4+NO^-_3 ppm) for *Ficus elastica*, year 2

Variant	NPK 0.5:1:1				NPK 1:1:1				NPK 1.5:1:1			
	NH^+_4+NO^-_3 ppm	%	Differ.	Signif.	NH^+_4+NO^-_3 ppm	%	Differ.	Signif.	NH^+_4+NO^-_3 ppm	%	Differ	Signif.
Unfertilized	8.0	100.00	-		8.0	100.00	-		8.0	100.00	-	
Tuff sort I	16.5	206.25	8.5	xxx	14.5	181.25	6.5	xxx	21.0	262.50	13.0	xxx
Tuff sort II	19.5	243.75	11.5	xxx	16.5	206.25	8.5	xxx	23.0	287.50	15.0	xxx
NH_4NO_3	22.5	281.25	14.5	xxx	19.0	237.50	11.0	xxx	24.5	306.25	16.5	xxx

DL 5% 1.6 ppm DL 1% 2.4 ppm DL 0.1% 4.3 ppm

For the species of *Hibiscus rosa-sinensis*, the evolution of the assimilated nitrogen from the crop substrate has been similar from the point of view of the factor "dose" involving values a little bit greater than the factor "type of fertilizer" and more statistically significant than in the first experimental year (fig. 1, 2, 3 and 4).

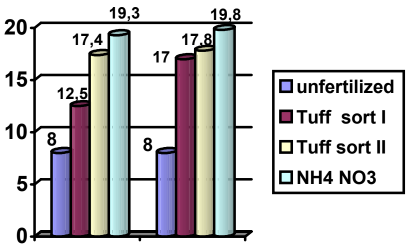

Fig. 3 - The influence of the fertilizer's type on the assimilated nitrogen's evolution (NH^+_4+NO^-_3 ppm) for the plants of Hibiscus

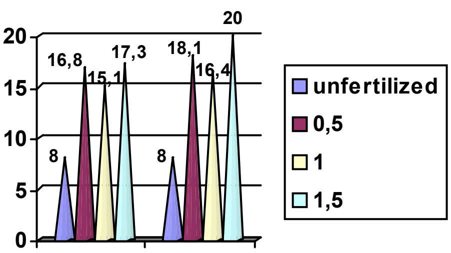

Fig. 4 - The influence of the fertilizer's dose on the assimilated nitrogen's evolution (NH^+_4+NO^-_3 ppm) for the plants of Hibiscus

By interaction, these two factors dose and fertilizer type, have reached maximum statistical significance for the values of assimilated nitrogen content in the complex ratio of 1.5:1:1 for tuff sort I for both experimental years (tab. 3 and 4).

Table 3. The influence of the interaction type of fertilizer x dose on the assimilated nitrogen's evolution (NH^+_4+NO^-_3 ppm) for the plants of *Hibiscus rosa-sinensis*, year I

Variant	NPK 0.5:1:1				NPK 1:1:1				NPK 1.5:1:1			
	NH^+_4+NO^-_3 ppm	%	Differ.	Signif.	NH^+_4+NO^-_3 ppm	%	Differ.	Signif.	NH^+_4+NO^-_3 ppm	%	Differ	Signif.
Unfertilized	8.0	100.00	-		8.0	100.00	-		8.00	100.00	-	
Tuff sort I	15.5	193.75	7.5		14.5	181.25	6.5		12.0	150.00	4.0	
Tuff sort II	20.5	256.25	12.5	xx	17.5	218.75	9.5	x	23.5	293.75	15.4	xxx
NH_4NO_3	23.0	287.50	15.0	xx	20.5	256.25	12.5	xx	25.5	318.75	17.5	xxx

DL 5% 7.8 ppm DL 1% 10.9 ppm DL 0.1% 15.4 ppm

Table 4. The influence of the interaction type of fertilizer x dose on the assimilated nitrogen's evolution (NH_4 + NO_3 ppm) for the plants of *Hibiscus-rosa sinensis*, year II

Variant	NPK 0.5:1:1				NPK 1:1:1				NPK 1.5:1:1			
	NH^+_4+NO^-_3 ppm	%	Differ.	Signif.	NH^+_4+NO^-_3 ppm	%	Differ.	Signif.	NH^+_4+NO^-_3 ppm	%	Differ	Signif.
Unfertilized	8.0	100.00	-		8.0	100.00	-		8.0	100.00	-	
Tuff sort I	20.0	250.00	12.0	xxx	17.5	218.75	9.5	xxx	22.5	281.25	14.5	xxx
Tuff sort II	21.0	262.50	13.0	xxx	18.5	231.25	10.5	xxx	23.5	293.75	15.5	xxx
NH_4NO_3	23.5	293.75	15.5	xxx	21.5	268.75	13.5	xxx	26.00	325.00	18.0	xxx

DL 5% 1.5 ppm DL 1% 2.1 ppm DL 0.1% 2.9 ppm

Biometrical determinations have shown a series of differences between variants only in the second year. Comparing to the control, the height of the plants, both for *Ficus* and *Hibiscus*, has registered greater differences in the case of the complex formula 1.5:1:1, using NH_4NO_3 and zeolite 1-3 mm. Concerning the number of flowers/plant for *Hibiscus* and the number of leaves/plant for *Ficus* there were no influences of the fertilizers.

The colour of the leaves, used as a marker of the nutritive plants status has been appreciated in 2 stages: in the first year, in 4 weeks after the establishment of the experiences (stage I) and in the second experimental year (stage II).

Table 5. The leaves color evolution in *Hibiscus rosa-sinensis* (stage II)

Variant	Leaves's position	N:P:K 0.5:1:1	N:P:K 1:1:1	N:P:K 1.5:1:1
Unfertilized	Leaves from the top	5 GY 6/10	5 GY 6/10	5 GY 6/10
	Basic leaves	5 GY 5/8	5 GY 5/8	5 GY 5/8
Tuff sort I	Leaves from the top	5 GY 5/8	5 GY 5/10-6/10	5 GY 6/8
	Basic leaves	7.5 GY 4/6-5/6	5 GY 4/8	7.5 GY 4/6
Tuff sort II	Leaves from the top	5 GY 6/8	5 GY 5/10	5 GY 5/8-6/8
	Basic leaves	7.5 GY 5/4-4/4	5 GY 4/8	7.5 GY 4/4-4/6
NH_4NO_3	Leaves from the top	5 GY 5/8	5 GY 5/8	5 GY 5/8-6/8
	Basic leaves	7.5 GY 4/6	7.5 GY 5/4	7.5 GY 4/4

If in the stage I, the colour of the leaves was approximately identical (5 GY 4/8 for *hibiscus* and 5 GY 4/4-4/6 for *ficus*), in the stage II had appeared colour differences, correlated partially with the assimilated nitrogen evolution from the substrate. For the variants with a big content in assimilated nitrogen, the color of the leaves varied between 7.5 GY 4/4 and 7.5 GY 4/6 for the basic leaves and 5 GY 5/8 and 5 GY 6/8 for those from the top of the offshoots, for *hibiscus* (tab.5), respectively between 7.5 GY 3/4 and 7.5 GY 4/4 for the basic leaves and 5 GY 5/10 and 5 GY 6/8 for those from the top, for *ficus* (tab.6).

Table 6. The color's evolution of the leaves *Ficus elastica* (stage II)

Variant	Leaves's position	N:P:K 0.5:1:1	N:P:K 1:1:1	N:P:K 1.5:1:1
Unfertilized	Leaves from the top	2.5GY 8/10-7/10	2.5GY 8/10-7/10	2.5GY 8/10-7/10
	Basic leaves	5GY 5/8-4/8	5GY 5/8-4/8	5GY 5/8-4/8
Tuff sort I	Leaves from the top	2.5GY 7/8-7/10	2.5GY 7/10	5GY 6/8-6/10
	Basic leaves	5GY 4/6	5GY 5/6	7.5GY 5/4
Tuff sort II	Leaves from the top	5GY 6/10	2.5GY 7/10	5GY 6/10-5/10
	Basic leaves	7.5GY 5/4-5/6	5GY 5/6-5/8	7.5GY 4/4-3/4
NH_4NO_3	Leaves from the top	5GY 6/8	2.5GY 7/10-6/10	5GY 5/10
	Basic leaves	7.5GY 4/4-3/4	7.5GY 5/6	7.5GY 3/4

As the content in assimilated nitrogen has decreased, the colour of the leaves has been approached more by the green – yellowish shades, the differences being more obvious to the young leaves.

CONCLUSIONS

In the crop of ornamental plants, the application of some unconventional fertilizers like the preloaded zeolite tuffs, had led to the improvement of plants nutritive regimen.

The progressive growth of nitrogen doses, on an agricultural constant background of phosphorus and potassium, had exerted a favourable influence on the assimilated nitrogen evolution of the substrate, for all fertilized variants, statistically significant compared to the control.

The fertilizing formula with the complex ratio 1,5:1:1 had a maximum efficiency in the evolution of assimilated nitrogen forms from the substrate, reflected also in the morphological and ornamental features of the plants.

The maximum values of the content in assimilated nitrogen had been obtained with the zeolite tuff type II (granulation 1-3 mm).

The ammonium nitrogen has been released gradually from the crystalline network of the zeolite tuff. That is why these materials could be considered unpolluting complex fertilizers, having similar effect with low-solubility fertilizers.

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Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE INFLUENCE OF FOLIAR FERTILIZERS USED AT ORNAMENTAL PLANTS

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Keywords: *cyclamen, foliar fertilizer,*

ABSTRACT

It is well known the complex effect of stimulating substances and foliar fertilization upon plants. The new foliar fertilizers, with a complex content of nutrients, macro and microelements protein-bound, are considered ecological products. That is why, they represent modern means, alternative and non-conventional use for quantitative and qualitative improvement of agricultural production. Moreover, they improve the decorative aspects of ornamental plants.

These products have a high solubility are involved in mineral nutrition, chlorophyllian assimilation and plants metabolism, influencing the energetic and photosynthetic efficiency of plant. Applied in the period of vegetation, they *ensure* increased yields, but do not substitute the chemical and organic fertilizer. The work concerns a series of experiments designed to test the effect of four liquid compounds: three with protein sources in the form as amino acids and ureides (CLAAU a_5, CLAAU a_6, CLAAU a_7) and *Folisof F 212* applied on a *Cyclamen persicum* culture (3, 5).

The experimental results showed the improvement of ornamental characters of tested plants.

INTRODUCTION

The foliar fertilization associated with the soil one, or even by itself, represents a technological way of crop growth. The foliar nutrition does not replace the soil fertilization, but it can supplement the nutrition deficiency during vegetation.

Studies in this field have shown the productive efficiency of foliar fertilization and its positive influence on the energetic and photosynthetic performances. The advantages of the foliar fertilization upon the soil one are obvious: it is used in smaller quantities, assures the rapid metabolic incorporation, prevents the nutrition deficits during the vegetative period and represents an unconventional and unpolluting way of influencing the metabolism and the photosynthesis (1, 2). In ornamental plants the efficiency of foliar fertilization reflects directly in their decorative qualities. The aim of this study was to test the possible effects of some new Romanian foliar fertilizers on *Cyclamen persicum.*

Cyclamen persicum L. – fam. *Primulaceae*, originates from the Mediterranean zone. It is cultivated as flower-pot specie, for interior decoration, and also for the procurement of cut flowers, very appreciated for their resistance in water pots (4, 6).

According to the moment of sowing and the way of leading the culture, it could blossom since autumn till spring.

MATERIALS AND METHODS

The study took placed in the didactic green house of the University. It aimed to test some new Romanian products as stimulators and fertilizers in *Cyclamen persicum*.

The tested products were liquid mixtures of amino acids and ureides coded CLAAU a_5, a_6, and a_7. They were applied on seeds before sowing. The plants obtained from the seeds were foliarly fertilized with *Folisof F 212* (1).

Selected *Cyclamen* seeds were immersed in aqueous solution of the three compounds, obtaining four experimental variants:

-V_1- the control variant (seeds wetted in distilled water);

-V_2- seeds treated with CLAAU a_5 1%;

-V_3- seeds treated with CLAAU a_6 1%;

-V_4- seeds treated with CLAAU a_7 1%

The sowing has been done in boxes, in a mixture made of leaf-soil, divot and sand, in a v/v ratio 2:1:1. The saplings have been pricked-out twice (at 5, respectively at 12 weeks from emergence), and in the end they have been planted in pots, in a mixture made of garden soil, oligotrophical peat dung and sand in a v/v ratio of 3:1:1:1.

The plants obtained from the V_1-V_4 variants have constituted the biological material for testing the foliar fertilizer *Folisof F 212* administered weekly, resulting other eight variants:

-V_5 – unfertilized plants obtained from V_1;

-V_6 – fertilized plants obtained from V_1;

-V_7 - unfertilized plants obtained from V_2;

-V_8 - fertilized plants obtained from V_2;

-V_9 - unfertilized plants obtained from V_3;

-V_{10} - fertilized plants obtained from V_3;

-V_{11} - unfertilized plants obtained from V_4;

-V_{12} - fertilized plants obtained from V_4.

RESULTS AND DISCUSSION

After 30 days from sowing, at 5 days intervals, it can be seen that at the first determination there was a percentage of 10-15% emergence only at the plants from the V_2-V_4 variants, in contrast with the control variant in which the process has started after 35 days and in a smaller percentage. After 40 days from sowing, the percentage of emergence was over 65% at the V_2-V_4 variants, while in the control it was only 26 % (tab.1)

Table 1. The plant emergence dynamic at *Cyclamen persicum*

Variant	Total % of emergence after				
	30 days	**35 days**	**40 days**	**45 days**	**50 days**
V_1-the control	2.0	16.0	32.0	51.0	73.0
V_2	12.0	37.0	68.0	84.0	84.0
V_3	15.0	41.0	71.0	87.0	87.0
V_4	10.0	33.0	65.0	83.0	83.0

Table 2 presents the treatment influence on the length and the percentage of emergence. Compared to the control (V_1), the other variants needed a shorter time for emergence and had a greater percent of emergence. The variant V_3 stands out with the best result in which the emergence in percent of 87 % (19.2 % compared to the control) was realized during 17 days (with 3 fewer days than the control). With same values as emergence percent are variants V_2 and V_4 which outrun the control with 15.1 and 13,7 %

Table 2. The CLAAU products treatment influence on the emergence of the plants of *Cyclamen persicum*

Variant	Nr. of seeds	Sow date	The emergence start date	The emergence finish date	The emergence necessary period		Emergence percent	
					Days	Days compared to the control (+,- days)	From total	Compared to the control
V_1-the control	50	16. 07.2003	14.09.2002	4.10.2002	20	-	73,0	100,0
V_2	100	16. 07.2003	12.09.2002	28.9.2002	18	-2	84,0	115,1
V_3	100	16. 07.2003	10.09.2002	26.9.2002	17	-3	87,0	119,2
V_4	100	16. 07.2003	12.09.2002	29.9.2002	19	-1	83,0	113,7

We studied the dynamic of leaves growth and development in plants untill pots transplanting to establish the possible influence of seeds treatment (fig.1, 2, 3, 4). Our results show small differences between variants although V_3 seemed to be superior to other variants. Last observations made after six months showed that the leaves number varied between 5.5-6.6 and the petiole had 3.3–3.5 cm and leaflet dimensions were 2.6 x 2.3 cm.

Fig. 1 - Developement and leaf growth dinamic at Cyclamen persicum (untill pots transplanting) - number of leaves

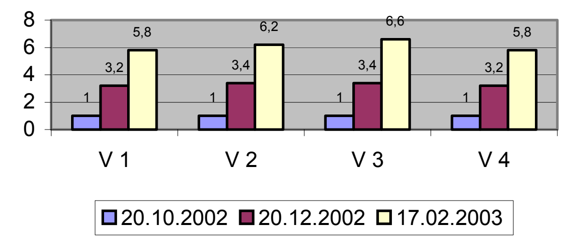


Fig. 2 - Developement and leaf growth dinamic at Cyclamen persicum (untill pots transplanting) - petiole lenght (cm)

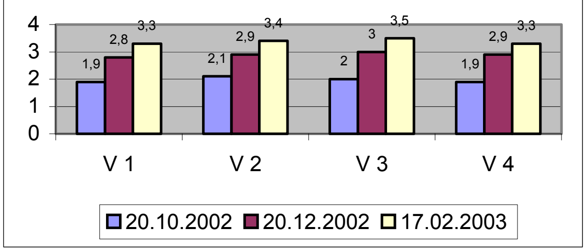


Fig. 3 - Developement and leaf growth dinamic at Cyclamen persicum (untill pots transplanting) - leaflet lenght (cm)

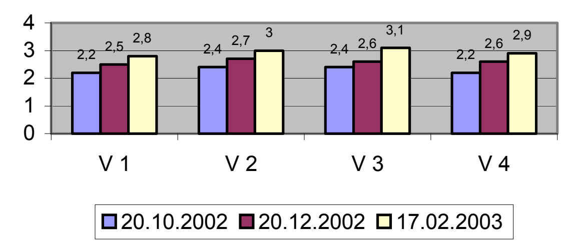
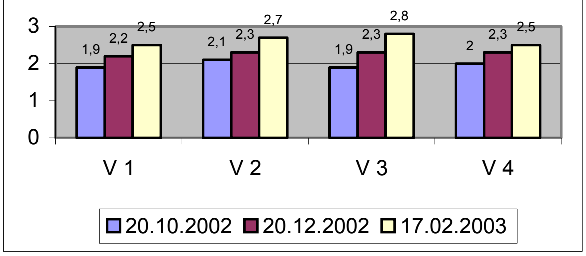


Fig. 4 - Developement and leaf growth dinamic at Cyclamen persicum (untill pots transplanting) - leaflet width (cm)



The influence of foliar fertilizer *Folisof F 212* was appreciated by biometric measurements (tables 3 and 4). In all fertilized variants height and foliar biomass were grater than in unfertilized ones, the differences being more evident in time. Adult plants exceeded control by 84.8 – 95.7 % regarding the average leaves/plant and by 29.1 – 43.9 % regarding the height. The influence of foliar fertilization upon plants decorative features was assessed by the number of flowers/plant, flowers stalk height and length of blossom period.

Fertilized plants exceeded by 50 % the unfertilized ones concerning flower number, reaching even 90 % in variant V_8 and V_{10}. Flowers stalks were higher by 40 – 50 % than corresponding unfertilized. The blossom period has been prolonged by 7 – 10 days in fertilized plants. All these characters contributed essentially to the increasing ornamental plants features.

Table 3. The influence of foliar fertilization upon *Cyclamen persicum* plantle growing

Variant	March 2003						May 2003						July 2003					
	Nr. of leaves/plant			Height			Nr. of leaves/plant			Height			Nr. of leaves/plant			Height		
	Nr.	Difference to the control (%)		cm.	Difference to the control (%)		Nr.	Difference to the control (%)		cm.	Difference to the control (%)		Nr.	Difference to the control (%)		cm.	Difference to the control (%)	
		nr (+;-)	%		cm (+;-)	%		nr (+;-)	%		cm (+;-)	%		nr (+;-)	%		cm (+;-)	%
V5	8,0	-	100,0	5,4	-	100,0	18,4	-	100,0	9,3	-	100,0	28,9	-	100,0	10,7	-	100,0
V6	9,4	+1,4	117,5	6,1	+0,5	112,9	26,2	+7,8	142,4	12,0	+2,7	129,0	53.4	+24,5	184,8	15,4	+4,7	143,9
V7	8,3	-	100,0	5,7	-	100,0	16,7	-	100,0	9,8	-	100,0	27,7	-	100,0	11,2	-	100,0
V8	10,0	+1,7	120,5	6,4	+0,7	112,2	28,7	+12,0	171,9	11,8	+2,0	120,4	54,2	+26,5	195,7	15.3	+4,1	136,6
V9	8,5	-	100,0	6,0	-	100,0	20,1	-	100,0	8,2	-	100,0	29,5	-	100,0	9,7	-	100,0
V10	10,5	+1,5	123,5	6,6	+0,6	110,0	29,4	+9,3	146,3	10,4	+2,2	126,8	56,5	+27,0	191,5	14,7	5,0	151,5
V11	8,1	-	100,0	5,6	-	100,0	15,8	-	100,0	9,5	-	100,0	27,4	-	100,0	11,0	-	100,0
V12	9,8	+1,7	121,0	6,4	+0,8	114,3	28,2	+12,4	178,5	11,0	+1,5	115,8	52,9	+25,5	193,1	14,2	3,2	129,1

Table 4. The influence of foliar fertilization upon *Cyclamen persicum* decorative features

Variant	The appearance of first flowers	Nr. of flowers/plant		The length of stalks		The length of bloosom period	
		Nr.	Difference to the control (%)	cm.	Difference to the control (%)	Days	Difference to the control (+,- days)
V5	8.08.2003	16.9	100.0	14.1	100.0	75	-
V6	18.07.2003	28.2	166.9	21.4	151.8	86	+9
V7	10.08.2003	16.5	100.0	15.2	100.0	68	-
V8	25.07.2003	31.3	189.7	22.0	144.7	79	+9
V9	3.08.2003	18.0	100.0	14.6	100.0	65	-
V10	15.07.2003	34.0	188.9	22.5	154.1	72	+7
V11	15.08.2003	17.3	100.0	14.9	100.0	78	-
V12	28.07.2003	27.5	159.0	22.7	152.3	88	+10

CONCLUSIONS

The CLAAU seed treatment before sowing has improved the percent of emergence and has reduced the time needed to the emergence. The best emergence percent was obtained with CLAAU a_6.

The influence of seeds treatments was less evident upon the growth and the development of the small plants, till prick-out.

The foliar fertilization with the *Folisof F212* after pricking-out have induced the growth number of leaves/plant with 84.8-95.7 % compared to the control and height plants with 29.1-51.5 %. It determined also the increasing number of flowers/plant with 60-90 % and it prolonged the blossom period with 7 -9 days.

The foliar fertilization represents an agrochemical alternative and efficient way of crop growth in the conditions of a sustainable development.

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THE BEHAVIOR OF SOME SPECIES AND CULTIVARS OF *FORSYTHIA SP.* TO VEGETATIVE PROPAGATION BY CUTTINGS

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Keywords: *Forsythia sp.*, species, cultivars, vegetative propagation, cuttings

ABSTRACT

The behaviour of eight new species and cultivars of *Forsythia* to vegetative propagation by hardwood cuttings was tested. All species and cultivars investigated have responded well to this type of propagation, developing both roots and shoots. The best rooting percent was obtained at *Forsythia viridissima Lindl* cuttings.

INTRODUCTION

Forsythia x intermedia is one of the most impressive and appreciated species which blooming early in the spring and consequently, new species and cultivars with precious ornamental qualities are always desired on the market. In the present study we investigated the behaviour of 13 new species and cultivars of *Forsythia* to vegetative propagation by hardwood cuttings. Hardwood cuttings are prepared from one year dormant, mature stems early in spring and planted outside, in field conditions (Iliescu, 1998). The value of the new species and cultivars, the different vigour of these and the reduced number of stems available for cuttings determined us to create special conditions for their rooting. Consequently, a mixture of sand and pearlite was used as rooting substrate and the base of the cuttings were treated with root-promoting compounds, for a successful rooting.

MATERIALS AND METHODS

The biological material was represented by stems of 13 new species and cultivars of *Forsythia* donated to Arboriculture Department from Faculty of Horticulture in 2002 by a French research institute – Institute Nationel de Research Agronomique (INRA), Angers, France.

In April 2002 one year stems, properly developed, healthy and well maturated were selected to make simple, straight cuttings of 15-18 cm long. Because the stems of *Forsythia* are empty inside, the base cut was made through the node. All the cuttings were treated with a combination of rooting hormones – ANA+IBA 1000ppm and then planted at 10cm/2-3cm into a mixture of sand and pearlite 2:1.

After the planting were assured all the conditions for a good vegetation of the plants: watering, pests' control, weeds' control.

The factors considered in the experiment were: the rooting percent, the number of roots per cutting, the length of the roots, the number of shoots per cutting, and the length of the shoots formed per cutting. All these measurements were made one year after the planting in 6.06.2003, when the plants were well stabilized. At this stage, the plants were transferred to containers for future investigations.

RESULTS AND DISCUSSIONS

From a total number of 13 species and cultivars tested, only eight has responded positive to the vegetative propagation by cuttings, forming roots. It is significant the fact that all four cultivars of *Forsythia x intermedia* investigated were reacted well to this type of propagation.

Analyzing the percent of rooting presented in table 1, we can observe that it varied between 11.53% at *Forsythia x intermedia 'Lynwood'* and 72.97% at *Forsythia viridissima Lindl* (Fig.1).

The average number of the roots produced by each cutting and their length were considered in the experiment. Comparing the results obtained by species and cultivars, we can observe that the number of roots formed is indirectly correlated with the length of the roots. Hence, *Forsythia x intermedia 'Lynwood'* cuttings initiated the biggest average number of roots per cutting - 12.33 roots, but the roots' length was the smallest comparing with all the other species or cultivars (average length – 2.91cm). At the opposite site, the *Forsythia x intermedia 'B Farrand'* cuttings recorded the lowest number of roots produced - 2.75, but their average length was the largest – 6.58 cm (Table 1, Fig. 2).

Considering now the average number of the shoots formed, we can say that it was between one at the *Forsythia suspense 'Sielboldii'* cuttings and maximum two shoots at *Forsythia courtasol 'Marée d'or'* cuttings. The average length of the shoots was also taking into account in our study. From this point of view, *Forsythia suspense 'Sielboldii'* cuttings were very well developed with an average length of 6.57 cm, followed by *Forsythia x intermedia 'Vitellina'* cuttings, with 5.76cm and *Forsythia viridissima Lindl* with 4.49cm. The shortest shoots were produced by *Forsythia paulina* cuttings, they having an average length of only 1.51 cm (Table 1, Fig. 3).

CONCLUSIONS

The vegetative propagation by hardwood cuttings is appropriate for the *Forsythia* species and cultivars and the introduction of valuable new species and cultivars in Romania can be successful in the future.

The best percent of rooting was obtained by *Forsythia viridissima Lindl.* cuttings – 72.97%, followed by *Forsythia paulina* cuttings - 38.63%. Although the cultivars of *Forsythia x intermedia* proposed for this study were not remarked through a high percent of rooting, we consider significant the fact that all four responded positive to this type of propagation.

It was observed a strong correlation between the average number of roots and their average length. Some species or cultivars formed fewer roots but long roots (*Forsythia x intermedia 'B Farrand', Forsythia x intermedia 'Vitellina'*), and some other more roots but shorter (*Forsythia x intermedia 'Lynwood', Forsythia viridissima Lindl*).

All the cuttings of those eight species and cultivars studied, developed shoots with variable number and length, and the shortest shoots were produced by *Forsythia paulina* cuttings – with an average length of 1.51cm.

ACKNOWLEDGEMENTS

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Tables

Table 1. The results obtained at vegetative propagation of *Forsythia* species and cultivars.

Species/Cultivar	Percent of rooting (%)	Average number of roots/cutting	Average length of roots/cutting (cm)	Average number of shoots/cutting	Average length of shoots/cutting (cm)
Forsythia x intermedia 'Vitellina'	17.14	4.66	5.11	1.16	5.76
Forsythia x intermedia 'Lynwood'	11.53	12.33	2.91	1.66	3.03
Forsythia x intermedia 'Spring Glory'	25.00	5.4	6.06	1.4	3.25
Forsythia x intermedia 'B Farrand'	18.18	2.75	6.58	1.25	3.91
Forsythia suspensa 'Sieboldii'	17.94	4.71	5.48	1	6.57
Forsythia courtasol 'Marée d'or'	26.19	5.27	6.02	2	3.24
Forsythia viridissima Lindl.	72.97	8.25	4.48	1.62	4.49
Forsythia paulina	38.63	5.47	5.33	1.7	1.51

Figures

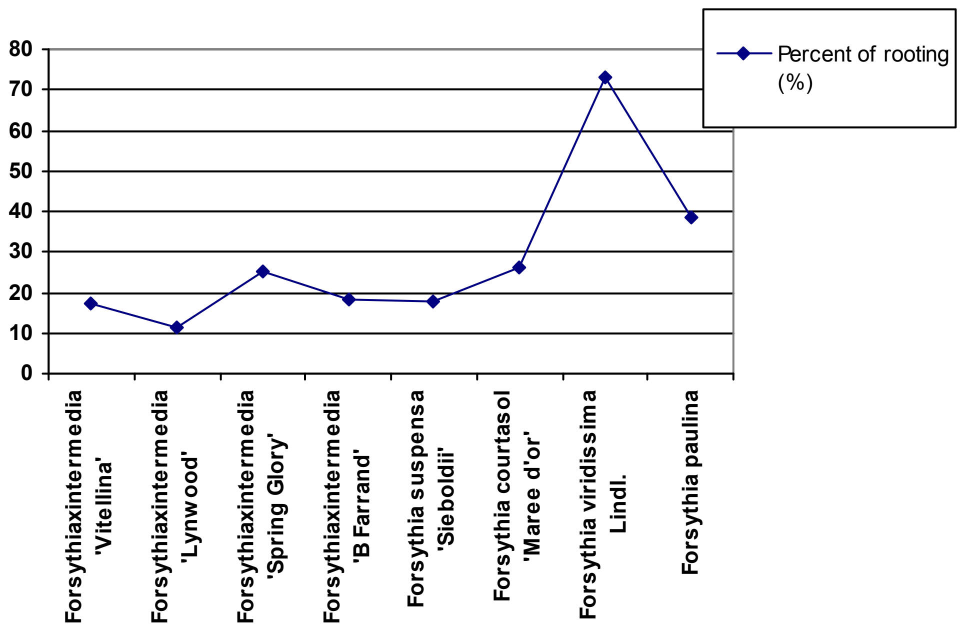

Fig. 1. The percent of rooting of *Forsythia* sp. cuttings

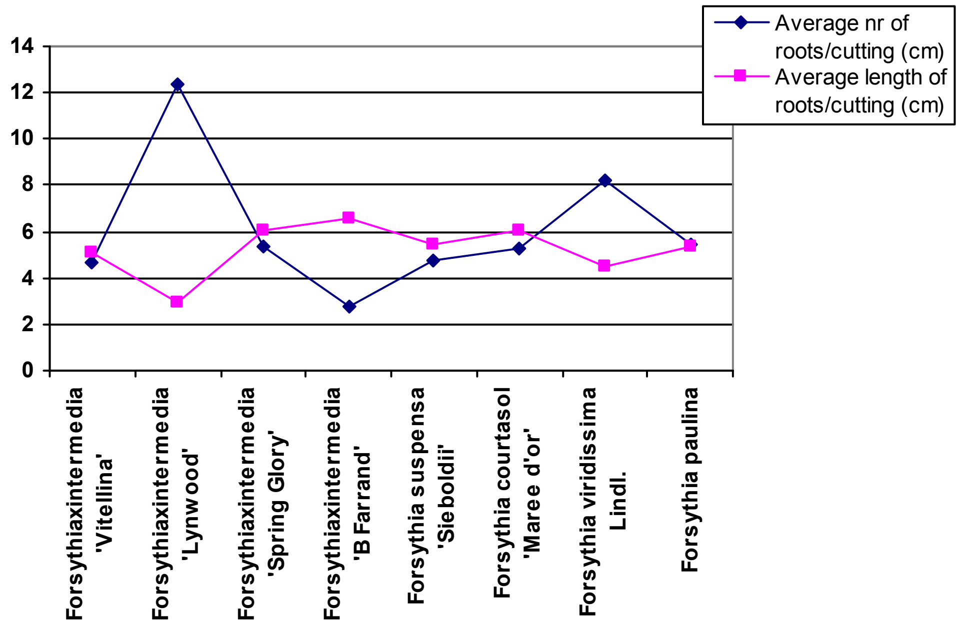

Fig. 2. The correlation between the average number of roots/cutting and the average length of the roots/cutting.

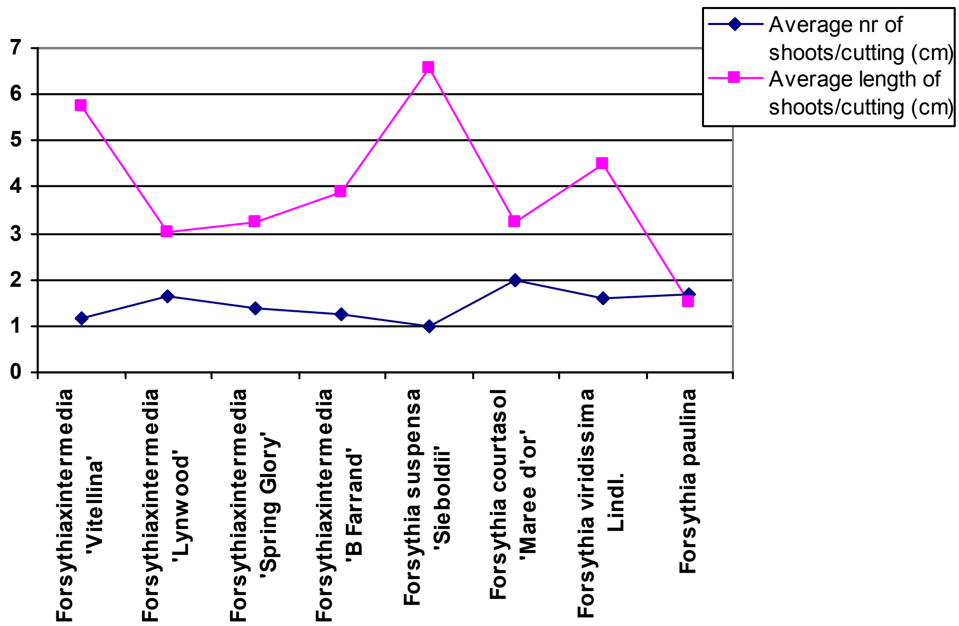

Fig. 3. The correlation between the average number of shoots/cutting and the average length of shoots/cutting.

Forsythia viridissima

***Forsythia x suspensa* var. sieboldii**

***Forsythia x intermedia* Lynwood**

***Forsythia x intermedia* B. Farrand**

***Forsythia x intermedia* Vitellina**

***Forsythia x intermedia* Spring glory**

***Forsythia x intermedia* Paulina**

***Forsythia courtasol* Maree D'or**

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MICROPROPAGATION OF GARDEN PLANTS: *MISCANTHUS SINENSIS* "YAKUSHIMA", *GENTIANA TRIFLORA*

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Keywords: *in vitro*, ornamental, axillary branching

ABSTRACT

Micropropagation has significant uses in vegetative propagation of horticulturally important species and cultivars. With a few exceptions most ornamentals can be micropropagated, and the need is for more and new basic research approaches. Although many of the techniques involved in the production and manipulation of plant *in vitro* cultures are in themselves relatively straightforward, there are problems in the view of the wide variation in behaviour of different plant species in response to chemical and physical culture parameters.

In the present work an approach to the development of suitable culture conditions has been made for two ornamental plant species (*Gentiana triflora* and *Miscanthus sinensis* "Yakushima") for which detailed protocols were not available.

INTRODUCTION

Micropropagation of ornamentals has taken tissue culture out of the lab and into the commercial world (Dodds and Roberts, 1995). For the ornamental industry, the use of tissue culture technology is as routine for some plants, as cutting and other traditional methods are for others. Considerable information is available on *in vitro* tissue culture propagation requirements of specific plants. Nevertheless, new ventures into micropropagation systems and the extension to new species and cultivars require considerable empirical research effort to establish feasibility and optimum conditions of culture and handling.

The present work reports the procedures used for *in vitro* propagation of some rare ornamental species/cultivars during a ten-month period. The aim was to initiate sterile, *in vitro* explant cultures and to micropropagate each species for commercial uses, having the starting material from one or two mother plants only. *Miscanthus sinensis* "Yakushima", a member of the Family *Gramineae*, *Gentiana triflora* belonging to the *Gentianaceae* Family, and *Dierama pulcherrimum* "Blackbird" a cultivar of the Iris Family (*Iridaceae*) are the three genus for which all micropropagation stages were carried out, the micropropagation procedures are considered below.

Gentiana triflora (the Clustered Gentian) is one of the 400 species included in the large *Gentiana* genera, which are cultivated for ornament. Ornamental gentians are largely propagated *in vitro* in the Netherlands, 26,500 plants were cloned *in vitro* in 1986 (Pierik, 1991). *Gentiana triflora* is a perennial originated from Eastern Asia (China, Japan, Siberia) 50 cm tall, with 4 cm long deep blue/mauve colour flowers, solitary or of 5 in axils and on the top.

Miscanthus is one of the chief genera of the large pantropical tribe *Andropogoneae* of the *Panicoideae* Subfamily. *Miscanthus sinensis* "Yakushima" (Dwarf Maiden Grass) is grown for ornament for its showy fast-growing clumps (3-4 feet tall, 3 feet wide) topped by silvery white blooms. It starts flowering at an early age. Great as specimen or in groupings, also beautiful in autumn because of golden bronze autumn foliage.

Dierama belongs to the *Iridaceae* Family which is valued principally for its garden and indoor ornamentals and a great deal of work has gone into the production of cultivars and hybrids in such genera as *Gladiolus, Iris, Crocus, Freesia, Ixia, Sparaxis, Crocosmia* (*Montbretia*) and *Tigridia. Dierama pulcherrimum* "Blackbird" (the Wand Flower) is a new cultivar of horticultural value of this family, very appreciated for its dark, dusky-purple flowers.

MATERIALS AND METHODS

The mother plants, conventionally grown, were provided by a Nursery in South-West Scotland (UK). *Miscanthus sinensis* "Yakushima" and *Dierama pulcherrimum* "Blackbird" mother plants were used during the dormant season; the underground structures kept under appropriate conditions (rhizomes and bulbs) were the starting material. *Gentiana triflora* culture was started using a mother plant completely developed and actively growing.

Explants were taken from the underground structures of mother plants by separation/division, trying to obtain pieces that have at least one lateral bud, "eye" or node.

To establish the explants in culture and to induce multiple shoots development for further multiplication the Murashige and Skoog medium (Murashige and Skoog, 1962) was used with the following additions (mgl^{-1}): sucrose, 20,000; 2iP (6-[γ,γ-dimethylallylamino]-purine), 1.00; BAP (benzylaminopurine), 1.00 (Triggs, 1994).

The underground structures that were used as starting material were cleaned of soil debris by washing in tap water. The epidermal layers were excised for a successful sterilisation. Smaller pieces were cut from rhizomes and the *Dierama* bulbs were divided. After choosing the explants, they were surface-sterilized and placed on agar-solidified medium. An initial pre-sterilization in 70% alcohol was followed by 1-2% (available chlorine) sodium hypochlorite. An emulsifer (Tween-20) was added at the rate of 1 drop per 100 ml solution.

The explants were left into the bleach solution in small, screw-topped, sterile plastic tubs for a timed 15 minutes, with occasional inversion and gentle agitation to enhance the effectiveness of the process. Then, with flame-sterilised forceps the pieces were transferred briefly through 5 sterile distilled water washes, finally putting them in a lidded Petri dish to await cutting. After removal from bleach solution all operations were conducted in a laminar airflow cabinet.

The explants were cut and then placed into the surface of the agar-based medium in 30 ml universal tubs (one piece per container). The cultures were placed in incubators at 25ºC, about 3000 lx light level, on a 16h light-8h dark cycle.

For multiplication the expanded explants were cut apart and propagules were recultured onto a new medium. Gamborg's B5 Basal Salts Mixture (Gamborg *et al.,* 1968) was used with the following additions (mgl^{-1}): sucrose, 20,000; agar, 8,000; 2iP, 1.00; BAP, 1.00 (Triggs, 1994). The axillary shoot method was used for *in vitro* propagation, until enough shoots were obtained. Multiplication was repeated at irregular intervals (see Discussion).

In the pretransplant stage changes were made to favour root initiation and shoot elongation. Some plants were subcultured on elongation medium (one passage) and then transferred again on axillary shoot medium.

For elongation, Murashige and Skoog mixture was used (4.43 gl^{-1}) with the following additions (mgl^{-1}): sucrose, 20,000; agar, 8,000; kinetin (6-furfurylaminopurine), 0.5; 2iP, 0.5; IAA (indole-3-acetic acid), 0.01 (Triggs, 1994).

When shoots were big enough they were transferred on rooting medium with low auxin concentration to induce the adventitious root formation.

For rooting, Murashige and Skoog medium was used (2.21 gl^{-1}) with the following additions: (mgl^{-1}): sucrose, 30,000; agar, 7,000; NAA (α-naphthaleneacetic acid), 0.05 (Triggs, 1994). No subculture was carried out after this stage.

Rooted plantlets of required size were removed from the culture vessel, agar was washed away completely with warm water and the plantlets were transplanted into compost in medium size pots.

Initially, plants were protected from desiccation in a shaded, high-humidity tent. Each pot was kept into a polyethylene bag inside the incubators and a loose, aerated, well-drained rooting medium was used, to allow new roots to develop quickly.

Once the plantlets were established in the rooting medium, they were gradually exposed to a lower humidity and a higher light intensity.

After 2-3 weeks plants were transferred to the free-living environment of the greenhouse.

RESULTS AND DISCUSSIONS

Gentiana triflora

Shoot buds appeared from explants after 2 weeks on axillary shoot medium. Some cultures had bacterial contamination into the agar-solidified medium. Uninfected plants were obtained by culture of the apical part of the shoots in new medium.

Gentian shoots on axillary shoot medium developed multiple fast growing axillary buds.

Transfer to fresh medium was repeated every month for further multiplication. A group of 30 shoots was kept without subculturing for three months; the shoots growth became inhibited. Transfer to fresh medium was followed by a slow recovery.

On elongation medium shoots developed long internodes and narrow leaves.

Rooting was achieved in 2 weeks time on the rooting medium.

At the end of a 6-month period, 199 plants were obtained (117 were kept in culture on axillary shoot medium as stock plants and for further multiplication, 34 were kept in culture on rooting medium and 48 were planted out). The procedure was continued in the same way.

Miscanthus sinensis “Yakushima”

Shoots appeared on explants after 3 weeks on axillary shoot medium. The small multiple adventitious shoots were “encouraged” to produce secondary adventitious shoots on the same medium. Subculture was repeated at irregular intervals, the optimal rates for transfer were found to be 12 days.

In *Miscanthus sinensis* “Yakushima” quite dense clusters of shoots were produced with cytokinin, the axillary shoots released from apical dominance in turn producing their own precocious shoots and so on. Such clusters were divided up into single and/or small groups of shoots and transferred to fresh medium for further proliferation.

A number of shoots developed roots spontaneously in culture on axillary shoot medium.

The axillary bud method was used in combination with elongation medium for a rapid shoot elongation.

On rooting medium shoots developed a fibrous root system with secondary roots after 3-week time, approximate.

Cultures were well responding in incubators under fluorescent tubes at intensities of 5000 lx for 13 hours daily.

After 2 weeks acclimatization period, rooted plantlets of the proper size were transferred to natural environment. In soil plants begun to grow immediately.

At the end of a 9-month period, 47 plants/groups of rooted shoots were obtained (11 were planted out, 12 were kept in culture on axillary shoot medium, 23 on elongation medium and one on rooting medium for further multiplication and transfer to soil). The procedure was continued in the same way.

Dierama pulcherrimum “Blackbird”

Shoots appeared from explants after 10 days on axillary shoot medium. Cultures were infected with a slow-growing bacterium that was persisting in modest numbers close to the explant. The repeated transfer of the explants was successful in getting a few cultures clean.

For shoot multiplication, subculture was carried out every month by transfer to fresh axillary shoot medium.

Shoot proliferation was very slow and shoots were chlorotic. After 4 months the 10 groups of shoots that had been obtained got severe bacterial contamination and were lost. Only one piece of explant with multiple shoots was transferred to fresh medium and survived. Under high intensity light the shoots became green and started to develop.

At the time this study was finished, further stages in propagation had yet to be conducted.

DISCUSSION

Factors that affected the success of culture establishment included the choice of explant (only 10% of explants regenerated adventitious shoots), the elimination of contaminants from the explants, the culture conditions including ingredients, light, temperature and the seasonal dormancy patterns.

The choice of the explants was, perhaps, the most critical since they had to be physiological competent to survive the initial culture and to elicit the appropriate response on the media used.

For the present study no micropropagation protocol was followed and the work included a somewhat empirical approach to the development of suitable culture conditions for the plant species that were investigated.

The Murashige and Skoog mixture with high cytokinin level was used as a general adventitious shoot initiation medium for all 3 species, as at the same time other 28 ornamental plant species/cultivars belonging to 12 different families were already in culture and the possibility to establish the optimal media composition for one plant by carrying out a so-called broad-spectrum experiment was limited by labour and facilities available.

Since each species or even specific genotypes may have different requirements for culture media, methods of sub-division for propagation, rooting, or transfer to the environment, a certain specialisation of any production laboratory is necessary for an efficient micropropagation.

For *Dierama pulcherrimum* “Blackbird” contamination can be regarded as the most serious limitation of the present micropropagation procedures. The centre of infection could be the inner tissues of the bulbs and infection only became apparent when the site of the infection was cut open (during subculture), and made contact with the medium. It is known that in some cases, bacterial cultures may co-exist with plant cultures and remain visually undetected for several culture passages while adversely reducing the multiplication rates and other growth responses. The poor growth and chlorosis of *Dierama* shoots can be an indication of such an internal infection.

Multiplication was successful with *Gentiana* and *Miscanthus*, which in consecutive multiplication stages had high rates of increase. Success in multiplication meant also the production of uniform shoots of proper size that recovered quickly after transfer and begun to grow immediately.

The analysis of the time sequence of shoot production, along with observations on the health of the cultures, were helpful to determine the need for transfer to fresh medium.

Gentiana shoots were resistant when transfer to fresh medium was delayed, in this case deterioration could slowly be recovered.

Miscanthus sinensis "Yakushima" needs subculture every 12 days; if transfer was delayed old leaves become brownish and sometimes "overnight" deterioration may occur and shoots may not survive even after subculture.

Previous experience with other ornamental plants (*Primula* sp., *Saxifraga* sp.) showed that apart from the quality of the plant material success in weaning depends to a large extent on the conditions of weaning facility. Use of the mist-unit was avoided as it induce a too wet and, therefore, anaerobic substrate which favoured the development of fungi and bacteria in and on the plant. No fog-unit being available, the plantlets were kept in polyethylene bags inside incubators; so, environmental parameters were artificially controlled and the adaptation to higher light intensity was gradual.

CONCLUSIONS

From *Gentiana triflora* and *Miscanthus sinensis* "Yakushima" explants were established on a nutrient medium containing high levels of cytokinin and subsequently shoot organs were initiated. Multiplication was achieved through subdivision of shooting clumps and repeated transfer on axillary shoot medium. After rooting on rooting medium plantlets were planted out in separate vessels.

ACKNOWLEDGEMENTS

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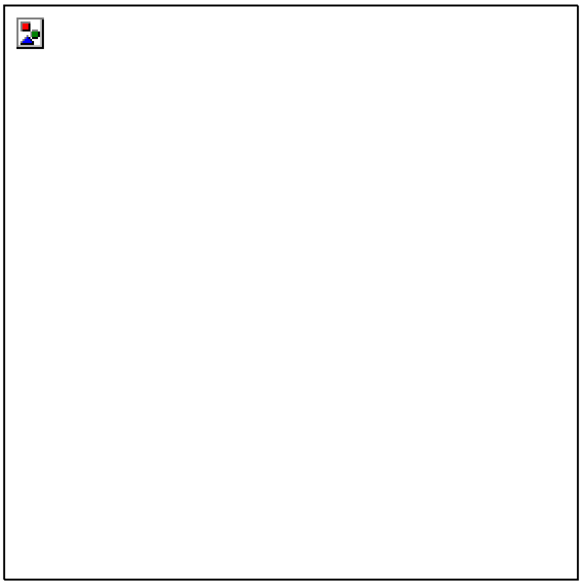

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IN VITRO STABILIZATION AND MICROPROPAGATION OF SEVEN *CLEMATIS* HYBRIDS

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Keywords: *Clematis*, uninodal fragments, antibiotics, micropropagation.

ABSTRACT

The purpose of this study was *in vitro* stabilization and multiplication of seven *Clematis* hybrids explants, starting from uninodal fragments. The sterilizing agents used were ethylic alcohol 96° and a detergent: DOMESTOS®15%. For stabilizing the culture we tested Murashige&Skoog medium (1962) with active carbon 0.1%, in two variants, the differences between them being represented by the amount of antibiotics substances added to the basal medium (PPM and Gentamicine).

INTRODUCTION

The main objective of this study was obtaining a large number of *in vitro* multiplied explants of *Clematis* hybrids selected by nursery specialists. In order to reach this objective, establishing a vegetal material disinfection protocol was required. In the first phase we attempt to stabilize the initial material that presents problems related both to infections and phenols.

The multiplication of the hybrids or clone varieties can be done only through *in vitro* micropropagation. This requires a better knowing of hormonal balances to which the plants give the best response action.

MATERIALS AND METHODS

Seven (07) selected hybrids were studied: H1, H2, H3, H4, H5, H6, H7. These plants cultivated in 10 liter containers were forced in the green-house, under controlled temperature and humidity conditions, for 30 days starting February. Above the pots plastic tunnels were put in order to preserve the atmospheric humidity required for plants to burst into vegetation.

The main advantage of forcing the plants in the green-house is obtaining a material free of micro-organisms, mycosis or other infection sources.

The vegetal material was actually represented by semi-hardwood cuttings. The cutting of the uninodal fragments consisted of the removing of the leaves entirely and keeping a 0.5 mm fragment of their petiole. Above the pair of buds there was a 0.5 cm piece of wood left and a 1.5-2 cm in the lower part.

The culture medium used for proceeding and multiplying was Murashige&Skoog: vitamins FABI 2ml/liter, BAP 0.5ml/liter, active carbon 0.1%. For the beginning phase two (02) types of antibiotics were used: V1-PPM (Plants Preservative Mixture) 2ml/liter and V2-Gentamicine 20mg/liter. The use of these two products was meant to determine the best biocide. The active carbon was used as an anti-oxidant because the plants of *Clematis* genus produce phenols in the culture medium, an undesired phenomenon that prevents plants' *in* *vitro* expansion. The culture recipients used were 80 ml test tubes, each containing 10 ml of basal medium.

The disinfection protocol was conducted as follows:

- immersing the uninodal fragments in a 96° ethylic alcohol for 5 minutes;

-immersing the shrubs for 15 minutes in a solution of 15% DOMESTOS® and distilled water;

- rinsing the vegetal material with sterile water 3 times for 5 minutes every time.

The whole disinfection process was conducted on the magnetic agitator under the laminar flow. After disinfection, the uninodal fragments were adjusted through removing of the shrubs' external coat, of the petiole's fragments and of the buds' cataphylls. Then, every fragment was individually inoculated in a culture medium in test tubes (See Tabel 1).

RESULTS AND DISCUSSIONS

After approximately one week from the inoculation, the first observations were made about the infections, the explants' stamina and the response reaction of the different hybrids to the basal medium. Following the disinfections process, various contaminations with bacteria or mycosis can appear.

Regarding the bacteria contamination of the studied hybrids, there was not any in medium treated with PPM (2mg/liter) or in the one treated with Gentamicine (20mg/liter).

The mycosis contamination was noticed at four (04) hybrids (H1, H3, H4 si H7) inoculated in the Gentamicine treated medium. The contamination percentage was different from one hybrid to another (See Drawing No. 1). The hybrid H3 provided the highest infection percentage: 16,66. There was no infection at hybrids H2, H5, H6.

Following the disinfection process, it was visible that some of the explants could not survive. The cause of mortality can be either the too concentrated disinfection agents, their too long action time or a vegetal material handling error during inoculation. Removing of the buds' cataphylls can lead to their destruction.

A comparison was made with reference to the number of valid plants in relation to the antibiotic used in the basal medium. The highest percentage of valid plants was obtained from the PPM treated basal medium for the hybrids H6 and H7 (100%). On Gentamicine treated medium, the best response action was given by H2, with a maximum percentage of valid plants. The evolution of all hybrids can be seen in Drawing No. 2.

Following *in vitro* stabilization of the 7 hybrids, the multiplication was performed. The basal medium was Murashige&Skoog without antibiotics. After 4 weeks from the inoculation, the first subculture was made. During the stabilization, the influence of the antibiotics on the multiplication ratio could be noticed. The highest multiplication ration was provided by H3 (3.9) V2 on medium (Gentamicine 20mg/liter). On V1 medium (PPM 2mg/liter) the values of the multiplication ration vary between 1.05 si 1.9. In this case, the highest value was recorded for hybrid H1 (See Drawing No. 3). After cca 2 weeks from transfer on the free of antibiotics multiplication medium, there could be noticed a spectacular evolution of the explants regarding the shrubs growth. Unfortunately, the short time did not allow performing a new set of observations.

CONCLUSIONS

The success in plants' *in vitro* stabilization depends on the genotype used and the vegetative phase of the plants at the time of taking the uninodal fragments. The disinfection agents used, their concentration and the action time had positive effects on semi-hardwood explants.

The PPM gives good results regarding the number of valid explants, with a concentration 10 times lower than Gentamicine's. The literature mentions this antibiotic as being harmful for humans and that its use should be avoided in treating basal mediums. The studies showed a different evolution of the plants on the two types of basal mediums, V1 and V2. The positive results related to the percentage of infection and the number of valid plant make us recommend the use of PPM for the inoculation and *in vitro* stabilization.

The antibiotics reaction is different, depending on the genotype used.

ACKNOWLEDGEMENTS

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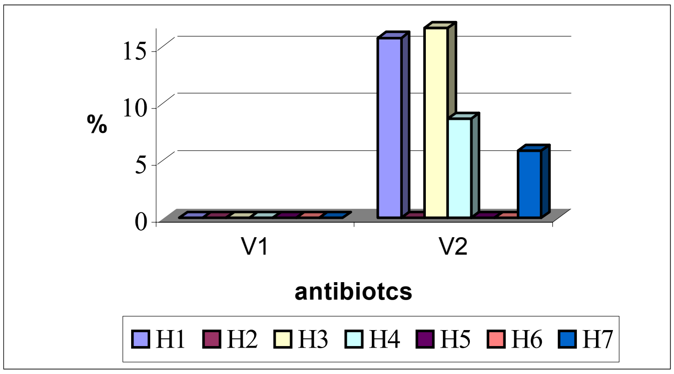
Tables

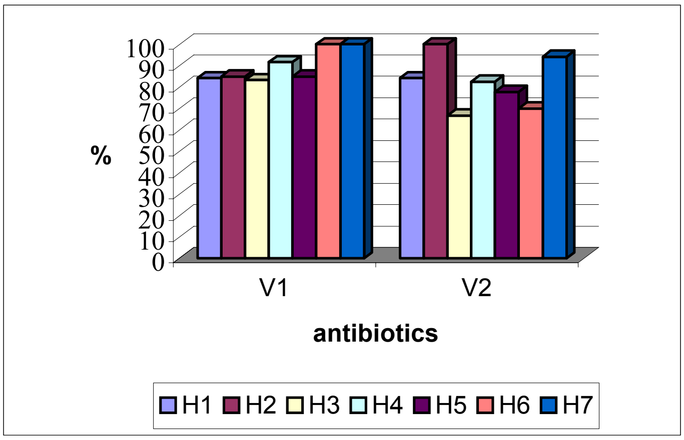
Table 1. The number of uninodal fragments inoculated into the two types of basal mediums

Hybrid	V1	V2
H1	19	19
H2	20	18
H3	12	18
H4	24	23
H5	20	18
H6	9	10
H7	18	17

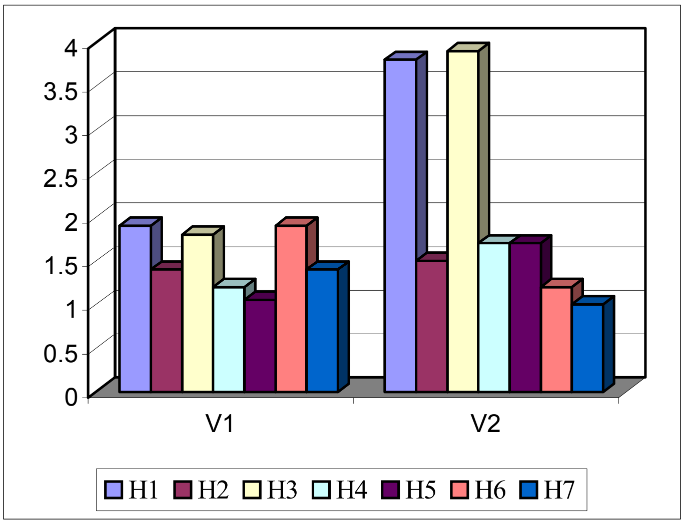
Drawings



No. 1. The percentage of fungus infections depending on the antibiotic used to treat the basal medium



No. 2. The percentage of valid explants depending on the antibiotic used to treat the basal medium



No. 3. The multiplication ratio of the hybrids depending on the antibiotic used to treat the basal medium

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RESEARCHES REGARDING CUTTING PROPAGATION OF *CLEMATIS* CULTIVARS

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Keywords: *Clematis*, hybrids, cutting, rooting hormons

ABSTRACT

After *in vitro* micropropagation, cutting is one of the main propagation methods for *Clematis* genus. The semi-hardwood cuttings of *Clematis* Multi Blue, *C*. The President, *C*. Hagley Hybrid, *C*. Nelly Moser and *C*. Rouge Cardinal were treated with Rhizopon AA(20%) and Rhizopon B(10%) tablets and Rhizopon AA(1%) powder. The rooting substrates were mixtures of turbe and perlite. The rooting percentage and the quality of the formed roots were strongly influenced by the hybrids, the cutting moment and the rooting hormons. Success percentage varied between 46% and 70%. For *C*. Rouge Cardinal, the cutting moment was unsuitable, all cuttings died before rooting.

INTRODUCTION

The main objective of *Clematis* multiplication by means of cuttings is obtaining as many plants possible in a short time. By using the vegetative multiplication, we have the conviction that the newly obtained plants maintain all the features of the mother-plants. The literature mentions several periods of time during which the *Clematis* cutting can be performed. These depend on the vegetative phase of the plants and the flourishing time.

On the other hand, this research was looking to establish what the best stimulator was and its influence on the rooting process.

MATERIALS AND METHODS

Five (05) hybrids of *Clematis* genus were studied: *C. Multi Blue*, *C. The President*, *C. Hagley Hybrid*, *C. Nelly Moser*, *C. Rouge Cardinal*. The cutting was performed in April. The semi-hardwood cuttings were taken from four (04) months old mother-plants cultivated in the green-house.

C. Multi Blue: 373 cuttings
C. The President: 593 cuttings
C. Hagley Hybrid: 121 cuttings
C. Nelly Moser: 283 cuttings
C. Rouge Cardinal: 50 cuttings

The vegetal material was represented by uninodal fragments. The cutting consisted of removing one (01) leaf entirely and reducing the surface of the second leaf at half of its size. Above the pair of buds there was a 0.5 cm piece of wood left and the internode was shorten up to 2.5-3 cm.

A mixture of perlite and turbe in a 1:1 proportion was used as a rooting substrate. The turbe pH was 6.5. Black alveolar plates were used as supports for the rooting substrate. Alveoli's size was: 4x4x7 cm.

The two (02) rooting stimulators used were:

V1 – Rhizopon AA(50mg/tablet, 20%) + Rhizopon B(25mg/tablet, 10%) – solution – 1AA + 2B;

V2 – Rhizopon AA(1%) – powder.

The active substance of these stimulators was IBA **(indolilbutiric acid)** for Rhizopon AA and ANA **(α naftilacetic acid)** for Rhizopon B.

The cuttings' treatment was made by immersing their base, on a 1-1.5 cm portion, in a water solution for 3 seconds. For V2-powder case, the treatment was made on a 2 mm segment.

Each of the treated cuttings was introduced in alveoli up to the bud. Above the alveoli a white mat plastic foil tunnel was mounted in order to preserve the atmospheric humidity and the heat at the cuttings level.

RESULTS AND DISCUSSIONS

Following the results, it was clear that the type of the stimulator had an influence on the rooting process. As we can see in Drawing No. 1, V2 gave the highest percentage value for the rooting of *C. The President*, *C. Multi Blue* and *C. Hagley Hybrid*, while *C. Rouge Cardinal* hybrid did not have any rooted cutting. The causes of this phenomenon can be various. The main reason can be the bad cutting time.

Among the five (05) hybrids used in this experiment, the best rooting can be noticed at *C. Hagley Hybrid*, with 67% for V1 and 70% for V2 (see Drawing No. 1).

The number of the roots was influenced by the type of the stimulator used for rooting. It was visible that V2-powder gave higher values regarding the total number of the roots. In Drawing No. 2 we can see that *C. Nelly Moser* has the greatest total number of roots – 124 for V2 and in the same time, the lowest value – 56 for V1.

Beside the rooting percentage and the total number of the roots, the total length of the roots was studied. The highest values were obtained in the case of V2-powder applied to *C. Nelly Moser* hybrid – 510 cm, while for V1 the value was 256 cm.

The values of the correlation factors of 0.85 (V1) and 0.95 (V2) show that, for both types of stimulators, there is a strong correlation between the number of the roots and their length. (see Drawings No. 3. and No. 4.). However, we can see that in V2-powder case the factor indicates a better correlation than in V1-solution case.

CONCLUSIONS

As far as about the rooting process, the best stimulator turned to be the powder - Rhizopon AA(1%).

The same stimulator determined the highest number of roots and their total length.

A successful rooting also depends on the genotype and the vegetative phase of the plants at the time of taking the uninodal fragments. The rooting time also plays an important role in reaching this objective.

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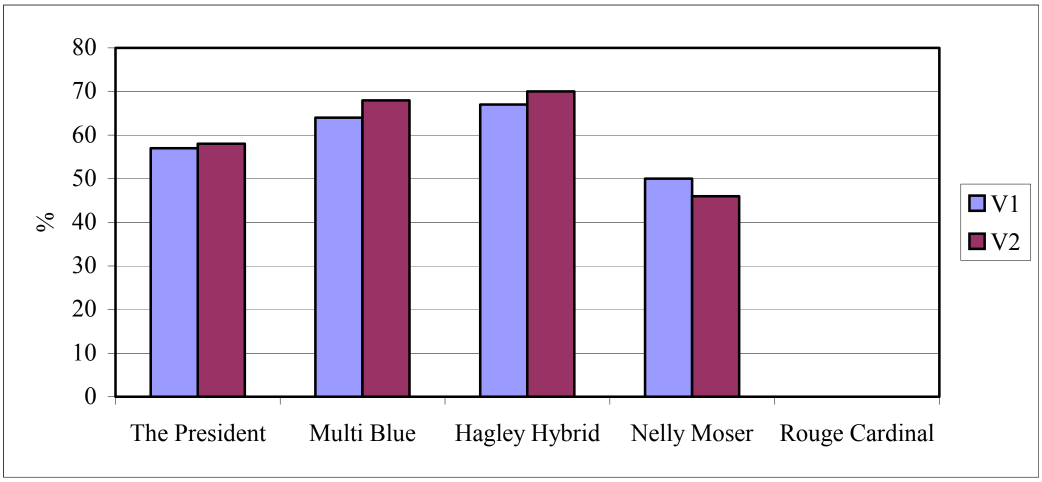
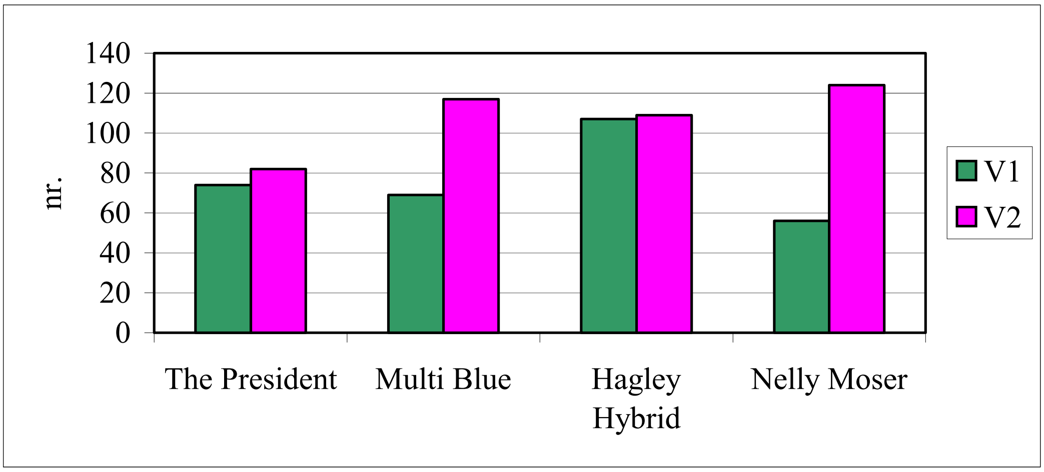
4. Quoirin, M.; Lepoivre, P. 1997- Etudes de milieux adaptes aux cultures *in vitro* de *prunus*. Acta Horticulturae.

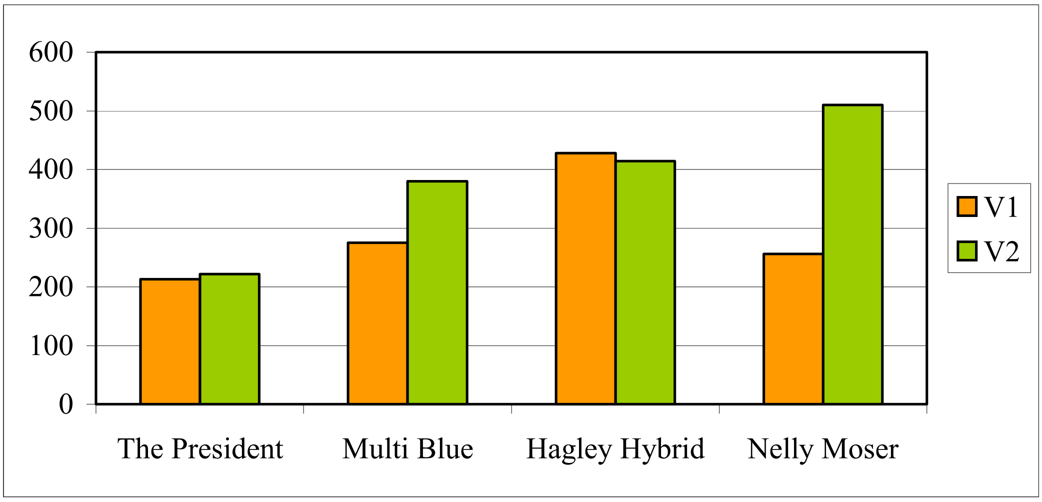
Drawings



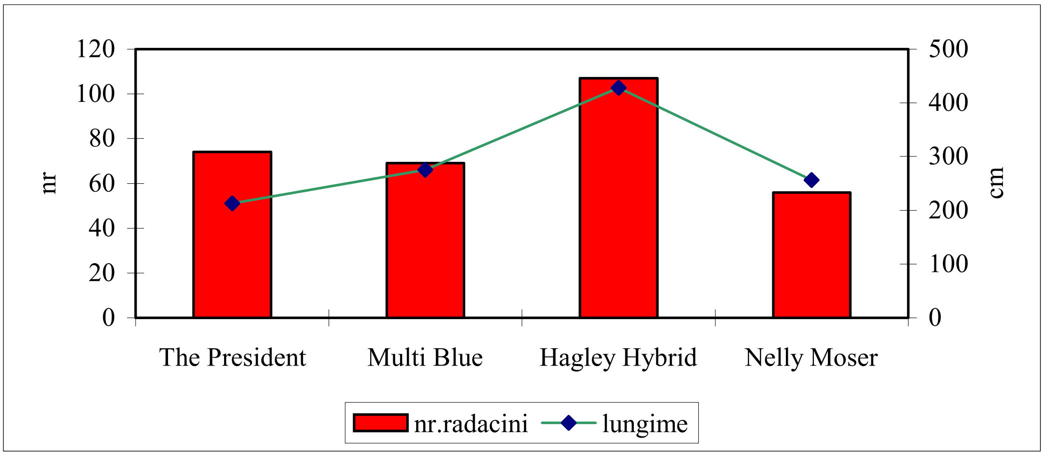
No. 1. The influence of the stimulators on the rooting process



No. 2. The influence of the rooting stimulators on the total number of roots

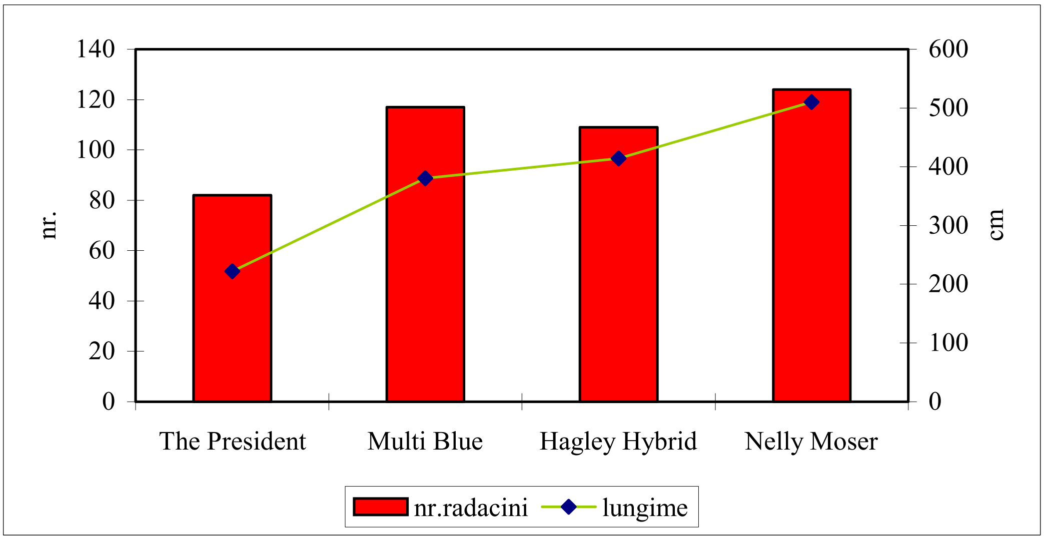


No.3. The influence of the rooting stimulators on the total length of the roots



Correlation factor: 0.85

No.4. The influence of the rooting powder (V1) on the number and length of the roots



Correlation factor: 0.95

No.5. The influence of the rooting powder (V2) on the number and length of the roots

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CONTRIBUTIONS AT THE DESIGN METHODOLOGY FOR AN ORNAMENTAL PLANT NURSERY PROJECT

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Keywords: production categories, technology, surface estimation, efficiency

ABSTRACT:

In this work we have approached the methods for drawing up a nursery project in Bucharest City area. The complex structure of a tree and shrub nursery implies detailed studies as to the efficiency of each production field, taking into consideration sensible investments and correct management to ensure long-term development. The proposed methodology comprises the criteria for choosing the types of planting material and the necessary steps to elaborate the project.

In the paper are given examples of ground surfaces calculation for each growing stage. Also it is shown how to draw estimations as essential aspects in building up the project. On the basis of cost analysis we have provided the efficiency of each nursery culture as guidelines for the investor.

INTRODUCTION

Because a significant number of city nurseries has been closed, and those still functioning cannot practically meet the demand of the public and private sector in point of quality, quantity and sort, the market in Bucharest is dominated by import tree planting material used even in public landscapes installed by the ADP.

Starting up a nursery either in the public or in the private sector will be an imminent consequence, also present situation leading to high costs and often to ecologic failures in planting new landscapes.

Such an investment should be well documented in point of technology and management, taking into account the specific features of planting material with more than one production cycle, which may sum up to 10 – 16 years.

This paper proposes a methodology of drawing up a nursery project on the basis of scientific criteria. The reason of this study is the lack of such a coherent approach of the documentation in specialized literature under present-day conditions.

MATERIALS AND METHODS

We have approached two types of project draft:

A. For private small and middle-sized nurseries of small and middle-sized enterprise type. The surface is given limited by available field.

B. For large nurseries with complex production functioning mainly for the public sector. The surface is established for certain production numbers.

We have advanced the following order in project development:

1. establishing production categories;
2. estimating the dimensions of the nursery;

3. estimating production figures;
4. drawing up estimates on the basis of norms and recommended technologies;
5. calculating technical economic indicators and highlighting efficiency for each production category.

RESULTS AND DISCUSSIONS

A. <u>The case of small and middle-sized nurseries</u>

1. Establishing production categories. Criteria :
   1.1. Species and varieties showing a deficit on the market;
   1.2. New species with high ornamental value and high adaptability;
   1.3. Species with short production cycles and high demanded on the market, adaptable for transitional crops in the first years of the activity of the nursery in order to cover investments;
   1.4. Most frequent species in street plantations needing replacement or completion.

We have chosen the following production categories:

- rootballed standard material
  - graft conifers
  - non-graft conifers
  - conifer and evergreen shrubs
  - deciduous trees
- bare root standard material
  - graft and fruit deciduous trees
  - deciduous trees
  - deciduous shrubs
  - graft roses
- high size trees
- container grown material

2. Estimating the dimensions of the nursery and establishing areas for each nursery sector.

We chose a 20 ha surface for the nursery.

The necessary surface for each stage of the growing process was estimated within each production category. The orientation of the estimations is from the trees or shrubs ready for sale to the production of young plants.

2.1. The way to establish the necessary surface for each technologic stage is taking into account planting distances, the culture duration and rotation structure;

2.2. The next step is the surface estimation for annexes and additional structures (roads, greenhouses, storehouses, mechanical premises, warehouses, etc.), following the tehnological processes and territorial organization of the crops

Taking into account the chosen assortment and growth technologies (table n^{o} 2) for the proposed production categories we came to the following structure of 20ha nursery territory.

- seeding field: 840 m2;
- greenhouses and hot beds: 1860 m2;
- field cuttings: 540 m2;
- plantation for multiplying material: 4700 m2;
- growing schools: 150700 m2;
- technological platforms: 6000 m2;
- roads: 14000 m2;

- the remaining surface up to 20ha: reserved land for future development, cultivated with annual crops, tree collections, work shops and mechanical premises, storehouses, soil sites, basins etc.

3. Estimating production figures

The production of planting material quantities demanded on the market cannot be taken into consideration in this case, because production figures are restricted by the available surface.

The production figures are estimated on the bases of production indicators in every growth stage according to the planting material category tehnological processes and growing schemata.

An example for such estimation is, in brief, as follows:

The necessary surface for producing 1000 standard deciduous bare root trees

a) School I, with 5 year growing cycle, with 1mx1m schema summing up 5 plots of 1000 m^2 each and one year soil improving crops, with 1000 m^2 plot

Total: 6 plots = 6000 m^2 necessary for complete growing cycle

b) Multiplying stage: average production is 450 seedlings/m^2 with 1 year growing period

Necessary for 1000 trees ready for selling: 1000 seedlings + 10% reserve = 1100 pieces

Total: 1100/450 = 2.5 m^2 surface required for planting

The production capacity of the proposed nursery in complete growing cycle is the following:

Standard material:

- Conifer trees: 4060 pieces.
- Deciduous trees: 17550 pieces.
- Conifer shrubs: 4440 pieces.
- Deciduous shrubs: 49800 pieces.
- Fruit trees: 8050 pieces.

High size trees: 230 pieces, (growing schools =4+4+4 years).

Small and medium container grown material:

- Trees: 5600 pieces (5 years).
- Shrubs and climbers: 150000 pieces (3 years).

This production follows a certain development in time depending on growing cycle period for various categories of planting material, so that the highest efficiency of the investment will be reached only after the first 10-16 years of activity (table n^o 2).

4. Drawing up estimates on the basis of norms and recommended technologies;

The estimates were drawn on the basis of forest regulations, which have the following advantages:

- they are updated according to new technologies;
- they can be used for high division rate surfaces, such as those of the nursery with various sorts.

5. Estimating technical economic indicators

On the basis of the estimates, following proper technologies, are estimated the costs for each production category (table n^o 3).

Selling prices for each category of planting material starting from production costs. They are compared to the average sum of the market prices for each production category analysed, pointing out the advantage of local production for the nurserymen, as well as for the buyer.

The profit rate estimation on the basis of the profit and total costs for each production category represents the technical economic indicative best reflecting efficiency. For this the following formulas are used:

Profit rate = Profit/Total costs per crop x 100

Profit = Selling price – Total costs

Total costs = work spending (manual and mechanical) + value of the materials + provision spending + common spending + other spending

Efficiency on standard planting material is higher for fruit and graft trees and also for bare root deciduous shrubs (short cycle and low production cost).

The lowest profit rate recorded is at rootballed deciduous trees and conifer shrubs. In their case the efficiency can be improved by selling excedentary at the second planting in school two. If immediate demand is not met for this material, we can turn to introducing it in container growing cycles, which ensure minimum losses and high profit rate.

B. <u>The case of large nurseries</u>

The project development has the following order:

1. Estimating production figures:

One can estimate production figures taking into account a guideline of necessary planting material for installing urban landscapes. We have taken into consideration average numbers of ornamental plants necessary for 1 ha green area. (table n^{o} 1)

The estimations for a big nursery should have as base the presumed developing surface of green areas in the next 20 years, and also theoretical necessary of planting material for replacements in urban landscapes.

2. Establishing production categories:

The production categories and growing rates were established following guiding data about the necessary planting material.

- high size trees
- high size shrubs
- small trees

3. General evaluation of nursery dimensions:

This formula can be applied as guideline:

$$\mathbf{S=(AxS_1 + axS_2) \; x \; K}$$

S – nursery surface in m^2;
A – number of large nursery young trees;
S_1 – necessary surface for growing a high size tree = 6 m^2;
S_2 - necessary surface for growing a small tree or high size shrub = 0.7 m^2;
a – number of young trees and shrubs;
K – 1.3 x surface covered by roads and additional structures.
A = 50000 pieces
a = 275000 pieces
S = 640250m^2 (64ha)

The method is applicable mostly for outside city nurseries, on compact surface.

Drawing up estimations and computing technical economic indicatives is similar to the one applied for limited surface nurseries, using the same grades and formulas.

However in this case we must notice that growing efficiency is highly due to larger production figures and cultivated surfaces.

CONCLUSIONS

1. The method presented provides a systemic draft of a nursery project and it is a stage in establishing total investments.
2. Taking into account the significant difference between estimated and existing prices and the obtained profit rate we notice that the proposed project method has a high degree of viability.
3. By analyzing production capacity for both methods proposed we notice that the demand for planting material is met after a given period of time, which can come up to 10 years and more for certain production categories.
4. The-investment cover of a nursery can be accelerated by growing a flexible assortment of tree, shrub and fruit tree with certain demand on the market (climbing roses, exotic flowering shrubs, village shrubs, cherry tree and seeds for hedges). Also it can be applied intercalate crops, rising efficiency by using surface for growing high trees, which allow short growing cycle shrub species between the lines.
5. The advantages of establishing a nursery for Bucharest are not only economic, but also ecologic, because planting material obtained in city area has a higher degree of adaptability to local conditions.

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Table no. 1 Necessary tree planting material

No.	Planting material category	Necessary for 100ha (pieces)	Growing period (years)
1	high trees	400-600	15-29
2	high shrubs	1000-1200	4-5
3	small trees	1500-1800	19-21

Table no. 2 Growing period for planting material

No	Planting material category	Growing period		Total period (standard)
		seedlings	growing schools	
1	graft and non-graft conifers	2-3	3+4	9-10
2	conifer and evergreen shrubs	1-2	2+2	5-6
3	graft deciduous and fruit trees	1-2	2	3-4
4	bare root deciduous trees	1-3	3-7	1-10
5	rootballed deciduous trees	1-3	3+3	7-9
6	graft roses	2	2	4
7	bare root deciduous shrubs	1-2	2-4	3-6

Table no. 3 Efficiency for each production category and delivery prices

No.	Planting material category	Proposed delivery price (thousands lei)	Delivery price (thousands lei)	Total costs/pieces (thousands lei)	Profit rate (%)
standard					
1	graft conifers	450	7000	391	15
2	non-graft conifers	400	4000	357	12
3	conifer and evergreen shrubs	250	500	242	3.5
4	graft deciduous and fruit trees	120	1500	90	33,8
5	bare root deciduous trees	110	2500	92	20
6	rootballed deciduous trees	210	700	197	6,7
7	rootballed deciduous shrubs	100	150	93	7,6
8	graft roses	25	150	19	25,14
9	bare root deciduous shrubs	25	250	18	41,5
10	high trees	2220	12000	2085	6,5
container grown (small)					
11	graft conifers	250000	1200	120	109,1
12	deciduous trees	130000	4500	69	88,3
13	shrubs	15000	320	9	74
14	climbers	20000	150	11	80,8

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ASPECTS RELATED TO THE DETERMINATION OF THE ANTIOXIDANTS IN THE CASE OF SOME EATABLE FLOWERS

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Keyworks: free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers

SUMMARY

In Romania there is no data concerning the chemical structure of the eatable flowers, either part of the spontaneous flora, or of the cultivated one, however tests have been made on the plant: leaves, stems, roots. The flowers of these species are surely eatable, depending on the extent to which receipts are known. This works deals with the above-mentioned species.

The analysed chemical constituents are just a few of the big group of the proanthocyans, notably: total polyphenols, anthocyans and catechins.

Taking into account the diversity of the structures of the phenolic constituents, still undefined completely, the dozing methods are not perfect, but they are often sufficient for measuring the quantity of the existing molecules, in this case, in the extract of the eatable flowers petals.

INTRODUCTION

The current knowledge in relation to the influences of the free radicals on the body immunity and on the ageing process, lend importance to the dietary antioxidants (ascorbic acid, tocopherols, selenium, methionine, cysteine, polyphenols, etc.). The antioxidants have complex anti-cancer effect upon the body by protecting it in the pathology of the coronary vessels, and by stimulating the immunity of the body.

Our temperate climate is favourable to over 150 eatables flowers that grow on the fields and in the gardens. The existent data in the specialized literature related to the constituents analysed on each plant and their influence
on the immunity of the body refers also to carotens and vitamin A, which is known to influence the immune system. Their lack leads to numerous infections. A generic term for the analysed constituents would be proanthocyanidols. The necessary daily doze of proanthocyanidols is considered to be 100 mg.

MATERIALS AND METHODS

The species that were selected from the neighbourhood area are the most easily to be found, the most common ones in the cultivated gardens, the simplest species cultivated in pots or wild species easily to pick up, but unknown as eatable plants.

The following species have become experimental variants (with a description of the colour of the extracts):

V1- *Syringa vulgaris*, lilac white, straw coloured
V2- *Yucca,* iuca- straw coloured
V3- *Taraxacum officinalis*, dandelidon, the flowers buds – green-yellow
V4- *Taraxacum officinalis*, dandelidon, flowers – green-yellow
V5- *Taraxacum officinalis*, dandelidon, leaves – light pink
V6- *Helianthus annuus,* sunflower – straw coloured
V7- *Calendula officinalis*, marigold – yellow-orange
V8- *Hemerocalis fulva*, yellow lily- yellow-orange

V9- *Bellis perenis*, daisy – light pink
V10- *Althea rosea*, rose mallow- pink- light mauve
V11- *Equinacaea purpurea*- light mauve
V12- *Tropaeolum majus*, nasturtium – red-orange
V13- *Monarda didyma*- red bluish
V14 - *Rosa*, rose, fresh flowers- garnet red
V15 – *Rosa,* rose, dry flowers- garnet red
V16 - *Hibiscus*, Japanese rose- intense red
V17- *Salvia officinalis*, common sage - mauve
V18- *Viola tricolor*, pansy - mauve – pink
V19- *Syringa vulgaris*, mauve lilac – intense mauve
V20- *Althea rosea,* mallow, intense red flowers – red-black

The following extraction diagram was taken into consideration when determining the chemical constituents of the eatable flowers:

Extraction preparation diagram

Samples from nature | Culture

Eatable flowers

Separation of eatable parts

Weight

Grinding

Maceration

Extraction in HCl

The extraction of the plants (the eatable parts) was made HCl 1%.

Methodology:

The petals (or, generally the eatable parts) are removed, washed, dried;
- 50 g plant (flowers) are grinded by quartz sand in a grinding mortar;
- the obtained paste is put in a Berzelius glass with 50 ml HCl 1%;
- it is left there 12 hours;
- the clear part is afterwards put in glass marked at the level of 100 ml, on filter paper, using another 50 ml HCl 1%;
- the filtered liquid has to get to the level marked on the glass.

The total polyphenols were determined following the Singleton and Rossi method, 1965, while the anthocyans were determined from the quantitative point of view following the Ribereau-Gayon and Stonestreet method, 1965. The riding is made directly, in comparison with the water, in the glass of 1cm. The catechins were determined by their reaction with the vanilin.

RESULTS AND DISCUSSION

These determinations, made at ICDVV Valea Calugareasca, revealed the following doze of proanthocyanidols, in the extracts obtained from the flowers' petals:

The dozes of total polyphenols, anthocyans and catechins in the flowers:
1 cm glass

Variant	Scientific name	Total polyphenols g/kg, in galic acid	Anthocyans mg/kg	Catechins mg/100 g plant
V1	*Syringa, white flowers*	1,754	2.00	10.4
V2	*Yucca, iuca*	0.091	-	12.4
V3	*Taraxacum buds*	0.267	2.00	45.0
V4	*Taraxacum flowers*	0.172	1.78	47.0
V5	*Taraxacum leaves*	0.456	5.96	25.0
V6	*Helianthus annuus*	0.157	-	15.4
V7	*Calendula officinalis*	0.163	-	13.8
V8	*Hemerocallis fulva*	0.110	64.00	12.4
V9	*Bellis perenis*	0.163	2.00	13.8
V10	*Althea var. rosea*	0.289	492.00	6.5
V11	*Equinacaea purpurea*	0.330	560.00	12.6
V12	*Tropaeolum majus*	0.176	2521.00	5.0
V13	*Monarda didyma*	0.447	825.00	25.8
V14	*Rosa fresh flowers*	0.560	1194.00	5.9
V15	*Rosa dry flowers*	0.480	1148.00	5.2
V16	*Hibiscus*	0.281	1419.00	4.5
V17	*Salvia officinalis*	0.373	30.98	7.8
V18	*Viola, pansies*	0.337	30.45	1.4
V19	*Syringa mauve*	1, 525	34.64	5.5
V20	*Althea var. nigra*	0.247	3196	12..9

The doze of total polyphenols in the flowers organizes the studied species according to the following scale:

- high doze, from 1,525 to 1,754 g/kg *Syringa* flowers, white and mauve;
- Average doze, from 0.289 to 0.560 g/kg *Equinacaea, Monarda didyma* flowers, *Rosa*, fresh and dry flowers, *Salvia officinalis, Viola*;
- Small doze: 0.091-0.289 g/kg *Yucca* flowers, *Taraxacum off.*, *Helianthus annuus, Calendula, Hemerocallis, Bellis perenis, Althea rosea*, var. pink and garnet-red, *Tropaeolum majus, Hibiscus*.

Regarding the anthocyans, here is the assessment scale of the dozes found in the flowers:

- Very high doze: > 3000 mg/kg in *Althea rosea* flowers, var. garnet-red;
- high doze, from 2000 to 3000 mg/kg in *Tropaeolum majus* flowers, *Rosa,* fresh and dry flowers, *Hibiscus* and *Monarda* flowers;
- average doze: from 1000 to 2000 mg/kg in *Althea rosea* flowers, var. pink and *Equinacaea*;
- small doze, from 500 to 1000 mg/kg in *Taraxacum off*. flowers, *Hemerocallis, Salvia, Bellis, Viola, Syringa* mauve.

There are no anthocyans in *Syringa vulgaris* and *Yucca* white flowers.

Regarding the catechins, here is the assessment scale of the dozes found in the flowers:

- high doze, over 10, as in the case of *Syringa* alb, *Yucca, Taraxacum*, *Helianthus, Calendula, Hemerocallis, Bellis, Equinacaea, Monarda* flowers, *Althea rosea* flowers, var. garnet-red;
- average doze, from 5 to 10, as in the case of *Althea rosea* flowers, var. rose, *Tropaeolum, Rosa* fresh and dry flowers, *Salvia, Syringa* mauve;
- small doze, from 1 to 5: *Hibiscus* and *Viola* flowers.

CONCLUSIONS

The chemical analysis of the eatable flowers of the studied species reveals the following dozes:

- total polyphenols: from 0,091 and 1749 g/kg, given as galic acid:
- anthocyans, from 500 to 3000 mg/kg;
- catechin, from 1 to 47 mg/100 g plant, respectively flowers petals.

Without making serious changes in our diets, the anthocyans could be a good menu for all our meals, thus contributing to a large extent to the improvement of our health. In the coming yeas, when the anthocyans will be known by the consumers, they will certainly change our diets. In the same time, we shall have to get used to see more flowers in our plates.

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RESEARCHES RELATED TO THE DETERMINATION OF SOME EATABLE FLOWERS COLOUR BY CHEMICAL AND BIO-CHEMICAL METHODS

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Keywords: optic density, colour intensity, pigments, , chromo-therapy

SUMMARY

We are all asking the following question: „What determines the colour of the petals?". In other words: „What determines the yellow, the red, the blue, the purple, or the aesthetic mixtures of the colours of the petals?" The answer is: the pigments, natural colouring substances, which colour the petals.

The present work aims to contribute to the study of pigments of the flowers' corolla, which, apart from their role played in the metabolic process of the plant, represents bio-stimulating substances. The study consists in a spectrophometric analysis of the colour.

From the point of view of the spectrum, the colour can be assessed by the inclusion of three constituents: red, yellow and blue. Each constituent is given by pigments with well-defined chemical structure.

The colours of the objects that we see are often described by means of terms like red, orange, yellow, etc., to which we add their shades. Visually speaking, the shades are hard to separate, but from the spectrophotometric point of view, they can be separated in terms of values.

The obtained information will be more precise if one compares the full range of wavelength perceived by the human eyeball (380-770 nm). That is why a method that uses the full spectrum shall supply, in principle, larger and more precise information about the colour. It is exactly the case of CIELab system, because the determination of the values of the chromatic characteristics in CIELab system represents a better variant in the separation of the colours' shades. This makes possible an objective assessment of the colour.

The medicine proved that the colours of the flowers could lead to different states of mind. Due to their sanogenetic characteristics, the eatable flowers are used in the chromo-therapy.

INTRODUCTION

The colour is a powerful way of expression. All living creatures use this method in order to attract or to reject. Plants do it the best. The plants, from the water to the land ones, have largely developed their secondary metabolites. By their biological activity and by their diversity, they allowed the protection and the evolution of the plants, thus **compensating their immobility**.

Most of these secondary metabolites have a phenolic origin and contribute to the coloured expression of the plants. While some polyphenols can be detected with the naked eye through their natural colour, we can also talk about a **masked colour**. This means that the poliphenols can appear with unexpected colours or new colours, according to the their location in the vegetal tissues or to the angle from which they are studied.

MATERIALS AND METHODS

The species that were selected from the neighbourhood area are the most easily to be found, the most common ones in the cultivated gardens. The following species have become experimental variants (with a description of the colour of the extracts):

V1- *Syringa vulgaris*, lilac white, straw coloured
V2- *Yucca*, iuca- straw coloured
V3- *Taraxacum officinalis*, dandelidon, the flowers buds – green-yellow
V4- *Taraxacum officinalis*, dandelidon, flowers – green-yellow

V5- *Taraxacum officinalis*, dandelidon, leaves – light pink
V6- *Helianthus annuus*, sunflower – straw coloured
V7- *Calendula officinalis*, marigold – yellow-orange
V8- *Hemerocalis fulva*, yellow lily- yellow-orange
V9- *Bellis perenis*, daisy – light pink
V10- *Althea rosea*, rose mallow- pink- light mauve
V11- *Equinacaea purpurea*- light mauve
V12- *Tropaeolum majus*, nasturtium – red-orange
V13- *Monarda didyma*- red bluish
V14 - *Rosa,* rose, fresh flowers- garnet red
V15 – *Rosa*, rose, dry flowers- garnet red
V16 - *Hibiscus*, Japanese rose- intense red
V17- *Salvia officinalis*, common sage - mauve
V18- *Viola tricolor,* pansy - mauve – pink
V19- *Syringa vulgaris*, mauve lilac – intense mauve
V20- *Althea rosea*, mallow, intense red flowers – red-black

The following extraction diagram was taken into consideration when determining the chemical constituents of the eatable flowers:

Extraction preparation diagram

Samples from nature | Culture

Eatable flowers

Separation of eatable parts

Weight

Grinding

Maceration

Extraction in HCl

<u>Determination of the intensity of the colour</u>
The 1 cm pot is used
The colour intensity shall be read for the following wavelengths: 420, 445, 495, 520, 530, 550, 620, 625, 640.

Intensity of the colour = the sum the optic densities corresponding to the wavelengths of 420 and of 520 nm and to the liquid layer's thickness of 1 cm. A minimal and a maximal value of the optic density curve correspond to these wavelengths.

Shade= the angle between the axis of the wavelengths and the line that connects the points of the spectrophotometric curve corresponding to the optic densities for the wavelengths of 420 nm and 520 nm.

RESULTS AND DISCUSSION

The obtained extracts made possible the determination, by spectrophotometric reading, with the help of Spekol device with electronic display, of the optic density for different wavelengths, notably to those perceived by the human eye. The values are given in the table below:

Table 1
The optic density according to different wavelengths of the extracts of the eatable flowers, 1 cm glass

Variant	Scientific name	420 nm	445 nm	495 nm	520 nm	530 nm	550 nm	620 nm	625 nm	640 nm
V1	*Syringa,white lowers*	0.285	0.265	0.145	0.125	0.100	0.065	0.105	0.100	0.105
V2	*Yucca, yucca*	6.60	7.20	9.0	6.20	5.40	2.0	0.18	0.17	0.14
V3	*Taraxacum buds*	0.25	0.21	0.17	0.145	0.135	0.125	0.12	0.145	0.1
V4	*Taraxacum flowers*	0.2	0.155	0.18	0.165	0.135	0.12	0.105	0.12	0.085
V5	*Taraxacum leaves*	0.295	0.225	0.225	0.2	0.195	0.155	0.14	0.105	0.11
V6	*Helianthus annuus*	0.65	0.67	0.36	0.28	0.32	0.20	0.16	0.15	0.13
V7	*Calendula officinalis*	0.93	0.80	0.60	0.22	0.19	0.13	0.31	0.13	0.10
V8	*Hemerocallis fulva*	1.67	1.73	2.53	0.70	0.75	0.82	0.32	0.27	0.25
V9	*Bellis perenis*	0.93	0.80	0.60	0.22	0.19	0.13	0.31	0.13	0.10
V10	*Althea var. rosea*	1.83	2.0	3.77	0.54	11.43	8.57	0.77	0.63	0.53
V11	*Equinacea purpurea*	2.10	2.0	1.0	6.20	12.00	10.20	0.68	0.70	0.55
V12	*Tropaeolum majus*	12.13	12.23	23.27	27.69	23.61	8.74	0.69	0.42	0.37
V13	*Monarda didyma*	9.63	10.80	28.97	9.07	9.18	4.90	0.41	0.26	0.23
V14	*Rosa fresh flowers*	11.70	12.57	13.00	13.11	18.24	13.17	0.63	0.55	0.46
V15	*Rosa dry flowers*	9.37	10.53	10.97	12.61	17.83	12.09	0.56	0.39	0.38
V16	*Hibiscus*	11.17	12.10	13.77	15.59	10.63	14.60	0.79	0.77	0.67
V17	*Salvia officinalis*	0.57	0.47	1.03	0.65	0.88	0.80	0.12	0.14	0.15
V18	*Viola, pansies*	0.41	0.395	0.565	0.78	0.845	0.81	0.195	0.18	0.145
V19	*Syringa mauve*	0.53	0.457	0.79	0.86	0.85	0.685	0.155	0.19	0.165
V20	*Althea var. nigra*	21.0	23.17	32.40	35.10	35.19	37.24	1.08	1.00	0.98

According to the classic method (in the visible spectrum), the results can be interpreted as follows:

Table 2

Variant	Species	IC	T	dA (%)	D420 (%)	D520 (%)	D620 (%)
V1	*Syringa,white*	-	-	-	-	-	-
V2	*Yucca, yucca*	12.980	1.065	-	-	-	-
V3	*Taraxacum buds*	-	-	-	-	-	-
V4	*Taraxacum flowers*	-	-	-	-	-	-
V5	*Taraxacum leaves*	-	-	-	-	-	-
V6	*Helianthus annuus*	1.090	2.321	-	-	-	-
V7	*Calendula off.*	1.460	4.227	-	-	-	-
V8	*Hemerocallis fulva*	2.690	2.386	-	-	-	-
V9	*Bellis perenis*	84.89	62.34	-	-	-	-
V10	*Althea var. rosea*	8.000	0.339	75.93	22.88	67.50	9.63
V11	*Equinacea urpurea*	10.200	0.330	60.45	25.30	64.40	9.22
V12	*Tropaeolum majus*	40.510	0.438	76.85	29.94	68.35	1.70
V13	*Monarda didyma*	19.110	1.062	64.65	50.39	47.46	2.15
V14	*Rosa fresh flowers*	25.440	0.892	52.97	45.99	51.53	2.48
V15	*Rosa dry flowers*	22.540	0.743	60.63	41.57	55.94	2.48
V16	*Hibiscus*	27.550	0.716	61.64	40.54	56.59	2.87
V17	*Salvia officinalis*	1.340	0.877	61.54	26.80	55.90	12.62
-V18	*Viola, pansies*	1.380	0.526	61.54	29.71	56.52	13.77
V19	*Syringa mauve*	1.530	0.599	61.05	33.66	56.21	9.19
V20	*Althea var. nigra*	57.180	0.598	68.55	36.73	61.39	1.89

Where: dA (%) is the percentage of flavilium cations (the dominant wavelength), d 420 (%) percentage for yellow, d520 (%) percentage for red,, d620 (%) percentage for blue.

Taking into consideration the spectrum, the colour can be assessed by the inclusion of three constituents: red, yellow and blue. Each constituent is given by pigments with well-defined chemical structure.

Thus, the red constituent is related to the free anthocyans under the shape of flaviliu cathions and to the combinations of tannins-anthocyans. They play an important part in the stability and the shade of the colour of the red flowers. The yellow constituent of the global colour is related to the tannins and to the degradation products of the anthocyans. The structure of these constituents determines a variety of colours, from yellow to orange. The blue constituent of the colour is related to the free anthocyans under the shape of quinone base (A-O) and to the combinations tannins-anthocyans.

In the classic system, the colour intensity has negative values for the white flowers, so it couldn't be presented as values because of the small readings to the wavelengths of 420, 520, 620 nm.

The information thus obtained is restricted and less precise unlike the case in which we compare it with the full range of wavelength perceived by the human eyeball (380-770 nm). That is why a method that uses the full spectrum shall supply, in principle, larger and more precise information about the colour. It is exactly the case of CIELab system.

According to CIELab system, the results can be interpreted as follows:

Table 3

Variant	Species	L	C	a	b	b/a	The colour of the extract
V1	*Syringa,white*	92.70	23.79	-11.47	20.84	-1.82	White-yellowish
V2	*Yucca, yucca*	44.45	125.84	-71.60	103.49	-1.45	Straw coloured
V3	*Taraxacum buds*	88.47	10.16	-4.99	8.85	-1.77	Yellow greenish
V4	*Taraxacum flowers*	69.01	4.29	0.76	4.22	5.54	White-grey
V5	*Taraxacum leaves*	86.95	9.78	3.07	9.29	3.02	Onion pink
V6	*Helianthus annuus*	82.55	43.45	-9.19	42.46	-4.62	Straw coloured
V7	*Calendula off.*	84.89	62.34	-9.41	61.62	-6.55	Onion pink
V8	*Hemerocallis fulva*	52.20	76.89	36.24	67.81	1.78	Pink
V9	*Bellis perenis*	84.89	62.34	9.41	61.62	6.55	Light pink
V10	*Althea var. rosea*	25.83	62.59	53.71	32.14	0.60	Purple red
V11	*Equinacea purpurea*	30.22	80.52	61.22	48.52	1.08	Purple pink
V12	*Tropaeolum majus*	33.14	104.52	61.22	84.72	1.38	Intense red
V13	*Monarda didyma*	39.56	118.15	69.21	95.96	1.38	Intense red
V14	*Rosa fresh flowers*	28.47	94.60	55.40	76.67	1.38	Ruby red
V15	*Rosa dry flowers*	34.29	106.90	62.64	86.62	1.38	Ruby red
V16	*Hibiscus*	21.56	79.89	46.80	64.75	1.38	Ruby red
V17	*Salvia officinalis*	60.57	55.70	49.82	-14.33	-0.26	Pink-mauve
V18	*Viola, pansies*	59.52	52.20	50.25	-14.12	-0.28	Pink-mauve
V19	*Syringa mauve*	60.50	45.35	45.31	-1.92	-0.04	Raspberry pink
V20	*Althea var. nigra*	15.49	66.98	39.22	-54.29	-1.38	Dark red

where L= luminosity, c= saturation, +a= position between green and red, -b= position between blue and yellow (image of the colour system CIELab).

L, the luminosity varies from O (black) to 100 (white). From this point of view, *Syringa,* the white lilac has the higher luminosity, close to 100 (92.70), the visual impression of light being best perceived in the case of this flower; *Althea rosea var. nigra*, has the smaller luminosity, only 15.49 and the visual impression is that of dark red, almost black.
a is the position between green and red (-100, +100)
b is the position between blue and yellow (-100, +100).

The average position, a=0 , b=0 and L=50, means grey and it is the case of the extract obtained from the dandelion flowers, *Taraxacum off.*

For instance: a= - 11.47 and b= 20.84, which means, in the organoleptical assessment, straw coloured.

Psychologists noticed that certain colours influence the mind, cheering us or making us sad, calming or wearing us out. The colour is nowadays analysed not only by painters but also by specialists in ergometry and work safety. The medicine proved that the colours of the flowers could create certain states of mind:

Table 4
The connection between the food's characteristics and its colour

Colour	Specific composition	Sanogenetic characteristics	Chromo-therapy
Yellow/orange	βcaroten Vitamin A Vitamin C Vitamin E	Improvement of the skin, of the eyesight and strengthening of the bones. Protection of the body against infections	This colour stimulates the appetite and favours the digestion. Fights depression and helps the metabolism.
Red/purple	Vitamin C, pigments that strengthen the immune system and anti-cancer substances	Protection of the body against free radicals and strengthening of the arteries	It is the colour of vitality and energy, gives the impression of warm and stimulates the brain. Influences the vital instincts.
Green	Chlorophyll and fibres, vitamin C	Detoxification, fight against cellulite and anaemia, stimulation of the liver's functions, fight against cancer.	It is a colour that relaxes, tones up and keeps the body and the mind in a good shape. Influences the heart and the affect .

CONCLUSIONS

1. It is difficult to distinguish between the definition of the colours and the definition of the shades, so we need to use spectrophotometric methods that allow us to assess them as comparable values. Visually speaking, the shades are hard to separate, but from the spectrophotometric point of view, they can be separated in terms of values.
2. The classic system of appreciation of the colour can be used in the limited value presentation of the chromatic characteristics.
3. The determination of the values of the chromatic characteristics in CIELab system represents an improved variant in the differentiation of the shades of the colour. This method integrates the visible spectrum (according to the photometric importance) and allows us to make an objective assessment of the colour.
4. The white and the yellow flowers cannot be characterized from the point of view of their participation to the colour of the yellow red and blue constituent, following the classic method. In the case of the pink and red flowers, the yellow and the red constituents equally participate while the blue constituent is higher in the case of the pink flowers (Althea and Equinacea). The blue constituent is reduced in the case of the red flowers. Their chromatic spectrum is very high and this gives the impression of red. The mauve flowers have the almost same percentage of yellow constituent as the red flowers, the same percentage of red constituent as the red flowers, and the higher blue constituent among all the analysed flowers.

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SALINITY RESISTANCE TESTING ON SOME ORNAMENTAL SPECIES: *TAMARIX TETRANDRA* AND *SYMPHORICARPOS X DOORENBOSSII*

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Keyword: substrate, pH, salinity, ornamental plants

ABSTRACT

Containerized plants of *Tamarix tetrandra* and *Symphoricarpos x doorenbossii* were fertilized with nutritive solutions (with alkaline pH) from May to August. Due to the salts accumulation in substrates, differences among the variants regarding the plant growth and development were observed.

INTRODUCTION

The containerized cultures of ornamental woody plants have become an important link for the production of plant material. Salt tolerance of plants is considered a limitative factor, which must be considered for the species selection in this culture system, because some species are more tolerant to salinity than others.

Because of the reduced volume of substrate and the repeated watering, the concentration of the nutrients in the soil solution can increase to excessive, with negative effects on the plant development. The risk of excessive salt accumulation in soil is called salinity. The soil salinity is expressed either by the content of dissolved salts (mg/l or ppm) or the electrical conductivity (CE) in mS/cm. The value of the pH for the containerized cultures has an important influence on the nutrients uptake.

The results obtained in the present study showed that *Tamarix tetrandra* require a soil pH level between 6 to 8 and *Symphoricarpos x doorenbossii* a pH of 6. One of the main aims of this study was to establish the limits of tolerance for salts variation in these 2 species, due to repeated watering.

MATERIALS AND METHODS

Salt tolerance of the ornamental plants was investigated in controlled conditions at the glasshouse of the University of Agronomic Sciences and Veterinary Medicine Bucharest.

The plant material was represented by two shrub species: *Tamarix tetrandra* and *Symphoricarpos x doorenbossii*. One year old rooted cuttings were planted in containers in March. For a month the plants were watered with ordinary water, and then, starting with May, two nutritive solutions (modified Robbins solution and Hellriegel solution) were used for this purpose. Both the irrigation water and the nutritive solutions were analyzed regarding the conductivity and the pH.

The control variant was watered only with simple water. The application of the nutritive solutions (alkaline pH) was followed by observations concerning the behavior of the plants through: biometrics measurements, physiological analysis, N P K determinations in leaves. The dynamics of pH and mineral salts, and the N P K soil content were determined. The water used for irrigation and the nutritive solutions were also analyzed. The growth of the plants was registered monthly by: the height of the plants, the cumulative length of the shoots, the number of the shoots/plant and the butt diameter.

RESULTS AND DISCUSSIONS

Analyzing the results presented in Table 1 obtained by the substrate (celery soil + leaves soil + forestry compost + sand or Cs+Ls+Fc+S; ratio 1:1:1:0.3), it can be observed that the value of electrical conductivity was 0.25 mS/cm, which is favorable for the culture of the plants sensitive to salinity.

During the culture, because of the fertilizations with nutritive solutions the CE values varied and significant differences were remarked comparing with the control. For *Tamarix tetrandra* between 0.27-0.3 mS/cm – the maximum value registered in August at the variant fertilized with Robbins solution.

The pH was relatively constant in June and July, but it started to decrease in August for the variant with the highest values of CE. The conductivity evolution was similar for both species *Tamarix tetrandra* and *Symphoricarpos x doorenbossii.*

Studying the evolution of conductivity, it was observed that the nutrients uptake in plants decreased in May and June due to an increase of the soluble salts in substrate.

This supra-saturation was more obvious for the variant fertilized with Robbins solution, which has a higher pH and a bigger salt content then Hellriegel solution. The fast decreasing of the concentration in soluble salts of the substrates at the beginning of September was a consequence of the finalization of the fertilizations, the nitrates being wash down with the irrigation water.

CONCLUSIONS

High salinity diminishes plant growth and may even cause plant death, therefore care should be taken to avoid excessive salt accumulation from any source.

The selection and the cultivation of trees and shrubs species with salt tolerance (alkaline pH) and the observation of the fertilizations over the anatomy of the shoots and leaves. The differences among the variants were determined by the different fertilizations with nutritive solutions, which influenced the CE evolution and the pH considerably.

To assure the control of the salinity in substrates, electrical conductivity must be considered.

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Tables

Table 1. The chemical characteristics of the substrate before the fertilizations

Substrate	pH(H_2O)	Electrical conductivity
Cs+Ls+Fc+S; ratio 1:1:1:0.	7.98	0.25

Figures

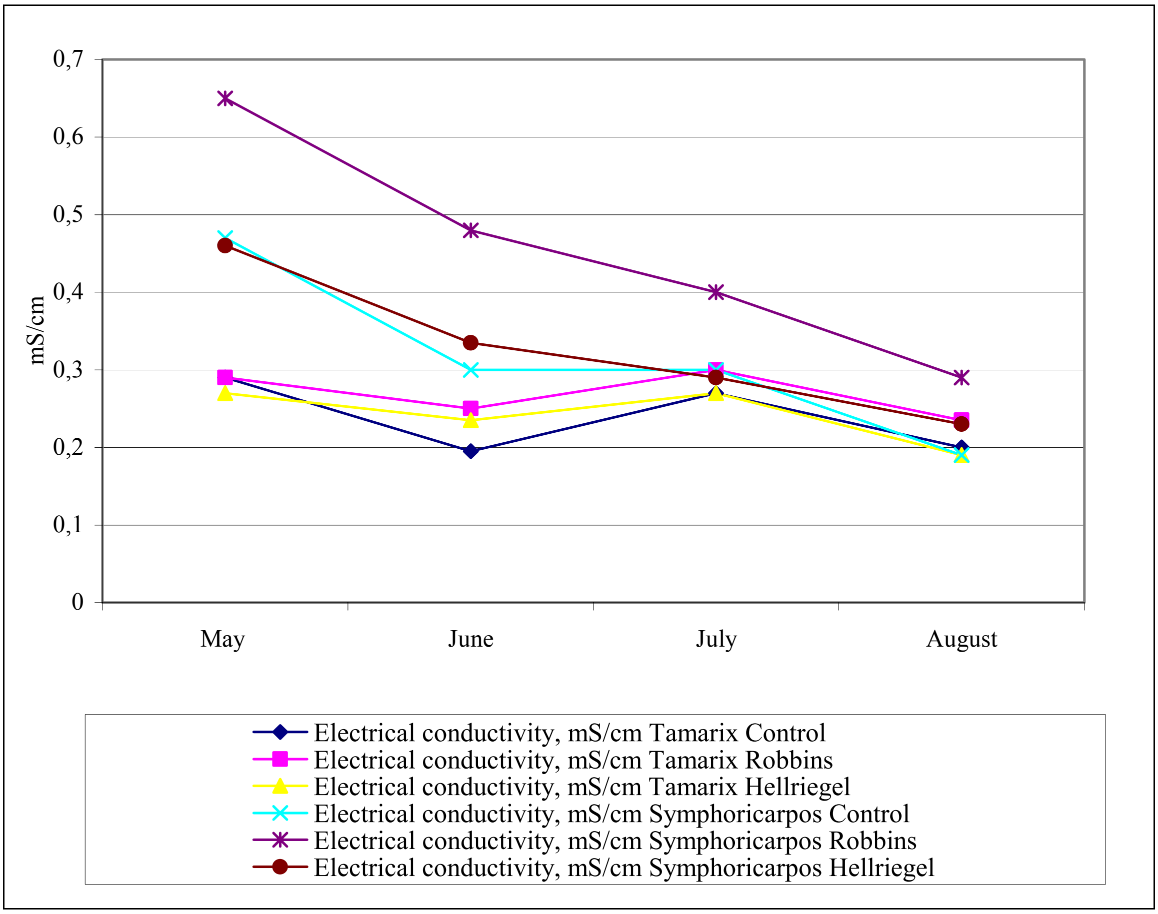

Fig 1. The evolution in time of the electrical conductivity (mS/cm) at *Tamarix tetrandra* and *Symphoricarpos x doorenbossii*

Fig.2. *Tamarix tetrandra*

Fig.3. *Symphoricarpos x doorenbossii*

Fig.4. *Symphoricarpos x doorenbossii* and *Tamarix tetrandra*

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

RESEARCH REGARDING *HYDRANGEA MACROPHYLLA* SER. POTS CULTURE ON DIFFERENT SUBSTRATE

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Key words: *Hydrangea macrophylla* Ser. plants, container culture, substrates, leaves compost

ABSTRACT

Hydrangea macrophylla Ser. is an ornamental plant, nice for its decorative flowers. Experiment made in glasshouse of University of Agronomical Science and Veterinary Medicine- Bucharest tries to obtain these plants in container culture using different substrates formed with different waste materials.

INTRODUCTION

Hydrangea macrophylla Ser. is one of the glamorous plants which blossoms in forced culture from March to May with big flowers, pink, white or blue. It is cultivated in open fields, in deep shade places and in public gardens where it blossoms from June to October. The aspects of *Hydrangea macrophylla* Ser. flowers are nice and decorative (A. Popa si colab., 1962, E. Selaru, 1998, V. Davidescu, 2001, F. Stanica, 2002, D. Davidescu, 1992).

The aim of this research was to obtain *Hydrangea macrophylla* Ser. flowers in containers using substrates formed from the mixture of different waste materials (leaves compost) compared with classic materials like peat and sand.

MATERIALS AND METHODS

The experiment was made in the glasshouse of University of Agronomical Science and Veterinary Medicine- Bucharest. At the beginning transplants were made on different mixtures formed from manure, peat, sand and forestry leaves compost. Then, the transplants were introduced in 5 kg containers. The pots were filled with 4 variants of volumetric mixture formed with red peat, garden soil, sand and forestry leaves compost. Each variant had 10 replicates.

Agrochemical analyses of the 4 variants were made. During the vegetative periods biometric measurements and analyses of plants were made. For the statistical interpretation Fisher test was used.

RESULTS AND DISCUSSIONS

Agrochemical characteristics of substrates were presented in Table 1. The pH values were between 6.22 and 6.48 soluble salts contents varied between 0.13% and 0.3% and characterized a weak content of the substrates. The contents of macroelements presented high values of nitrogen and potassium, but smaller values of phosphorus.

Biometrical measurements of *Hydrangea macrophylla* Ser. were presented in Tables 2 and figure 1.

The height of plants differed with the variant and also with the vegetation period.

At May 11 the highest plants were obtained in variant 3 with red peat, garden soil, leaves compost and sand in proportion 20%, 305%, 40%, 10%. The other plants from other variants realized variable heights, but smaller than the control.

In the other period of measurements in June and July, respectively variant 3 also registered the highest values of height.

In August and September, the highest values of plants height were registered in variant 2 with 30% leaves compost.

During the vegetation period beginning in August and September the shoots were abundant so that in all the variants the cumulative length of shoots in August presented the highest value.

In blossom, variant with 40% leaves compost assured the highest number of flowers, with a difference of 18 flowers compared with the control and than the variant with 45% leaves compost with a number of 15 flowers.

Statistic analysis of the cumulative shoots length with Fisher test shows that the most significant variant from the point of view of development of plants is the variant 3 with 30% leaves compost (Table 3).

CONCLUSIONS

1. The plants height varied with the substrates composition and vegetation period;
2. In June and July variant 3 with 40% leaves compost registered the highest values of the height. It is noticed on the experimental variants that, in July, all the variants with variable content of leaves compost overtook the control;
3. In August and September, the highest values of the plants height were registered in the variant 2 with 30% leaves compost and in the others variant, with 30% - 45% leaves compost, the plants height overtook the control;
4. The statistic analysis of the cumulate shoots length with Fisher test shows that the most significant variant concerning the development of plants is the variant 3 with 30% leaves compost;
5. The variant with 40% leaves compost provides the highest number of flowers.

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Tables

Table 1. Agrochemical characteristics of substrates

Variant	pH	Soluble salts total content %	Content, ppm			
			NH_4^+	NO_3^-	PO_4^{3-}	K^+
Red peat:Garden soil:Sand 45%:45%:10%	6.22	0.39	24.37	570	3.5	210
Red peat:Garden soil:Leaves compost:Sand 30%:30%:30%:10%	6.48	0.13	14.6	266	2.3	185
Red peat:Garden soil:Leaves compost:Sand 20%:30%:40%:10%	6.30	0.30	20.6	301	2.8	196
Red peat:Leaves compost:Sand 45%:**45%**:10%	6.31	0.23	29.25	271	3.3	205

Table 2. The dynamics of *Hydrangea macrophylla* Ser. height -11.05.2004-

No	Variant	Height of plants -medium value on variant- cm	Foliar surface - medium value on variant- cm^2
-11.05.2004-			
1	V1	15.458	16.082
2	V2	14.083	12.852
4	V3	**16.958**	12.938
3	V4	13.375	13.058

Table 3. Statistical interpretation of the cumulative values of the shoots length

Variant	Cumulative values of the shoots length -medium value on variant- cm			
	16.06.2004	**19.07.2004**	**18.08.2004**	**20.09.2004**
Red peat:Garden soil:Sand 45%:45%:10%	41.9 **Ct**	60.3 **Ct**	72.3 **Ct**	161.1 **Ct**
Red peat:Garden soil:Leaves compost:Sand 30%:30%:30%:10%	34.136 -7.764 **oo**	57.2 -3.1 **ns**	65.7 -6.6 **ns**	125.1 -36.0 **oo**
Red peat:Garden soil:Leaves compost:Sand 20%:30%:40%:10%	51.55 +9.65 **	67.5 +7.2 **ns**	83.2 +10.9 *	163.95 +2.85 **ns**
Red peat:Leaves compost:Sand 45%:**45%**:10%	39.181 -2.719 **ns**	53.7 -6.6 **ns**	67.3 +5.0 **ns**	138.05 -23.05 **o**

DL5%=7.06cm	7.5cm	9.6cm	24.49cm
DL1%=9.16cm	10.2cm	12.3cm	35.23cm
DL0.1%=15.8cm	14.7cm	15.6cm	51.81cm

Figures

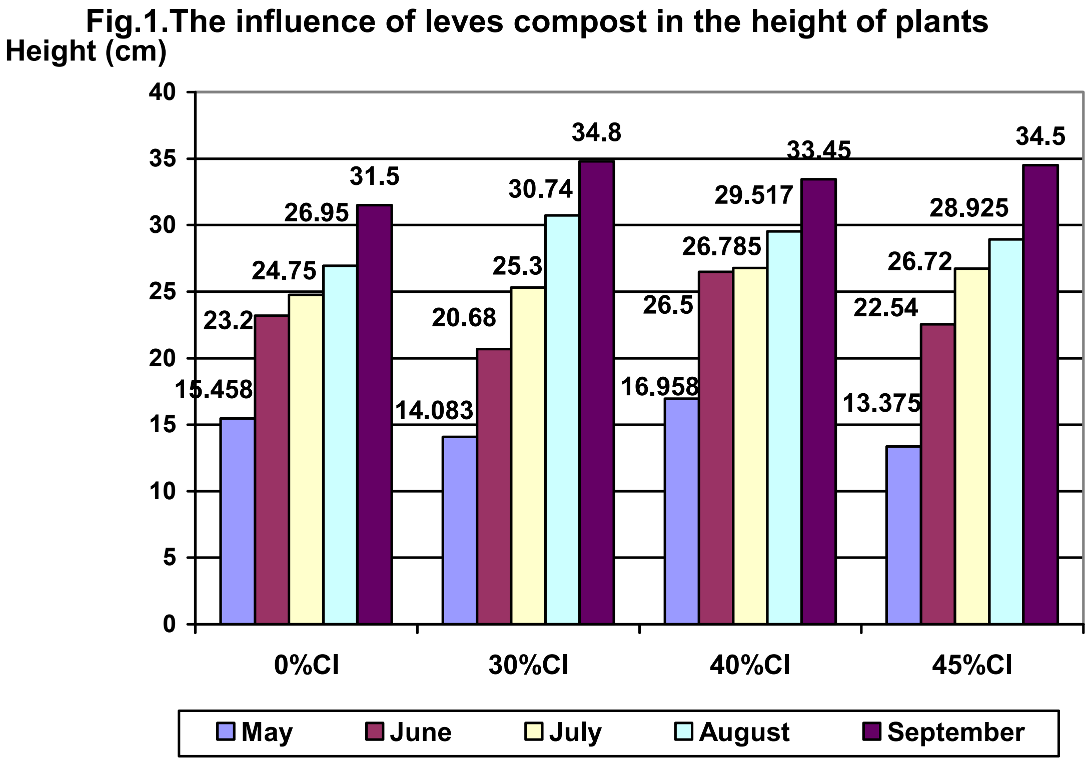
Fig.1.The influence of leves compost in the height of plants
Height (cm)
40
35
30
25
20
15
10
5
0
15.458
23.2
24.75
26.95
31.5
14.083
20.68
25.3
30.74
34.8
16.958
26.5
26.785
29.517
33.45
13.375
22.54
26.72
28.925
34.5
0%Cl
30%Cl
40%Cl
45%Cl
May
June
July
August
September

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STIMULATION OF THE RHIZOGENESIS AND THE FORCING OF *HYDRANGEA MACROPHYLLA SER.* FOR CONTAINER PRODUCTION

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Keywords: *Hydrangea*, cuttings, containers, blueing

ABSTRACT

Producing pot plants of *Hydrangea macrophylla* needs to use a special techniques to obtain earlier blossom, large inflorescences and a diversity of colours. Our first series of experiments resulted in the stimulation of the cutting rhizogenesis from mature plants and the growth of the plants potted in a deep 4 L containers using an intensive programme of the fertilisation and foliar feed. In addition we tried blueing the sepals by $Al_2(SO_4)_3$ treatments using the commercial recommendations. We concluded also the importance of cold treatment of the young plants during winter, concerning the plant ability to come in blossom, on the height and quality of the flowers. For blueing, the treatments have to be conducted by a rigorous control of the level of Al and pH in the substrate and the plant.

INTRODUCTION

The techniques of producing *Hydrangea* in container especially for the terases, balconies, and even for cut flowers are not known in our country.

The reports concerning forcing and colouring the flowers of *Hydrangea* were published by Vidalie H. (1995) Guerin V., Ph. Morel (1998), Naumann A., W.J. Horst (2003).

The propagation of *Hydrangea* is very easy using two internodes cuttings from mature plants at the end of blossom after the inflorescence cutting.

In the aim to speed the rhyzogenesis can be use growth regulators. To produce forced plants of *Hydrangea* in the aim to obtain an advanced blossom, can be use different cold treatments, some growth regulators or miniature cultivars (Vidalie H., 1995).

MATERIALS AND METHODS

The experiments were organized at ECO-HORTICULTURA S.R.L. in the nursery cold greenhouse.

The shoots for cuttings were harvested from 10 years old plants from a private garden at the end of blossom on 20th of July.

Two internodes 8-12 cm cuttings with two terminal buds and the leaves were ½ sectioned.

To speed rhizogenesis we used 5% Rhizopon AA (NL) powder.

The cuttings were planted in two variants of substrates: Sphagnum peat with sand 1:1 and leaves compost with sand 1:1.

The temperatures in substrate were variables between 22-25ºC for the 4-5 weeks. After November the 1st the young plants were protected with PE tunnels, dried leaves and sawdust. The minimum temperatures under plastic cover were up to 0ºC and a few young plants were lost.

The young plants presented one or two vigorous shoots in the spring and were transplanted in 4 L containers at the end of April, 10 plants for 6 variants of substrate (table no. 1)

During the growing season 5 fertilisation were applied with Complex III (15-15-15) in 0,4% solution, 200 ml/plant for the variants no. 1-5.

An extra foliar fertilisation was applied with Kristalon (0,2%). No pathogenic agent or insects atacs was noted.

During the growing season the temperatures inside of the glasshouse were variables between 15-30ºC.

The blossom started at 20 of June and the percentage of plants with 1-2 inflorescences was 86%.

We noted the effect of the cold temperatures concerning flower differences and the vigour of cuttings.

Another experiment was conducted to note the effect of treatment with Aluminium sulphate during vegetative stage using the commercial recommendations.

We applied 1-3 treatments in the substrate and 1 treatment by spraying on the plants at the moment when the inflorescences were at 5 cm, with 3 g/L $Al_2(SO_4)_3$. Only 5 plants were treated with 9g/L to check the over-dozing.

RESULTS AND DISCUSSIONS

From the dates presented in the table no. 1, 2 and 3 concerning the height of the plants, shoots and leaves number resulted:

The medium height of the plants was dependent of the substrate but was also influenced by the Al sulphate three time addition during the growth period which had a stunted effect on the plants in the case of variants no. 1, 2 and 3 comparison with the variants no. 4, 5 with only one and the variant no. 6 non treated.

The medium number of shoots was variable but the variants no 2 had the highest number (2).

A low medium number of leaves was noted at the variant no. 3 with peat substrate with Al treatment (18,2 cm) and the highest number had RS2 substrate variants (21,5cm).

The Al sulphate treatment had also a positive influence on the inflorescences diameter but only in RS2 substrate.

The RS2 substrate together with Al treatment was the best concerning the lowest height of plants and the inflorescences diameter in commercial point of view.

The low pH of the substrate together with Al treatments had a positive influence especially during blossom period concerning blueing of sepals and earliness but we noted a negative effect on uniformity of blue colour, and commercial aspect of the plants.

The highest percent of plant in blossom resulted at variants no. 1, 2 and 4 (90-100%) comparison with no. 3 and no. 5 – peat 100% (70-80%) and no. 6 – RS2 professional potting substrate without any extrafertilizer or Al treatment (Fig. 1).

CONCLUSIONS

The first experiments concerning *Hydrangea* forcing in the aim to produce plants in containers for terraces, small gardens, balconies and even cut flowers, using the most profitable techniques, conducted to the followings conclusions:

1. The biological material for *Hidrangea* propagation must be very well known and selected using mature mother plants.
2. Using the easiest classical method of propagation by cuttings harvested at the end of blossom, the growth regulators as Rhizopon AA 0,5% powder, and a peat/sand substrate 1:1, a high percent of rhizogenesis added 1-2 vigorous shoots had been obtained in the proximity of winter.
3. The protection of young plants with PE small tunnels under cold greenhouse or large PE tunnels during winter is favourable by low temperature condition inflorescence differentiation.
4. Transfer of the young plants in the 4L large containers in the same protected conditions using a potting substrate RS2 AGRO CS with pH 6 obtained the best results.
5. During the growth season the plants received 5 regularly fertirrigation with NPK (15-15-15) 0,4% and 3 times application of foliar feed nutrition 0,2%.
6. The treatments with Al sulphate applied 1-3 times during plant growth had not been able to induce the blueing in sepals, even with 1-2 sprays of the inflorescences in early stage (5 cm). The results had given nonsatisfactory commercial features.
7. The techniques concerning that method have to follow a strategy of treatments where the pH have to be between 4.2-4.7, and the biochemical reaction to alter the delphynidine pigment with $Al(OH_3)$ must be control by knowing the level of Al in plants and sepals to avoid his toxicity (Naumann A., Horst W.J., 2003).

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4. *** 2001 – Rhizopon stecklings tabelle – Hazerswoude - Holland

Tables

Table 1. Shoot number, height of plants (cm) and the number of leaves at the blossom end

	Var.	1		2		3		4		5		6		7		8		9		10		M		%
		V	F	V	F	V	F	V	F	V	F	V	F	V	F	V	F	V	F	V	F	V	F	F
1	RS2 100%	0	1	0	2	0	2	0	2	0	2	0	1	0	2	0	2	0	2	0	2	0	1	100
		36		36		42		40		36		28		32		39		39		33		36.1		
2	RS2 T:N 1:1	2	0	0	2	0	2	0	2	0	1	0	2	0	1	0	2	0	1	0	1	0	2	90
		45		45		39		40		36		45		40		36		39		34		39		
3	T 100%	0	2	0	2	0	2	0	1	0	1	0	0	0	1	0	1	0	0	0	2	0	1	80
		17		33		21		25		25		49		39		35		42		40		36.7		
4	RS1 100%	0	2	1	1	0	1	0	2	0	2	2	1	0	2	0	1	0	1	0	2	0.3	1.5	100
		54		51		48		45		48		45		44		35		51		43		46.4		
5	T 100%	2	1	2	0	0	2	1	2	1	0	2	1	2	0	2	1	1	2	1	2	1.4	1.1	70
		43		58		53		40		40		39		53		39		37		34		43.6		
6	RS2 100%	1	0	2	1	1	0	0	2	0	2	2	1	1	2	2	0	2	0	0	2	1.1	1.0	60
		35		46		44		48		39		42		27		42		43		32		41.6		

V = vegetativ; F = flowers

Table 2. Number of leaves per plant

	Var.	1	2	3	4	5	6	7	8	9	10	Media
1	RS2 100%	23	19	26	18	23	22	25	19	21	22	21.5
2	RS2 / N 1:1	24	11	22	25	22	26	20	24	28	26	20.2
3	T 100%	27	15	10	28	28	17	20	21	17	15	18.2
4	RS2 100%	21	18	25	21	21	20	19	20	24	24	21.5
5	T 100%	20	19	21	20	20	19	23	22	20	22	20.2
6	RS2 100%	20	20	19	20	20	20	21	21	20	25	21.4

Table 3. Substrate influence on the cluster diameter (cm)

Var / pl		1	2	3	4	5	6	7	8	9	10	M (cm)
1	RS2	0:11	20:10	18:18	18:16	0:29	0:29:19	0:19	0:0:25	0:25	12:9	18.5
2	RS2:N 1:1	0:00	19:22	20:19	21:19:13	19:25	0:25	0:25	26:19	0:25	0:0	23.0
3	T	17:10	16:7	16:17	0:22	0:24	0:0	0:19	0:16	27:16:0	20:6	16.6
4	RS1	0:20	25:12	0:0	22:21	20:19:6	18:23	23:19	14:15	0:8	23:6	17.3
5	T	0:25	0:0	0:3	29:9	0:27	0:0	11:9	0:12	12:8:13	0:23	15.1
6	RS2	12:12	12:33	0:0	21:18	28:18	0:19	0:25	0:29:19	0:25	21:10	19.5

Figures

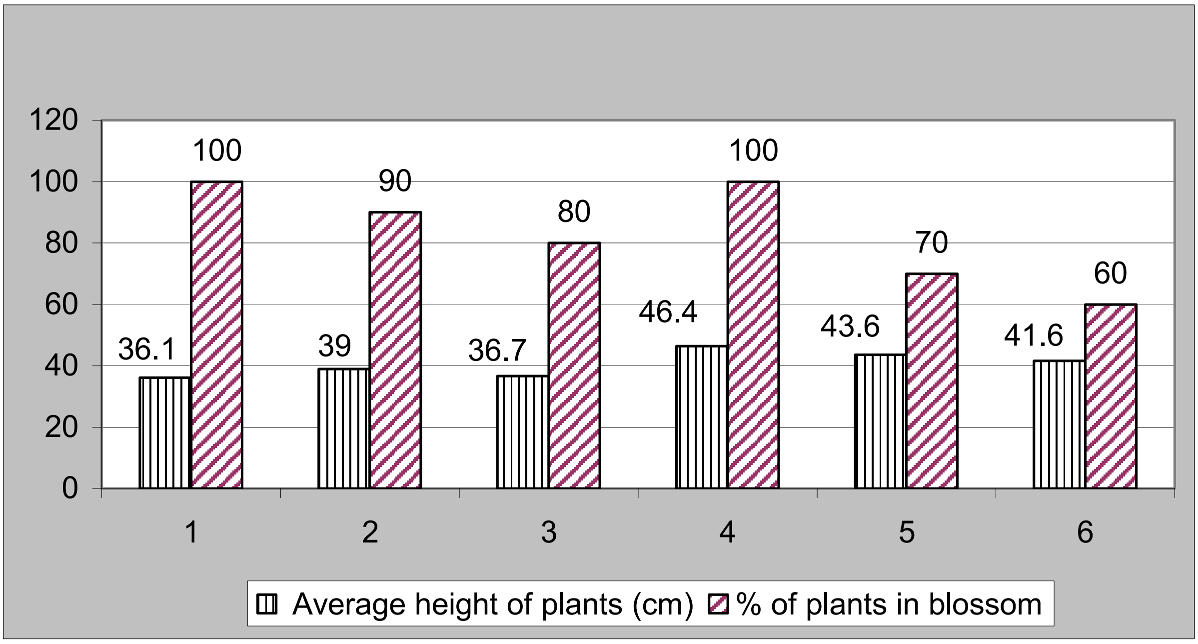

Fig. 1. – The plant growth and blossom

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A PRELIMINARY STUDY CONCERNING THE RESTORATION AND THE REVITALIZATION OF THE HISTORICAL PARKLAND OF BONȚIDA

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Keywords: French baroque style, romantic style, planning, discreet interventions, geophysical survey

ABSTRACT

One of the most important castles surrounded by parklands in Romania is the Banffy Castle in Bonțida. Both, the castle and the parkland were built in three stages. The periods related to these stages are: the medieval period, the baroque period and the romantic period. In our days one can observe some traces from the three stages in the area of the park. The parkland needs to be restored and revitalised and Transylvania Trust foundation that is already restoring the castle has initiated a landscape study in this direction, which will be developed on several years. We were invited by this foundation to take part of the study and to create a pilot layout for the park. We studied archive documents (maps, engravings and époque photographs), we searched *in situ* for more traces of the former designs of the park (alleys, vegetal compositions, gloriettes, grottoes, lakes and waterfalls) and we analyzed the impact of the strong environmental elements upon the parkland (electricity line, the old mils, the former stables, the old churches in Bonțida and Răscruci). The geophysical survey was very useful and important to the research in order to elaborate the pilot restoration project. In consequence, the concept for the pilot layout is to preserve the traces of the romantic and baroque stages and to introduce new elements in order to bring more people in the parkland. For the precincts of the castle we elaborated variants in order to respond to the new function of the castle that is a cultural centre.

INTRODUCTION

One of Romania's most famous parklands is the one related with Bánffy Castle in Bonțida, in Cluj district.

In the medieval period water ditch surrounded the castle.

During the eighteenth century Johann Christian Erras designed parkland for the Banffy Castle in the fashionable baroque French style with symmetrical avenues, large parterres, clipped or exotic trees and shrubs. An important element of the design was a trident of linden tree avenues, each 1000 meters in length, and two transversal alleys, on the west side of the castle (Fig.3).

In the first decades of the nineteenth century the park was transformed again into the fashionable Romantic style, first by Hermann Samuel and later in 1831 by Laszló János (Fig.4).

The Transylvania Trust Foundation had solicited the Landscape Department from The University of Agronomic Sciences and Veterinary Medicine, Bucharest to participate at the restoration of the park and the precincts of Banffy Castle from Bonțida, together with The Landscape Faculty from St. Istvan University, Budapest. Therefore two teachers and eleven students from The Landscape Department from Bucharest have participated at the summer school organized by Transylvania Trust Foundation. The summer school was developed on three sections: geophysical survey, planning and practical application – the execution of a wattle fence (Fig. 9).

We presented the results of our activity at The Cultural Bonțidean Days, festival that took place in the precincts and the parkland of the castle in august 2004.

MATERIALS AND METHODS

The methods we used in order to elaborate the restoration and revitalization project for the parkland and the precincts of the Banffy Castle were:

- study of archive documents: maps, engravings and époque photos (Fig. 1 and 2);
- geophysical survey of the important zones of the parkland with a view to discovering vestiges of the former park composition;
- *in situ* research in order to discover gloriettes (Fig. 6), grottoes, lakes (Fig. 5) and waterfalls (Fig. 7) and other former characteristic features;
- *in situ* research in order to discover the traces of the former paths and the vegetal composition (Fig. 8);
- environment study (electricity line crossing also the parkland, two ancient mils, the building of the former stables at south-east, the thirteenth century church from Bonțida and the church in Răscruci that constitute the terminus point of the main axis in the baroque stage).

RESULTS AND DISCUSSION

The result of the research was materialized as a pilot solution for the parkland and three variants for the precincts of the castle.

The strategy for the parkland project was first of all to divide it in three characteristic zones (Fig. 10).

The first zone includes the precincts and the area around the castle limited by the streets and the ditches. We wanted to reveal the lost parts of the castle from the medieval and Renaissance periods. We suggested the former limits of the fortified castle in the south part with low box hedges and on the west part with a pavement of bricks. In the first stage, before restoring the "riding school" building in the east, witch will be the last rebuild wing of the castle, we proposed an aromatic garden, a kind of *hortus*, with floating wood alleys, pergolas and trellises with climbing plants. This is a light construction in order not to deteriorate the undiscovered remains of the castle. We proposed also a minimalist garden in front of the north wing witch will be a conference building (Fig. 11 the precincts zone).

The precincts of the castle were solved in two more ways, both in order to respond to the new function of the castle that is a cultural centre (Fig. 12 and 13).

We proposed a free grassy space for the two precincts, to work like a polyvalent open space, mostly for events like the festival Cultural Bonțidean Days; witch is very popular and has a great success (Fig. 9).

One of the major purposes was to focus the attention towards each precincts centre. So we suggested the limits of the former medieval and Renaissance parts of the castle, we shaped them as sitting places, and we proposed to rebuild the "riding school" in the first precinct. We have marked only the main axis and the most important accesses.

After passing through the two precincts along the main axis, the parkland will be discovered like a big, beautiful surprise.

In the second zone we intended to reveal the known baroque element, the trident of alleys, with white gravel on a breadth of 60 cm. A freestyle composition will overlap this suggested trident, with sinuous alleys, small groups of trees, masses of shrubs and of trees and shrubs that form spectacular and various frames.

We introduced an amphitheatre as natural as possible, with sitting places on grassy gradins that fit perfectly on the existing landform. The events that will take place here can exploit the view of the castle as background. This function is supposed to bring more people into the parkland and to animate it (Fig. 10 and 11).

In the third zone we reveal the former longitudinal axis as the single living proof of the baroque period of the parkland proposing a grass alley 15 cm lower than the lawn. It is necessary to rehabilitate the bilateral linden tree lines knowing their very bad state.

The general freestyle composition will overlap also this important element and as in the second zone it will include the rehabilitation of the water streams, the former waterfall and the lake (Fig. 5 and 7) For both last zones we marked places for belvederes and rest so that the future discovers of the former elements and composition of the parkland will complete this plan (Fig. 10 and 11).

The restoration layout for the parkland proposes discreet and delicate interventions, rather suggested, in order to preserve and underline its natural character.

The area of the romantic parkland was much larger than now so we marked the old limits planting columnar tree lines.

CONCLUSIONS

The study has to be continued the next years in order to reach the definitive solution also adding the results of the research of botanical archaeology. So, next year's project will be based on more data.

The proposed variants are encouraging the activities that already take place in Bonțida (equestrian races and parades, medieval games for the children, drawing competitions for the children, ethnical shows and medieval music concerts). For the future we suggest also theatre and opera performances, art performances, happenings, inserting land art works in the park and in the two precincts, heaving the castle or the parkland as background.

ACKNOWLEDGEMENTS

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Figures

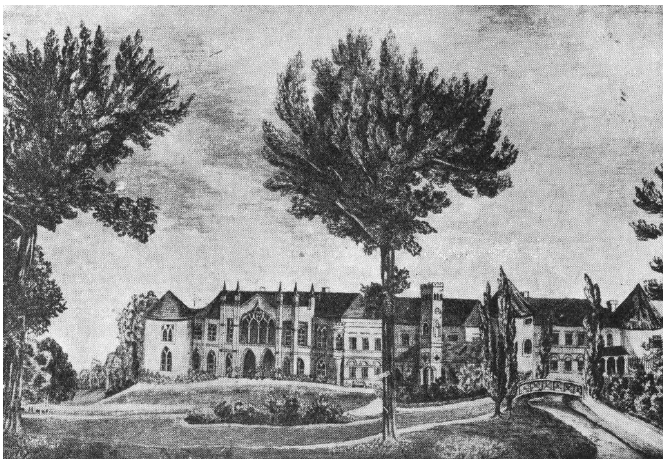

Fig.1. Banffy Castle from the parkland in 1850 (after Marcus R. 1958)

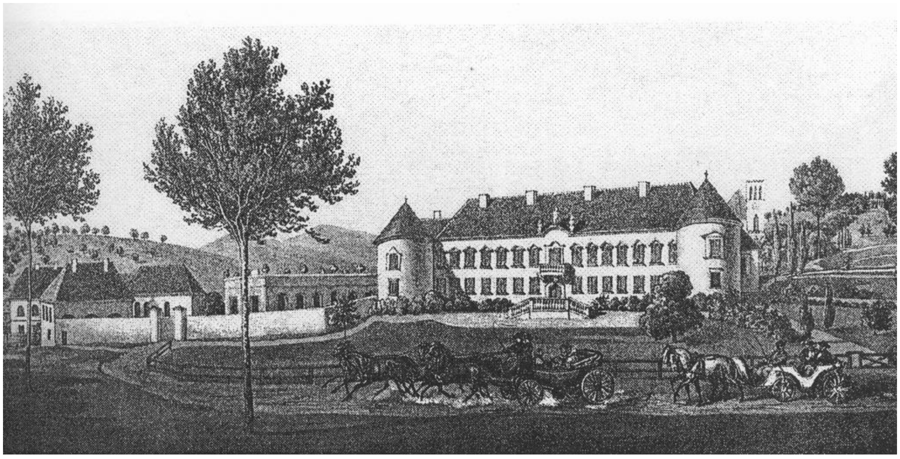

Fig.2. The northern castle façade lithography entitled “Le Château de Bonczida en Transylvanie du coté du Nord. Propriété du Comte Joseph Banffy. Lit. par H. Engel, Wiene” (Gyula D 2001)

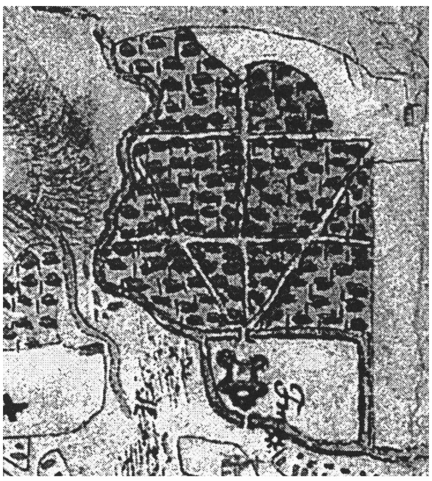

Fig. 3. Baroque plan (Gyula D 2001)

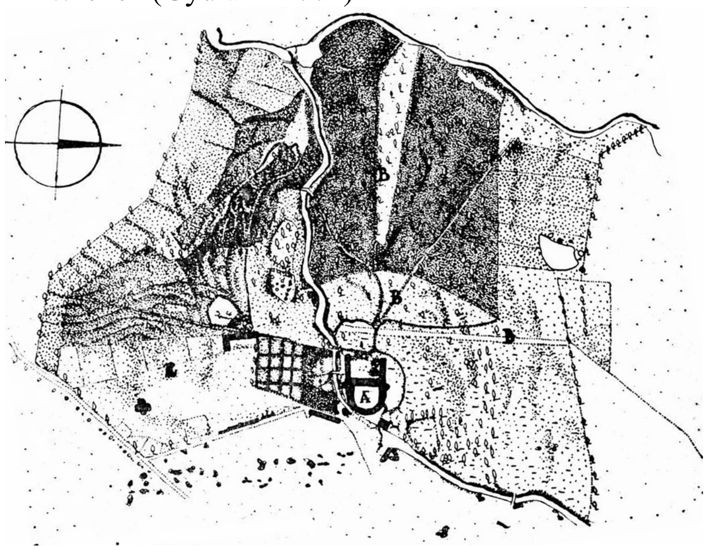

Fig. 4. 1831 romantic plan by Laszlo Ianos (Marcus R. 1958): A-the castle, B-the XVIIIth century alleys, C-the fasantry

Fig. 5. Plane tree on the former island

Fig. 6. Supposed gloriette place on the hill

Fig. 8. The main linden tree baroque axis

Fig. 7. Supposed waterfall place

Fig. 9. The wattle fence in a festival day

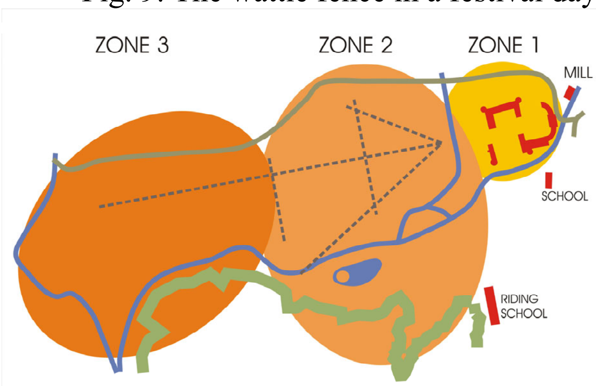

Fig. 10. Zoning sketch for the parkland

Fig. 11. The parkland pilot project – plan

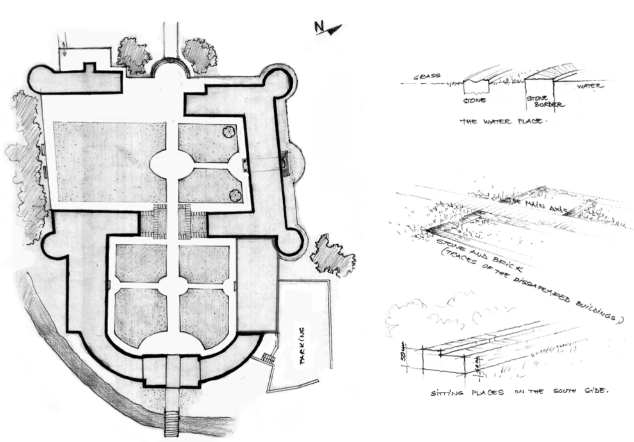

Fig. 12. The precincts of the castle - a

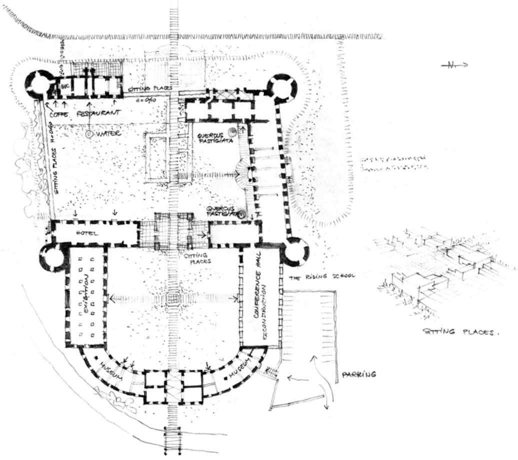

Fig. 13. The precincts of the castle - b

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STUDY OF THE EVOLUTION OF CAROL PARK IN BUCHAREST. POINT OF VIEW ON THE PLACEMENT OF THE PEOPLE'S SALVATION CATHEDRAL IN CAROL PARK

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Keywords: Romantic, historical monument, art monument, main alley, axis, law.

ABSTRACT

Carol Park was built in 1906 for "The Jubilee Exposition" and it was transformed several times till now, when the People's Salvation Cathedral is going to turn the park in the Cathedral's appendix. This approach was determined by the decision of erecting the Cathedral in the place of or behind the heroes' monument, ignoring that Carol Park is a historical monument, and taking the political decision of the monument exclusion from the List of Romanian Monuments. This paper wants to demonstrate that to build the People's Salvation Cathedral in Carol Park and to demolish "The Heroes Struggle for the People and Country Liberty for Socialism" Monument means to ruin the park value as historical monument. The decision of erecting The People's Salvation Cathedral in the place of or behind the monument had a great impact on us, as being implicated in the landscape educational process. We felt obliged to express our opinion and to argument it, on this subject, in order to preserve one of the three historical parks in Bucharest (Cişmigiu Garden, Herăstrău Park and Carol Park). By means of a profound analyse we demonstrate that the place of The People's Salvation Cathedral is not in Carol Park. We hope that the observance of Romanian laws in landscape and historical monuments field will be binding upon all of the citizens - politicians, clericals, the military, and us, those implicated in landscape architecture.

INTRODUCTION

Carol Park was built in 1906 for "The Jubilee Exposition" (40 years since Carol II became king of Romania) after the designs made by the French landscape architect E. Redont, especially invited in Bucharest for this project (Fig. 1). The main element of the park composition was a large alley with water features and with provisory pavilions, especially built for this exposition (Fig. 11). The terminus of the main axis was "The Palace of Arts", which was on the high plateau of the opposite lakeside. A grotto with a romantic sculptural ensemble was placed on the bottom of the hill, just in the axis. One of the first reinforced concrete bridges was built in the eastern side of the park. Meanwhile, the pavilions were demolished and only the Gheorghe Grigore Cantacuzino Fountain, "Vlad Țepeş Tower" and the reinforced concrete bridge were preserved (Fig. 2). The water features of the main axis have disappeared too, and the two giants from the statuary group were moved in two vegetal cells, situated along the main axis (Fig. 8, 9). The "Nymph" is now in Herăstrău Park, on the main esplanade.

In the dictatorship of the communist party years, the plaza in the north end of the main axis was enriched with the Zodiac Fountain designed by the architect Octav Doicescu and the sculptor Mac Constantinescu (Fig. 10). The axis was extended over the lake, by a very large bridge and in the place of The Palace of Arts was built the Heroes' Monument, surrounded by crypts and linked to the main axis by monumental stairs. (Fig. 3). The monument, an important work of art, was designed by one of the best architects of the time, Professor Nicolae Cucu.

MATERIALS AND METHODS

The methods we used in order to argument these statements are:

- Historical study;
- Legislation study;
- Study of recent documents from professional implicated organizations;
- Sociological study;
- Visual analysis.

RESULTS AND DISCUSSION

The main axis became more and more important in the composition of the park, by enlarging the width of this axis, and by extending it to the plaza (placing here the "Zodiac Fountain"), the other features being subordinated to it. The mane axis became increasingly important in the park composition; it was physically and visually extended over the lake, by a very large bridge and in the place of The Palace of Arts was built "The Heroes Struggle for the People and Country Liberty, for Socialism" Monument and linked to the main axis by monumental stairs (Fig. 3, 4, 5).

The heroes' monument, created as a necropolis, has a monumental but simple conception. The five very toll arcs, built in red granite, erects on a massive volume shaped as a star, in black Swedish granite. The inner necropolis cupola is covered by golden mosaic from Italy. The accuracy and the beauty of all its details, the elegance of its proportions induces the artistic value of this monument. This is an enduring and firm monolith, designed for "supporting casual uncommon earthquakes, more important than those usually received" ("Arhitectura" review, number 1 / 1964). This monument, beyond its symbolic significance, is a very well proportionate terminus point of the main axis. The highness (46 m.) of this important work of art in comparison with the length and the width of the main alley illustrates the artistic skill of Professor Nicolae Cucu, one of the best architects of the time (Fig. 6).

The value and the beauty of the monument are strong linked with the site, in the terminus of the park axis. In any other place, this monument will be no more attractive and useful in the architectural or artistic point of view. Its artistic value is not a result of its symbolic value, so we think that it should no longer be dedicated to the communists' heroes, but become the National Pantheon.

The minister of Culture and Religious Affaires does not respect the law, and without the approval of the Committee of Historical Monuments, and without a dossier to lower the historical position of the Heroes' Monument, decides its exclusion from the List of Historical Monuments (the 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 the monument.

The consequences of the Cathedral placement in Carol Park are:

- The ruin of the park quality and unity, as historical monument;
- The demolishment or the alteration of the most important work of art in the park, which can be a National Pantheon;
- The park transformation in a construction site, for a long time;
- The park transformation in the Cathedral's appendix;
- The infringing of the Romanian Laws in landscape and historical monuments:

the low number 415/2002, for the ratification of the European Convention of Landscape (adopted in Florence, the 20th of October 2000), the decree no. 646/16.07.2004 (including the List of Historical Monuments) and the Environment Law.

All the six national unions of the Romanian creators disagreed with this placement and request respecting the laws.

CONCLUSIONS

We think that:

- It is unacceptable that political criteria are used in jugging the artistic value of a monument (the park and the monument);
- The artistic value is not a result of its symbolic value;
- The Carol Park, as a historical monument, has to be preserved. We cannot change its image, composition, etc. according to our political, religious or group interests;
- To take 5 hectares out of the park area for this gigantic building is out of law, cause the park is a historical monument, since 1978;
- The actual axis is very strong and needs a symmetrical terminus - the Cathedral is not a symmetric building according to this axis (Fig. 7);
- This placement is disastrous for both the park and the Cathedral too - this gigantic building will be viewed perpendicularly on its axis and from its north side (as the direction onto the monument is from North to South, the Cathedral façade is perceived as a dark screen profiled on a shiny sky – the contre-jour effect);
- Landscapers, urbanists, artists and art historians consultation is without fail necessary.

We propose the inclusion of the reinforced concrete bridge, built in 1906, in the List of Historical Monuments.

ACKNOWLEDGEMENTS

We thank to the six national unions of Romanian creators and to civil society for disagreeing this placement and for requesting the laws respect.

We thank to the Bucharest City Hall for the opportunity to express our opinion concerning this subject.

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Figures

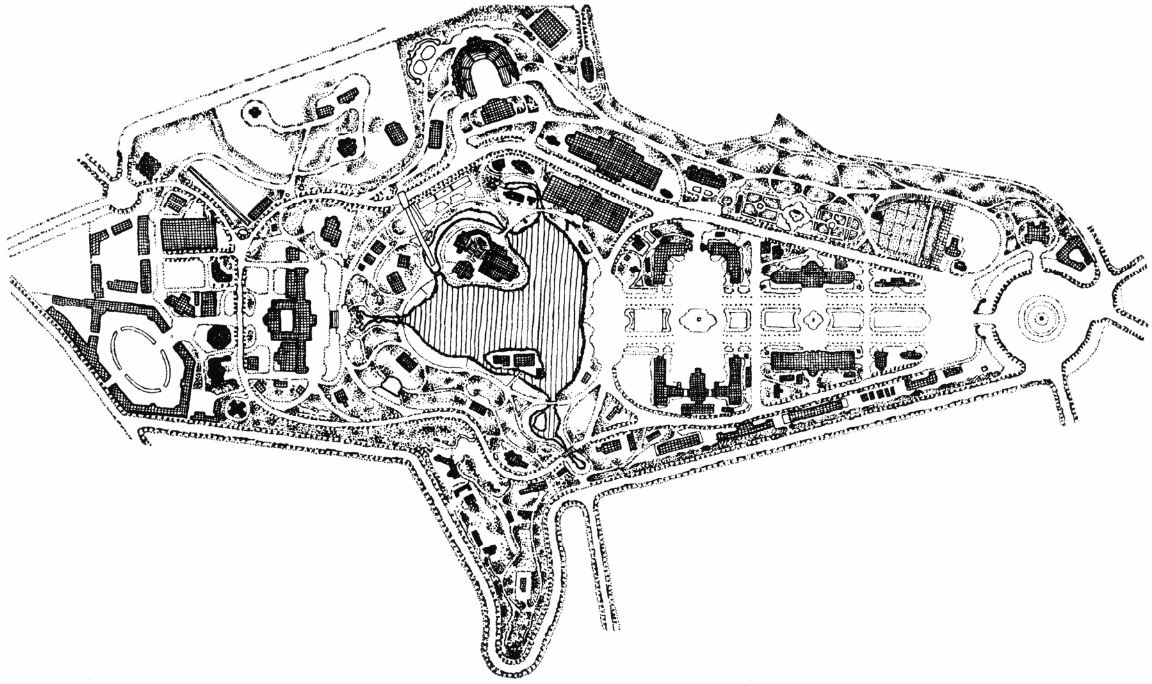

Fig. 1. Carol Park in 1906 (Marcus R. 1958, pg. 177)

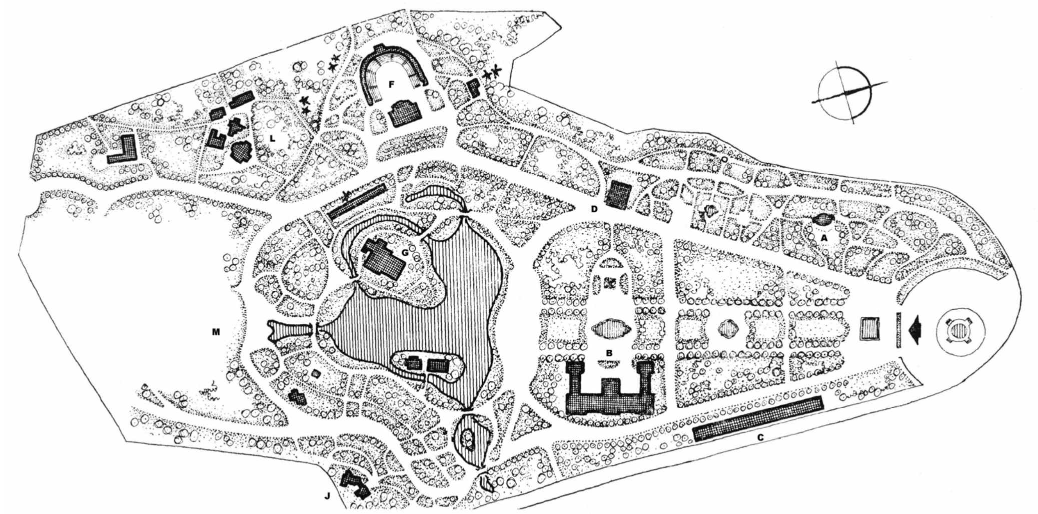

Fig. 2. Carol Park in 1958 (Marcus R. 1958, pg. 178)

Legend:

A – Estrada for performances
B – Pavilion
C – Electricity Museum
D – Library
E – Ghe. Gr. Cantacuzino Fountain
F – Liberty (or Roman) Arenas
G – Restaurant
H – "Geamia"
I – Glass Palace
J – "Vlad Țepeş Tower"
K – Zoo
L – Astronomic Observatory
M – free lend

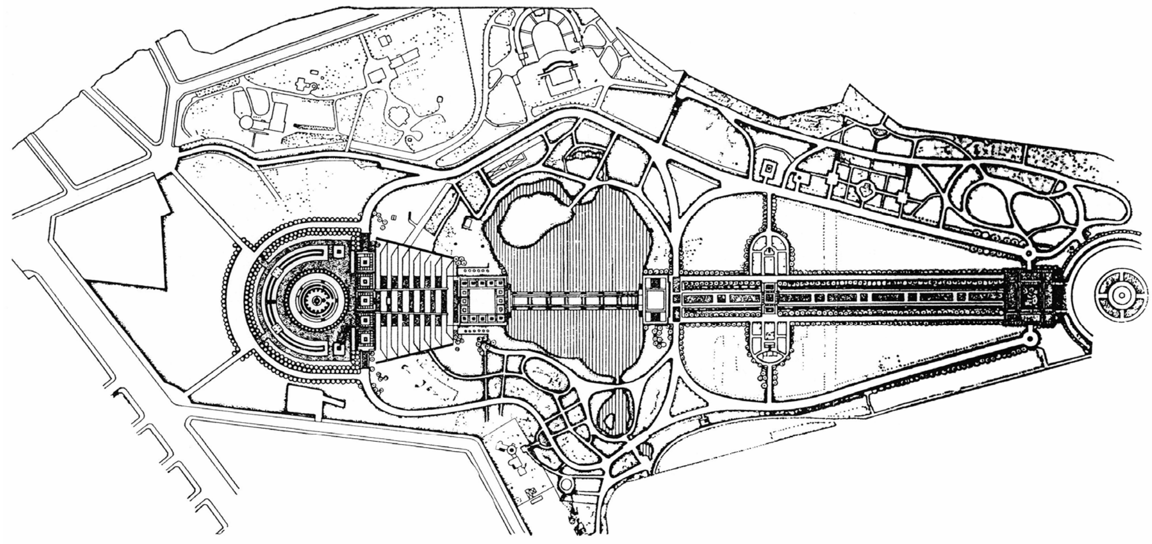

Fig. 3. Carol Park in our days

Fig. 4. The main axis with the monument

Fig. 5. The main axis from the monument

Fig. 6. The main axis with the monument

Fig. 7. The Romanian Ortodox Patriarchy proposal

Fig. 8. Giant 1

Fig. 9. Giant 2

Fig. 10. the Zodiac Fountain

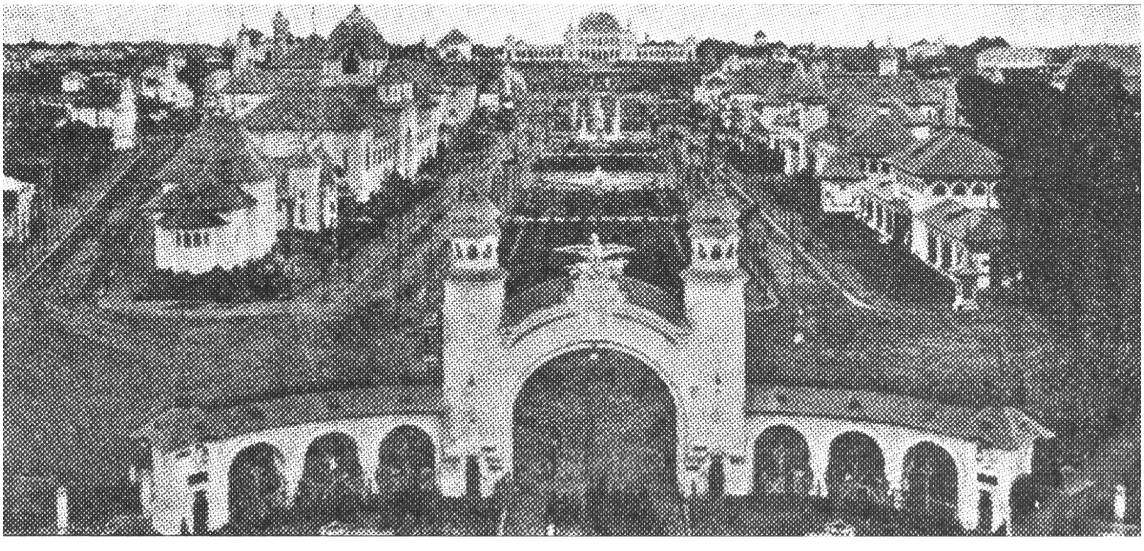

Fig. 11. Carol Park in 1906, the 6TH of July

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE REVITALIZATION OF THE "VILLAGE AND FOLK ART MUSEUM" IN BUCHAREST – A MATTER OF LANDSCAPE

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Keywords: Countryside, authentic, slope, lakeside, stream, surroundings.

ABSTRACT

The "Village and Folk Art Museum" in Bucharest represents the cultural part of Herăstrău Park, which was included in the Official List of Romanian Historical Monuments, in 1978, 1980 and then in 2004. The impact of the "Village and Folk Art Museum" upon those who walk along the alleys of Herăstrău Park and along the avenue Kiseleff decreased on account of some public and private interests which come into conflict, on account of some negative images, on account of some obnoxious surroundings, on account of some much bigger buildings placed here, on account of the technological progress and on account of the uncontrolled vegetation growth. Some specious of trees and shrubs doesn't feet at all with the Romanian village. Some areas are very flat in contrast with another too matched sloppy, almost like a precipice, along the border of the lake, witch cannot be seen from the museum. In the same time, the museum cannot be seen from the island placed in front of its lakeside and from the avenue Kiseleff, on account of the vegetation. We have analyzed these disadvantages and our conclusion is: Yes, we can solve these problems by landscape methods, in connection with their causes, which are landscape matters. We think that the presence of the water is very important for the Romanian village air, so we inserted two little streams in our design, in order to obtain an authentic Romanian village atmosphere inside the urban space. Our concept for this design is to get the feeling that you are in the countryside, in the very moment you will pass throw the museum gate.

INTRODUCTION

The "Village and Folk Art Museum" in Bucharest, founded in 1936, is one of the most important Village Museums in Romania and one of the first open air village museums in the world. Due to its great historical, artistically and documentary value, it was recognised like a historical monument, and it was inserted in the Official List of Romanian Historical Monuments, since 1955, long time ago before Herăstrău Park.

This very important museum can be seen neither from the avenue Kiseleff nor from the island (Fig. 3) and the park, because the vegetation.

Much better links with the park and with the island are supposed to bring more people into the museum, and to enjoy it.

The access to Elisabeta Palace, also a monument, but a private one, is in a great conflict with the way of the museum guests.

The amphitheatre, in the very proximity of the museum, has to be brought to life, for cultural purposes.

MATERIALS AND METHODS

The methods we used in order to elaborate the revitalization design for the "Village and Folk Art Museum" in Bucharest were:

- To study of archive documents (engravings and époque photos of he country side life and landscape);
- To discover negative images caused by the uncontrolled vegetation growth and to solve them by cuttings and replacements (Fig. 1 and 3);
- To open the view to the museum for an better visual perception, by cuttings and replacements (Fig. 11 and Fig. 12);
- To identify the vegetation who doesn't feet at all with the Romanian landscape (Fig. 4, *Taxodium* on the lakeside of the museum) to create an authentic village air and to emphasize the patrimony buildings, using traditional vegetation (trees, fruit trees, vine, herbal plants, culture plants);
- To study the environment in order discover without any charm surroundings and inconvenient buildings and to screen them;
- To solve the access to Elisabeta Palace by putting it out of the museum guests way level (Fig. 9);
- To change the appearance of "roses island", for image and proximity reasons, by designing a free lay-out and by linking it with the museum lakeside by two foot bridges and a ferry (Fig. 7, 8, and 10);
- To model upon the real country side landscape (Fig. 6), by creating slopes, little streams crossed by foot bridges, foot paths accompanied by wayside crosses (Fig. 5) and by wells etc. for the new area of the museum, placed in its south side and for the island (Fig. 8).

RESULTS AND DISCUSSION

All this effort is:

- To get the feeling that you are in the country side, in the very moment you will pass through the museum gate;
- To get a better linking with the park and with the city by inserting two foot bridges and a ferry and creating one more entrance on the south museum side;
- To capture the people interest in folk art and traditional country life by creating an authentic Romanian landscape as a back ground for the patrimonial architecture in the area of the museum (creating slopes, streams, foot paths and etc. and planting fruit trees, vines, some not very large agricultural cultures, linden trees and *Robinia Pseudacacia* and placing here beehives);
- To raise the museum income by increasing the number of visitors and so to solve some financial problems by self-financing.

For the future it will be necessary:

- To elaborate a new Detailed Urban Layout (establishing the high of the buildings in this area; using traditional materials; inserting another spectacular patrimony objects; and laying down the maintenance vegetation works);
- To elaborate a study for the extension of the museum area;
- To research *in situ* in order to discover spectacular patrimony objects to enrich museum's landscape image (bridges, crosses, fences, benches, wells, etc.);
- To study other open-air village museums in Romania and in Europe and to see theirs problems and the way they have solved them.

CONCLUSIONS

We solved:

- The parking problem for the museum and for the "Ministry of Culture and Religious Affairs" (Fig. 11 and 12);
- The access to Elisabeta Palace by putting it out of the museum guests way level (Fig. 8);
- The access for fire-fighter trucks;
- The alleys fluency for occasional traffic inside the museum and for the visitors (Fig. 8) and the vegetation according to the Romanian countryside.

The most important point is to bring the Romanian village air in the area of the museum, with its lawns mixed with wild flowers and hay cocks, with fruit trees, linden trees and *Robinia Pseudacacia* accompanied by beehives, and with sunflower, linen, lavender little fields. The presence of aromatic herbals is also very important for our village air.

Not only the image, but also the smell (of blossomed trees, wild flowers, aromatic herbals etc.) and the sound (the murmurs of a stream, the rustle in the leaves trees, the sound of the church bell or of the cattle bells) are important traces of our village air.

The museum will be more attractive and the number of its guests will increase as a benefit of visual openings into the vegetation and of new accesses.

Museum income will increase according to visitors' number growth and according to own production (fruits, vegetables, vine, honey on one side and postcards, pictures and hand made objects on the other side).

This "landscape-museum" as background will be the place for a lot of performances, activities and competitions, or a place for meditation, for study or for cultural meetings. It will be a wanted place, and all that because of solved landscape problems.

ACKNOWLEDGEMENTS

This study was accomplished without any financial support, on the proposal of the "Village and Folk Art Museum" direction.

We thank to museum ethnographers, ethnologists, museologues, architects and historians for helping us in the research study.

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Figures

Fig. 1. Lakeside abundant vegetation (left)

Fig. 2.
The slope along the museum lakeside

Fig. 4. Wrong selected vegetation

Fig. 3.
Museum lakeside - view from the island

Fig. 6. Footbridge in Buzău district

Fig. 5. Wayside Crosse

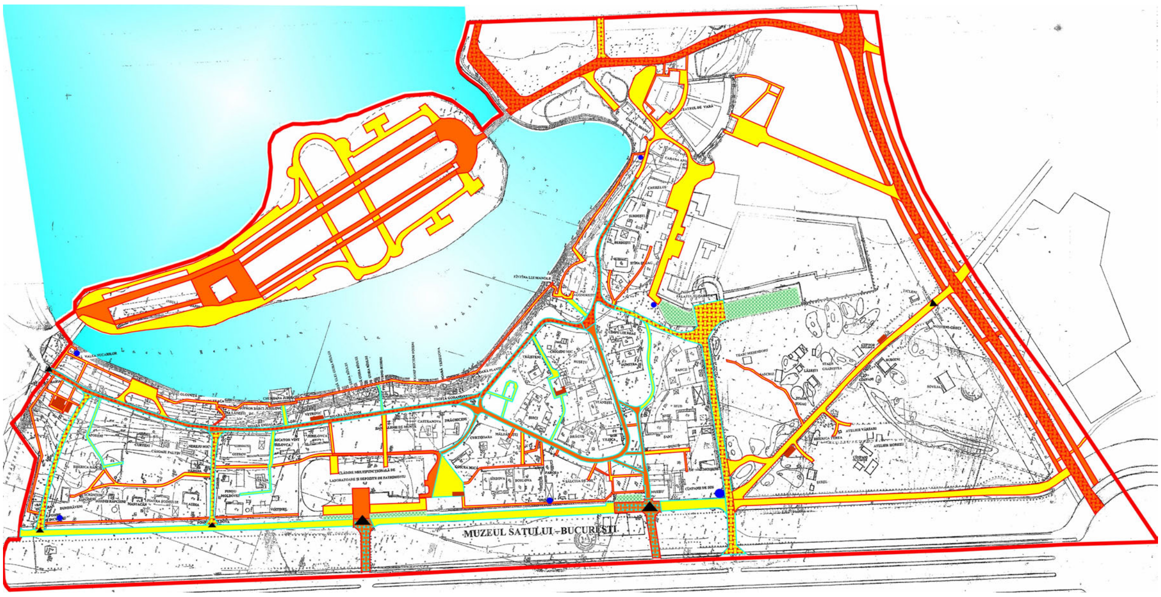

Fig. 7. Actual layout of the “Village and Folk Art Museum” in Bucharest

Fig. 8. Proposal layout for the revitalization of the „Village and Folk Art Museum” in Bucharest

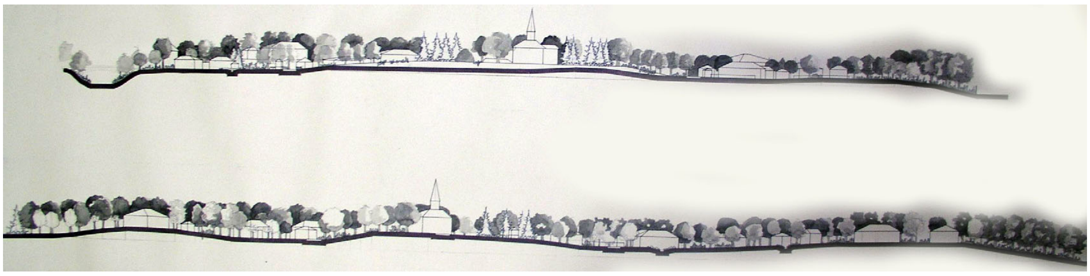

Fig. 9. Sections trough new area from the proposal layout for the revitalization of the „Village and Folk Art Museum” in Bucharest

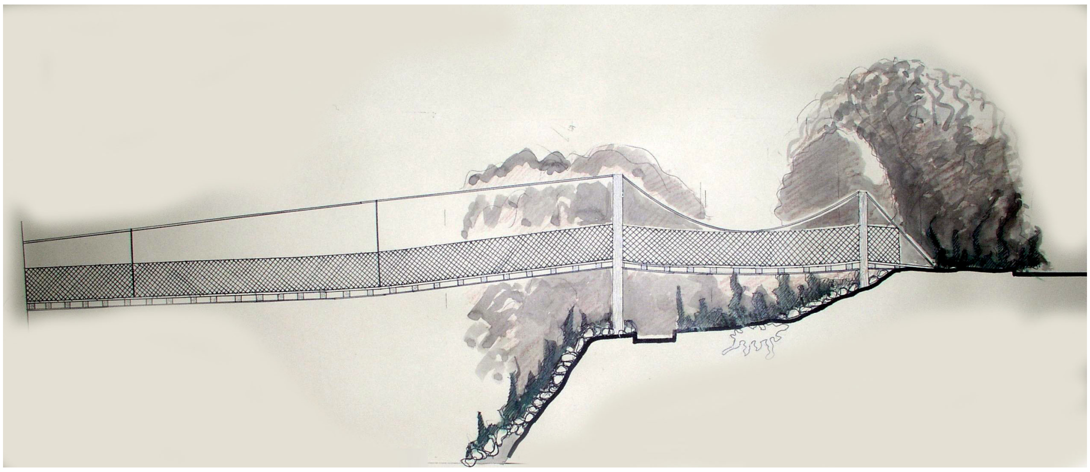

Fig. 10. Section trough the slope to the Herăstrău Lake and the suspended footbridge

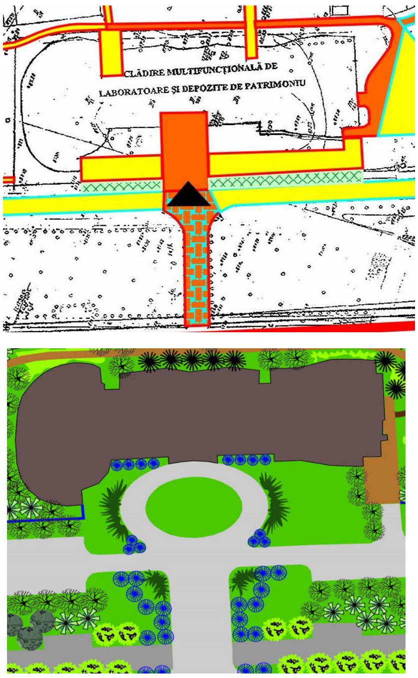

Fig. 11.
The existing access to the Ministry of Culture and Religious Affaires (top), and the proposal (bottom)

Fig. 12.
The access to the museum (top) and the proposal to modify it (bottom)

THE IMPROVEMENT OF TECHNOLOGY FOR *IN VITRO* PROPAGATION OF *LAVANDULA ANGUSTIFOLIA*

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Keywords *Lavandula angustifolia*, *in vivo* rooting, microcutts, rooting stimulators, micropropagation

ABSTRACT

This article presents the realizations of technology of producing biological material with rapidly clonal multiplication with reference at the phase of aseptically rooting, the obtained results showed that changing the in vitro rooting phase with in vivo rooting phase let as to establish a new improved technology more efficient.

INTRODUCTION

In the last years the medical and aromatic plants are more important because are used like base material for obtaining active substances for pharmaceutical and cosmetics industry. In the present in our country ascertained a tendency for returning at phytotherapy, who lead at the extinctions of plantations of *Lavandula angustifolia.*

This article presents the realizations of technology of producing biological material with rapidity clonal multiplication, with reference at the phase of septical rooting of microshuts realized by in vitro cultures.

MATERIALS AND METHODS

The *in vivo* rooting of microcutts of *Lavandula Angustifolia* represent a technological sequence who leads at the improving of multiplying method by aseptical culture. The good results realized in this faze contribute at elimination of *in vitro* rooting works. Also, the rooting in aseptical conditions allow to shorten the obtaining time of plants, in this case the rooting and acclimatization are achieved at the same time.

Biologic material used in this experiment was picked up from micro multiplication medium and it was represented by minicuttings of Hidcote and Codreanca varieties.

From micro shoots was realized 3 tips of microcutting: microcuttings with growing tips; microcuttings without growing tips with 1 -2 nods and bazal microcuttings .

We used two types of growing stimulators: Radistim for grassy species(R1) and Radistim for woody species (R2), as powder. Witness was represented by microcuttings with growing tips untreated with rooting stimulators.(Table 1)

The experiment was realized on perlite and height atmospheric humidity was realized with cover in plastics. (Fig.1.)

The research was made on 10 variants in 3 repetitions and untreated witness. The observations was made periodically, the final results was registered after 30 days, like a repetitions average.

Plantlets rooted were transferred on mixture of peat, putrefied manure and perlite in 2:1:1 proportion.

RESULTS AND DISCUSSIONS

The observations realized showed that in process of *in vivo* rooting the behavior of two genotypes was different; the best results obtained Hidcote variety.

In the same genotype were registered differences because of interaction from minicuttings like biotic factor and used phytohormones like abiotic factor.

The Hidcote variety realized the best percent of rooting when we used the minicuttings with growing tips when the difference between the variants with the 2 types of Radistim was only 7%. The best results (78% rooting) were obtained when we used R2, who has good influence on root system grows also. (Fig.2.)

The Radistim for grassy species stimulated in a less proportion rooting, but the root system has also a good development, with many ramifications.

The minicuttings without growing tips had a small percent that minicuttings with growing tips and the Radistim had another influence.

The minicuttings without growing tips rooted in proportion of 45% or higher, when we used Radistim for grassy species.

The Radistim for woody species was rooted in proportion of 31% at microcuttings without growing tips.

The basal microcuttings has no root even we used different types of Radistim. In this case we observed a great numbers of looses because of medium remained on microcuttings was a properly support for bacterial agents and fungi.

The experience made showed that micocuttings with grows tips was rooted in witness variant in proportion of 22% but it is the smallest value. (Fig. 3)

The Codreanca variety has a smaller rooting percent *in vivo* but the interactions between biotic and abiotic factors were the same as Hidcote variety.

The microcuttings with growing tips registered the highest percents of rooting (64%) under the influence of woody species Radistim.

The microcuttings without apex were rooted in the small percent then minicuttings with apex, but in this case the highest value (28%) was registered when we used grassy species Radistim.

We observed that the value of 25 % rooting obtained under the influence of woody Radistim is smaller than the untreated witness. (Fig.4.)

The rooted plants *in vivo* in the same time with acclimatization has a good behaviour in the fortification in the pots without registering losses at the transfer from perlite to mixture of peat+ putrefied manure+ perlite.

Resultants obtained until now permit as to replace the *in vitro* rooting phase with rooting on septic conditions in the same time with acclimatization.

The obtained material can be delivered like *in vitro* rooted plants, acclimatized plants or *in vivo* rooted and acclimatized plants. The fezability study show as that by *in vivo* rooting the producing price is diminished from 16300 lei to 11652 lei.

CONCLUSIONS

In vivo rooting of *Lavandula angustfolia* microcuttings is made in the same time with acclimatization and reduces with o phase of the obtaining plants technology by aseptically culture

For aseptic rooting of lavender we recommend:

- utilization of perlite or perlizol;
- to use rooting stimulators (Radistim for woody and grassy species);
- temperatures of 15 -25 ^{0}C;
- to assure a high atmospheric humidity on rooting period (artificial smog or covering with plastics.

For pots fortification we recommends a light mixture of peat+ putrefied manure+ perlite. In 2:1:1 proportion.

We observed a better comportment of minicuttings with apex in the presence of Radistim for woody species.

The results obtained until now let as to realize 2 schemes with the phases of *in vitro* micropropagations of *Lavandula angustifolia*. (Fig.5)

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Table 1. The experience organization for *in vivo* rooting of *Lavandula angustifolia* minicuttings

Nr. variantă	Soiul	Tip minibutaş	Fitohormoni
Martor			
1	Hidcote	V	R1
2			R2
3		I	R1
4			R2
5		B	R1
6			R2
7	Codreanca	V	R1
8			R2
9		I	R1
10			R2
11		B	R1
12			R2

Legendă: V = Vârf de creştere; i = minibutaş intermediar;
b = Baze sub formă de tufă; R1 = Radistim – specii ierboase;
R2 = Radistim – specii lemnoase.

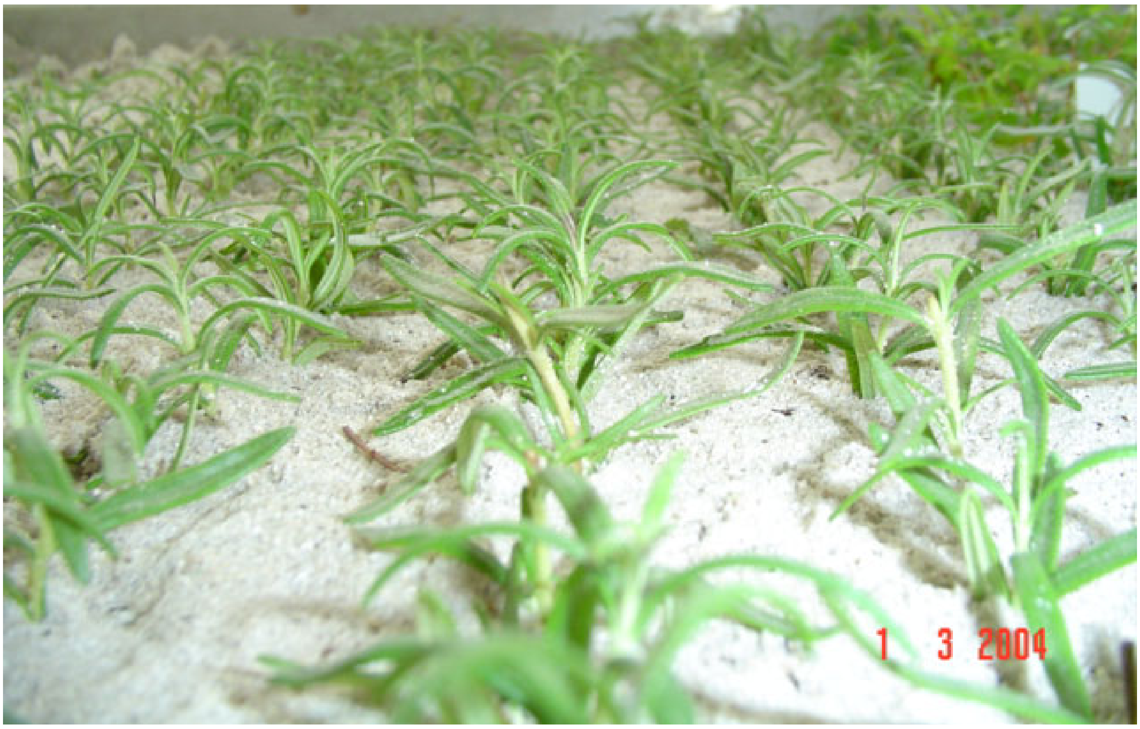

Fig. 1. *In vivo* rooting of *Lavandula angustifolia* on perlite

Fig. 2. Hidcote plants *in vivo rooted*

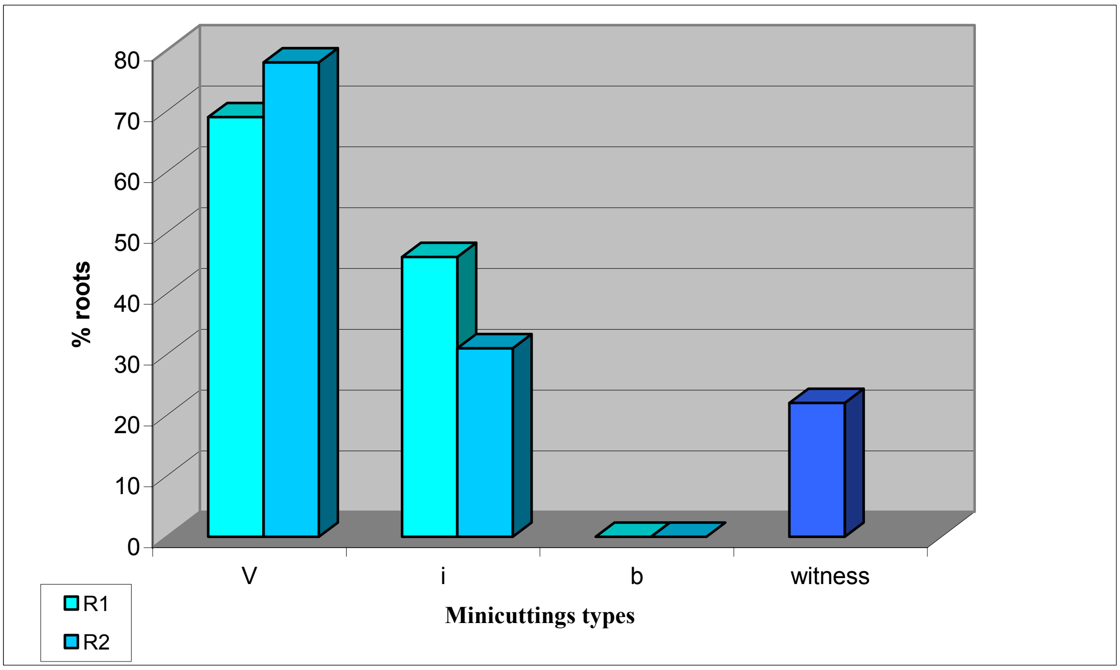

Fig. 3. The influence of minicuttings type and Radistim on Hidcote rooting variety

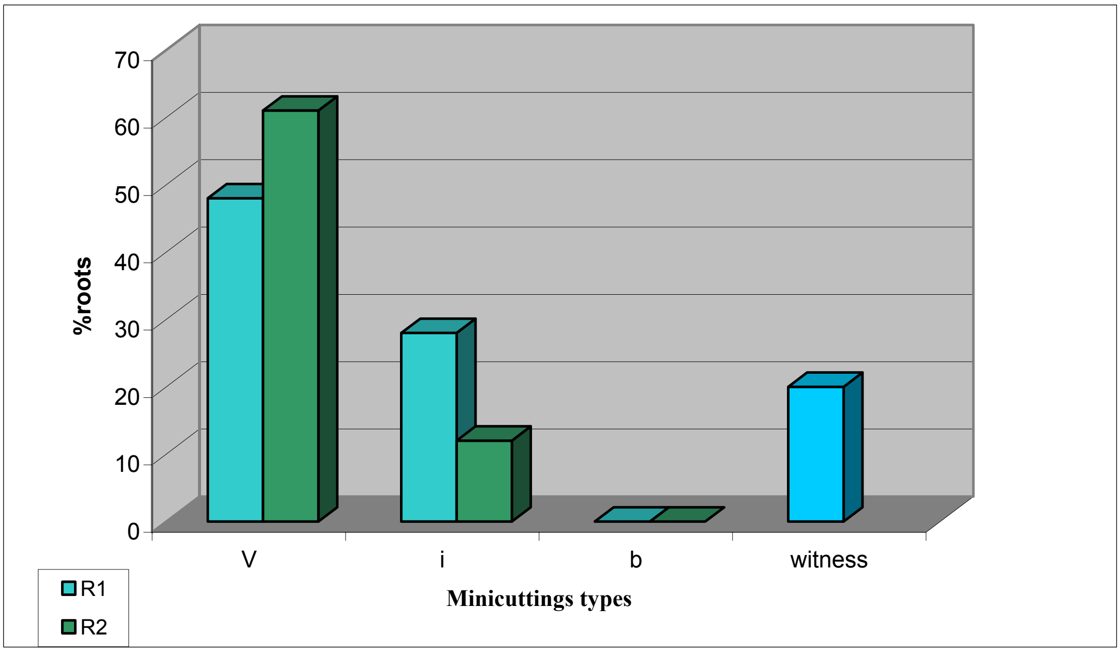

Fig. 4. The influence of minicuttings type and Radistim on Codreanca rooting variety

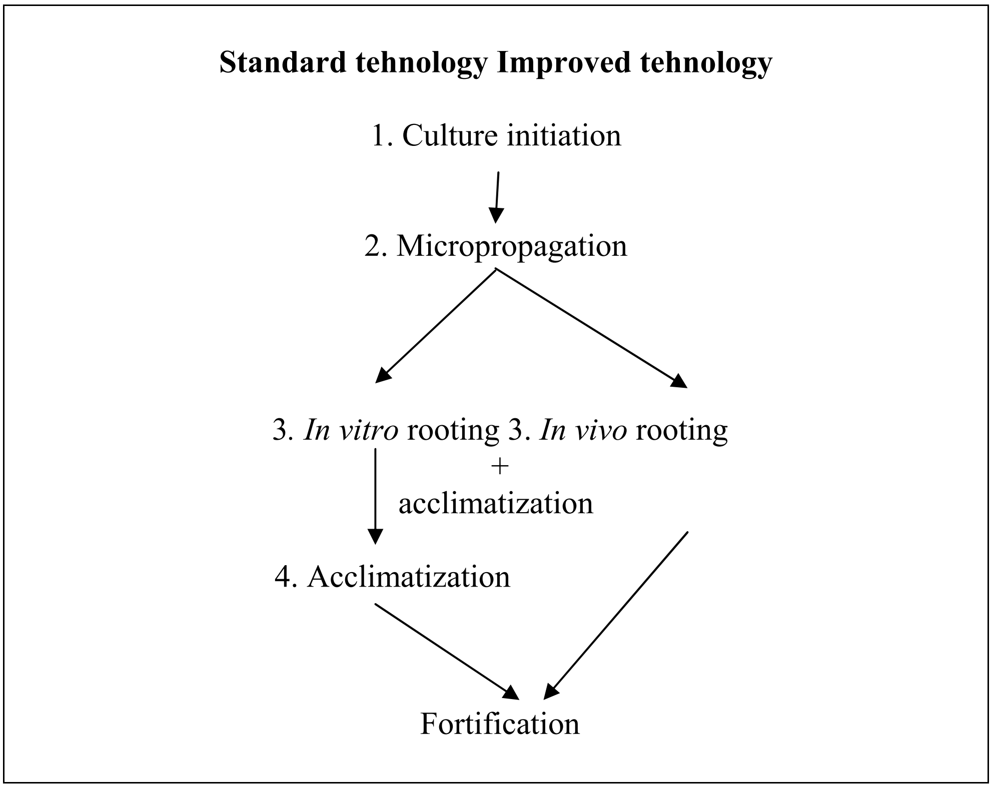

Fig. 5. The schemes of producing planting material

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LANDSCAPE ANALYSIS AND VALUATION METHODOLOGY TESTING – CASE STUDY: THE TOURING ZONE OF CHEIA – PRAHOVA COUNTY

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Keywords: characteristic indicators, rating system, landscape categories, functional landscape value, general valuation of the landscape

ABSTRACT

The work presents a control study of the methodology thought out within the Landscaping Department, regarding the analysis and valuation of the areas with landscape potential (landscape concern territories).

INTRODUCTION

The work theme aims the improvement of the landscaping interest site analysis and evaluation methods, inside and outside urban areas (localities); these methods were the subject of a previous grant, concerning the creation of a scientific instrument for the landscape potential acknowledging.

The carried out researches have allowed the development of the methodology aiming to provide landscape planners an efficient and unitary work instrument with the purpose of settling the fair ways to develop the landscape concern areas, within the framework of the ecological impact and of the sustainable development concept.

The methodology, developed by the completion of value categories, indicators and analysis and evaluation criteria, was tested on Cheia touring zone.

The application of the rating system has led to the tie-break of the global general values of several landscape types: *forestry mountain landscape*, *anthropic mountain landscape and pasture subalpine landscape*.

The final and the analytic values have shown the landscapes with great touring development potential, prior to the initiation of ecological impact studies.

The study concerns two landscape categories: the forestry mountain landscape and the human mountain landscape, using the set up criteria and valuation system.

MATERIALS AND METHODS

1. For the improvement of the methodology established in the previous researches we proposed:
   - The completion of the criteria set aimed to deepen the landscape analysis
   - The perfecting of the inquiry systems targeted towards the seen landscape
   - The perfecting of the analysis criteria for the landscape potential
   - The settlement of the rating system for the analysis criteria
2. On-site researches for the landscape analysis, mapping and evaluation
3. The processing of the evaluation results.

The verification and the improvement of the method consisted in the deepening of the global landscape analysis and evaluation on the base of different landscape types, with the contribution of the students of the landscape department.

RESULTS AND DISCUSSIONS

The methodology improvement adapted the criteria set up in a previous research to the analysis of the specific landscape typologies in the study. The aesthetic features of the existing landscape were detailed by introducing the subcriteria of the unity-variety ratio, the natural relevance, the landscape depth, the landscape amplitude, the valuation of landscape's internal and external horizons, the dynamic, the texture, the chromatics and the accents in the analyzed landscape typological area. As far as the potential landscape is concerned, the criteria we followed in this study were: the fishery and boating potential for the waters on site, the proportion and the possible natural relevance of the forests, as they are a major landscape concern in the area, the open space available for facilities building, the natural potential of the forests and the sportive fishing potential of the rivers. In completion to the valuation of the aesthetic value we added for the first time a valuation of the functional qualities of the typological zones: the accessibility value and the town network valuation (power networks, water networks, touring specific utilities).

We choose a five steps valuation system for the criteria organized mostly in three ranks of importance.

The on-site researches were carried out with the help of the students, by completion of analysis and valuation sheets, organized as shown below.

The processing of the evaluation results was carried out according to the principles of the Delphi inquiry.

1. The valuation of Grohotis-Tataru forestry landscape

1.1. Valuation of landscape existing features (VLEF)

1.1.1. 1st Degree Values (DV1) - A and B criteria, graded from 1 to 5

A. The unity – variety ratio (reference) = 5
B. The natural relevance = 5
DV1 = (A+B) / 2 = 5

1.1.2. 2nd Degree Values (DV2) – A to E criteria graded from 1 to 5

A. The landscape depth = 4
B. The landscape amplitude = 4
C. The landscape external horizon value = 3
D. The landscape internal horizon value = 5
E. The landscape dynamics = 3
DV2 = (A+B+C+D+E) / 5 = 3,6

1.1.3. 3rd Degree Values (DV3) – A to C criteria graded from 1 to 5

A. The accents = 4
B. The texture = 5
C. The chromatics = 5
DV3 = (A+B+C) / 3 = 4,66

1.1.4. The value of the landscape existing features
VLEF = 0,5 * DV1 + 0,3 * DV2 + 0,2 * DV3 = 4,51

1.2. Valuation of landscape potential features (VLPF)

1.2.1. 1st Degree Values (DV1)
A. Waters with fishery and boating potential = 2
B. Natural forest landscapes = 5
1.2.2. 2nd Degree Values (DV2)
A. Open space available for facilities building = 5
1.2.3. 3rd Degree Values (DV3)
A. Waters with fishery potential = 4
B. Touring adapted forests = 2
1.2.4. The value of landscape potential features
VLPF = 0,5 * DV1 + 0,3 * DV2 + 0,2 * DV3 = 4,3

1.3. The Global Landscape Value (GLV)
1.3.1. GLV = (VLEF + VLPF) / 2 = 4,40

1.4. The Functional Landscape Valuation (FLV)
1.4.1. The accessibility value (AV) – 5 steps ranking scale
5 – Updated routes within the target area
4 – Unmetalled routes within the target area
3 – Updated routes in the adjacent areas
2 – Unmetalled routes in the adjacent areas
1 – No routes in the adjacent areas
AV = 4

1.4.2. The town network valuation (TNV)
5 – Existing town networks within the target area
3 – Existing town networks within the adjacent area
1 – The lack of town networks of any kind
1st Degree Value (DV1) – the power networks = 3
2nd Degree Value (DV2) – water networks = 3
From the network categories:
TNV = 0,7 * DV1 + 0,3 * DV2 = 3

1.4.3. The touring specific utilities valuation (TSUV)
5 – Utilities in good status
4 – Utilities in medium status
3 – Utilities in bad status
1 – The lack of specific utilities
TSUV = 1
1.4.4. The Functional Landscape Value
1.4.5. FLV = 0,5 * AV + 0,3 * TNV + 0,2 * TSUV = 3,1

1.5. The General Qualitative and Functional Valuation of the Landscape
GQFVL = 0,7 * GLV + 0,3 * FLV = 4,01

2. The valuation of the anthropic landscape in Cheia Touring Resort area
The work was carried out by the same criteria and valuation system as in the forestry landscape case.

2.1. Valuation of landscape existing features (VLEF)
2.1.1. 1st Degree Values : DV1 = (A+B) / 2 = 3

2.1.2. 2^{nd} Degree Values : DV2 = (A+B+C+D+E) / 5 = 3,2
2.1.3. 3^{rd} Degree Values : DV3 = (A+B+C) / 3 = 3,5
2.1.4. The value of the landscape existing features
VLEF = 0,5 * DV1 + 0,3 * DV2 + 0,2 * DV3 = 3,16

2.2. Valuation of landscape potential features (VLPF)
2.2.1. 1^{st} Degree Values : DV1 = 0
2.2.2. 2^{nd} Degree Values (open space available for facilities building) : DV2 = 5
2.2.3. 3^{rd} Degree Values : DV3 = 0
2.2.4. The value of landscape potential features :
VLPF = 0,5 * DV1 + 0,3 * DV2 + 0,2 * DV3 = 1,5

2.3. The Global Landscape Value (GLV)
2.3.1. GLV = (VLEF + VLPF) / 2 = 2,33

2.4. The Functional Landscape Valuation (FLV)
2.4.1. The accessibility value : AV = 5
2.4.2. The town network valuation : TNV = 0,7 * DV1 + 0,3 * DV2 = 5
1^{st} Degree Value (DV1) – the power networks = 5
2^{nd} Degree Value (DV2) – water networks = 5
2.4.3. The touring specific utilities valuation : TSUV = 3
2.4.4. The Functional Landscape Value :
FLV = 0,5 * AV + 0,3 * TNV + 0,2 * TSUV = 3,6

2.5. The General Qualitative and Functional Valuation of the Landscape
GQFVL = 0,7 * GLV + 0,3 * FLV = 1,631 + 1,08 = 2,71

3. Following the same criteria have also been analyzed the **Ciucaş forestry landscape** - with 4,56 as the final mark – and the **anthropic landscape in Măneciu village area** – which got 2,71 as final mark.

The forestry mountain landscape in **Ciucas area and the pasture subalpine landscape** were valued by similar means, achieving (obtaining) the following general qualitative and functional landscape valuations: 4,56 for the first one and 2,73 for the last one.

CONCLUSIONS

The landscape valuation as established by the perfected methodology allowed the differentiation of the sites and their hierarchisation for the correct implementation of the planning proposals.

Although the pasture subalpine landscape global value was found inferior to the forestry mountain landscape one, the availability of the open space, unique within the site indicates this area as preferred for the introduction of mountain touring specific utilities.

The methodology improvement has built new steps towards the material finality of the planning process: the feasibility study. The next necessary step is the impact study for the territorial strategy.

The apposition of the presenting methodology validates it as an objective must in the planning studies.

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STUDIU PEISAGISTIC IN ZONA TURISTICA CHEIA
INCADRARE IN JUDET
JUDEŢUL BRAŞOV
JUDEŢUL BUZĂU
JUDEŢUL DÂMBOVIŢA
JUDEŢUL ILFOV
JUDEŢUL IALOMIŢA
N
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CHEIA
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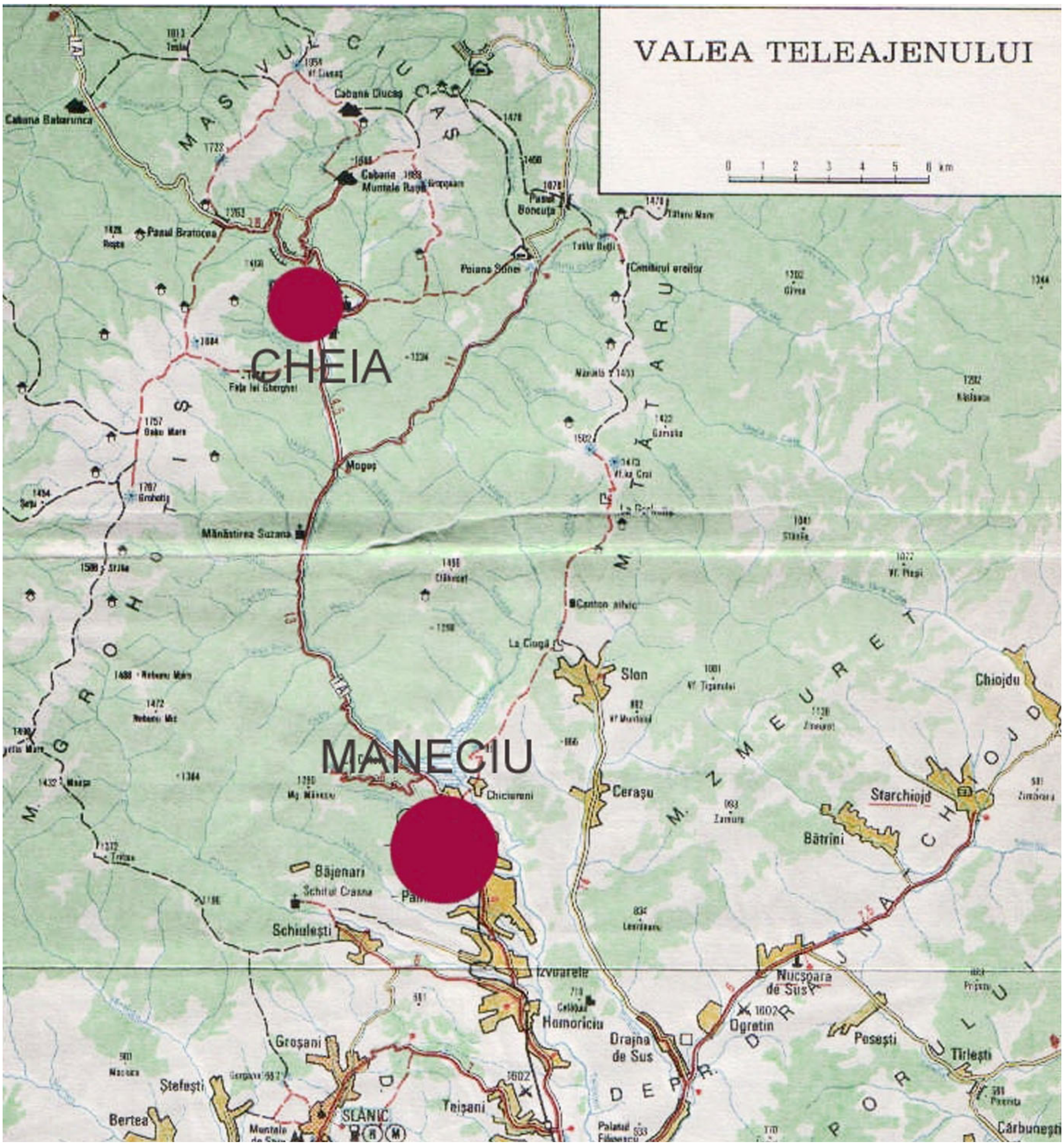
VĂLENII DE MUNTE
BĂICOI
BOLDEŞTI-SCĂENI
URLAŢI
MIZIL
PLOIEŞTI
LEGENDĂ
DRUM NAŢIONAL
DRUM JUDEŢEAN
CALE FERATĂ
LIMITĂ DE JUDEŢ
LIMITĂ DE LOCALITATE
RÂU
MUNICIPIU
ORAŞ
COMUNĂ


VALEA TELEAJENULUI
CHEIA
MANECIU
MASIVUL CIUCAS
Cabana Ciucaş
Cabana Muntele Roşu
Cabana Babarunca
Pasul Bratocea
Pasul Boncuţa
Poiana Stânei
Mănăstirea Suzana
Mogoş
Canton silvic
La Cioga
Slon
Cheia
Cheia
Cerașu
Chiojdu
Starchiojd
Bătrîni
Băjenari
Schitul Crasna
Schiulești
Izvoarele
Homoriciu
Drajna de Sus
Nucşoara de Sus
Ogretin
Poseşti
Tîrleşti
Cărbuneşti
Groşani
Ştefeşti
Bertea
SLĂNIC
Teişani
M. GROHOTIŞ
M. TĂTARU
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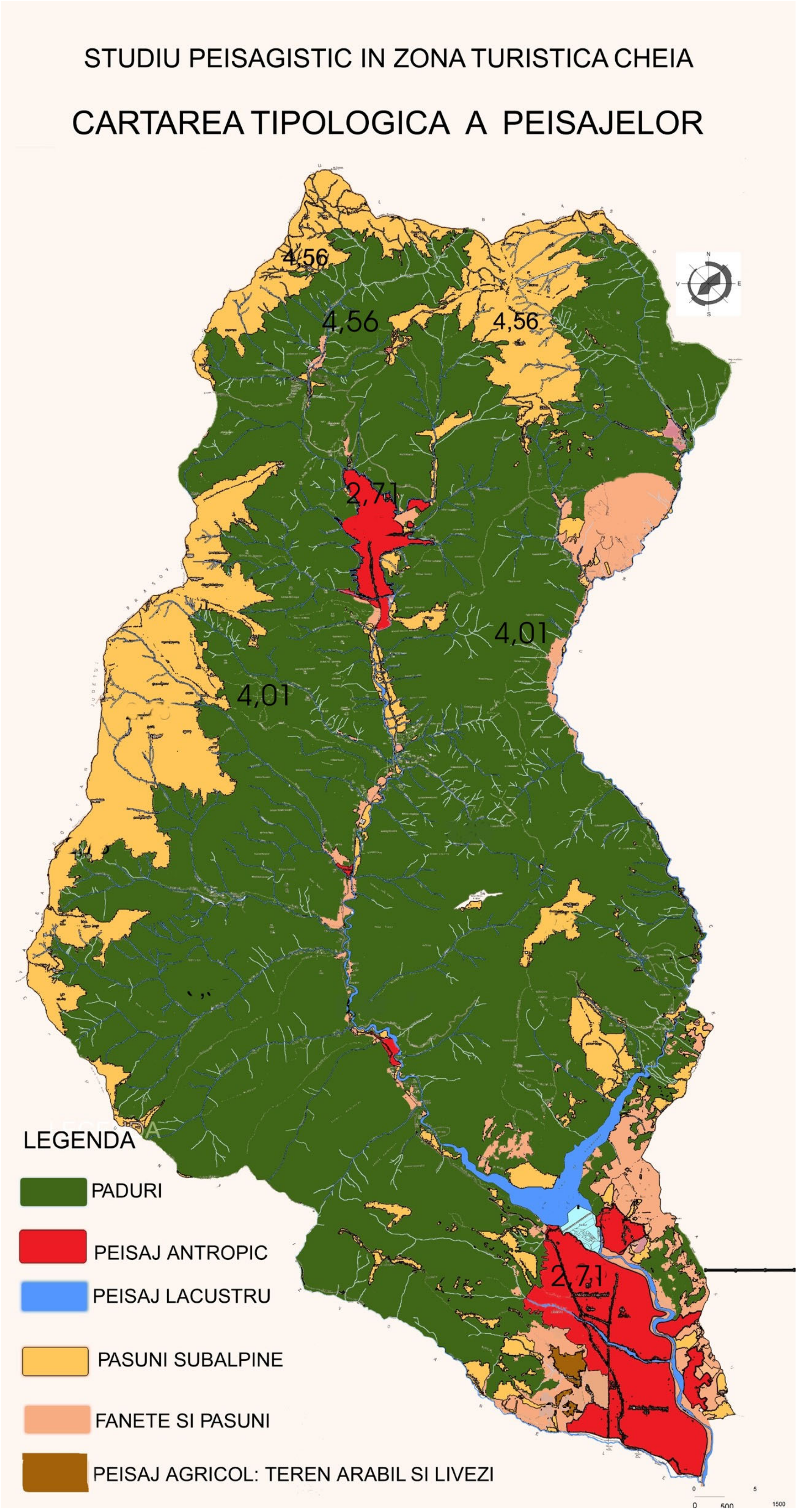
M. MĂNECIU
DEPR. DRAJNA
PORUL


STUDIU PEISAGISTIC IN ZONA TURISTICA CHEIA
CARTAREA TIPOLOGICA A PEISAJELOR
4,56
4,56
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2,71
4,01
4,01
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LEGENDA
PADURI
PEISAJ ANTROPIC
PEISAJ LACUSTRU
PASUNI SUBALPINE
FANETE SI PASUNI
PEISAJ AGRICOL: TEREN ARABIL SI LIVEZI

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RESEARCHES CONCERNING THE IN VITRO PRODUCTION OF POLYANTHES TUBEROSA L. PLANTING

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Keywords: bulbs, in vitro cultures, multiplication coefficient

ABSTRACT

Tuberose is undoubtedly one of the most appreciated flowers, called of some authors, the Queen of the summer – autumn flowers assortment. But this beautiful flower has major difficulties concerning the flowers bulbs production (it is necessary about three years for the flower bulbs production). Also, the flowers bulbs no flowering if the temperature in the rest period is under 20 – 22 ºC. In this reason we initiated ample researches of in vitro production of the planting, following which is the effect upon the revigoration of biological material. We used bulbs from an aboriginal population in the Bucharest area, very appreciated for the quality of its flowers. The culture media was the M&S' 62 with NAA, KIN and BAP in different ratio. The explants were represented by buds from bulbs with 1 cm diameter, these being inoculated in April. We followed the evolution of the explants for each variant by biometrical observations and physiological determinations, too. The best results – also for the multiplication coefficients and physiological determinations – were obtained for the variant with 0,2 mg/l NAA + 1,5 mg/l KIN + 2,0 mg/l BAP. The plants obtained in vitro were planted in pots on substrate composed from manure 1/3 + tourbe 1/3 + perlit 1/3. In these pots the plants were maintained in vegetation until November, when the plants were passed in rest period. The rest period for the bulbs was assured in two different conditions: one half of bulbs were maintained in 20 – 22 ºC + 75 – 80 % UR and the other half of bulbs were maintained in 8 – 10 ºC + 55 – 60 % UR.

INTRODUCTION

Very appreciated for its beautiful and strong perfumed flowers, tuberose has major difficulties concerning the growing of the flowers bulbs and the percent of blossoming of the plants. Our and the other authors pervious researches show a superior percentage of plants blossoming if the flowers bulbs were maintained in the rest period at 20 – 22 ºC and 75 – 80 % UR. Known the role of the in vitro production of the planting upon the plants revigoration we developed an ample program of researches for establishing the effect of this method of multiplication upon the growing and the flowering of tuberose. These researches covered more years and it aimed all the stages concerning the in vitro production of the planting and also, the growing and the flowering of the plants in field. In this work we present only the results for one stage of in vitro production of the planting.

MATERIALS AND METHODS

In this experiment we used bulbs of 1 cm diameter belong to one aboriginal population from Bucharest area. The flower steam has 70 – 100 cm length and the inflorescence has 18 – 26 double flowers, very strong and pleasant perfumed. The duration of flowers bulbs growing is three years, if the technological conditions are optimal.

We used Murashige & Skoog' 62 base culture media, with 30 g/l saccharose + 8 g/l agar, the pH medium being 5,7. We see the report of growing hormones in the table 1.

The explants were represented by buds from bulbs of 1 cm diameter. These explants were disinfected 20 minutes by mercury chloride 0,1 %. After disinfection the explants were washed 2 – 3 times with sterile water and before inoculation we maintained the explants 2 minutes in ethylic alcohol 70 %.

Each variant was three repetitions of 20 explants.

In the climatic room we assured:

- 16 hours light/8 hours dark;
- 20 – 22 ºC in the day and 16 – 18 ºC in the night;
- 80 – 85 % UR.

The acclimatization of the plants regenerated was made on sand substrate under moist lint. After acclimatization the plants were planted in pots on substrate composed from manure 1/3 + tourbe 1/3 + perlit 1/3. These plants continued its vegetation until November when we introduced its in rest period. We assured in rest period two different conditions for the bulbs: 20 – 22 ºC + 75 – 80 % UR for half of bulbs and 8 – 10 ºC + 55 – 60 % UR for the other half of bulbs.

The elements which we analyzed were: the number of explants which regenerated plantlets, the number of plantlets regenerated per explants, the growing elements of regenerated plantlets, the number of acclimatized plantlets, the physiological indices of regenerated plantlets, the growing of the acclimatized plants, the multiplication coefficients, the number of the quality of the bulbs.

RESULTS AND DISCUSSIONS

The number of explants which regenerated plantlets varied between 53,33 % for variant V 4 and 83,33 % for variant V 3 (table 2). Also, the variant V 3 present the maximum value concerning the number of plantlets regenerated per explants (fig. 1.); this hierarchy was demonstrated by statistical gravel (table 3).

The growing of the plantlets on the rooting media presented approached values (table 4). The number of acclimatized plants varied between 89,09 % at variant V 4 and 98,99 % at variant V 3 (fig. 2).

The physiological analyses show a significant variation of plants intensity perspiration and a chlorophyll pigments, depending a culture media used for explants inoculation (table 5).

Thus, the perspiration intensity – determined with Riken analyzer – varied between 16,1 mg/l CO 2/kg/h for variant V 1 and 52,12 mg/l CO 2/kg/h for variant V 3 (fig. 3). The variation of intensity of perspiration certified the importance of culture media for the plantlets evolution. Like the biometrical observation upon the plantlets we observed the maximum values at variant V 3, with 0,2 mg/l NAA + 1,5 mg/l KIN + 2,0 mg/l BAP in the culture media.

The chlorophyll indices determined by Arnon method varied between 27,08 mg/100 g vegetal material at variant V 5 and 49,63 mg/100 g vegetal material at variant V 1. We see that the maximum value of report between a and b chlorophyll was obtained at variants V 1 and V3, what signify a same capacity of collection of assimilated energy (fig. 4.).

After plantation in pots, the plants have a similar growing, without significant differences between variants (table 6).

We observed that the maximum influence of culture media was made of coefficient of in vitro multiplication which varied between 0,61 at variant V 4 and 3,28 at variant V 3 (fig. 5.). These differences were also certified by coefficient of bulbs multiplication (table 7). Concerning the influence of the conditions from rest period we observed that the best results of bulbs multiplication were obtained at bulbs maintained in the rest period at 20 – 22 ºC + 75 – 80 % UR.

CONCLUSIONS

1. The results of our studies show that the tuberose respond very well at in vitro multiplication, the culture media being very important for the values of the planting multiplication.

2. The best culture media were the M & S with 0,2 mg/l NAA + 1,5 mg/l KIN + 2,0 mg/l BAP.
3. The best conditions for the rest period of the bulbs were 20 – 22 ºC + 75 – 80 % UR.

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Tables

Table 1. Experimental variants

Variant	Growing hormones (mg/l)		
	ANA	KIN	BAP
V 1	0,2	0,5	2,0
V 2	0,2	1,0	2,0
V 3	0,2	1,5	2,0
V 4	0,2	2,0	2,0
V 5	2,0	0,5	2,0

Table 2. The explants evolution from inoculation to the transfer on rooting media

Var.	Regenerated explants		Plantlets regenerated per explants	Total plantlets	Length of plants (cm)	Leaves number
	no.	%				
V 1	15,00	75,00	1,34	20,33	4,11	0,62
V 2	16,00	80,00	1,73	28,00	3,50	0,31
V 3	16,66	83,33	4,05	67,66	3,69	0,30
V 4	10,66	53,33	1,52	16,33	2,69	0,22
V 5	16,00	80,00	1,70	27,33	4,07	0,43

Table 3. Differences between variants concerning the number of plantlets regenerated per explants

Var.	Plantlets	Differences between variants and its signification			
		V 1	V 4	V 5	V 2
V 3	4,05	2,71 ***	2,53 ***	2,35 ***	2,32 ***
V 2	1,73	0,39 *	0,20	0,03	--
V 5	1,70	0,36*	0,18	--	--
V 4	1,52	0,18	--	--	--
V 1	1,34	--	--	--	--

DL 5 % = 0,285; DL 1 % = 0,391; DL 0,1 % = 0,533

Table 4. The evolution of plantlets on the rooting media and the plants resistance of acclimatization

Var.	Length of plants (cm)	Leaves number	No. of roots	Length of roots (cm)	Plants passed at acclimatization		Acclimatized plants	
					no.	%	no.	%
V 1	8,83	1,96	4,73	2,20	19,66	96,46	19,33	98,48
V 2	8,30	2,00	4,30	2,03	27,00	96,81	26,66	98,66
V 3	6,80	1,80	3,93	2,30	67,00	99,05	66,33	98,99
V 4	5,83	1,36	2,90	2,13	15,33	94,26	13,66	89,09
V 5	8,93	2,06	3,90	2,12	26,00	95,11	25,33	97,31

Table 5. The variation of some physiological indices for the plantlets regenerated in vitro

Var.	Perspiration *	Total chlorophyll **	Chlorophyll a**	Chlorophyll b **	a/b	Carotene **
V 1	16,10	49,63	37,01	12,62	2,92	0,70
V 2	47,30	42,61	27,90	14,71	1,90	0,51
V 3	52,12	30,13	22,41	7,71	2,91	0,00
V 4	16,97	34,98	20,15	14,83	1,36	0,00
V 5	20,39	27,08	14,74	12,34	1,19	0,10

* mg CO 2/kg/h

** mg/100 g

Table 6. The growing of acclimatized plants from plantation in pot until the introduction in the rest period

Var.	Leaves number		Length of leaves (cm)		Viable plants		In vitro coefficient of multiplication
	*	**	*	**	no.	%	
V 1	6,93	9,70	5,63	7,00	19,33	100,00	0,96
V 2	6,50	9,43	5,55	6,74	26,33	98,98	1,31
V 3	6,80	9,86	5,68	7,47	65,66	98,94	3,28
V 4	6,06	8,33	5,50	6,41	12,33	90,95	0,61
V 5	7,80	10,06	6,24	7,61	25,33	100,00	1,26

* the observations were made at plants acclimatization

** the observations were made at introduction of plants in the rest period

Table 7. The variation of number, quality and coefficient of bulbs multiplication

Var.	Bulbs number per plants		Coefficient of bulbs multiplication		Diameter of bulbs (cm)		Weight of bulbs (cm)	
	*	**	*	**	*	**	*	**
V 1	3,20	3,62	14,13	16,93	1,09	1,10	3,16	3,29
V 2	3,08	3,36	16,00	18,00	1,11	1,11	3,06	3,17
V 3	3,87	4,27	51,20	56,00	1,12	1,11	3,15	3,24
V 4	2,72	2,95	6,53	7,46	1,11	1,11	2,91	3,10
V 5	3,50	4,07	17,73	20,73	1,09	1,11	3,05	3,15

* bulbs were maintained at 8 - 10 °C + 50 - 60 % UR

** bulbs were maintained at 20 - 22 °C + 75 - 80 % UR

Figures

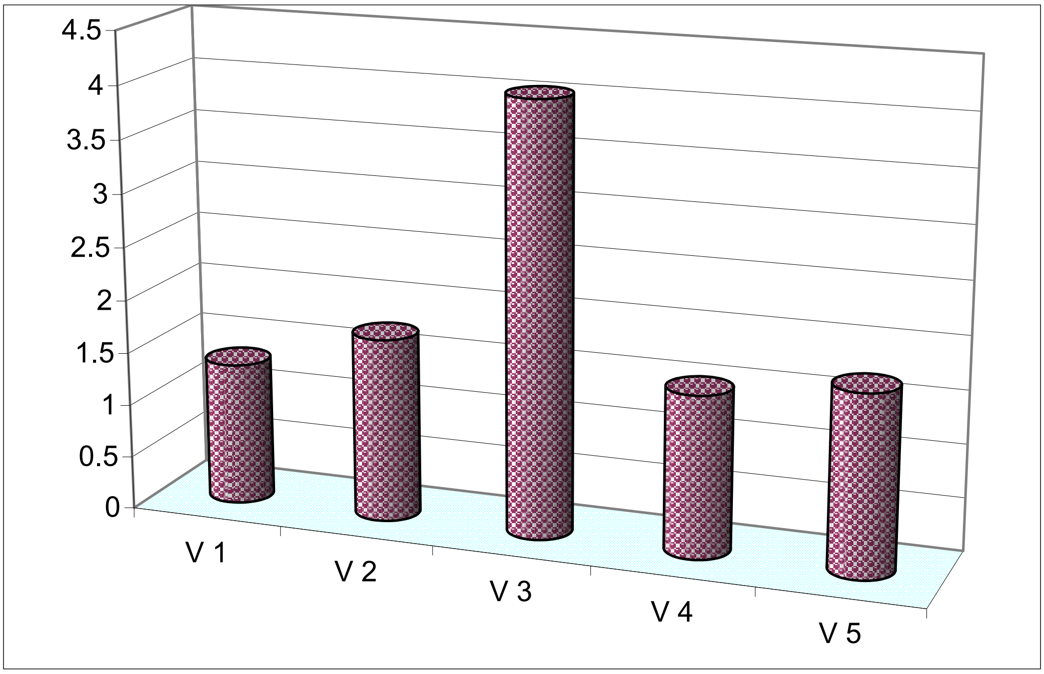

Fig. 1. The variation of the number of plantlets regenerated per explants

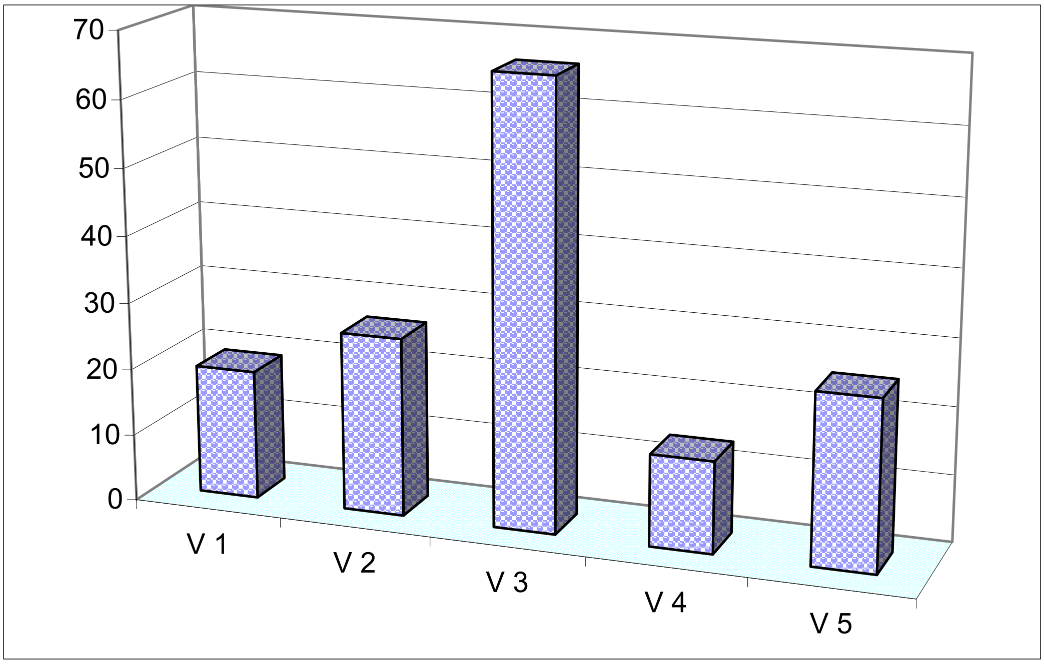

Fig. 2. The variation of the number of acclimatized plants

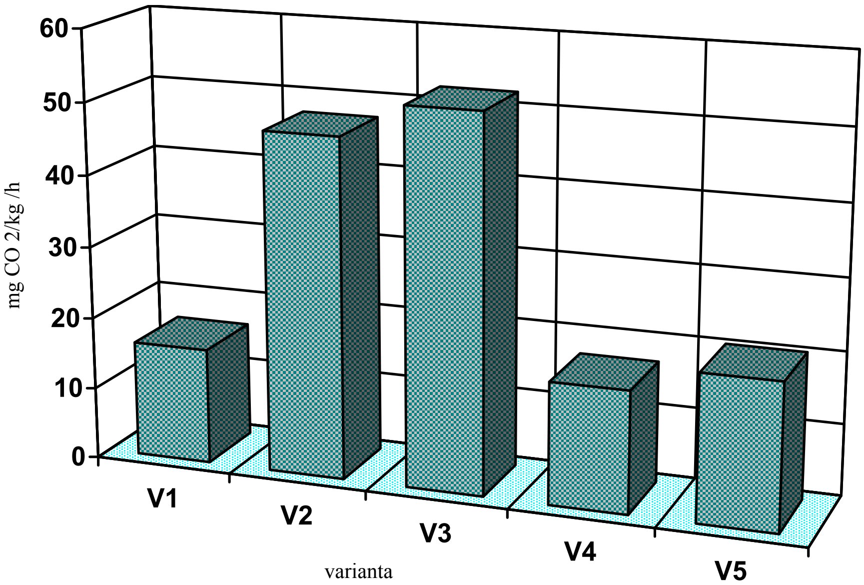

Fig. 3. The variation of perspiration intensity of plantlets regenerated in vitro

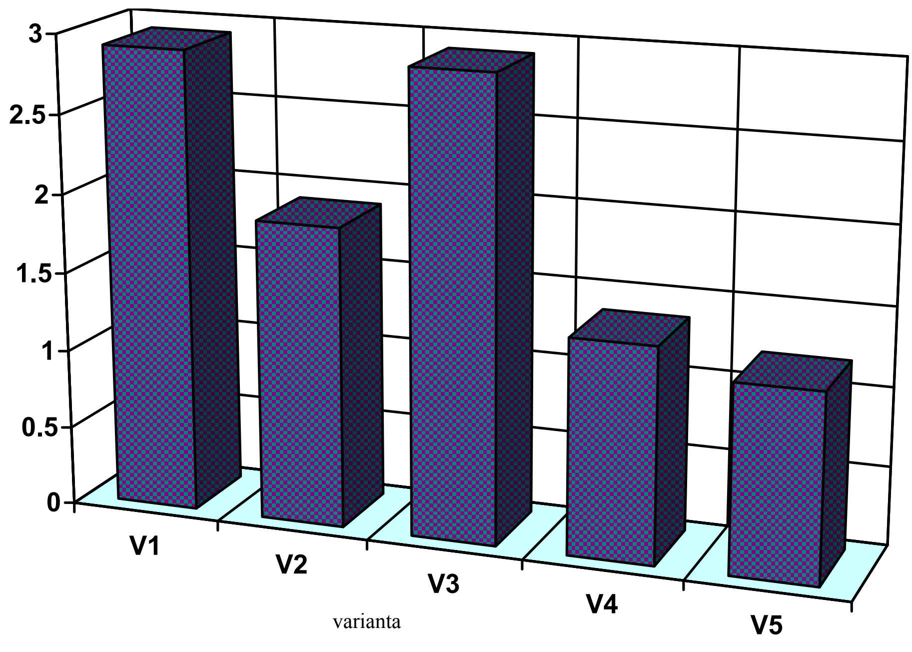

Fig. 4. The variation of report between a and b chlorophyll

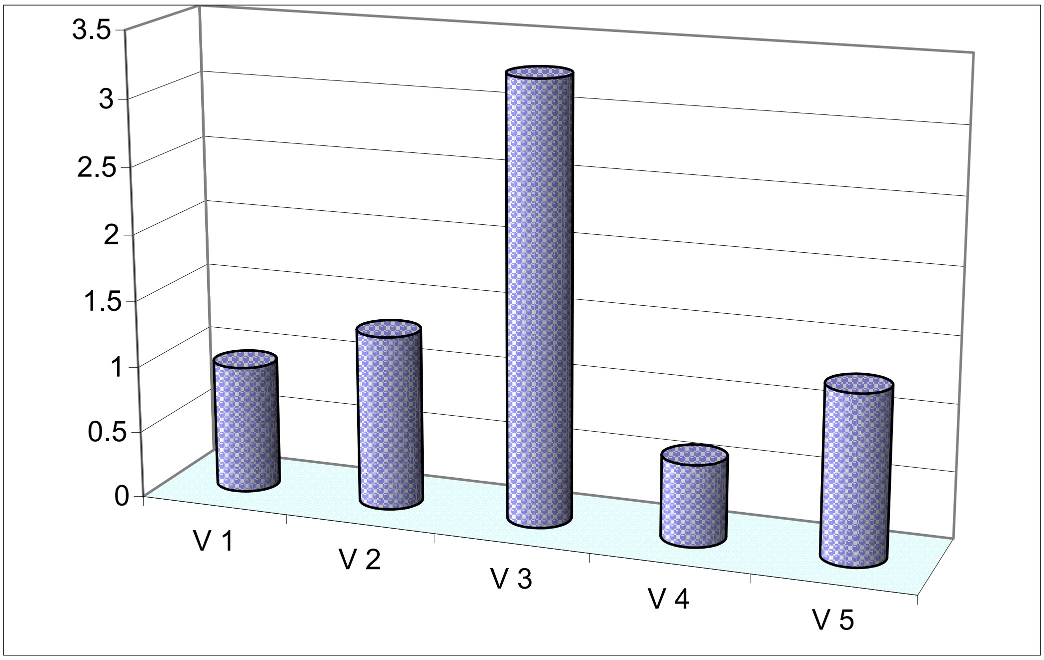

Fig. 5. The variation of coefficient of in vitro multiplication

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FRUIT GROWING & TECHNOLOGY

STUDIES REGARDING THE BIOCHEMICAL COMPOSITION OF SOME INTERSPECIFIC CHERRY HYBRID ROOTSTOCKS

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Keywords: *Prunus sp.* hybrids, protein, glucide accumulation, peroxides activity

ABSTRACT

The relationship established between the scion and the rootstocks in the graft process is a complex one. There are a lot of factors which intervene and contribute to the compatibility or incompatibility. The biochemical factors are very important because a simple presence or a bigger amount of the responsible substances could determine the incompatibility. We propose in this study to observe the influence of protein and soluble glucides concentration, the peroxides activity upon the grafted cherry hybrid plants. There was made determinations in three different zones: under the graft point, trough the graft point and upper the graft point. The dates showed that the protein concentration was bigger in all variants upper the graft point, the soluble glucide concentration in almost all variants was bigger at the graft level, also the activity of the peroxides.

INTRODUCTION

Compatibility or incompatibility between scion and rootstock plays a special role in succeed of grafting. Generally speaking, compatibility represents the capacity of the scion to grow with the rootstock. The failure of the grafting, respective incompatibility represents, by researches opinions, a process genetic controlled by the presence of some dominant alleles in the cells of the scion that are incompatible with the rootstocks ones. This process could be biochemical controlled by the scion's substances accumulated at the rootstock level which start the incompatibility reactions. The incompatibility could result from the morph anatomical differences between the scion and the rootstock too.

In the first phase after the grafting moment, there is an unspecific adhesion process between the scion and the rootstock which is expressed by the appearance of the pectic substances on the cut surfaces. At this process take part the Golgi complex where are synthesized the galacturonic acids and the golgian vesicles which transport those acids to the plasmalema level where through an exopinocytosis process are eliminated outside of the cells, being used for the pectic substances syntheses.

The aim of this paper is to show in which way the rootstock responds after about 10 days by grafting moment at the scion presence respectively the biochemical changes induced by his presence.

The determination of the enzymatic activity of the peroxides is considered as a measure of the stress existent level respective a possibility to evaluate the grafted plant capacity to respond properly to this inner biochemical factor induced by the physiological condition of the plant.

Other biochemical parameter is the soluble glucide concentration in the point of graft, which is correlated in the next days after the grafting with the pectic substances synthesis that contribute to the unspecific adhesion between the scion and the rootstock. The level of the soluble glucide concentration determinated in the growing time of the scion with the rootstock is correlated with the transport intensity of the photo assimilates and also with the restoration degree of the vascular continuity.

MATERIALS AND METHODS

The biological material was represented by four interspecific cherry hybrids, respective IPC 1-6 *(Prunus subhirtella x Prunus canescens),* IPC 6-8 *(Prunus incisa x Prunus subhirtella),* IPC 3-7 *(Prunus subhirtella x Prunus pseudocerasus),* IPC 5-0 *(Prunus pseudocerasus x Prunus incisa)* and as control was used a selection of *Prunum avium L*. The samples were represented by the 2cm fregments of the portions situated upper the graft point, near the graft point and under the graft zone. Those fragments were fine break up and milled, then by homogenize 1h it was released the extraction in 1/10 reports. The total proteic extract was analysed measuring the content of the proteins and peroxydes and the total glucide extract was analysed measuring the content of the total soluble glucides.

Determination of the proteins was released conformable to the Biuret method (Iordachescu and Dumitru, 1988), determination of the peroxydes was released conformable to the Brad method (Iordachescu and Dumitru, 1988), and determination of the total soluble glucides with Scott and Melvin method (Iordachescu and Dumitru, 1988).

RESULTS AND DISCUSSIONS

Protein concentration determined in the five rootstocks samples varied between 32,98 mg/g p.s. (IPC 6-8) and 55,16 mg/g p.s. (IPC 1-6), the control having a high value, similar with the maximum obtained for the variant IPC 1-6 (fig. 1).

Analyzing the different zones situated upper, under and near the point of graft, the dates show a different content of proteins in each analyzed zone. Thus, is remarkable the high protein content in the zone situated upper the point of graft at almost all rootstocks variants, except the variant IPC 3-7 which recorded a maximum content of proteins in the graft zone (fig. 2).

The control and the variants IPC 5-0 and IPC 1-6 had appropriate values of the protein concentration, about 55 mg/g p.s., and the variants IPC 6-8 and IPC 3-7 recorded values of the protein concentration, about 40 mg/g p.s. In the case of the control and the IPC 3-7 rootstock also it was recorded values relative uniformly of the protein concentration in the three analyzed zones with one exception: if in the case of the control, the maximal value was recorded in the upper zone, for the IPC 3-7 variant, this maximal value is recorded at the graft level. At the IPC 6-8, IPC 5-0 and IPC 1-6 variants, there are noted bigger values in the zone situated upper the graft point than in the graft zone or under the graft zone.

Soluble glucide concentration measured in the fragments of the five studied rootstocks, point out smaller differences between variants than the protein concentration. This is explainable maybe because of the phase when was made analyses. In that phase, predominate the producing of pectic substances involved in the unspecific adhesion between the scion and the rootstock (fig. 3). The glucide concentration vary between 26,4 mg/g p.s. at IPC 5-0 and 36,5 mg/g p.s. at the control.

Analyzing the glucide concentration in the different studied zones (fig. 4), is emphasized in general way a bigger content in the graft point than the upper and under graft zones (at the control - 40,6 mg/g p.s., IPC 5-0 - 35.7 mg/g p.s and IPC 1-6 - 36,7 mg/g p.s.). In the case of the rootstocks IPC 6-8 (25,1 mg/g p.s.) and IPC 3-7 (26 mg/g p.s.), the glucide concentration in the graft point is relatively smaller than the upper and under zones, at this variants, maybe the unspecific adhesion phase is passed.

The biggest difference between the glucide concentrations determined in the graft zone was observed at the IPC 5-0 rootstock, where the content of the total soluble glucide is approximately double in the graft zone comparatively with the upper and under of this zone but more reduced than the control.

Determination of the enzymatic activity of the peroxide in the graft zone of the five studied rootstocks shows major differences regarding their answer at the oxidative stress generated by the presence of the scion. Thus, is remarkable the IPC 5-0 which record an intense enzymatic activity (fig. 5) (18.7 µmoli ascorbic acid/ml/min at 25^0C), about three times bigger than the control (7,1 µmoli ascorbic acid/ml/min at 25^0C) and IPC 3-7 (6,8 µmoli ascorbic acid/ml/min at 25^0C) and double than IPC 1-6 (9,2 µmoli ascorbic acid/ml/min at 25^0C). It's explainable now, the existence of rich protein concentration in the grafted zones of the IPC 5-0 and IPC 1-6 but not in the case of the control and IPC 3-7.

Looking for each portion of the graft zone it's obvious that the activity of the peroxides is released especially in the graft zone, maybe because of the wound presence there and the presence of the poliphenoles synthesized by the rootstock. For the IPC 5-0 rootstock, the peroxides activity in the graft point is 22,4 µmoli ascorbic acid/ml/min at 25^0C and in the upper and under this zone about 16,8 µmoli ascorbic acid/ml/min at 25^0C. This shows an intense metabolic answer of the rootstock to the presence of the scion (fig. 6). The IPC 6-8 variant record also rich values of the peroxides activity: in the graft point (14,61 µmoli ascorbic acid/ml/min at 25^0C) and in the zones situated upper and under the graft point (12 µmoli ascorbic acid/ml/min at 25^0C and respective 11,59 µmoli ascorbic acid/ml/min at 25^0C).

The reduced peroxides activity associated with the presence of a high protein concentration in the graft zone of the control could indicate a favorable metabolic answer for grafting compatibility between the scion and the rootstock.

CONCLUSIONS

1. Comparing the protein concentration in the graft point and in the zones situated upper and under the graft point, is remarkable the fact that for all variants the values obtained in the upper zone are bigger than the others zones;
2. The soluble glucide concentration is for almost all rootstocks bigger in the graft zone than the upper and under graft zones;
3. The peroxide enzymatic activity is bigger in the point of graft than the other zones;
4. For the control it was obtained high protein and soluble glucide concentrations and a lower enzymatic activity of the peroxide, which could be associate with a metabolic compatibility between the scion and the rootstock;
5. For IPC 5-0 rootstock, the protein and soluble glucide concentrations vary inverse proportional in the graft zone, with significant differences between the values in the three studied zones, and it was recorded an intense enzymatic activity of the peroxide especially in the graft zone.

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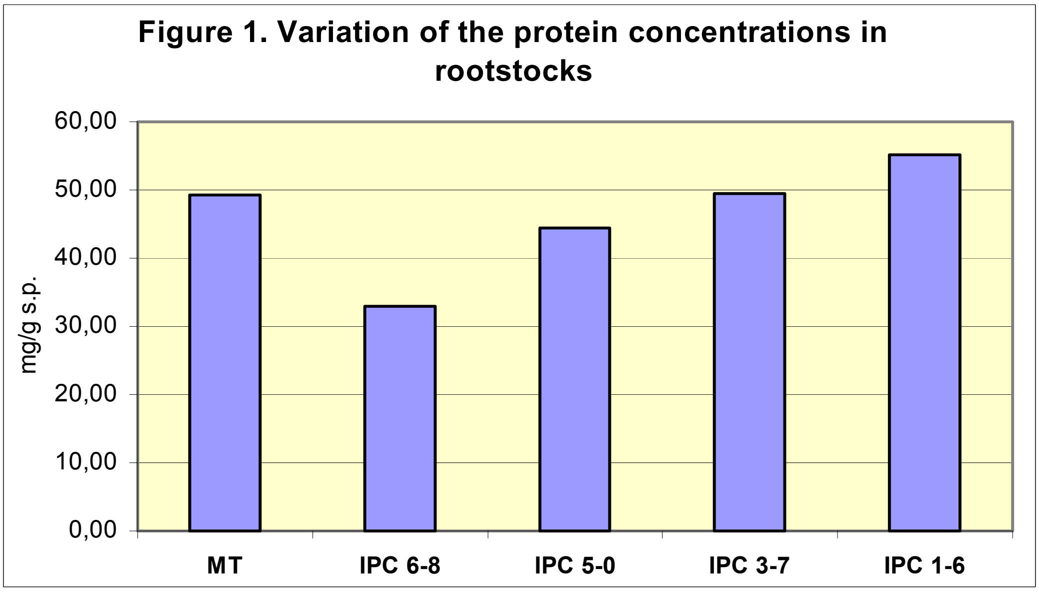
Figures



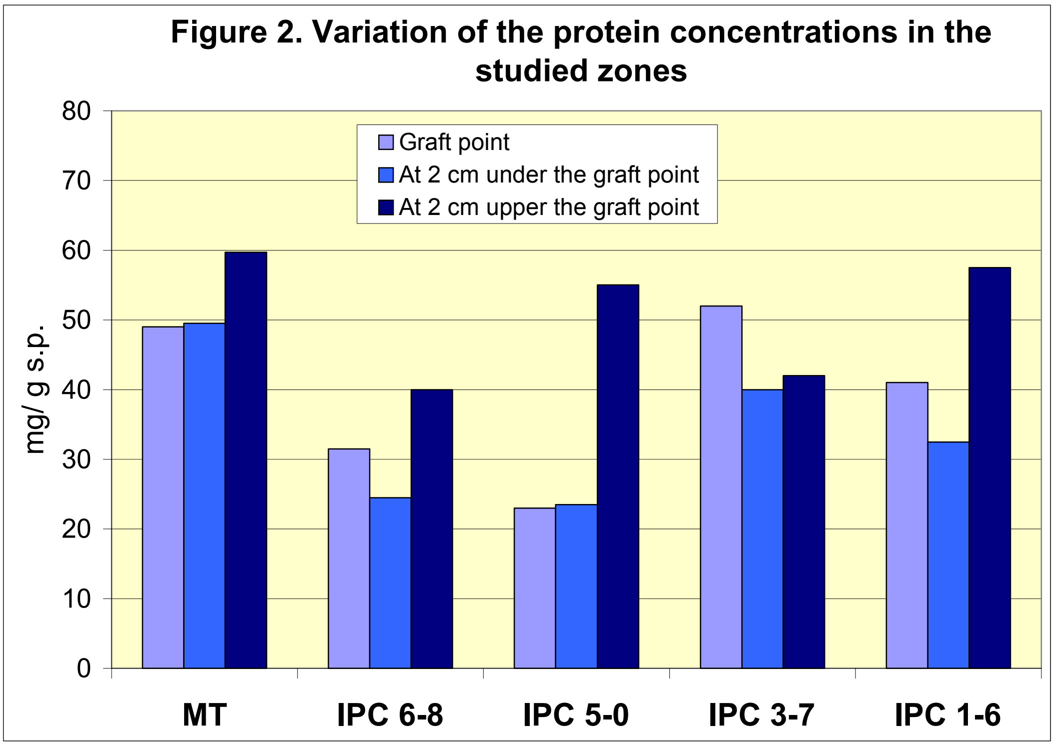


Figure 3. Variation of the soluble glucide concentration in rootstocks

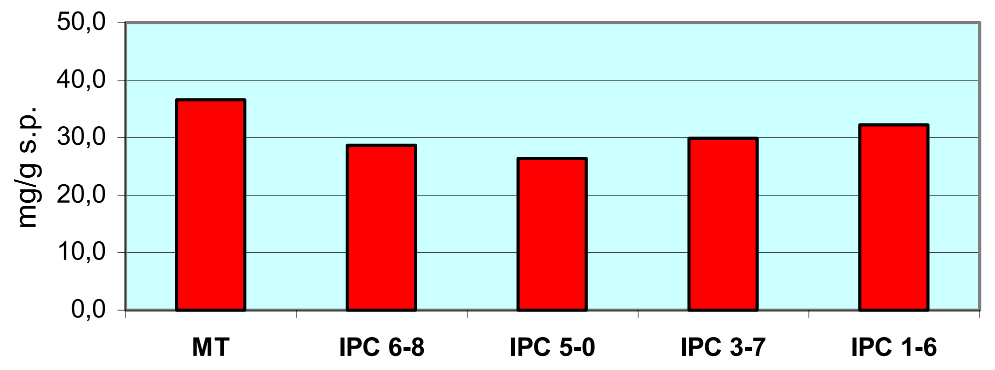


Figure 4. Variation of the soluble glucide concentration in the studied zones

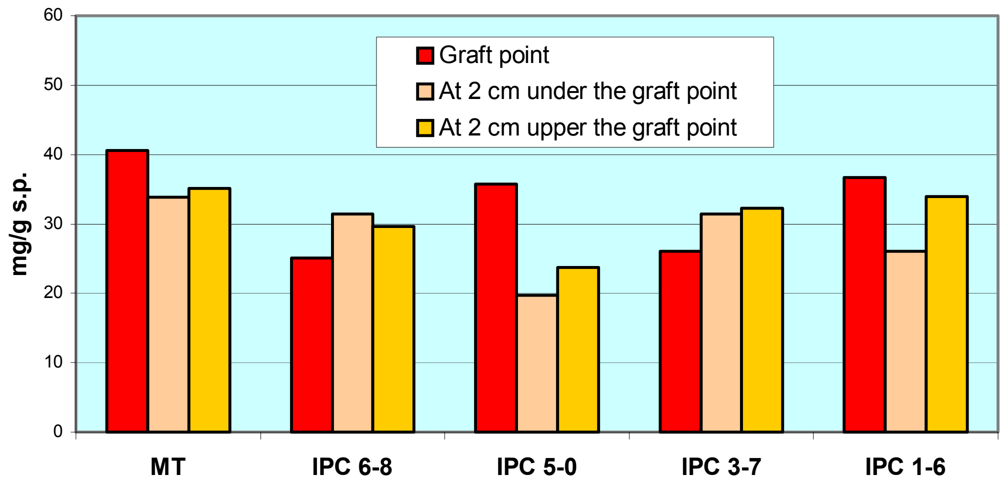


Figure 5. Variation of the enzymatic activity of peroxide in rootstocks

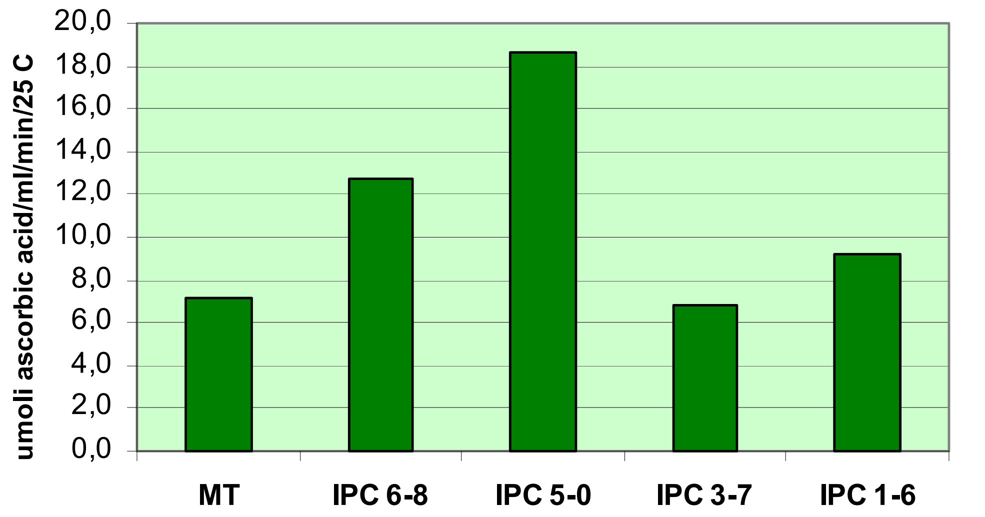
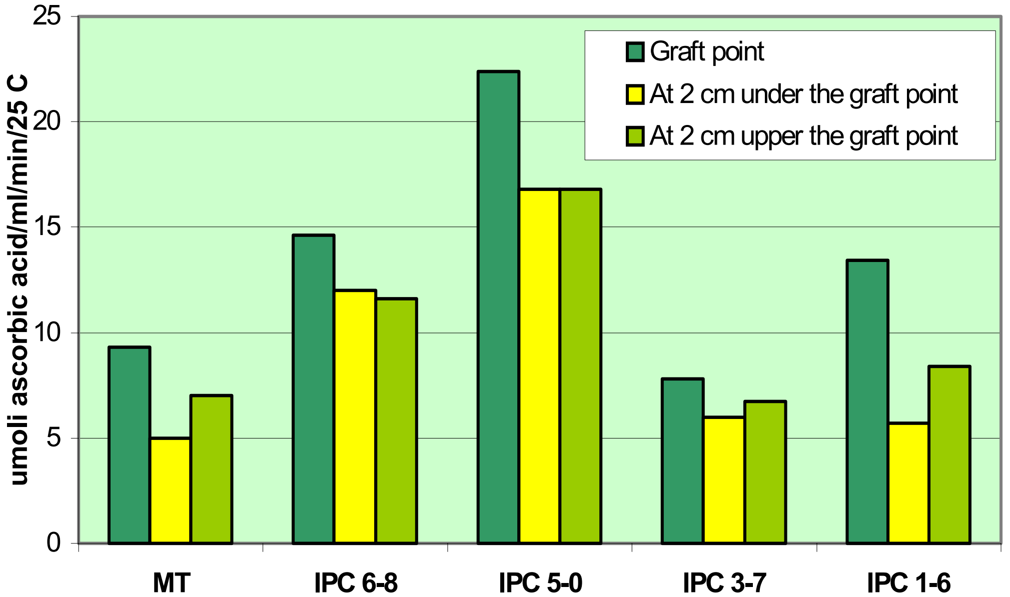
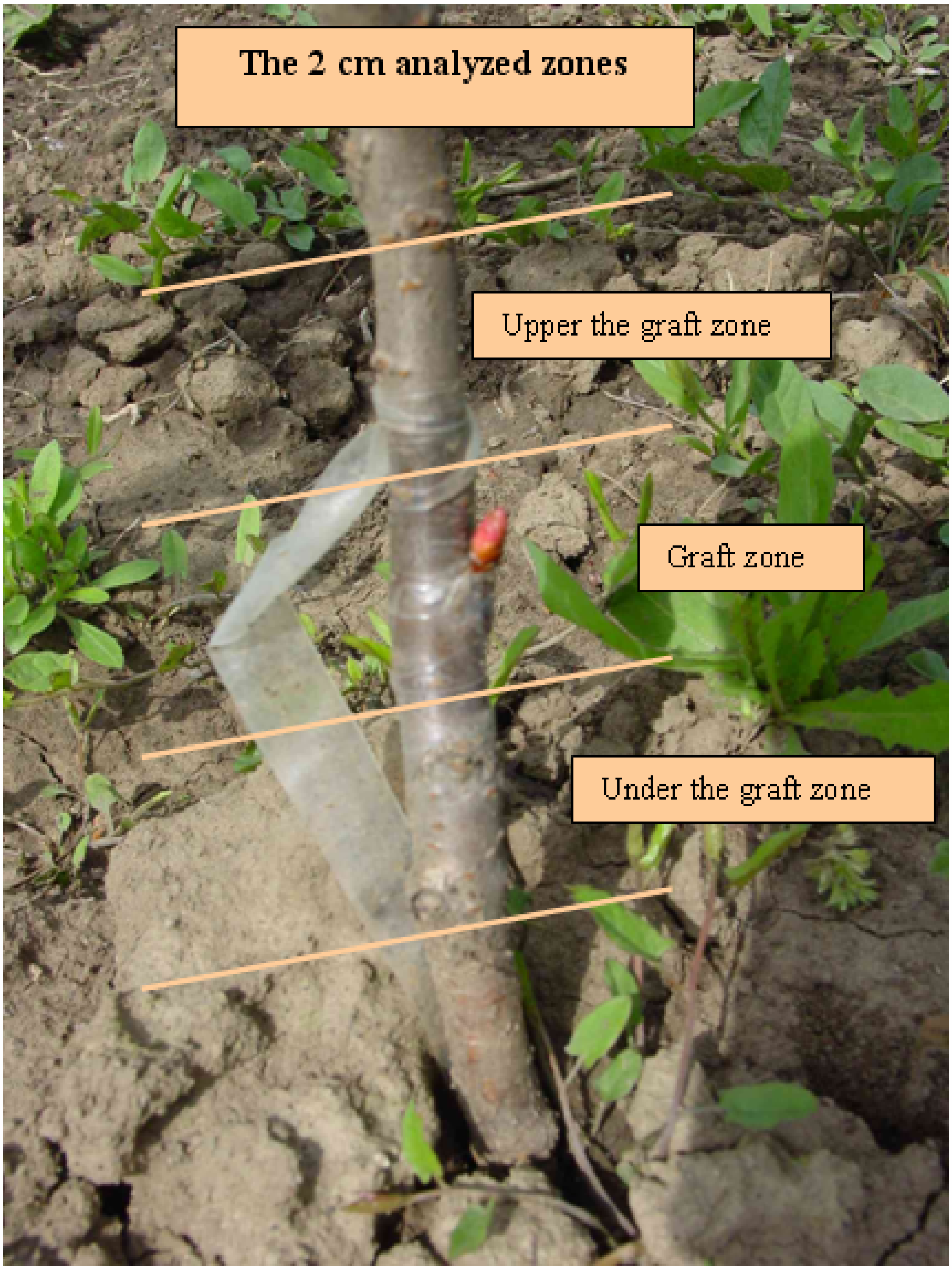


Figura 6. Variation of the enzymatic activity of peroxide in the studied zones




The 2 cm analyzed zones
Upper the graft zone
Graft zone
Under the graft zone

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STUDIES REGARDING THE BEHAVIOUR OF SOME INTERSPECIFIC CHERRY HYBRID ROOTSTOCKS IN NURSERY

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Keywords: rootstocks, *Prunus sp.* hybrids, comparative, biometry

ABSTRACT

Concerning the requirements imposed by the modern pomiculture upon the cherry rootstocks, it was achieved a lot of hybrid creations which later became the main rootstocks used in tree production. Those, has to own a much larger scale of favourable features from nursery point of view. In this paper are presented the results of a comparative research regarding the behaviour of some interspecific cherry hybrids in the first field of nursery. There was made a series of biometric measures and observations which showed that all studied rootstocks presented a good resistance upon the foliage specific diseases but they were affected by the temporary exceed of humidity. The root system is superficially localized and well ramified. The most vigorous rootstocks were *Prunus subhirtella* x *Prunus canescens* which also presented a lot of ramifications. All variants recorded the optimal thickness in the grafting moment.

INTRODUCTION

In present conditions, on national and worldwide plan is desired to obtain cherry rootstocks which have to satisfy the requirements of the modern pomiculture. Therefore, the features of those rootstocks have to assure a good behaviour in the first field of nursery and also later in orchard. The new cherry rootstocks must own a large adaptability capacity for different soil and climate types, to refinement the poor and low physical-chemical features of the soils for the tree culture (Budan S., Gradinariu G., 2000), an increased resistance at diseases, drought, temporary exceed of humidity, to assure a good root system in order to fix the trees, to be compatible with the main commercial varieties (Cepoiu N., 2001), a good rate of propagation, no shoot emission phenomenon, to induce as early as possible the bearing of the scion and to reduce the vigour.

The present research aim some interspecific cherry hybrids in comparatively way in order to identify and select any of them with excellent features from nursery point of view.

MATERIALS AND METHODS

The experience was carried out in the 2002-2004 period in the experimental field of the Fruit Growing Department from the Faculty of Horticulture Bucharest. There were studied 4 interspecific hybrids, each one representing an experimental variant (V1-*Prunus subhirtella* x *Prunus canescens*; V2-*Prunus incisa* x *Prunus subhirtella*; V3-*Prunus subhirtella* x *Prunus pseudocerasus*; V4-*Prunus pseudocerasus* x *Prunus incisa*) and as control was used a selection of *Prunum avium L*. The experience was set as randomised block, with 3 repetitions and 50 plants per repetition, the curent maintenace operations were the normal ones from the first field of nursery.

During the researches, there were made a series of biometrical measures and observations regarding the height of the rootstocks, the internodal length, the diameter of the graft zone, the volume of the root system, the rootstocks resistance at the main diseases, their tolerance at drought and temporary exceed of humidity etc.

RESULTS AND DISCUSSIONS

Analyzing the dates collected it was observed that regarding the height of the rootstocks, the variant V1 recorded the biggest values in all three years of study, vigour next by the variant V2 which had also big values. At the opposite side is remarked the control which rich in average 58,47 cm.

Regarding the length of the internodes, is obvious that there are no big differences between variants, the control being the one with bigger values.

The diameter of the rootstocks measured at the height of graft was bigger at the control and variant V1, the others variants recorded average values appropriate to 8 mm.

From the observations and measures made upon the root system, it was evidenced the fact that the root system has a superficial growth, deeper being the control which root grow in average 23.25 cm and the most superficial growth about 13 cm in average at the V4 variant.

The observations made during the studding period showed that all rootstocks presented a good resistance at the specific foliage diseases but they also presented a sensibility at the temporary exceed of humidity, during the long raining periods when the water stagnate, the rootstocks suffer enough. The root system is superficial and well ramified, with a lot of fibrous roots. All variants at the moment of graft had the optimal thickness.

It is important to know that all rootstocks, especial V1 variant had presented ramifications and anticipated shoots.

CONCLUSIONS

1. The most vigorous rootstocks were the rootstocks from V1 variant, respective *Prunus subhirtella* x *Prunus canescens* which also ramified a lot;
2. All rootstocks presented a good resistance at the specific foliage diseases but they also presented a sensibility at the temporary exceed of humidity;
3. All variants at the moment of graft had the optimal thickness;
4. The root system is superficial and well ramified.

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Tables

Table 1. The biometrical parameters of the interspecific cherry hybrid rootstocks

Variant	Height (cm)				Internodal length (cm)				Diameter (mm)			
	2002	2003	2004	Average	2002	2003	2004	Average	2002	2003	2004	Average
V1	92,93	69,80	75,73	79,49	2,05	1,93	3,29	2,42	9,57	7,04	11,30	9,30
V2	84,00	67,45	75,54	75,66	1,87	2,08	3,51	2,49	7,75	6,41	9,90	8,02
V3	88,00	66,13	64,59	72,91	1,75	2,13	3,60	2,49	9,44	6,89	9,80	8,71
V4	73,22	66,20	69,73	69,72	1,51	2,00	3,41	2,31	9,15	6,10	10,10	8,45
Mt	65,00	50,15	60,27	58,47	3,12	2,90	4,87	3,63	12,71	7,14	10,90	10,25

Table 2. The growth of the root system (spring 2004)

Variant	Deep of the roots (cm)	Root mass (g)	Root system volume (cm^3)
V1	17,87	91,12	100
V2	19,25	67	67,5
V3	16,12	69,62	100,5
V4	13	59,8	79
Mt	23,25	87,82	88

Figures

Fig. 1 The height of the rootstocks (cm)

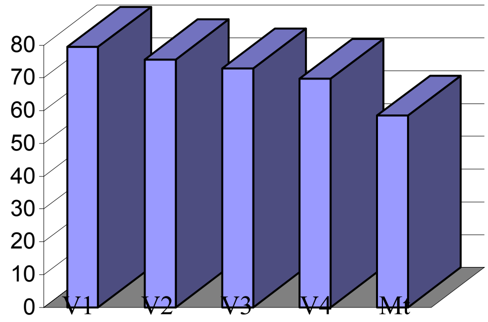


Fig. 2 The diameter of the rootstocks (mm)

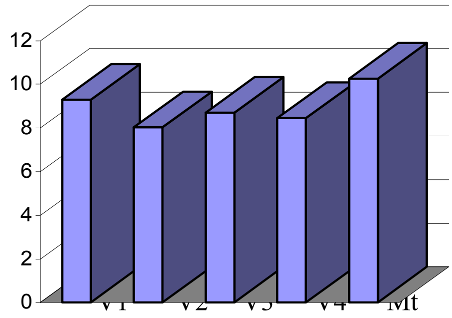


Fig. 3 The deep of the roots (cm)

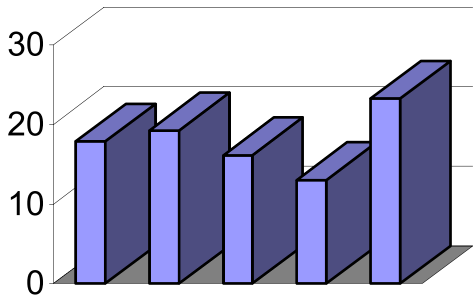
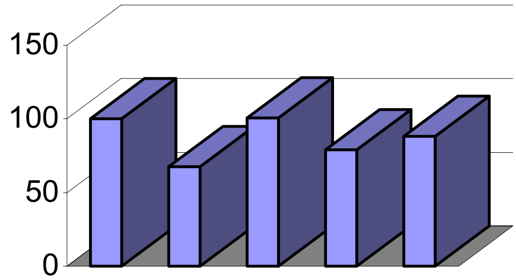


Fig. 4 The root system volume (cm^3)



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RESEARCHES REGARDING THE NEW PLUM VARIETIES WHICH WILL CHANGE THE ASSORTMENT IN THE BANAT AREA

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Keywords: quality, profitable, the times am period of growth, resistant, productivity

ABSTRACT

In the hillocky area from Banat, the plum tree has favourable conditions for growing. As a result of this fact and also as a result of the market economy, the assortment at this species was diversified and extended in accordance with the economic result, being easily accepted in growth the new sorts of plums for consumption in fresh conditions.

From the growth of 25 sorts and plum hybrids was distinguished through exquisite quality of the fruits and output with highest quality the sorts: Centenar (32,2 t/ha), Record (28,6 t/ha), Stanley (26,0 t/ha), Tita (25,3 t/ha), Alina (24,3 t/ha), Pescarus (21,8 t/ha), Gras ameliorat (20,6 t/ha) and Baragan 17 (20,3 t/ha).

By spreading of these sorts, the ripening spread time of this area is advanced by 25 days, but the excellent quality of the fruits (weights comprised between 43,0 gr. and 62,3 gr.) as well as the acquired benefit (64,8 mill/ha respectively 193,8 mill/ha) has facilitated as these sorts to become a large income source for many a man fruit growers from zone, the market being enriched by fresh fruits of exceptional quality.

INTRODUCTION

The plum is growing in the area with temperate climate and has an important statute among the pomiculture species (Constantinescu, 1956) whose ripening order has known serious modification in the last few years. Accordingly today exists a very rich and varied assortment in different ripening seasons and fruit destination with absolute predominance of the new inland sorts (Cociu, 1997). The new sorts are pointing out first through a big fruit and good aspect, trough small and detaching core and very much dry material.

Proper to the new created species, there had been studied aspects referring to the technologies of the culture: the planting distance, the form of the treetop, different cutting types (Coman, 1987; Fenesan, 1987). The acclimatization in the area had been determined through different test and benefic conclusions for the cultivation of the Banat area (Bancila, 2000).

MATERIALS AND METHOD

The experiment field was made in 1992 containing a number of 25 variety and hybrids. The experiment has a linear form, each variety containing 3 repetitions of 3 trees altogether 9 trees for each sort.

The distance between the trees in 4 x 5 m, there will be planted 5000 trees/ha, the treetop is like a pot ameliorated.

The stock used in the franc-buburuz. The earth is a mixture between clay and sand with average productivity situated on the first terrace of the Timis river.

RESULTS OBTAINED

Between the 5^{th} and the 9^{th} year of productivity the 25 studied varieties and hybrids are bringing about 33,8 kg/tree – 16,9 t/ha.

In this period the witness Tuleu timpuriu is making a production of 30,0 kg/tree – 15,0 t/ha, Centenar (64,4 kg/tree – 32,2 t/ha), Record (57,2 kg/tree – 28,6 t/ha), Stanley (53,2 kg/tree – 26,0 t/ha) and Tita (50,6 kg/tree – 25,3 t/ha) are pointed out through very important positive productions.

Alina sort with a production of 48,0 kg/tree – 24,0 t/ha exceeds the experience witness.

The sorts Pescarus, Gras ameliorat, Baragan 17 with the productions of 43,6 kg/tree – 21,8 t/ha, 41,2 kg/tree – 20,6 t/ha, 40,6 kg/tree – 20,3 t/ha, are exceeding the witness production maintaining the phenomenon in time with the probability of 0,1%. The sort Renclod Althan is producing less than the experience witness with the probability of 0,1%, in the same situation is the hybrid 53/118 whose production is less than the witness with 5,4 t/ha in the period between years 5 – 9.

Cultivating the new sorts of plums, there is attaining a phase, approximate 55 days (table nr. 2) starting with the 3^{rd} July decade (Ialomita, Tita, Centenar, Carpatin, H-19/44, Minerva).

The last sorts are having the maturity just at the end of September: Romanian Gras (20.IX) and Record (25.IX).

All the tested sorts and hybrids are presenting quality fruits for consumption on fresh condition. Record 61,4 g and Prezident 61,8 g are pointed out through a significant weight of the fruit. Although the fruits have a very good quality, the sorts Tuleu timpuriu and Ialomita are not pointed out through big fruits. They have the smallest fruits (43,0 g, 44,3 g) (table nr.2).

In 2001, as the sorts and hybrids have been studied in the phase of the fruits fastening they had suffered negative temperatures, $-3,4^0C$ (table nr. 2) affecting the fruit production on average 47,9%.

The most affected was the Baragan 17 sort, in percent of 86,0%, succeeded by Ialomita sort 81,4% .

The witness Tuleu timpuriu was affected by the negative temperatures in percent of 69,4%. The single sort which did not suffer was Record, proving that it is very resistant at the comeback frosts.

The sort Tita was affected in percent of 9,3%. Although the fruit production in 2002 is not included in the calculation, in table nr. 2 is illustrated the behaviour of the sorts and hybrids in the blooming phase at the temperature of $-4,0^0C$, appeared in the spring of year 2002. In this phase the analyzed hybrids and sorts are affected in medium about 14,7%, proving the total resistant: Minerva, Pitestean, Renclod Althan, H 10/18, Edwards< Oneida, H 53/118, Stanley. The most sensitive sort is Dambovita attacked in proportion of 42,9%.

CONCLUSIONS

1. From the analyzed sorts, Centenar, Record, Stanley, Tita, Alina, Pescarus, Gras ameliorat, Baragan 17, Prezident are being noticed through their production and quality and whose productions have statistical insurance.
2. Alina, Tita, Baragan 17, Centenar, Tuleu timpuriu are noticed through the remarkable quality of their fruits.
3. For reproduction is recommended through earliness and good quality the sorts Ialomita and Tuleu timpuriu.

1. 4. Concerning the resistance at low temperatures, ascertaining is that the tied fruits have a higher sensibility than the flowers at their first blooming. On average the 25 sorts and hybrids are affected in proportion of 47,9% at -3,4^{0}C. Record, Tita, Oneida, Pitestean are pointed out through their resistance at frost.
4. Ialomita, Tuleu timpuriu, Tita, Carpatin, Alina are recommended especially for the private farms because of the important production and Stanley, Gras romanesc and Record are recommended for the late and very late ripening.

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Tables

Table 1. The medium fruit production and economic efficiency for the sorts and plum hybrids studded at S.D.P. Caransebes year V – IX from planting

Hybrid sort	The fruit production in the year V-IX from planting		The difference countenance (Mt)	The purpose countenance (Mt)	The benefit mil. lei/ha
	Kg/tree	T/ha			
0	1	2	3	4	5
Tuleu timpuriu (Mt)	30,0	15,0	-	-	120,3
Centenar	64,4	32,2	17,2	+++	193,8
Record	57,2	28,6	13,0	+++	185,5
Stanley	53,2	26,0	11,0	+++	183,8
Tita	50,6	25,3	10,3	+++	181,4
Alina	48,0	24,0	9,0	++	180,3
Pescarus	43,6	21,8	6,8	+	176,8
Gras ameliorat	41,2	20,6	5,6	+	169,3
Baragan 17	40,6	20,3	5,3	+	167,8
Prezident	40,0	20,0	5,0		166,0
Pitestean	39,8	19,9	4,9		159,3
Valcean	38,6	19,3	4,3		157,5
Carpatin	38,4	19,2	4,2		156,8
Gras romanesc	33,0	16,5	1,5		132,2
Edwards	29,6	14,8	-0,2		110,9
H 7/27	29,6	14,8	-0,2		110,9
Oneida	29,2	14,6	-0,4		109,1
Minerva	27,2	13,6	-1,4		108,7
H 19/44	25,2	12,6	-2,4		96,5
H61/88	24,6	12,3	-2,7		95,3
Dambovita	22,6	11,3	-3,7		81,5
Ialomita	21,6	10,8	-4,2		74,4
H 10/18	20,6	10,3	-4,7		70,9
Renclod Althan	19,6	9,8	-5,2	0	66,3
H 53/118	10,2	9,6	-5,4	0	64,8
M(x)	33,8	16,9			

DL 5% = 5,10 t/ha

DL 1% = 7,48 t/ha

DL 0,1 % = 9,90 t/ha

Table 2. The harvest maturity, the fruit size and the resistance at lower temperature for the hybrids and plum sorts studded at S.D.P. Caransebes

The hybrid sort	The harvest maturity	Fruit size gr.	The resistente to the comeback frost %	
			The feminine fruits $3{,}4^0$ C	At mase bluming $4{,}0^0$ C
0	1	2	3	4
Tuleu timpuriu (Mt)	2.VIII	44,3	69,4	14,2
Ialomita	2.VII	43,0	81,4	30,0
Tita	25.Vii	53,0	9,3	6,3
Centenar	29.VII	52,3	23,4	12,5
H 7/27	29.VII	43,5	21,6	18,9
Carpatin	30.VII	45,0	31,5	30,8
H 19/44	30.VII	44,8	51,3	7,6
Minerva	30.Vii	44,0	66,6	0
Pitestean	2.VIII	49,0	19,0	0
Renclod Althan	3.VIII	55,3	89,2	0
Pescarus	3.VIII	43,6	40,7	13,3
Alina	3.VIII	55,0	46,8	33,0
H 10/18	4.VIII	44,6	75,0	0
Valcean	5.VIII	62,3	50,7	7,2
Edwards	6.VIII	56,5	38,9	0
Oneida	10.VIII	50,0	42,6	0
H61/88	14.VIII	52,0	45,0	21,4
Dambovita	15.VIII	52,0	21,6	78,6
Prezident	25.VIII	61,8	41,8	14,3
H 53/118	26.VIII	49,8	43,8	0
Baragan	28.VIII	45,5	86,0	0
Stanley	28.VIII	46,5	33,3	18,5
Gras ameliorat	10.IX	44,8	17,6	42,9
Gras romanesc	20.IX	45,5	75,0	7,2
Record	25.IX	61,4	0,0	6,3
M(x)	21.VII-25.IX	49,2	47,9	14,7

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RESEARCH CONCERNING THE POSSIBILITY TO OBTAIN NEW HYBRIDS ROOTSTOCKS FOR PEACH

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Keywords: peach dwarf, nectarine dwarf, cross breading, auto pollination, hybrid fruits

ABSTRACT

The researches were done during the period 2003-2004 in the experimental field of the Department of Fruit Growing, University of Agronomic Sciences and Veterinary Medicine of Bucharest. The biological material was represented by hybrids of dwarf peach and dwarf nectarine: VT-GB-sel.86 N.O., VT-84-M-R10P11, VT-83-B-B-01, VT-F-sel.89 P.O., VT-GD-P11 sel.90 and VT-84-G-08.

MATERIALS AND METHODS

The fruits hybrids for peach and nectarine can be obtaining through those methods: cross breeding, auto pollination, free pollination.

Obtaining new fruits hybrids by artificial pollination

Like mother genitors were used varieties and hybrids of dwarf peach and dwarf nectarine, with an appreciated tasteful qualities, and like father genitors were used species with a different degrees of resistance at the stress factors, especially: *Amygdalus communis, Armeniaca vulgaris, Prunus cerasifera, Prunus spinosa* and *Prunus tomentosa.*

RESULTS AND DISCUSSIONS

The most important results are presented in table1.

CONCLUSIONS

The dwarf peach and the dwarf nectarine were reacting positively to the artificial pollination, using pollen from *Amygdalus communis, Armeniaca vulgaris, Prunus cerasifera* and *Prunus tomentosa* species. In year 2003 were obtaining a number of 3454 hybrid fruits, and in year 2004 were obtaining a number of 3118 hybrid fruits.

Also, we noticed that in the combinations where we used like father genitor the species *Prunus spinosa* we didn't obtain any hybrids fruits, this fact leads us to the conclusion that is no compatibility between the two species.

The climate conditions can influence negatively or positively the binding of hybrid fruits. The low temperatures, the high humidity, winds and late freezing represents factors which can reduce the percentage of binding fruits or the physiological collapse of the fruits.

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Tables

Table 1. The situation of cross breeding using dwarf and semi dwarf material

No. Crt.	Hybrids obtaining by artificial pollination	Nr. of hybrid fruits gathered		Total hybrids
		Year 2003	Year 2004	
1.	VT- GB-sel.86. N.O. (Dan) ♀ x *Amygdalus communis* ♂	210	215	425
2.	VT- GB-sel.86. N.O. (Dan) ♀ x *Armeniaca vulgaris* ♂	280	190	470
3.	VT- GB-sel.86. N.O. (Dan) ♀ x *Prunus cerasifera* ♂	250	95	345
4.	VT- GB-sel.86. N.O. (Dan) ♀ x *Prunus tomentosa* ♂	180	175	355
5.	VT - 84-M-R10P11 (Liviu) ♀ x *Amygdalus communis* ♂	205	275	480
6.	VT - 84-M-R10P11 (Liviu) ♀ x *Armeniaca vulgaris* ♂	280	200	480
7.	VT - 83 – B - 01 ♀ x *Amygdalus communis* ♂	237	225	462
8.	VT - 83 – B - 01 ♀ x *Armeniaca vulgaris* ♂	95	103	198
9.	VT - 83 – B - 01 ♀ x *Prunus tomentosa* ♂	97	165	262
10.	VT – F – sel.89 P.O. (Paul) ♀ x *Amygdalus communis* ♂	290	210	500
11.	VT – F – sel.89 P.O. (Paul) ♀ x *Armeniaca vulgaris* ♂	250	125	375
12.	VT – F – sel.89 P.O. (Paul) ♀ x *Prunus cerasifera* ♂	175	165	340
13.	VT- GD- P11 sel.90 ♀ x *Amygdalus communis* ♂	200	210	410
14.	VT- GD- P11 sel.90 ♀ x *Prunus tomentosa* ♂	130	165	295
15.	VT-84-G-08 ♀(Melania) x *Amygdalus communis* ♂	215	200	415
16.	VT-84-G-08 ♀(Melania) x *Armeniaca vulgaris* ♂	260	200	460
17.	VT-84-G-08 ♀(Melania) x *Prunus cerasifera* ♂	100	200	300
TOTAL		3454	3118	6572

Figures

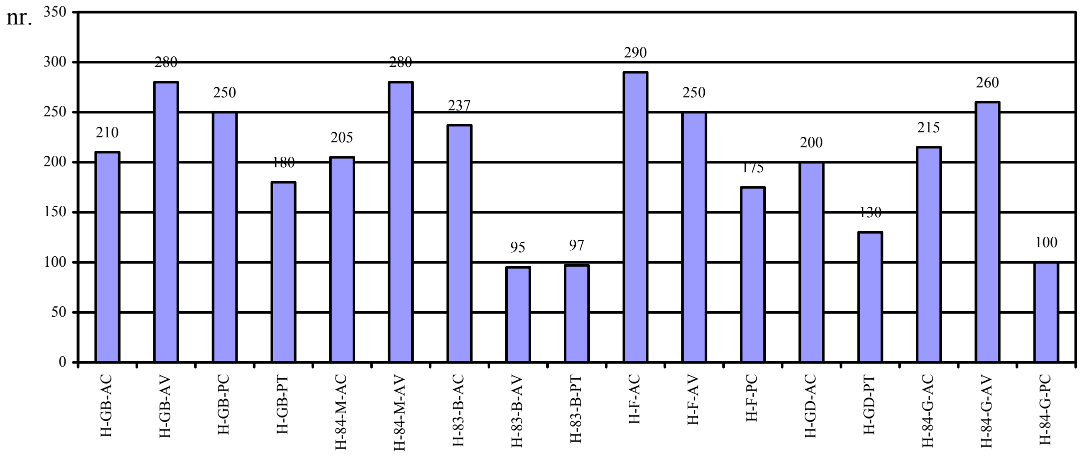

Fig. 1. No. of hybrid fruits obtaining by artificial pollination gathered in year 2003

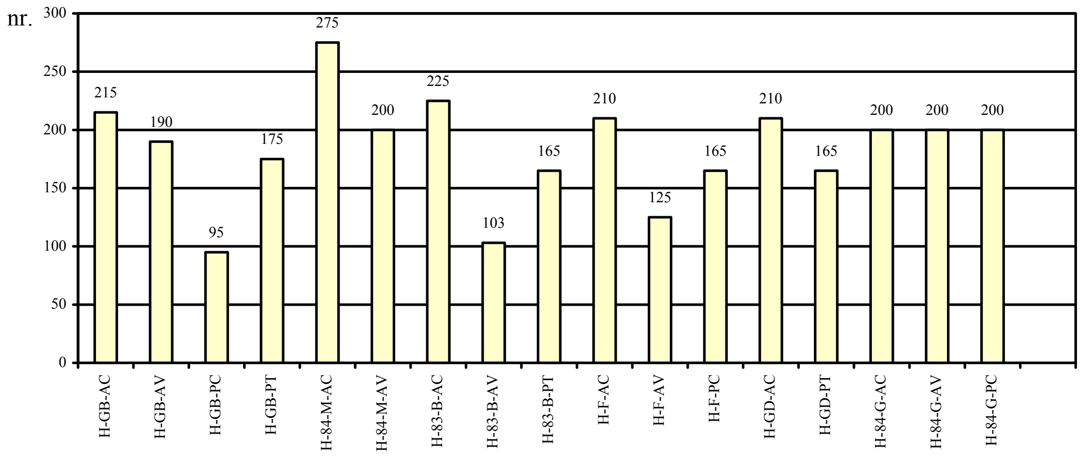

Fig. 2. No. of hybrid fruits obtaining by artificial pollination gathered in year 2004

Fig. 3. – Peach x *Amygdalus communis* hybrid fruits

Fig. 4. – Peach x *Armeniaca vulgaris* hybrid fruits

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

RESEARCH CONCERNING THE BEHAVIOR OF DIFFERENT ROOTSTOCKS IN THE NURSERY

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Keywords: seedling, resistance diseases, peach dwarf, nectarine dwarf, hybrids

ABSTRACT

The researches were done during the period 2003-2004 in the experimental field of the Department of Fruit Growing, University of Agronomic Sciences and Veterinary Medicine of Bucharest. The biological material was represented by hybrids obtaining from artificial pollinations, where the mother genitors were the dwarf peach and the dwarf nectarine, and the father genitors were species: *Amygdalus communis, Armeniaca vulgaris, Prunus cerasifera* and *Prunus tomentosa.*

MATERIALS AND METHODS

Were made studies concerning the sensibility of some dwarf peach and dwarf nectarine genotypes regarding the attack of main deseases, like: *Thaphrina deformans*, *Sphaerotheca pannosa şi Stigmina carpophila*.

The apreciasion of resistence to the deseases was made after the injury degree of the hostess plant. The frequency of the attack was note with F%, and the intensity of the desease attack was note with I%. The frequency value of the attack of de *Thaphrina deformans*, *Sphaerotheca pannosa* and *Stigmina carpophila* was made through the direct observations upon the seedling's leaves.

RESULTS AND DISCUSSIONS

The most important results are presented in the table 1.

CONCLUSIONS

The hybrid rootstocks obtained by free pollination, auto pollination and artificial pollination behave very well in climate favorable to the attack of main deseases, like: *Thaphrina deformans*, *Sphaerotheca pannosa şi Stigmina carpophila*.

From the total of hybrids which were formed, few of them were sensitive to the deseases attack. The average values of frequency of the desease attack was comprised between 10-33%, and the average values of the intensity of the desease attack was comprised between 0,5-1,5%.

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Tables

Table 1. The hybrids sensibility (free pollination, auto pollination, artificial pollination) upon the desease attack (2002-2004)

No. Crt.	Variety or hybrid	*Taphrina deformans* Intensity -notes 0	1	2	3	4	5	F %	I %	*Sphaeroteca pannosa* Intensity -notes 0	1	2	3	4	5	F %	I %	*Stigmina carpophila* Intensity -notes 0	1	2	3	4	5	F %	I %
Free pollination																									
1.	*Armeniaca vulgaris*							20,0	0,60							-	-							18,2	0,60
2.	*Prunus cerasifera*							-	-							21,5	0,60							-	-
3.	*Prunus tomentosa*							-	-							14,3	0,60							-	-
Auto pollination																									
1.	VT – F – sel.89 P.O. (Paul)							17,4	0,60							14,3	0,50							-	-
2.	VT-84-N-05							-	-							24,0	0,50							-	-
Artificial pollination																									
1.	H-GB-AC							-	-							-	-							-	-
2.	H-GB-AV							10,8	0,60							-	-							13,5	0,50
3.	H-GB- PC							-	-							20,4	0,60							18,2	0,50
4.	H-GB-PT							-	-							17,5	0,50							7,5	0,60
5.	H-84-M-AC							24,1	0,50							-	-							-	-
6.	H-84-M-AV							15,0	0,83							-	-							20,0	1,33
7.	H-83-B-AC							-	-							-	-							-	-
8.	H-83-B-AV							25,0	0,60							20,0	0,60							15,0	0,60
9.	H-83-B-PT							-	-							28,0	0,80							-	-
10.	H-F-AC							-	-							-	-							-	-
11.	H-F-AV							33,3	1,50							-	-							-	-
12.	H-F-PC							10,0	0,60							16,6	1,25							16,6	1,25
13.	H-GD-AC							11,11	1,00							11,1	1,00							11,1	1,00
14.	H-GD-PT							-	-							-	-							-	-
15.	H-84-G-AC							23,3	0,60							16,6	1,00							16,6	1,00
16.	H-84-G-AV							20,0	0,60							17,1	0,60							14,3	0,50
17.	H-84-G-PC							-	-							16,2	1,00							-	-

Legend:

Note of the intensity of desease attack in the field	The surface which was attack by the desease (%)
0	0 %
1	1-3 %
2	4-10 %
3	11-15 %
4	16-50 %
5	51-75 %

Figures

Fig. 1 - *Thaphrina deformans*

Fig. 2 - *Stigmina carpophila*

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

MORPHO-PRODUCTIVE PARTICULARITIES OF A LOCAL POPULATION (PGO) OF *ASIMINA TRILOBA* (L.) DUNAL, FROM ROMANIA.

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Keywords: *Asimina triloba* (L.)Dunal, pawpaw, local population-PGO.

ABSTRACT

At present the diversification and improving of the range of species and varieties of fruit trees are basic concerns for breeders. In this context, our results had in view the testing of the performances of a species that is barely known in Romania- whose popular name is "pawpaw" or "Northern banana".

The asimina fruit are used for multiple purposes: eaten fresh or as cream, juices, ice-creams; as a source of secondary metabolites with pharmaceutical and pesticide effects, as well as an ornamental species for public parks and gardens.

In the interval 1999-2004, the present research team performed a survey for gathering information regarding the biological characteristics of *Asimina triloba* (L.)Dunal in the Romanian climatic and edaphic conditions. In september 2004 we made also same biochemical analyses in 4 stage of ripening of pawpaw fruit from one 8 years old tree (V2).

INTRODUCTION

Pawpaw belongs to *Annonaceae* family which includes about 130 genera and 2.300 species (Callaway, B.M.- 1993) from which the most important for their nutritive value are the species that belong to *Annona* and *Asimina* genera.

The cultivated species that belong to *Annona sp.*, can not be adapted to the weather condition, from our country, they have persistent leaves and prefer climate conditions specific to subtropical and tropical regions.

Unlike *Annona, the Asimina* genus includes 9 species adapted to the temperate climate from which the best known and appreciated is *Asimina triloba* (L.)Dunal, because of its adaptation at low temperatures (-25 C) and of its potential species with fruit of exquisite qualities and its landscaping value.

The distribution area of pawpaw includes almost the whole East of U.S.A., with a defined the Northern frontier of Ontario –Canada, the Eastern boundary of Florida and the Western one up to Nebraska.

Pawpaw fruit have superior nutritional qualities, being higher content in some vitamins, minerals and aminoacids than in apple, peach or bananas. The complex flavor profiles of the ripe fruit resembles a combination of banana and pineapple, with variations among cultivars.

The unique qualities of the pawpaw fruit, the ornamental value of the tree and the natural compounds in the leaf, bark and twig tissues that possess insecticidal and anti-cancer properties, suggest that pawpaw has great potential as an alternative high value crop.

MATERIALS AND METHODS

The researches regarding the biological characteristics of the local population that was taken into study (PGO) were performed between 1999-2004, on 8 years old trees (V2) and 30 years old trees (V1) from Fruitree Department Collection of Faculty of Horticulture – Bucharest (South of Romania-V2) and some private orchards (West of Romania- V1).

Our observations and the biometric measurements had in view the: plant habit, branching capacity, the phenological phases of vegetative and reproductive organs (the flowering time and the period of fruit maturation). A special attention was given to the fruit characteristics: length, diameter and the mean weight of the fruit, number of seeds/ fruit, seed mean weight and also the proportion between fruit components (peel, pulp and seed).

Biochemical analyses were made in autumn of 2004 at „ Center of Researches for Quality Studies of Products from Horticulture and Viticulture" (U.S.A.M.V.-Bucharest) in order to determine the composition of pawpaw fruit, respectively: total dried substance (%), water (%), mineral substances (%), soluble dried substance (%), titrabile acidity (% malic acid), ascorbic acid (mg/100g), hydrolisable soluble glucids (%), concentration of porphirinic pigments (chlorophill *a*, chlorophill *b*, total chlorophill, rapport *a*/*b* – mg/100g) and carotenoid pigments (carotene, rapport chlorophill/ carotene) and volatile oils identification.

Methods used for the biochemical determinations of pawpaw fruits (V1):

- total dryed substance and water were determined by drying tissue samples in dry-air sterilizer, at temperature of 105°C, for 24 hours, (g/100g fresh pulp);
- mineral elements were gravimetrical determined after the vegetal tissue calcinations at temperature of 570°C. Determinations were made using the extracts obtained after dissolving calcinated tissues in 1 ml HNO3 brought to 50ml final volume. Analyses were read at a spectrometer with inductive coupled plasma;
- analyse of hydrolysable soluble glucids was made using the Schorl method;
- clorophyllian and carotenoid pigments from fruits were determined using a Cecil spectometer, in the 80% concentred acetonic extract. To calculate the pigment concentration, values of extinction determined by the length of waves for 663, 646 and 470 nm were used;
- extraction in volatile oils was made by hydro-distillation using a Clevenger apparatus (first stage) and in the gas phase using a chromatograph with masspectometer detector, Aqgilent 5973 N (second stage).

RESULTS AND DISCUSSIONS

From the synthesis of the investigations made during 1999-2004 regarding the growth and fructification characteristics of the pawpaw trees (Table no.1) from these two regions examined, reveal that the values of the height and diameter of pawpaw trees varies depending on the age of the analyzed samples.

Comparing the shape of the asimina trees of different ages we found out that the rate of their growth is faster in the first 8 years but in the next years this rate was slower. To the 30 years old trees we noticed an intensive development of the lateral branches and that cause an evolution of the crown shape from the conic-pyramidal one at the young samples (V2) to a globular shape with many branches slightly pendulant according to the fruit yield and to the morphological organization , of the fruiting branches that have morphological characteristics similar to the „dropping branch" of the cv." Ramon Oliva" cherry tree.

From the observations made on period of flowering and fructification shown by the samples of the pawpaw local population-PGO, it was obvious that in the temperate-continental climate of our country the asimina trees begin to blossom at the same time as apple trees (the second decade of April) and the fruit ripening begins at the end of August and ends in the first decade of September. The long intervals for blossom cause a different ripening time of the fruit in the range 2-3 weeks period (Table no.1).

The difference of flowering and fructification seen at pawpaw samples are due to the age and the microclimate of the growing region at which can interfere some unpredictable meteorological phenomena: vary high temperature, hail or heavy rains.

In the table no.2 are presented the observations on the pomological fruit and seed characteristics of the local population (PGO) of pawpaw analyzed between 2003-2004.

The average total weight of seeds in a fruit varies between 5.2-12.7 g depending of its size. During the two years (2003-2004) differences of fruit-bearing were noticed at pawpaw trees from PGO population, which are due to ageing of the trees that show a periodicity of fruit-bearing and a slight diminution of the fruit weight. The application of the maintenance cuttings for removing of the exhausted and old branches can correct these problems.

Biochemical analyses were made in 4 stages of ripening of pawpaw fruit taken from the sample of 8 years (V2) between 20.VIII-8.IX.2004 (Chart no.1-4). The results obtained after the biochemical analyses at pawpaw fruit do not relieve a significant differences between the 4 periods when we harvested the pawpaw fruit.

The ripening of the fruit are characterized by the change of physiological, biochemical and morphological features. These changes which have taken place in the fruit are indicators for establishing of the ripening stage and for the best moment of harvesting.

In the volatile oil obtained from the pawpaw fruit we separated 67 compounds and from this we identified 28 compounds: metil geranat (20.98%), metil octanoat (19.71%), etil hexanoat (18.85%), germacren D(8.91%), β-elemen (7.44%) and etil octanoat (6.09%).

CONCLUSIONS

The researches made during 1999-2004 on biological characteristics of pawpaw local population PGO (*Asimina triloba* L.) analyzed in two regions (west and south) of Romania, enable us to draw the following conclusions:

1. Asimina trees find favourable conditions of growing in the temperate climate of Romania as is showed by the annual growth of 30-40 cm to 60-80 cm recorded at the varieties of different ages (V1 and V2) as well as the fruit production between 12-35 kg/ a tree;
2. The gradually flowering beginning from the second half of April on a period of about 2-3 weeks determines the ripening of the fruit beginning with the last decade of August to extend till the 10 of September;
3. The trees from the pawpaw analysed population (PGO) did not need the performing of phytochemical application or special work for the maintenance, but it was noticed that depending on the age the trees they may show a periodicity of fruit bearing;
4. The high content of nutritive elements (mineral substances and soluble glucids) as well as tasty qualities and specific flavours of pawpaw fruit drew the attention of the scientific researchers who propose to include this species for cultivation in the near future. The concern of improving the size of the fruit in this species remains a priority for achieving of this goal.
5. The biochemical analysis through chromatography in gas phase of the volatile oil extracted from *Asimina triloba(* L.) Dunal fruit leads to the separation of 67 compounds from which 28 compounds represented 96.28% from the total .
6. As a conclusion we consider that in Romania the culture of pawpaw is fully profitable for the many qualities that this exceptional species posses.

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Tables

Table 1. Growth and fructification characteristics of *Asimina triloba(* L.) Dunal samples from the PGO population (mean values during 1999-2004).

Characteristics		**V1-(west) 30 years old**	**V2-(south) 8 years old**
1. Trunk height		5,75-6	4,5
2. Trunk diameter		21,3	16,5
3. Number of brunches		10-12	6-7
4. Number of suckers		7	_
5. Flowering period		17.IV_10.V	10.IV_5.V
6. Fruit maturation period		15-25.VIII-10.IX	20-25.VIII_5.IX
7. Fruit number/ flower		2-3	5-8
8. Harvested fruit	Number/flower	1-2	3-6
	Production	28-35 kg	10-12 kg

Table 2. The pomological characteristics of pawpaw fruit and seeds from PGO local population analysed between 2003-2004 (mean values)

Characteristics		**V1**	**V2-**
1. Number analysed fruits		80	105
2. Fruit shape		Cylindrical obovat	globulous, obovat, oblong cylindrical
3. Fruit length		6,5-8	7-9,5
4. Fruit diameter		3,5-4	4,5-5
5. Weigh(g)	/fruit	50	86,33
	seed/fruit	5	6,8
	peel/fruit	2,20	2,66
6. Fruit element(%)	Pulp (%)	88	91,5
	Seed (%)	10	7
	Peel (%)	2	1,5

Figures

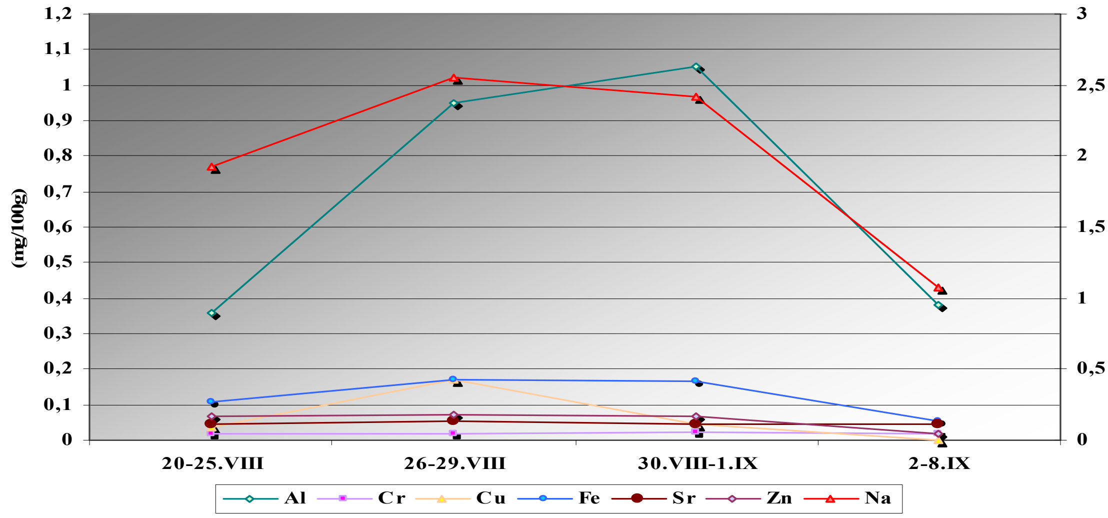

Chart no. 1 The microelement composition determined in 2004 from the PGO pawpaw fruit (V2); mg/100g fresh fruit

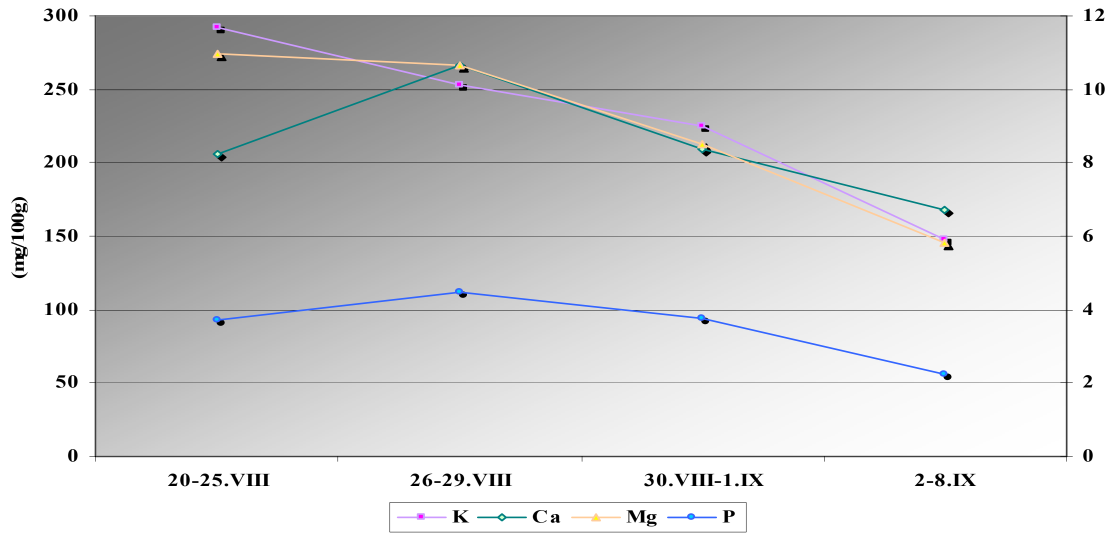

Chart no. 2 The macroelement composition determined in 2004 from the PGO pawpaw fruit (V2); mg/100g fresh fruit

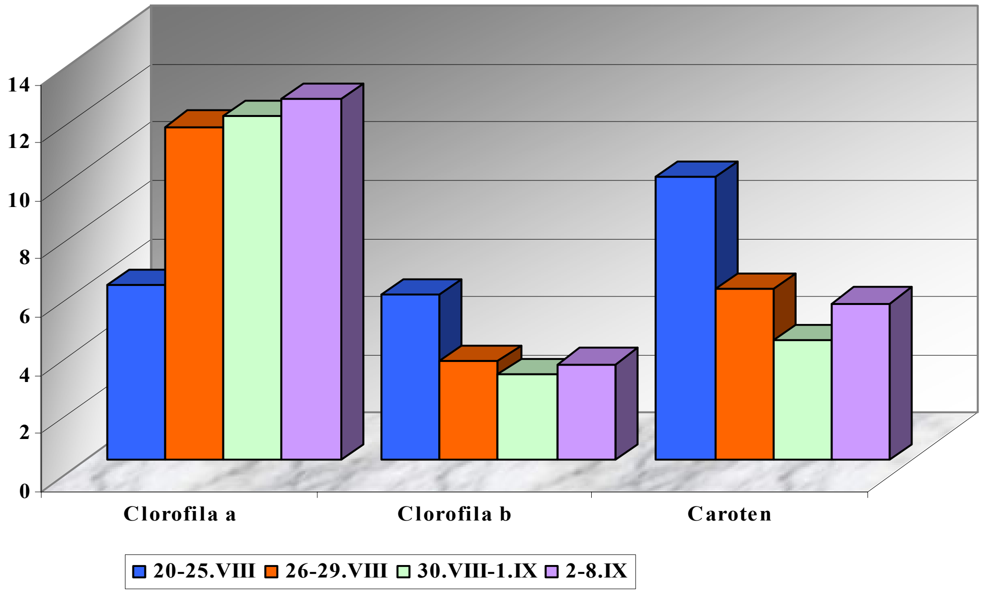

Chart no. 3 The porphyrinic and carotenoid pigments content analysed in pawpaw fruit (PGO local population, V2),2004; mg/100 fresh fruit

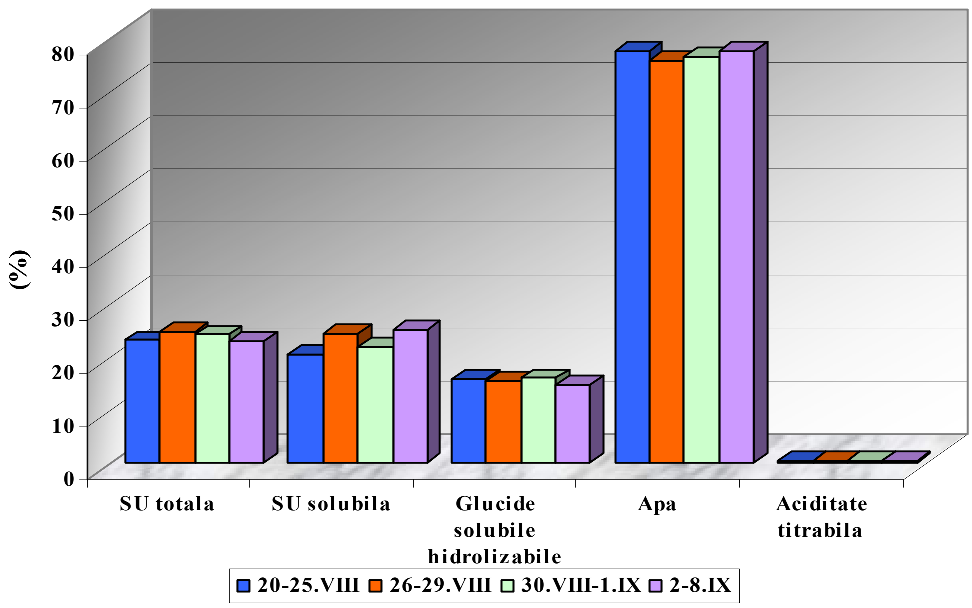

Chart no. 4 The biochemical element content of pawpaw fruit (PGO local population, V2),2004; %100 fresh fruit

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE EFFECT OF CALCIUM TREATMENTS ON SOME TOMATO FRUIT QUALITY PARAMETERS

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Keywords: firmness, quality, respiration rate, soluble solids, calcium treatment

ABSTRACT

Mature green tomato fruit (*Lycopersicon esculentum cv. Arleta*) were treated with different calcium based products, stored at 8^{o}C and analyzed on day 12 for some physical, physiological and biochemical parameters such as: firmness, tissue electrical conductivity, total electrolyte content, respiration rate, soluble solids, vitamin C content. Firmness decreased during fruit storage, in interrelation with membrane permeability, but calcium treatments assured a preservation of the integrity of the cell wall as well of membrane selectivity. This prolonging of cell structure integrity was reflected in the biochemical processes evolution.

INTRODUCTION

Tomatoes are commercially important vegetables worldwide.

New procedures for improving the post-harvest storage quality of horticultural produce together with modified growing and storage techniques designed to minimize pesticides residues may often lead to increased production costs. These extra costs can only be justified if they are recouped directly in higher prices or are perceived as necessary in terms of public safety and the protection of the environment (Sharples, 1990).

The action of Ca ions on plant physiology in general and on fruit in particular is a topic of current interest. Research in this field has become more widespread, especially since this caution has been correlated with the development of more physiological diseases, as well as with the course development of the fruit ripening and senescence processes in fruit and vegetables (Pratella et al., 1979).

The objectives of this work were to investigate the effect of Puracal and $CaCl_2$ on some tomato fruit quality parameters.

MATERIAL AND METHODS

Greenhouse grown tomatoes (*Lycopersicon esculentum Mill. Cv. Arleta*) were obtained from U.S.A.M.V. Bucharest. Fruit were harvested at the maturate green stage according to the USDA colour chart (USDA, 1976) and selected for uniformity of size.

Tomatoes were analyzed concerning the following parameters: fruit physical parameter (firmness) and some physiological parameters such as tissue conductivity, total electrolyte content, electrolyte leakage. Then there were divided into 4 variants: control (untreated), treated with $CaCl_2$ 1,5%; Puracal 0,3% and Puracal 0,6% by immersion into solution for 30 minutes. These lots were stored in the dark, at relative humidity 85% and at 8^{o}C.

Four fruits for each treatment were used as samples after 12 days and the same parameters were determined.

The objectives of this study were to determine and evaluate the effect of Ca application of the mainly quality characteristics.

RESULTS AND DISCUSSIONS

Data concerning fruit firmness evolution are presented in Table 1 and as we can observe, from a value of 4,35 kgf/cm^2 (mean value for 8 determination for fruits with pericarp) before treatments, after 12 storage days, generally, the values are lower, ranges from 1,85 kgf/cm^2 in the case of fruit without pericap prelevated from the variant treated with $CaCl_2$ 1,5% to 2,35 kgf/cm^2, for the variant treated with Puracal 0,3%.

In tomato fruit, internal variation in softening during ripening has been reported (Hall, 1987) and the tissue softening appears to be highly correlated with appearance of polygalacturonase enzyme (Tieman and Handa, 1989). Although endo-PG activity increases during the ripening process of tomatoes, and the increased activity of this enzyme results in structural changes of the middle lamella, the softening of fruits is more complex process than anticipated (Schuch et al., 1989). Also the rise in endogenous ethylene production appears to trigger ripening, and exogenous application of inhibitors delay or prevent the onset of fruit ripening. To improve storage life there are now created cultivars with improved fruit quality through biotechnology, confirming resistance to softening to ripe fruit for extended period of time (Grierson and Schuch, 1993).

The firmness values are in a close interrelation with those that characterize the cell permeability, tissue conductibility and electrolyte leakage, respectively. Thus, as regard tissue conductibility, before the treatments, there were noticed the following values, corresponding with the tissue area and the used electrode type (Table 2).

In the case of the transversal fruit section, tissue conductivity varied from the central area to the periphery as follow: 480, 459,400 µS cm $^{-1}$ (green fruits in the central region - unripe) and 535, 872,548 µS cm $^{-1}$ (yellow fruits in the central area). After storage period, tissue electrical conductivity increased corresponding to the ripening processes, but it can be noticed that in the case of Puracal 0,6% it was registered a low diminution (Figure 1). Probably, the higher value as compared with the control may be due to the applied substances too. Increasing the Ca $^{2+}$ content of fruits, for example, by spraying several times with Ca $^{2+}$ salts during fruit development or by postharvest dipping in Ca Cl_2 solution, leads to are increase in firmness of the fruit and can delay fruit ripening (Chira et al. 2001, Hirschi, 2004).

For the entire fruit, the determination performed on different area are presented in Table 3, and the higher values were registered at the variant Puracal 0,6%, while the lower one for the variant $CaCl_2$ 1,5%.

Regarding the membrane selectivity changes, at Puracal 0,6% variant, the electrolyte leakage was 808,89 µS/g/20 ml H_2O, as compared with the control- 1269,84 µS/g/20 ml H_2O, so a reduction by 1,57 times (the case of pericarp). For the placentar tissue, the lower value were registered at the same variant- 471,48 µS/g/20 ml H_2O, as against the control- 546,19 µS/g/20 ml H_2O, but the differences are not significantly.

The results allow to conclude that calcium treatments diminuated membrane permeability, as in the case of $CaCl_2$ especially, followed by Puracal 0,3%, so this contribute to prolonging the storage period as a fresh fruits, moreover fruits can be harvested at a ripening stage which corresponds with the maximum of the organoleptics feature.

The total electrolyte content is one of the intern factor which influence the permeability index (IP = electrolyte leakage/ total electrolyte content), and from this view point the differences are large, for instance at the control pericarp level there was registered the highest IP value (0,09 as compared with 0,05 as a mean value) as compared the calcium treated variants, as well for the placentar tissue the situation is similar (2,8 as compared with 0,04) (Table 3).

As regard some biochemical parameters suggesting are data presented in Table 5.

Thus, the respiration process varied from 3,81 mg CO_2 /kg/h (at harvesting moment), till 10,87 mg CO_2 /kg/h (after storage period - Puracal 0,6%) From our experimental variant it can be noticed that treated with Puracal 0,3%, were the respiration rate was 7,61 mg CO_2 /kg/h. In fact, tomato exhibits a climacteric rise in respiration, followed by a rise in ethylene production during ripening and senescence (Burg and Burg, 1965). Tomato fruit ripening consist of coordinated synthetic and degradative reactions, and color, flavor, aroma, texture, composition, change dramatically (Grierson and Schuch, 1993).

As our results demonstrated, total soluble solids for the fresh fruits at harvesting time had an average of 4,8% and during storage period it has been registered a decrease of this indicator value as a consequence of the utilization of the simple organic compounds and especially of reducing carbohydrates during respiration process.

Vitamin C content of placental tissues decrease also during storage, but it can be noticed that calcium treatments assured a preservation of the ascorbic acid, and differences between treated variants are not significant.

CONCLUSIONS

Calcium treatments has a cumulative effect on physical, chemical, physiological and biochemical fruit parameters during storage, contributing to prolonging tomato storage life.

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Table 1. Tomatoes firmness evolution under calcium treatments influence

Fruit		Control	$CaCl_2$ 1,5%	Puracal 0,3%	Puracal 0,6%
Firmness (kf/cm^2)	Without pericarp	1,50	1,85	2,15	2.15
	With pericarp	2,30	2,05	2,35	2,20

Table 2. Tomatoes tissue electrical conductivity at the fruit harvesting time

	Electrical conductivity (µS cm^{-1}) At a superficial area (S.a.)	More profoundly (M.p.)
Peduncular area (P.area)	325	349
Ecuatorial area (E.area)	350	353
Top area (T.area)	250	413

Table 3. Electrical tomatoes tissue electrical conductivity after storage period (µS cm^{-1})

	Control		$CaCl_2$ 1,5%		Puracal 0,3%		Puracal 0,6%	
P.area	232	349	149	570	250	597	315	460
E.area	255	377	272	637	306	647	258	587
T.area	282	422	283	745	385	615	232	498

Table 4. Total electrolyte content and permeability index of tomatoes

	Pericarp		Placentar tissue	
	Total electrolyte content µS/g/20 ml H_2O	**Permeability index (IP)**	**Total electrolyte content µS/g/20 ml H_2O**	**Permeability index (IP)**
Control	14025	0,09	19500	2,80
$CaCl_2$ 1,5%	22000	0,04	12075	0,04
Puracal 0,3%	15030	0,06	12050	0,04
Puracal 0,6%	17000	0,05	12020	0,04

Table 5. Some biochemical parameters in tomatoes under calcium treatments impact

	Respiration rate (mg CO_2/kg/h)	Soluble solids (%)	Vitamin C (mg ascorbic acid/100 g f.w.)
At harvesting	3,81	4,8	20,00
$CaCl_2$ 1,5%	8,52	4,2	18,00
Puracal 0,3%	7,61	4,4	17,45
Puracal 0,6%	10,87	4,6	17,00
Control	5,96	4,1	16,40

ASPECTS REGARDING FOOD SAFETY AND TRACEABILITY

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Keywords: food safety, traceability, risk

FOOD SAFETY AND FOOD SECURITY

Food safety became a quality component of food earlier to be conceptual formulated, appearing from the normal necessity to consumers' protection.

This means that to be able to sell food, products must to be safe, a requirement that is found out at the communitarian, as well as at the national level, in a series of generally or specifically regulations, on groups' products (ex. Dir.92/59 CEE, Dir.93/43 CEE, Reg.178/2002 UE, respectively HG 1198/2002, Low 150/2004, etc. in Romania).

Initial, the food safety notion appeared under the name of *food security* (not as food safety). But often, in the specialty literature it is also used the name food security, with the significance of food safety. In fact, food security represents to assure corresponding nourishment for all the earth population, with a view to be able to perform an active and sound life. Food security conceptually developed in time and space too, accepting different connotations, in function of its elements peculiarities. Thus, for developed countries the accent of food security is beyond on food quality, referring to the food safety, respectively to assure people sound conditions on a long time. For undeveloped and many of those in course of development, food security is specially oriented on social protection of the disadvantageous people groups, by all people access to nourishment.

We can say that food security represents a life quality component, while food safety may be defined as a component of food quality, so, between the two notions being an inclusion relation.

FOOD RISKS AND CONTROL MEASURES

Hygienically food quality (food safety) frequently is negatively influenced by many potential risk factors for the consumer's sound. If we analyse only some of the mass taken ill causes of food consumers from the last years and here we refer at: *bovine spongiform encephalopathy* (BSE), *Dioxin contamination in poultry meat* (identified in Belgium in 1999), and *aviary influenza* from South-East Asia -2003 etc., at the world level, it can be observed a "lose" of the food consumer's confidence, determining to take measures both from the abilities world organizations (FAO and OMS) and from the European Union level, or of every country in part (extra communitarians), by elaborating some lows to visa the consumers protection and to reacquire their in food confidence.

Moreover, in 2000 it has been launch *Global Food Safety Initiative* (GFSI) coordinated by CIES – Firms Forum of Food, in cooperation with Food Marketing Institute (FMI). This is en detail marketing net leadership, formed by over 40 experts in the field of food safety and by the world associations implicated in that commercialization, which by creating their own marks, follows the transfer of the responsibilities on food safety, at the detail's level.

The objectives of this initiative are the followings:

- foot safety development;
- consumer's protection guarantee;
- consumer confidence improve;
- food safe system requirements harmonization;
- cost's efficiency improving along the entire food chain .

Between the different methods proposed to assure the hygienically-sanitary food production, HACCP system is that was accepted by the majority international organizations on this field, being recommended by the Codex Alimentarius Commission too, and this defines it as: "*a system which identifies specifically risks and the prevention measures to theirs control, able to assure food safety*".

We mention it is failed to consider that the HACCP system represents a method that eliminates at all the risks, to obtain sure food and that this also accept the possibility to risks reduction at an acceptable level. This aspect represents a novelty introduced by HACCP, which obliges to rigorous respect of the promoted preventing principles and departing these in any process production phase, constitutes a danger for the whole system.

FOOD TRACEABILITY

HACCP system application in a company, requests the availability of some adequate and correct data and on the other hand, to maintain these documents. In practice, all that it has been done to carry out the HACCP system, as referred to the established product/process, the system methods managements and the resulting recording after its application, represents the documentation that must actualized and archived.

Existing a system to maintain the recordings, determines to satisfy one of the most important system requirement: "*products traceability*".

This represents the possibility to reconstitute the way followed by a product in any manufacturing step, with the aid of the performed recordings, which in fact represents a proof of the system functionality manner. Thus, at the system functionality checking, the registrations are essential elements.

Food traceability became a specifically requirement, wide considered by the No. 178/2002 EU Regulation, that promoted the concept "*from farm to fork*", or with the other words, the knowledge food way from the primary producer (farmer) till the consumer, to be able to identify in the case of some major problems as concerning the product safety, the cause of that manifestation and to limit as more as possible the negative impact extinction. To support this requirement it is added also the procedure solicited both by Codex Alimentarius and by The Certification Standards HACCP (DS 3027E: 2002, IFS, BRC etc), named "*Notification and recall*", to pursue a rapid communication of the information referring to some food safety significantly risks manifestation, so, all the interested partners (producer, distributor, dealer, admitted control devices etc.) to be able to efficiently intervene.

REGULATIONS IN ROMANIA AND EUROPEAN UNION

In Romania, by the Low 150/2004, concerning food safety, there were undertaken the majority of EU no. 178/2002 Regulation requirements, *traceability* being defined as: "*the possibility to identify and watching over on all the production, processing and production steps, of food, animal food, one animal destined for food production or of some substances that follow or which ca be incorporated into food or food for animals*".

At the art. 18 from this low, it is mentioned that "*food traceability must be established in all production, processing and distribution steps*".

Following we mention some of the in operation regulations, at the EU level, referring to some potential risks factors traceability, as for instance allergens and genetically modified organisms (GMO).

Therefore, in No. 89/2003 EU Order it is stated that: "*in an organization must be implemented systems and procedures which will permit the identification of the most frequently food allergens, including auxiliary compounds and other substances. Maintaining under control, based on documents of the food allergen traceability, include a relation between first matters, partial processed products and materials, as well as finite products"*. According to this order, in the positive list of the important sensible allergens there are included 12 product categories, which must be mentioned on the product's tab, where these are found out, so:

- Cereals that contain gluten;
- Crustaceae;
- Eggs;
- Fish;
- Nuts;
- Soybean seeds;
- Milk and milk products;
- Nuts and products from nuts;
- Celery;
- Mustard;
- Susan;
- Sulfur and sulfites, above 10 mg/l.

As concerning products obtained from GMO (Genetically Modified Organisms), which contain GMO or there are derived from GMO, in the 1829/2003 EU Directive, it is mentioned that in a organization it is necessary to introduce systems and procedures by which the above mentioned products can be identified, and their traceability must be under control, based on documents.

In fact, in the Romanian low, in HG No. 106/2002 referring food tabbing is it specified that on the product's tab it will be mentioned " *product from.....genetically modified*" , when a such ingredient is found out in a proportion over 1% in the finite product composition , or of course is entire represented by these (ex. maize flour from genetically modified maize).

REALITIES AND PERSPECTIVES

European Union integration of Romania, from the view point of food safety, need a support of economical agents and of the competent authorities in this field, if we consider that at the middle of 2004, following the evaluation of food processing units, 93,7% from the slaughterhouse and 85% from the milk processing companies, have been included in the last category – D, specifically those who are not at the EU norms and have not a restructure plan, to permit them to receive a transition period. Starting from these realities, unfortunately, we are waiting that at the moment integration, the situation from Hungary, Czech, and Poland after May 2004 (the affiliation date at EU) where many food companies has been closed, to be repeated in Romania too, possibly at a larger scale.

The following question is in actuality and our unrest is: *until the closing moment of the companies that don't correspond to the requirements (if to produce a sure food, is against all reason a requirement!), what food safety elements will these units promote on the market?*

We want to finish in an optimist manner this presentation, starting from the reality seldom existing in the last period in some Romanian companies that implemented and even certified the HACCP system, understanding that "*food safety isn't negotiable, and the* *business isn't an obligation*". Food safety is conditioned by on market propagation of an adequate food for the human consume.

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RESEARCHES CONCERNING THE GRAY MOLD (*BOTRYTIS CINEREA*) CONTROL ON APRICOT FRUITS BY POST HARVEST HEAT TREATMENT

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Keywords: inoculated, *Botrytis cinerea*, fruit quality

ABSTRACT

Apricot (Olimp variety) were inoculated with gray mold conidia (*Botrytis cinerea* Pers.) and were subjected to post harvest heat treatment by dipping in water at various temperatures for 20 min. Heat treatment delayed *Botrytis* proliferation, but using dips at ≥ 49°C caused fruit to soften and develop an atypical pink pigmentation. Fruit treated at 45 or 47 °C showed the best retention of firmness and maintained initial quality, developing neither an off-colour nor an off-flavour.

INTRODUCTION

Botrytis cinerea is a ubiquitous, fungal, plant pathogen that causes economic losses in a wide range of fruit, vegetables and ornamentals in the field and during transport and storage. Apricot bruit is highly susceptible to its action. Control of *Botrytis* during storage can be achieved by physical and chemical methods. Post harvest heat treatments are nonpolluting physical procedures for insect disinfestations and disease control in fresh horticultural products. Recent contributions in this field have been summarized. Couey and Follstad (1996) effectively controlled post harvest decay of five California strawberry cultivators by heat pasteurization using moist air at 44 °C for 40 min, and they observed no effect on flavour or texture. Hot – water dips allow a more homogeneous heating of the product, and it has been used successfully to prevent decay in a variety of fruit species (Paul and Chen, 1990).

The start of infection in harvested apricots appears mainly in fruit previously infected in the green stage; however, the fungi from these fruit subsequently can invade the healthy and ripe neighbours. We used a mycelia suspension of *Botrytis* applied to ripe strawberries as a model system to test the effect of post harvest hot-water treatment on *B. cinerea* growth in Olimp apricot fruit.

MATERIAL AND METHOD

Olimp apricots were harvested early in the morning and transported to the laboratory where undamaged fruit at the same ripening stage (80% of the skin yellow) was selected and distributed randomly among seven treatments of 60 fruit (1 kg) each. A 20-µl droplet containing $1{,}94 \times 10^5$ conidia of *Botrytis* cinerea/ml water was placed on the surface of each fruit. Three 20 apricot fruits replicates for each treatment were inoculated. The conidia were obtained by washing mycelia from pure culture grown on potato dextrose agar (PDA) with 1% Triton X100 solution. After filtering and centrifugation at 6500 g for 5 min, the pellet was resuspended in water. The conidia were counted using a Thomas camera, and the final concentration was adjusted by dilution. One hour after inoculation, six of the seven groups of inoculated apricots were submerged for 15 min at 41, 43, 45, 47, 49 and 50°C in water baths for heat treatments. Afterwards, the fruit were dried, using a dry air stream at 50°C for 5 min, and were placed in a room at 20°C. Using an air stream for drying the fruit after the hot-water dip only affect the internal temperature of the fruit slightly because the energy supplied was used to evaporate the water located on the fruit's surface. The seventh group was placed directly in the 20°C room without heat treatment. At the same time, further control was provided by another seven groups with the same number of noninoculated apricots, which were subjected to the same treatments. The experiment was performed in two consecutive seasons under the same conditions.

The number of fruit in the various treatments with visible mycelia growth of Botrytis was monitored daily for 4 days.

Samples of 24 noninoculated healthy fruit were taken daily at the same hour from each treatment and were tested organoleptically in a sun-illuminated room by an analytical panel of 5 tasters using the simplified procedure of multiple comparisons. Nonheated fruit were used as a reference sample. The possible occurrence of off-flavours or off-colours as a consequence of heat treatment was especially examined.

RESULTS AND DISCUSSION

For inoculated fruit, the extent of fungal growth was inversely related to the temperature used in the heat treatment (Tab. 1). Thus, fruit treated at 51°C needed 4 days to achieve the same percentage of mycelia development as the nontreated fruit on the first day after inoculation. The fruit treated at 41°C and 43°C were intermediate in behaviour with significantly less mycelia development than nontreated fruit but more than the other heat-treated fruit. Three days after inoculation, there was no statistically significant difference in mycelia growth between fruit treated at 45 or 47°C and between fruit treated at 49 or 51°C. Four days after inoculation, decay of 49 and 51°C fruit was significantly less than in fruit from all other treatments, but hot-water dips significantly delayed gray mold development but did not prevent it.

Heat treatments also were effective in controlling post harvest decay in the noninoculated fruit (Tab.2). After 3 days at 20°C, >15% of the nontreated fruit has decayed, while <5% of the heated fruit showed decay. Treatments at 41 and 49°C were less effective after 4 days at 20°C. However, apricots treated at 45°C had a lower, incidence of decay at 4 days than the other fruits.

Treatments at 49 and 51°C injured fruit quality. Apricot fruit treated at this temperature showed a significantly greater loss of fruit firmness than fruit subjected to other treatments. This softening was accompanied by the development of an atypical pink pigmentation on the fruit like that of boiled apricots, which made the fruit unmarketable. Fruit treated at 45 or 47°C retained firmness best, maintaining ≈ 90% of the initial value even 4 days after heat treatment. Nontreated fruit and fruit heated at 41 and 43°C showed an intermediate behaviour, losing a mean of 25% of initial value of fruit firmness.

Sensory analysis did not find any negative effect of heat treatments at <49°C on fruit quality. These fruit maintained their initial quality for 4 days after heat treatment, developing neither the atypical colour nor an off-flavour. The appearance and the softening of fruit treated at ≥49°C gave them a repulsive flavour, and they were rejected.

CONCLUSIONS

1. Immersion in water at 45 or 47°C allowed the best control of *Botrytis cinerea* development without affecting sensory quality of fruit.

2. Heat treatments could be especially suitable in practice for apricots with a foreseeable high postharvest decay, such as fruit harvested after rain.

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Table 1. Decay (%) in apricot fruit inoculated with Botrytis cinerea conidia and later treated with 20 min water dips at various temperatures

Treatment	Time after inoculation (days)			
	1	**2**	**3**	**4**
Non treated 20°C	25	75	95	100
41°C	0	15	50	75
43°C	0	10	35	60
45°C	0	0	15	55
47°C	0	0	10	55
49°C	0	0	5	40
51°C	0	0	5	30

Table 2. Decay (%) in noninoculated apricot fruit treated with 20 min water dips at various temperatures

Treatment	Time after harvest (days)			
	1	**2**	**3**	**4**
Non treated 20°C	0	0	16,5	25
41°C	0	0	3,5	12,5
43°C	0	0	3,5	8,5
45°C	0	0	0	5,0
47°C	0	1,5	1,5	8,5
49°C	0	0	0	11,0
51°C	0	0	0	8,0

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RESEARCHES ON PEAR ORCHARD ECOSYSTEM ENTOMOFAUNA IN BANEASA-BUCHAREST AREA
I. Pest and Beneficial Insect Populations in Pear Orchard Ecosystem in Baneasa-Bucharest Area

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Keywords: *Pyrus communis*, community structure, abundance, faunistic study

ABSTRACT

The aim of the research was to know the current situation of insect community in pear orchard ecosystem (annual treated with insecticides) of Research-Development Institute for Plant Protection, in Baneasa-Bucharest, by determine the range, structure and abundance of the pest and beneficial insect species. It were sampled a total of 26031 individuals of insects, 22194 pests and 3837 beneficials. Pear psyllids group, (specialy *Cacopsylla pyri*) fallowed by leaves weevils group (*Phyllobius oblongus* and *Polydrusus inustus*) were the most abundant pests. Within beneficial insects, predatory bugs *Anthocoris nemoralis* and *Orius sp*. were dominant, they being the specific natural enemies of pear psylla, fallowed by *Chalcididae* group. The biological material was collected weekly using the branches beating method.

INTRODUCTION

The researches on the ecological impact of the orchard management practices on the insect populations present a great practical and scientific importance. The insects community was studied by many researchers in the last years, in Europe, (Barić and Ciglar, 2003, Mărgărit, et al. 1996) on pear and apple, and North America, (Brown 1993, Brown and G.J. Puterka 1996) on apple, apricot and peach.

The aim of this study was to extend knowledge on the investigation of insects community, pests and their natural enemies, in pear orchard ecosystem under chemical conditions of plant protection.

MATERIALS AND METHODS

The study was conducted in the RDIPP Bucharest pear orchard during on April-September 2003. The orchard was sampled weekly using the beating method. 100 branches of trees were beaten into an entomological funnel with 0,5 mp opening. Samples were sortted in laboratory and identified to species, genus and families. Aranea (spiders) were omitted from the samples. Parasitic Hymenopteras were identified to hiperfamily. Species identifications and confirmations were helped by Mr. N. Hondru, Systematic Biologist, to whom we gratefully. For the codling moth, we used the specific Romanian pheromone trap (1trap/ orchard).

For phytoprotection of pear orchard was used a standard spray programme. There were prebloom oil and three post-bloom organophosphate applications.

RESULTS AND DISCUSSIONS

Like the apple or peach orchards, the pear orchard ecosystem is a good model for the study of the insects community, pests and their natural enemies. High pest insect populations, especially common psylla *Cacopsylla pyri* provided a reliable food resource for natural enemies complex.

The whole entomofauna collected in RDIPP pear orchard were grouped into two groups according to the role in pear entomocenosis: pests and beneficial entomofauna.

A total of 26031 individuals were recorded as being part of insects community associated with pear orchard ecosystem. Of these, 22194 individuals (85,26 %) pest and 3837 individuals (14,74%) beneficial entomofauna.

Systematic, pest entomofauna was framed in 6 orders, 21 families and 32 species; beneficial entomofauna was frame in 8 orders, 2 hyperfamilies, 21 families and 45 species.

Two lists of the pest and beneficial entomofauna are given in tables 1 and 2.

Pest entomofauna. Data presented in table nr. 1 showed that Homoptera was the most abundant group with 21651 individuals, representing 97,55 % in pest entomofauna structure of pear ecosystem. The number of homopteras was the highest at the beginning of summer (June) (10 046 ex.), and decreased at the beginning of spring (401 ex.) and autumn (21 ex.). This group was represented by 4 families and 8 species. The most species-rich family was the Psyllidae with 4 species: *Cacopsylla pyri* L., *C. pyrisuga* Főrst, *C. melanoneura* Főrst and *C. bidens* Főrst.

The first psylla, named common pear psylla or european pear sucker is the most important insect pest of pear in all pear-growing regions in Europe and in our country. It occupied 98,01% in psyllids and 95,04% in whole pest entomofauna structure.

Among the aphids, two species were present on pear leaves, *Aphis pomi* and *Dysaphis pyri*, with low numbers, 44 ex., respectively 52 ex. alates.

Second important group was Coleoptera. This was recorded with 396 individuals, the highest number (260 ex.) was found in May. Two species from the family Curculionidae (leaves weevils) were important pest species in pear orchard of RDIPP, in 2003 year: *Phyllobius oblongus* and *Polidrusus inustus*. They represented 74,49% in coleopteras structure. The damage is due to the feeding by the adult weevils on the leaves of pear trees.

Beneficial entomofauna. List and structure beneficial entomofauna are presented in Table 2.

With regard to the beneficial insect populations, the Hymenoptera group was the most abundant (2182 individuals), fallowed by the Heteroptera (1159 individuals), the Coleoptera (238 individuals), the Diptera (51 individuals), the Dermaptera (60 individuals) and Tysanoptera (10 individuals) during this study.

Ants (Formicoidae) recorded a total number of 1841 individuals, and represented 84,37% in Hymenoptera structure or 47,85% in whole beneficial entomofauna.

Predatory bugs, in particular Anthocoridae and Miridae families are very commun predators in pear psylla colonies. These, in high number, (694 individuals, respectively, 454) had been regularly observed in pear orchards attacked by psylla. Their high abundance and permanent presence indicate a very important role among natural enemies. The investigation of structure of particular species of caught Heteroptera show that *Anthocoris nemoralis* is the most abundant predatoy bug (32,53%), fallowed by *Orius sp*. (17%), *Campylomma verbasci* (15,7%) and *Pilophorus perplexus* (14,24%).

The next most abundant groups were Coccinellidae and Chrysopidae, 208 individuals 111 respectively, individuals. Other predator groups appeared in lower numbers.

CONCLUSIONS

The obtained results during the considered period for the samples collected in pear orchard ecosystem of RDIPP in Baneasa-Bucharest, annual treated with insecticides, showed that the pest insects community was more abundant (85,26 %) than beneficial insects (14,74%). The P/B ratio between pests and beneficial entomofauna was above 5,8.

Systematic, pest entomofauna was framed in 6 orders, 21 families and 32 species; beneficial entomofauna was framed in 8 orders, 2 hyperfamilies, 21 families and 45 species.

Reaching the knowledge on pear ecosystem entomofauna is essential to choose the strategy of integrated protection of the orchards, allowing the use of selective insecticides which act less on beneficial entomofauna and the increase the potential of biocenotic regulation in horticultural ecosystems.

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Table nr. 1
Species list and numerical abundance of pest insect populations in the pear orchard of RCDPP Bucharest-Baneasa in 2003

Taxon	Samples period and numerical abundance (April - September)						
	A	M	I	J	A	S	Total
1. THYSANOPTERA **Thrypidae**		**-**	**5**	**4**	**5**	**2**	**16**
2. HETEROPTERA	**3**	**13**	**4**	**8**	**6**	**-**	**34**
Tingidae *Stephanitis pyri* F.	3	9	-	8	5	-	25
Cydnidae *Tritomegas bicolor*	-	3	1	-	1	-	5
Pentatomidae	-	1	3	-	-	-	4
3. HOMOPTERA	**401**	**1750**	**10046**	**7 545**	**1888**	**21**	**21 651**
Aphididae	10	36	24	6	2	18	96
Aphis pomi De Geer	5	17	10	2	1	9	44
Dysaphis pyri Boyer	5	19	14	4	1	9	52
Coccidae *Quadraspidiotus perniciosus* (Comst.)	-	4	6	-	-	1	11
Cicadide *Cicadella viridis* (L.)	-	2	8	7	2	2	21
Psyllidae	391	1 708	10008	7 532	1 884	-	21 523
Cacopsylla pyri L.	362	1 611	9 833	7 411	1 878	-	21 095
C. pyrisuga Forst.	25	53	35	-	-	-	113
C. melanoneura Forst.	4	11	-	-	-	-	15
C. bidens Forst.	-	33	140	121	6	-	300
4. COLEOPTERA	**67**	**260**	**43**	**13**	**11**	**2**	**396**
Elateridae *Agriotes obscurus* L.	-	3	4	2	2	-	11
Mordellidae *Modelistena parvula*	-	2	4	-	-	-	6
Anthicidae	3	7	5	1	-	-	16
Anthicus hispidus L.	1	5	2	1	-	-	9
A. antherinus	2	2	3	-	-	-	7
Nitidulidae	-	4	6	1	3	-	14
Meligethes aeneus F.	-	4	2	-	2	-	8
M. maurus	-	-	4	1	1	-	6
Buprestidae *Agrilus viridis* L.	-	1	4	1	1	1	8
Chrysomelidae	-	2	11	7	5	1	26
Chaetocnema aridula Gyll.	-	1	2	2	2	1	8
Longitarsus tabidus	-	1	3	-	-	-	4
Phyllotreta nemorum L.	-	-	4	4	1	-	9
Ph. Vittula Red.	-	-	2	1	2	-	5
Curculionidae	64	238	7	1	-	-	310
Phyllobius oblongus F.	34	144	5	1	-	-	184
Polidrusus inustus Germ.	19	90	2	-	-	-	111
Sciaphobus squalidus Gyll.	11	4	-	-	-	-	15
Scolidiidae *Scolytus rugulosus* Ratz	-	3	2	-	-	-	5
5. LEPIDOPTERA **Olethreutidae** *Cydia pomonella* L.	**-**	**-**	**26**	**20**	**13**	**-**	**59**
6. DIPTERA	**3**	**23**	**11**	**1**	**-**	**-**	**38**
Itonididae *Dasyneura pyri* Bauche	-	4	7	-	-	-	11
Chloropidae	3	7	3	1	-	-	14
Agromyzidae	-	9	-	-	-	-	9
Tripetidae	-	3	1	-	-	-	4
TOTAL	**474**	**2 046**	**10 135**	**7 591**	**1 923**	**25**	**22 194**

Table nr. 2
Species list and numerical abundance of beneficial insect populations in the pear orchard of RCDPP Bucharest-Baneasa in 2003

Taxon	Samples period and numerical abundance (April - September)						
	A	**M**	**I**	**J**	**A**	**S**	**Total**
1. THYSANOPTERA **Aeolothripidae** *Aeolothrips intermedius*	**-**	**-**	**2**	**3**	**5**	**-**	**10**
2. DERMAPTERA **Forficulidae** *Forficula auricularia* L	**-**	**2**	**19**	**21**	**16**	**2**	**60**
3. HETEROPTERA	**-**	**29**	**286**	**468**	**346**	**30**	**1 159**
Anthocoridae	-	11	208	269	178	28	694
Anthocoris nemoralis F.	-	10	124	135	96	12	377
Orius sp.	-	1	48	80	48	15	192
Anthocoridae larve	-	-	36	54	34	1	125
Miridae	-	18	78	195	163	2	456
Campylomma verbasci M&D	-	18	23	48	92	1	182
Deraeocoris lutescens Schill.	-	-	12	11	29	-	52
D. ruber L.	-	-	1	4	2	-	7
D. olivaceus L.	-	-	1	1	1	-	3
Orthothylus sp.	-	-	1	1	1	-	3
Pilophorus perplexus Dougl&Scott	-	-	25	107	32	1	165
Miridae larve	-	-	15	23	6	-	44
Nabidae	**-**	**-**	**-**	4	5	-	9
Hymacerus apterus L.	-	-	-	2	3	-	5
Nabis ferus L.	-	-	-	2	2	-	4
4. NEUROPTERA	**5**	**7**	**15**	**38**	**49**	**21**	**135**
Chrysopidae	4	5	9	35	38	20	111
Chrysoperla carnea Steph.	4	5	8	29	21	18	85
Chrysopa sp.	-	-	1	2	1	-	4
Chysopidae larve	-	-	-	4	16	2	22
Hemerobiidae *Hemerobius humulinus* L.	1	1	5	3	9	1	20
Panorpidae *Panorpa communis* L.	-	1	1	-	2	-	4
5. RAPHIDIOPTERA **Raphidiae** *Raphidia sp.*	**-**	**-**	**1**	**-**	**1**	**-**	**2**
6. HYMENOPTERA	**47**	**179**	**789**	**451**	**483**	**233**	**2 182**
Sf. Chalcidoidea	4	7	55	37	124	14	241
Aphidiidae	-	-	5	3	6	-	14
Braconidae	-	-	1	4	4	-	9
Sf. Ichneumonoidea	-	2	5	4	5	1	17
Formicoidea	43	170	720	383	321	204	1 841
Vespidae *Vespula germanica* F.	-	-	3	20	23	14	60
7. COLEOPTERA	**7**	**35**	**74**	**52**	**38**	**32**	**238**
Carabidae *Lebia humeralis* Dej.	-	-	1	3	-	-	4
Cantharidae *Chantaris fusca*	-	3	4	-	4	-	11
Staphylinidae	-	1	2	2	-	-	5
Lathridiidae	-	1	5	4	-	-	10
Corticarina gibbosa Hbst.	-	-	2	2	-	-	4

C. elongata Gyll.	-	1	3	2	-	-	6
Coccinellidae	7	30	62	43	34	32	208
Adalia bipunctata L.	-	16	16	11	5	12	60
Adonia variegata Goeze	-	-	2	1	1	1	5
Chilocorus bipustulatus L.	-	-	1	3	3	2	9
Coccinella 7-punctata L.	-	8	14	9	6	5	42
C. 10-punctata L.	-	-	3	-	3	-	6
Coccinula 14-punctata L.	1	1	1	1	2	1	7
Exochomus 4-pustulatus L.	3	2	1	3	4	-	13
Halyzia sedempunctata L.	-	-	7	-	-	1	8
Hippodamia 13-punctata L.	-	-	1	1	-	1	3
Propylea 14-punctata L.	-	3	-	-	-	5	8
Scymnus sp.	3	-	2	1	5	-	11
Stethorus punctillum Weise	-	-	-	2	2	-	4
Synharmonia conglobata L.	-	-	2	2	-	4	8
Coccinella larve	-	-	12	9	3	-	24
8. DIPTERA	**2**	**12**	**13**	**16**	**8**	**-**	**51**
Sciaridae *Bradysia fungicola*.	-	6	3	3	2	-	14
Syrphidae	-	1	7	9	5	-	22
Epysirphus balteatus De Geer	-	-	6	5	2	-	13
Syrphidae larve	-	1	1	4	3	-	9
Tachinidae	-	5	3	4	1	-	15
TOTAL	**61**	**264**	**1 199**	**1 049**	**946**	**318**	**3 837**

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THE INFLUENCE OF FOLIAR FERTILIZATION UPON APPLE TREE GROWING AND FRUCTIFICATION

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Keywords: *foliar, fertilizers, apple, yield, unpolluting*.

Our researches made between 1996-2002 aimed to establish the most efficient technology and fertilizers used in apple fruit growing.

Compared to the conventional fertilization methods applied on the soil, foliar fertilization brings supplementary small nutrients amounts that act stimulating the leaf metabolism and determining increased absorption of soil nutrient elements.

The experiment was placed in a high-density apple *Idared* variety orchard, and totalized 16 variants, placed into randomized blocks of 8 trees/variant.

The foliar fertilizers were applied 3 times: immediately after blossom and every 2 weeks after.

The experimental variants totalized 15 types of Romanian and foreign foliar fertilizers (*F 231, Folifag, Plant power, Nutrivit, Nutricamp 10-20-40, Cropmax, ICPA 6288, Amestec, Nutrient expres, Calmax, PPCF, Stimucrop 10-10-10, Stimucrop 15-3-3, Kristalon start, Kristalon pold*) compared to the control group without any foliar fertilizers (1, 2).

After these treatments the yield raised with 1.6 t/ha (7%) using *F231* and 7.4 t/ha (32.4%) using *Stimucrop 15-3-3* compared to the control.

The foliar fertilization determined the increase of the photosynthetic efficiency and stimulated leaf metabolism.

Total assimilating pigments increased from 2.0518 mg/g fresh leaves in control to 2.5423 mg/g using *Cropmax* solution 0.1 % and to 2.6711 mg/g with *Stimucrop 15-3-3* 1% concentration.

Foliar fertilization determined increasing yields using small quantities of nutrients, vitamins, stimulatory substances that are totally absorbed, preventing environmental and fruit contamination (3).

INTRODUCTION

While using unconventional ways of soil fertilization, with natural and chemical fertilizers in order to obtain bigger yields, the risk of environment degradation could appear. This degradation would be caused by chemical pollution of soil and crops.

Foliar fertilization is a technique leading to an increase of the energetic and photosynthetic efficiency by stimulating leaf metabolism and consequently intensifying the absorption of soil nourishing elements (1-4).

Our researches made between 1996-2002 aimed to establish the most efficient technology and fertilizers used in apple fruit growing.

MATERIALS AND METHODS

The experiment took place in a high-density apple *Idared* variety orchard, and totalized 16 variants, placed into randomized blocks of 8 trees/variant. The soil characteristics are presented in the table 1.

Table 1. The main properties of the soil

Soil horizon	Depth	pH H_2O	Humus %	Nt %	C/N	Pal ppm	Kal ppm	V %	% clay
Amp	0-20	7.41	4.38	0.231	12.7	88	151	93.4	38.1
Am	20-40	7.58	3.12	0.211	11.8	77	196	91.2	37.7
A/B	40-60	7.47	1.43	0.142	11.6	41	177	82.7	39.4
Bv_1	60-90	8.24	0.88	0.056	10.8	32	166	88.4	36.1
Bv_2	90-110	8.35	0.75	0.035	10.1	10	141	98.5	34.5
B/C	110-130	8.44	0.58	0.022	10.7	11	141	100	35.4

The foliar fertilizers were applied 3 times: immediately after blossom and every 2 weeks after, using 1000 l/ha solution.

The experimental variants were: V_1 - the unfertilized control group; V_2 - *F 231* 1%; V_3 - *Folifag* 1%; V_4 - *Plant power* 0.2%; V_5 - *Nutrivit* 0.5%; V_6 - *Nutricamp* 10-20-40 0.5%; V_7 - *Cropmax* 0.1%; V_8 - *I.C.P.A. 6288* 1%; V_9 - *Amestec* 1%; V_{10} - *Nutrient expres* 0.5%; V_{11} - *Calmax* 1%; V_{12} - *P.P.C.F. 231* 0.5%; V_{13} - *Stimucrop 10-10-10* 1%; V_{14} - *Stimucrop 15-3-3* 1%; V_{15} - *Kristalon start* 1%; V_{16} - *Kristalon pold* 1%.

RESULTS AND DISCUSSIONS

The results concerning the production and energetic efficiency of the new types of Romanian and foreign foliar fertilezers compared to the old Romanian *Folifag* and *F_{231}* fertilizers are presented in table 2.

The largest average production (30.2 t/ha) was obtained at V_{14} (fertilized with *Stimucrop 15-3-3* 1%) followed by V_{13} - *Stimucrop 10-10-10* 1%; V_{16} - *Kristalon pold* 1%; V_{15} - *Kristalon start* 1%; V_5 - *Nutrivit* 0.5 %; V_7 - *Cropmax* 0.1 % and V_6 - *Nutricamp 10-20-40* 0.5% with production over 29 t/ha.

When using the foliar fertilizer *F_{231}* 1% the production efficiency compared to the control group was insignificant (1.6 t/ha).

Folifag 1% gave a significant production efficiency compared to the control group (1.7 t/ha).

We noticed the following products with very significant production efficiency: *Nutrivit* 0.5%; *Nutricamp 10-20-40* 0.5%; *Cropmax* 0.1%; *Calmax* 1%; *Stimucrop 10-10-10* 1%; *Stimucrop 15-3-3* 1%; *Kristalon start* 1%; *Kristalon pold* 1% with over 5.7 t/ha compared to the control group.

I.C.P.A 6288 - the new Romanian product which will be soon released on the market, applied in 1% concentration also contributed to a very significant production efficiency by 5.7 t/ha.(4, 5)

By using Romanian or foreign foliar fertilizers an increase in production efficiency and bioconversion of light energy can be observed (table 2).

Table 2. The productive and energetic efficiency of the foliar ferilization in *Idared* apple trees

Variants	Average production		Production efficiency			Energetic efficiency (Mcal/ha)		
	kg/ha	t/ha	Production t/ha	%	Signific.	Consumption	Balance	Total
V_1 control	22825	22,8	-	100		6480	2777	9257
V_2 F231 1%	24476	24,4	1,6	107,0		7341	3146	10487
V_3 Folifag 1%	24493	24,5	1,7	107,4	x	7359	3154	10513
V_4 Plant Power 0,2%	26536	26,5	3,7	116,2	x	8415	3606	12021
V_5 Nutrivit-0,5%	29043	29,0	6,2	127,2	xxx	9722	4167	13889
V_6 Nutricamp 10-20-40 0,5%	29311	29,3	6,5	128,5	xxx	9862	4227	14089
V_7 Cropmax 0,1%	29275	29,2	6,4	128,1	xxx	9843	4219	14062
V_8 I.C.P.A. 6288 1%	28542	28,5	5,7	125,0	xxx	9461	4055	13516
V_9 Amestec 1%	26540	26,5	3,7	116,2	x	8417	3607	12024
V_{10} Nutrient expres	26608	26,6	3,8	116,7	xx	8452	3623	12075
V_{11} Calmax 1%	29030	29,0	6,2	127,2	xxx	9715	4164	13879
V_{12} P.P.C.F.231 0,5%	28248	28,2	5,4	128,2	xx	9308	3989	13297
V_{13} Stimucrop 10-10-10 1%	29962	29,9	7,1	131,1	xxx	10201	4373	14574
V_{14} Stimucrop 15-3-3 1%	30279	30,2	7,4	132,4	xxx	10367	4443	14810
V_{15} Kristalon start 1%	29773	29,7	6,9	130,2	xxx	10103	4330	14433
V_{16} Kristalon plod 1%	29838	29,8	7,0	130,7	xxx	10137	4344	14481

DL 5% = 1,64 DL 1% = 3,78 DL 0,1% = 5,63 t/ha

When the fertilization was made with F_{231} and *Folifag*, the energetic efficiency rose with about 1000 Mcal/ha cmpared to the control group where the total energetic efficiency was 9257 Mcal/ha. The treatmens with new foliar fertilizers determined total energetic efficiency increases of 3000 - 5000 Mcal/ha compared to the control group.

By foliar fertilization the energetic balance rose from 2777 Mcal/ha in V_1 to over 4000 Mcal/ha in V_5, V_6, V_7, V_8 and V_{11}.

The increase of leaves photo-assimilative pigments content in foliar fertilized variants determined an intensified photosynthesis and consequently significant production efficiency.

Table 3. The photoassimilative pigments and mineral elements content after foliar fertilization in *Idared* apple trees

Variants	Chlorophyll a mg/g fs	Chlorophyll b mg/g fs	Carotene mg/g fs	Total a+b mg/g fs	a/b	a+b/c	Nt %	P_2O_5 %	K_2O %	Na_2O %	CaO %	Total mineral elements %
V_1 the control grup	1.1705	0.4583	0.4230	2.0518	2.55	3.85	0.65	0.78	0.85	0,29	0.34	2.91
V_2 F231 1%	0.8110	0.3442	0.3505	1.5057	2.36	3.89	0.41	0.40	1.10	0,39	0.30	2.60
V_3 Folifag 1%	1.6122	0.6340	0.5639	2.8101	2.54	3.78	0.58	0.60	1.20	0,40	0.34	3.12
V_4 Plant Power 0,2%	1.1716	0.4358	0.4038	2.0112	2.69	3.98	0.42	0.41	1.12	0,58	0.38	2.91
V_5 Nutrivit-0,5%	1.1022	0.3543	0.3343	1.7908	3.11	4.35	0.38	0.30	1.30	0,46	0.44	2.88
V_6 Nutricamp 10-20-40 0,5%	0.8017	0.2802	0.2578	1.3397	2.86	4.19	0.43	0.70	1.05	0,45	0.42	3.05
V_7 Cropmax 0,1%	1.1796	0.7988	0.5639	2.5423	1.48	3.51	0.56	0,35	0.96	0,30	0.44	2,61
V_8 I.C.P.A. 6288 1%	1.1687	0.4977	0.4230	2.0894	2.34	3.93	0.48	0.70	1.87	0,67	0.40	4.12
V_9 Amestec 1%	1.1726	0.4348	0.4028	2.0102	2.69	3.99	0.47	0,43	1.02	1,48	0.40	2.80
V_{10} Nutrient expres	1.1959	0.4317	0.4431	2.0707	2.77	3.67	0.58	0.92	1.00	0,36	0.34	3.20
V_{11} Calmax 1%	1.3113	0.5696	0.4431	2.3234	2.30	4.24	0.65	0.63	1.25	0,43	0.40	3.36
V_{12} P.P.C.F.231 0,5%	1.0037	0.3831	0.3545	1.7413	2.62	3.91	0.58	0.73	1.95	0,65	0.34	4.25
V_{13} Stimucrop 10-10-10 1%	1.4310	0.6108	0.5237	2,5655	2.34	3.89	0.56	0.67	1.25	0,42	0.41	3.31
V_{14} Stimucrop 15-3-3 1%	1.5533	0.5941	0.5237	2.6711	2.61	4.10	0.57	0.58	0.90	0,29	0.49	2.83
V_{15} Kristalon start 1%	1.4370	0.4756	0.4632	26758	3.02	4.13	0.58	0.30	1.00	0,36	0.40	2.64
V_{16} Kristalon plod 1%	1.1722	0.4204	0.3867	1.9793	2.79	4.12	0.47	0.45	1.40	0,48	0.44	3.24

The content of chlorophyll *a* increased from 1.1705 mg/g of fresh substance (fs) in the control group to 1.5533 mg/g fs by treating with *Stimucrop 15-3-3* 1% and to 1.4370 mg/g fs when using *Kristalon start* 1%.

The chlorophyll *b* content showed an increase from 0.4583 mg/g fs in V_1 to 0.5696 mg/g fs by using *Calmax* 1% and to 0.6108 mg/g fs with *Stimucrop 10-10-10* 1%.

As an effect of foliar fertilization, the carotene content also increased from 0.4230 mg/g fs in V_1 to 0.5237 mg/g fs in the variant fertilized with *Stimucrop* 10-10-10 1% (V_{13}).

The same tendency of increase was observed in the assimilative pigments content which varied between 2.0518 mg/g fs in V_1 and 2.6711 mg/g fs in V_{14} fertilized with *Stimucrop 15-3-3* 1%.

The chlorophyll ratio *a/b* had values between 2.55 in the control group (V_1) and 3.11 in V_5 fertilized with *Nutrivit* 0.5%.

We observed significant differences between total chlorophyll and carotene ratio (a+b/c), with values oscillating between 3.85 in the control group (V_1) and 4.35 in V_5 fertilized with *Nutrivit* 0.5%. The increase of the content of chlorophyll *a, b*, and carotene as well as the total content of pigments showed the significant role of the foliar fertilizers in stimulating plant metabolism with a direct influence upon the crop yields.

Table 4. The utilization factor of the nutrient elements after foliar fertilization and harvest efficiency

Variants	Average production kg/ha	Efficiency			GAUPEN %		
		kg/ha	%	Signif.	N	P	K
V_1 the control grup	22825	-	100		-	-	-
V_2 F231 1%	24476	1.6	107.0		101.2	113.5	108.4
V_3 Folifag 1%	24493	1.7	107.4	x	102.7	113.8	107.8
V_4 Plant Power 0,2%	26536	3.7	116.2	x	129.8	130.1	129.9
V_5 Nutrivit-0,5%	29043	6.2	127.2	xxx	148.5	150.8	144.1
V_6 Nutricamp 10-20-40 0,5%	29311	6.5	128.5	xxx	148.4	151.2	148.3
V_7 Cropmax 0,1%	29275	6.4	128.1	xxx	149.9	151.2	147.7
V_8 I.C.P.A. 6288 1%	28542	5.7	125.0	xxx	136.6	146.3	139.4
V_9 Amestec 1%	26540	3.7	116.2	x	129.9	130.2	129.9
V_{10} Nutrient expres	26608	3.8	116.7	xx	130.2	130.5	130.4
V_{11} Calmax 1%	29030	6.2	127.2	xxx	148.2	150.4	143.8
V_{12} P.P.C.F.231 0,5%	28248	5.4	128.2	xx	140.6	143.9	144.2
V_{13} Stimucrop 10-10-10 1%	29962	7.1	131.1	xxx	149.7	157.7	157.4
V_{14} Stimucrop 15-3-3 1%	30279	7.4	132.4	xxx	149.9	160.3	160.1
V_{15} Kristalon start 1%	29773	6.9	130.2	xxx	149.3	156.2	155.9
V_{16} Kristalon plod 1%	29838	7.0	130.7	xxx	149.5	156.7	156.4

The results concerning the leaves mineral elements content determined by foliar diagnosis showed that the absorption and translocation kinetic of those elements is faster when using foliar fertilizers and could prevent some negative aspects during the vegetation period.

Thus, the total nitrogen content (Nt) was 0.65% in the control grup (V_1), 0.48% in V_8 fertilized with *ICPA 6288* 1% and 0.38% in V_5 fertilized with *Nutrivit* 0.5%.

The phosphorous content varied between 0.78% in the control grup (V_1) and 0.30% in V_{15} fertilized with *Kristalon start* 1%.

The potassium content had higher values after foliar fertilization, respectively 1.95% in V_{12} (*P.P.C.F. 231* 0.5%) compared to the control group.

The use of foliar fertilizers determined significant production increases as a result of improved utilization of the nutrient elements from the soil and leaves. It also diminished the risk of environment and fruit chemical pollution.

The utilization factors of nourishing elements (GAUPEN) after foliar fertilization are greater than those usually obtained when common soil fertilizers are used.

The GAUPEN factor for nitrogen started from 101.2% when fertilizing with F_{231} and went up to 150% when using *Stimucrop* products (6).

The GAUPEN value for potassium was 107.8% using *Folifag,* rose to 139.4% for the Romanian foliar fertilizer *I.C.P.A. 6288* and rose up to 160% with *Kristalon* and *Stimucrop* products.

CONCLUSIONS

The foliar fertilization with small doses applied three times every two weeks (using 1000 l solution/ha) after the blossom period, determined an increase of the plants assimilation capacity, influencing positively the energetic and photosynthetic efficiency.

That is why we consider the foliar fertilization an important unconventional and unpolluting measure, meant to increase fruit crops through an ecological process suitable for sustenable development.

Foliar fertilization in *Idared* apple trees yielded in production efficiencies between 1.6 t/ha (V_2 - *F 231* 1%) and 7.4 t/ha (V_{14} - *Stimucrop* 15-3-3 1%).

Nevertheless foliar fertilization should not substitute soil fertilization, because if used for a long period of time, it may determine soil degradation by mineral elements depletion.

Therefore it is necessary to alternate correctly in time and space the unconventional fertilization with optimum doses of fertilizers applied on soil.

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STUDIES REGARDING THE REACTION OF SOME APRICOT TREE VARIETIES TO THE GREEN PRUNING

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Keywords: *Prunus armeniaca*, thinning, fruit, quality

SUMMARY

The green cutting of the apricot gives the possibility for a better counting of the fruits production, assures the compensation of the damages caused by cold and a better healing of the wounds. The summer cutting can be done after the tied fruits or after harvesting. The choice for the cutting moment is 100% dependent on the tied fruits. As a result, at a high level of tied fruits the cutting must be done after the process is completed, otherwise the cutting is conducted after harvesting in order to preserve all the fruits. At the 6 varieties studied it was proved that the summer cutting determines an easier pass of the tress over the winter and a decrease of damages caused by freezing with 20-25%.

INTRODUCTION

In the last years, the culture of apricot tree has regressed because of the lost in productions registered caused by the thermal changes in spring. Using the technology in orchard it is tried to reduce the negative effect of the environmental factors upon the production. Although in the past 10 years, dominant have been the years without rod because of the frost the coming back white frost.

If the lost of the bud in rod hasn't surpassed 50-60%, the summer pruning performed after the fruits bind or even after harvesting can reduce the negative impact of the while frost and coming back frost. The pruning after the fruit bind gives the possibility to compensate the lost of the affected arias by leaving more loads in the superior part of the crown. At too low temperatures the destruction grade can be extremely high and the compensating pruning doesn't have any effect. If there still pruning after harvesting could be favorable in order to obtain harvest. If not, is performed a more severe pruning to stimulate new growing. Those will be fruit branches for the next year.

MATERIALS AND METHODS

The experience above has been organized in the didactic field of the Pomology department from Horticulture Faculty of Bucharest, in the 2001/2004 period, in an apricot tree plantation founded in 1994, by supra-grafting in the designing point of the plum tree crown. As a biological material were used 6 new apricot tree varieties: Dacia, Comandor, Excelsior, Sulmona, Mamaia and Favorit, planted at 4/3 m, the tree were leaded as vasell-bush and the soil maintained as worked land. In the plantation were performed specific workings for fruit orchard, except the thinning of the fruits and the pruning which was done in tree different moments as it follows.

- V1 – the dry pruning
- V2 – the green pruning after the bind of fruits
- V3 – the green pruning after harvesting

On the duration of the researches were performed biometrical determinations and measures regarding the growing and production capacity and was registered the reaction of the trees at pruning moment.

RESULTS AND DISCUSSIONS

The quantity of wood remained from pruning depended on the variety, but also on the way the trees were pruned (table 1). Except V1 and V3 at Mamaia variety whose values have been considerably higher. The statistical analyze of dates at the variety level shows that, in general in comparison with Dacia variety, the other varieties have had close values or even lower then the former one, especially V2. The less quantity of wood has registered at Excelsior, which proved to be less vigorous for all variants.

Table 1

The wood quantity lost in cutting

Variety	Variant	2001	2002	2003	2004	Media	Semnification
Dacia	V_1	4.6	4.5	5.2	4.9	4.80	Mt
	V_2	6.1	7.4	8.1	7.3	7.22	Mt
	V_3	7.4	7.7	8.7	7.6	7.85	Mt
Excelsior	V_1	3.5	4.2	3.5	4.4	3.90	ooo
	V_2	4.2	4.6	4.1	4.8	4.42	ooo
	V_3	5.9	6.4	6.3	6.1	6.17	ooo
Comandor	V_1	4.9	5.3	5.3	5.2	5.17	N
	V_2	5.4	6.1	6.2	5.9	5.90	ooo
	V_3	6.2	7.1	8.4	9.2	7.72	N
Sulmona	V_1	4.6	4.8	4.5	5.1	4.75	N
	V_2	5.4	5.6	6.2	6.6	5.95	ooo
	V_3	7.2	7.6	8.4	9.4	8.15	N
Mamaia	V_1	5.1	5.4	5.2	5.4	5.27	*
	V_2	6.4	6.3	6.5	6.4	6.40	oo
	V_3	8.2	8.5	8.9	9.5	8.77	*
Favorit	V_1	4.6	4.3	4.8	4.6	4.57	N
	V_2	5.2	5.8	5.4	5.8	5.55	ooo
	V_3	7.5	7.6	8.2	8.4	7.92	N

DL 5% = 0.39 kg pt V1	DL 5% = 0.54 kg pt V2	DL 5% = 0.80kg pt V3
DL 1% = 0.54 kg	Dl 1% = 0.82 kg	DL 1% = 1.11 kg
DL0,1%= 0.74 kg	DL0,1%=1.13 kg	DL0,1%=1.54 kg

If we analyze the pruning influence on the variety, we observe that V_3 lost more quantity of biomase because in the summer there are more leaves on the branches. The figure 1 shows sketchily the changes of biomase for variety and experience.

The affecting grade of buds and flowers by the coming back frost and while frost was very different from an year to another, resulting a period of 2 years with normal production and 2 years with potty production. In 2002 the damaged percent of the buds reached 70% at some varieties and variants, when the temperature in the flower button faze went under 9°C. In 2004 at a -6°C temperature the percent went to 43-48%. For varieties, haven't been registered average differences higher than 2-4 percent in the 4 years of experience. This fact is caused by the less temperatures, no matters of the pruning method used.

Especially in 2004, when the frost affected the flowers, the fruit bind percent was affected more in the frost years, remaining only 11-23% of the opened flowers. In the former years the situation was better, especially in 2003, when the bind grade was of 3-46,5%

depending on the variety and the variant used (table 2). The 2003 years, very good from the climatic point of view, the fruits of the trees pruning dry indeed more, probably because of the higher quantity of food and of the less number of the buds.

The production capacity of the apricot tree was influenced more by the climatic condition from the experimenting period (table 3).

Table 2

The joint capacity of fruits at some apricot varieties (%)

Variety	Variant	2001	2002	2003	2004	Media
Dacia	V_1	29.6	16.3	42.2	16.1	26.050
	V_2	30.1	17.2	39.5	16.9	25.925
	V_3	29.8	16.7	39.1	15.4	25.250
Excelsior	V_1	23.5	11.4	46.5	11.3	23.175
	V_2	22.9	11.5	43.4	12.1	22.475
	V_3	23.7	12.1	41.2	10.9	21.975
Comandor	V_1	43.5	22.3	44.9	21.2	32.975
	V_2	42.9	21.3	45.2	23.4	33.325
	V_3	43.3	23.4	41.4	22.0	32.525
Sulmona	V_1	38.6	12.5	44.7	14.3	27.525
	V_2	38.2	12.4	41.3	15.5	26.850
	V_3	38.4	12.9	42.5	15.1	27.225
Mamaia	V_1	28.9	14.5	35.7	18.5	24.400
	V_2	29.1	14.8	33.2	17.4	23.625
	V_3	28.9	15.2	33.4	18.1	23.900
Favorit	V_1	31.4	19.2	44.5	17.5	28.150
	V_2	32.4	19.8	42.4	18.2	28.200
	V_3	31.8	18.4	43.0	18.9	28.025

If in the 2001 and 2003 years the production got closed to the potential of the varieties, in 2001 the production didn't over passed 30-50% from the normal one, no matter of the pruning way used. A similar situation took place in 2004. At a variety level it can be observed that at the summer pruning the average production in 4 years was higher at the green pruning trees, the values for this 2 variants being almost the some. The average weigh of the fruit was slightly influenced by the pruning method. In summer pruning after harvesting, especially in the years with normal productions the trees were overloaded and the fruits remained small.

Table 3

The production capacity of some apricot varieties

Variety	Var.	2001	2002	2003	2004	Media	Semnification
Dacia	V_1	14.4	4.3	16.4	5.5	10.15	Mt
	V_2	15.9	5.3	18.5	6.8	11.62	Mt
	V_3	15.4	4.9	17.4	7.2	11.22	Mt
Excelsior	V_1	16.3	3.2	17.8	5.1	10.60	N
	V_2	17.2	3.6	21.2	6.2	12.05	N
	V_3	17.7	3.8	20.4	6.9	12.20	N
Comandor	V_1	17.9	9.3	20.1	8.5	13.95	**
	V_2	18.9	9.9	24.4	10.2	15.85	**
	V_3	19.2	10.2	25.3	10.7	16.53	***
Sulmona	V_1	19.4	3.6	18.6	6.5	12.02	N
	V_2	21.1	5.3	23.9	7.4	14.42	*
	V_3	20.4	5.1	23.5	7.9	14.22	*
Mamaia	V_1	15.9	6.2	17.3	8.2	11.90	N
	V_2	18.2	6.7	19.2	8.9	13.25	N
	V_3	17.7	6.3	19.9	8.5	13.10	N
Favorit	V_1	13.2	6.9	17.4	6.4	10.97	N
	V_2	14.9	7.2	19.2	7.4	12.17	N
	V_3	14.4	7.0	19.7	7.2	12.07	N

DL 5% = 0.39 kg pt V1 | DL 5% = 0.54 kg pt V2 | DL 5% = 0.80kg pt V3
DL 1% = 0.54 kg | Dl 1% = 0.82 kg | DL 1% = 1.11 kg
DL0,1%= 0.74 kg | DL0,1%=1.13 kg | DL0,1%=1.54 kg

CONCLUSIONS

From the above experiences it can be sum up:

1. the apricot tree reacts real good at green pruning, the applying moment can be established depending on the number of trees and on the working force available;
2. the tolerance of buds to cold wasn't considerably influenced by the cutting , method, in the experimenting period the temperature was adequate or under the limit of tolerance of buds and flower;
3. the production capacity was normal in 2001 and 2003, weak in 2002 and 2004. At the pruning after harvesting the trees were overloaded and some fruit branches broke;
4. the size of the fruits was small at V_3 because of the overloaded trees.

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THE EFFECT OF SOME FACTORS ON SHOOT REGENERATION FROM MERISTEM CULTURE OF *RUBUS* IDAEUS L.

VALENTINA ISAC

Key words: raspberry, *in vitro*

SUMMARY

The influence of 4 different media and 9 moments for explants inoculation on the differentiation ability of explants was tested in 11 genotypes of raspberry. Murashige-Skoog (1962) medium supplemented with 0.5 mg/l AG, 0.1 mg/l BA, and 10.0 mg/l ascorbic acid, allowed the most favorable conditions for the regeneration process. August and September proved to be the most favorable periods for buds harvest with high capacity of differentiation in plantlets.

INTRODUCTION

As soon as *in vitro* techniques have been developed, many scientists utilized the micropropagation as a tool of rapid propagation (Anderson, 1985; Donelly&Daubenny, 1986). The first phase *in vitro* culture system is development of explants. The influence of nutrient medium and time when the plants are collected, namely the phenological phase of donor on the differentiation ability of explants was assessed.

MATERIALS AND METHODS

The experiment was conducted in the raspberry utilizing adult plants of 11 cultivars. The disinfection was performed in ethilic alchool and Calcium hypochloride. The explants selected should have 1-2 leaf primordia. To get a high plant regeneration rate, 4 several nutrient media were tried:

M1: Murashige-Skoog mineral salts and vitamins, 0.5 mg/l GA 3, 0.1 mg/l BA, 10.0 mg/l ascorbic acid;

M2: Murashige-Skoog mineral salts, Lee Fossard vitamins, 0.1 mg/l GA 3, 1.0 mg/l BA;

M3: Anderson mineral salts and vitamins, 0.2 mg/l BA, 0.5 mg/l IBA, 10.0 mg/l ascorbic acid;

M4: Murashige-Skoog mineral salts and vitamins, 0.2 mg/l BA, 0.2 mg/l IBA. All nutrient medium contained 32.0 mg/l NaFeEDTA.

For each cultivar and treatment, 20 explants were sampled in July and August in 3 replicates. To find the optimum time for explant sampling, the stock was collected in 9 periods of the year: January-February, March, April, May, June, July, August, September and October-December. Within this experiment, we used M1 nutrient medium. The readings were done six weeks later from culture initiation. The data are statistically processed by Duncan test.

RESULTS AND DISCUSSIONS

The tests for the influence of nutrient medium on the differentiation ability of explants have proved that no matter the cultivar or medium involved the development rate ranged from 36% to 63%, being over 50% (Table 1). According to differentiation percentage of 11 raspberry plantlets, we can see that M 1, provided the best conditions for the regeneration process. Duncan test has highlighted that Gradina was highly influenced by the nutrient medium, the average differentiation of explants on various media varying from 15.1% to 88.6%.

Table 1
Influence of media on explants differentiation

Cultivar	Medium treatment			
	M 1	M 2	M 3	M 4
Gradina	88.6a	26.2c-f	29.6b-f	15.1 f
Schopska Alena	85.1ab	73.7a-c	84.3ab	75.9a-d
Romy	82.8ab	70.7a-c	49.1a-f	51.4a-f
The Latham	82.5ab	57.4a-f	52.1a-f	59.2a-f
Heritage	80.7ab	50.4a-f	48.8a-f	46.9a-f
Cayuga	78.8a-c	70.0a-e	65.5a-f	55.4a-f
September	62.9a-f	45.7a-f	43.3a-f	44.7a-f
Newbourgh	59.2a-f	39.2a-f	31.8b-f	47.9a-f
Rubin Bulgarsky	72.2a-d	54.3a-f	61.1a-f	48.5a-f
Willamette	71.0a-d	24.0d-f	21.2ef	13.8f
Podgorina	58.3a-f	58.3a-f	34.9a-f	41.1a-f
Mean	75.2*	51.8	46.4	47.5

*There are no significant differences between values listed in the same letters, statistically measured 5%.

Generally Schopska Alena responded the best, the nutrient medium having a low influence on it which explained its high regeneration ability (73.7%-85.1%).

Cayuga (67.4%) and Romy (63.5%) responded very well and had a good regeneration capacity on each of the media tried.

Following our studies with the bud explants of 11 raspberry cultivars collected in 9 different periods around the year we could notice that the differentiation under *in vitro* culture conditions did not happen in January-February because of the strong influence of phytohormones involved in the dormancy. Otherwise, the beginning of full dormancy is reflected by the average values which were very low even with the cultures initiated in October-December (0.3% Podgorina and 6,2% Schopska Alena).

The cultures using explants collected within March-May differentiated plantlets into a high percentage (20.2%-Newbourgh; 54.1%-Willamette; 50.4%-Gradina, in April, 41.45%-Heritage and 77.9%- September, in May). In May, the average values of regeneration were over 50% in 9 of the 11 cultivars involved in this experiment. When the cultures were initiated in June, the average percentage of differentiation has ranged from 62.0 to 84.1 (Table 2 a). August and September were the most favourable months for plants collecting. Therefore, the cultures initiated in August provided the best regeneration percentage of *in vitro* plantlets in 8 of raspberry cultivars tried: 84.3%(Heritage) and 94.4% (Rubin Bulgarsky, Podgorina, The Latham). In September similar good results were recorded (Table 2b).

Table 2 a

Influence of collecting time on differentiation of *in vitro* raspberry meristems

Cultivar	Differentiated explants (%)				
	Jan.-Febr.	**March**	**April**	**May**	**June**
Gradina	0n*	36.9a-n	50.4a-n	49.4a-n	68.1a-n
Heritage	0n	43.6a-n	36.2a-n	41.5a-n	71.0a-m
Rubin Bulgarsky	0n	49.4a-n	32.6a-n	57.2a-n	66.5a-n
Willamett e	0n	54.1a-n	41.7a-n	59.5a-n	67.9a-n
Podgorina	0n	48.4a-n	48.8a-n	56.6a-n	67.6a-n
Schopska Alena	0n	26.8a-n	34.4a-n	60.9a-n	62.0a-n
Cayuga	0n	8.1a-n	42.9a-n	63.8a-n	**84.1ab**
Romy	0n	35.8a-n	38.3a-n	62.9a-n	76.2a-h
Newbourg h	0n	20.0b-n	36.9a-n	61.5a-n	67.5a-n
The Latham	0n	37.5a-n	36.5a-n	63.8a-n	73.7a-l
September	0n	37.5a-n	41.6a-n	**77.9a-e**	69.2a-n

*There are not differences between values listed in the same letters, statistically measured 1%

Table 2 b

Influence of collecting time on differentiation of *in vitro* raspberry meristems

Cultivar	Differentiated explants (%)			
	July	**August**	**Sept.**	**Oct.- Dec.**
Gradina	71. 2 a-m	84. 0 ab	**84. 5 ab**	0 n
Heritage	76. 5 a-g	**84. 3 ab**	74. 5 ab	0 n
Rubin Bulgarsky	69. 9 a-m	**94. 4 a**	81. 6 ab	33. 3 f-n
Willamette	81. 7 ab	69.9 a-m	**85. 5 ab**	2. 0 j-n
Podgorina	78. 8 a-d	**94. 4 a**	80. 4 a-c	0. 3 n
Schopska Alena	70. 7 a-m	**87. 7 ab**	84. 2 ab	6. 2 c-n
Cayuga	73. 1 a-m	71. 6 a-m	77. 0 a-f	1. 1 mn
Romy	56. 5 a-n	**91. 6 ab**	80. 5 ab	1. 2 l-n
Newbourgh	69. 5 a-m	**83. 9 ab**	74. 6 a-j	0 n
The Latham	64. 3 a-n	**94. 4 a**	80. 0 a-c	4. 3 e-n
September	72. 5 a-m	72. 1 a-m	70.7 a-m	0 n

*There are not differences between values listed in the same letters, statistically measured 1%

CONCLUSIONS

The most productive nutrient medium in the raspberry tissue culture proved to be Murashige-Skoog supplemented with 0.5 mg/l GA 3, 0.1 mg/l BA and 10.0 mg/l ascorbic acid.

The average regeneration percentage for all 11 cultivars under trial was 75.2%, 23.4%-28.8% higher than in case of meristems culture on the other nutrient media.

It was noticed an obvious interaction between cultivar and time of plant collecting, the optimum period being August and September. The highest explant regeneration was recorded in August 84.3% Heritage and 94.4% Rubin Bulgarsky, Podgorina and The Latham.

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THE INFLUENCE OF TOMATOES RIPENESS DEGREE ON THEIR STORAGE BEHAVIOUR

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ABSTRACT

The study was carried out in the Vegetable Crops greenhouse of the Horticulture Faculty of Bucharest. Plants at different aging degrees have been harvested (green, ripening and physiological maturity) from L 112586. We have tracked the ability to maintain the tomato fruits at different environment conditions (variant 1 – temperature 23°C and relative humidity 70%; variant 2 – temperature 12°C and relative humidity 85%). We have noticed that for variant 1, the number of days for keeping the fruits was of 4 (for fruits harvested at physiological maturity) and 7 for green fruits. For variant 2, the number of days for keeping the fruits was 7 (for fruits harvested at physiological maturity) and 19 for green fruits. The green fruits did not reach the physiological maturity.

There were differences regarding the acidity, the vitamin C content, dry soluble substance (DSS), total dry substance (TDS) and mineral substances.

INTRODUCTION

Marketing the harvested tomato fruits is made when the fruits reach physiological maturity. The time for keeping the fruits is limited, except for hybrid plants that have a genetic resistance (Long Life genes).

In this study we have tried to identify the best moment to harvest and keep the fruits for marketing.

MATERIALS AND METHODS

The study was carried out in the Vegetable Crops greenhouse of the Horticulture Faculty of Bucharest.

The crop was established in the 1st cycle and used as biological material L 112568. Fruits have been harvested in 3 separate moments: green, ripening and at physiological maturity. We have then determined the keeping time of those in different conditions: variant 1 – at a temperature of 23^{0}C and relative humidity of 70% and variant 2 – 12^{0}C and 85% relative humidity.

The analysis for acidity, vitamin C, dry soluble substance (DSS), total dry substance (TDS) and mineral substances were made in the Horticulture Products Technology Laboratory from the Horticulture Faculty of Bucharest.

RESULTS

Based on the results obtained we noticed that the fruits harvested for analysis presented initial average masses between 260-310 g.

We observed that for variant 1, the mass loses were of 10 g (for fruits at physiological maturity), 15 g for the ripening fruits and 11 g for the green ones.

For variant 2, it has been noticed that the ripening fruits presented the highest average mass loses – 20 g.

From records presented in table 2, we notice that in case of keeping the fruits in temperatures of 23^{o}C and relative humidity of 70%, the days for keeping the plants were lower (4 days for mature fruits, 6 days for the ripening fruits and 7 days for the green ones) compared with those kept in a temperature of 12^{o}C an 85% relative humidity (7 days for mature fruits and 19 days for ripening fruits).The green fruits did not reach physiological maturity.

In case of acidity, for the mature fruits, at the end of the keeping period, the values are between 19% for variant 1 (for the fruits harvested at physiological maturity) and 0.31% for the ripening fruits.

The content of vitamin C presented close values between variants, except for the fruits in variant 1 harvested at physiological maturity (17.04 mg/100 g).

The content on DSS was lower for variant 2; also the mineral substances content.

CONCLUSIONS

We assume that the fruits harvested and kept in conditions of 23^{0}C and 75% relative humidity can maintain there properties for 4 days, for fruits harvested at physiological maturity.

The ripening fruits reach physiological maturity in 6 days, while the green fruits reach maturity in 7 days.

For fruits kept in temperatures of 12^{o}C and 85% relative humidity, the mature fruits can be kept for 7 days, while the ripening fruits can be kept for 19 days before they reach the physiological maturity. The green fruits kept in these conditions do not reach physiological maturity.

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Table 1: Initial and final fruits' mass depending on the maturity degree

Keeping variant	Degree of maturity at harvest	Initial average mass g	Final average mass g	Keeping days
V1	Mature fruit	310	300	4
	Ripening fruit	270	255	6
	Green fruit	260	249	7
V2	Mature fruit	310	301	7
	Ripening fruit	270	250	19
	Green fruit	260	*	*

Table 2: The fruits' acidity, vitamin C content, DSS, TDS and mineral substances

Keeping variant	Degree of maturity at harvest	Acidity %	Vitamin C mg/100g	Soluble substance (DSS)%	Total dry substance (TDS)%	Mineral substances %
V1	Mature fruit	0,19	17,04	6	3,48	1,16
	Ripening fruit	0,31	22,7	3,5	5,07	1,01
	Green fruit	0,26	23,7	5	4,12	0,82
V2	Mature fruit	0,20	20,5	3,5	3,54	0,88
	Ripening fruit	0,23	22,7	4	4,69	0,93
	Green fruit	*	*	*	*	*

*The green fruits kept in these conditions do not reach physiological maturity.

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RESEARCHES CONCERNING THE INFLUENCE OF HIGH PRESSURES ON THE DYNAMICS OF THE FRUITS CANDY PROCESS

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Keywords: apples, cherries, infusion, syrup, equipment

ABSTRACT

The paper includes the results following the establishing of the increase of the fruits dry soluble mater on a step of the candy process at the application of some high pressures (200 – 600 bar) on the fruits immersed in sugar syrup, comparatively with the increase obtained in the same conditions at atmospheric pressure. Also, it is presented the equipment for the study of high pressure influence on the food product, realized at University of Craiova, which has as main element an hydraulic cylinder specially blueprint to obtain a pressure of ~ 1 kbar. The compression strength is obtained by means of a test machine, utilized for the determination of the mechanic features for the metallic materials. The research studies made pointed out the possibility of speeding of the fruits infusion in the fruits candy process through the application of some high pressures (200 – 600 bar), which is required by production reasons. The increase of the infusion speed is dependent, on the one hand by the fruits features – texture, thickness and features of the epidermis, size of the fruits, way of preliminary processing – and on the other hand by the conditions of pressure application – level of the pressure and time of application.

INTRODUCTION

The candied fruits are products preserved with sugar which have a decorative connotation, a special gift aura (Larousse, 1993). The principle of candy is the diffusion of the sugar in the interior of the fruits, where it replaces a part of the contained water (85 %) because of the osmose phenomenon through the cellular membranes. The candy is realised in many stages, in baths of syrups more and more concentrated to reach the suitable saturation of the products (a sugar content of minimum 75 %).

The technology applied at the fruits candy must ensure the preservation of the fresh fruit turgor, the main gustative features and a the high sugar content.

In the classic technology, the candy process is of long standing, with all the negative associated results.An elegant method to speed the process is the application of some high pressures to increase the speed of the fruits impregnation with sugar through the osmotic pressure increase.

The technologies witch use high pressures, either a hydrostatic pressure or the pressure of an inert gas, are applied in industry for the production of metallic alloy, ceramic products a.s.o. using pulverulent materials.

Pressures bigger than 1 kbar exert actions on biological materials, with reversible effects until 3 kbar and irreversible effects over this level of the pressure, depending on the biological material features, the temperature and the length of the treatment and the levels of the applied pressure.

The high pressures can be obtained either in gaseous atmosphere or using a hydrostatic method. The most utilized is the hydrostatic one, when the food product is immersed in a quasi-incompressible liquid, which transmits the pressure without direct contact with the food product. The proceeding is isostatic, so the pressure is exerted uniformly, without gradient of pressure and the volume of the studied product does not determine the length of the process at high pressure (Cheftel, 1991).

Concerning the equipment for the treatment at high pressures, these are usually realized of metallic materials, which do not determine corrosions when the product is in direct contact with the liquid.

The high pressure is exerted by a hydraulic pump with plunger in a cylinder of stainless steel, pressurized through multiplier hydraulic system, to reach pressures between 1 and 10 kbar. The closing system must resist at the mentioned pressure (Larousse, 1993).

MATERIALS AND METHODS

The equipment for the study of high pressure influence on the food product, realized at University of Craiova, has as main element an hydraulic cylinder specially planned to obtain a pressure of ~ 1 kbar. The compression strength is obtained by means of a test machine, utilized for the determination of the mechanic features for the metallic materials (Rosca et al., 2004).

The conception of the high pressure cylinder is in accordance with the technical recommendations of ISCIR.

To realize the high pressure cylinder, it was use a 8Cr170X stainless steel tube with the mechanic features R_m^{20}= 1450 N/mm^2, R_p^{20}=890 N/mm^2, where R_m^{20} is the strength at drive breaking at 20°C and R_p^{20} is the flowing limit also at 20°C.

For the engineering of the cylinder we choose a tube with 65×10 diameter. After the specific processing for the hydraulic cylinders we obtained the quota D_{int} = 48 mm, D_{ext}=58,2 mm, where D_{int} is the interior diameter of the cylinder and D_{ext} is the exterior diameter of the cylinder.

In the experimental studies already done we establish that for a strength of 18 kN it corresponds a pressure of 1 kbar.

The equipment for experimental studies of high pressure is presented in figure 1.

To realize the tightness of the plunger, polytrafluorinethylene (PTFE) special fittings were used for food applications.

The tightness was realized with fittings dimensioned for pressures of 1,2 kbar. In figure 2 it is presented the equipment of high pressure installed on a test machine of 30 kN.

Tests were made on apples from the Ionathan variety with 12,3 % dry soluble matercontent, after peeling and cutting in cubes with sides of 1 cm and cherries from the local population, Oltenia area, with ripening in May, with red pulp, middle firmness, juicy, sweet-sourish pleasant taste, with 9 % dry soluble mater content and after the kernels removing.

The fruits were infused in sugar syrup with 70 % dry soluble mater content, in a report of 60 g fruits at 150 ml syrup, establishing the following work options:

V1 – fruits infused at atmospheric pressure for 2 hours;

V2 – fruits infused at atmospheric pressure for 20 hours;

V3 – fruits infused at a pressure of 600 bar for 10 minutes;

V4 – fruits infused at a pressure of 600 bar for 10 minutes;

V5 – fruits infused at a pressure of 200 bar for 2 minutes, at 400 bar for 2 minutes and then at 600 bar for 6 minutes (therefore, a total infused time of 10 minutes, with gradual increase in three steps of the pressure and maintaining on each step). After infusion, for each variant it was determined the dry soluble mater content of fruits and syrups.

RESULTS AND DISCUSSION

The results concerning the dry soluble mater content of the fruits and syrups are shown in tables 1 and 2.

At 600 bar pressure application for 10 minutes during the candy process we determined an increase of the dry soluble mater of 26,8 %, bigger than the increase obtained at the infusion at the atmospheric pressure for 2 hours (22,2 %).

Like it was expected, the increase of the infusion length at 20 minutes under a pressure of 600 bar, led at a bigger increase of the dry soluble mater content of the apples cubes (27,7 %), accompanied by an adequate diminution of the dry soluble mater content of the syrup.

An interesting behaviour was found at the gradual application of the pressure, in three steps, with maintaining on each step, where, although the total infusion time is of only 10 minutes, the increase of the dry soluble mater content recorded by the fruits was bigger (28,2 %) even than the increase obtained at 600 bar for 20 minutes.

Apples cubes infused under pressure present an excelent appearance, they are translucent, non-wrinkled, without meaningful browning, with a good maintaining of the shape and with the tipical features of the candied fruits.

The fruits candy process is based on a shorter or longer process of diffusion and osmose, between fruits and syrups is realized an osmotic exchange, because of which the fruits grow richer gradually with sugar, in the same time the juice of the fruits dilutes the syrup. The process go on until the syrup and the fruits attain the isotonicity state, process which can be speeded up and shortened depending on the means of processing.

The pressure application on fruits is made through the hydrostatic method, when the fruits are immersed in a quasi-incompresible liquid, in this case the syrup transmits the pressure through direct contact with the fruits cubes.

The pressure uniformly exerted on fruits speeds up the process of diffusion and osmose, which determines the important accumulations of sugar in fruits in relatively short time. The uniform exercise of the pressure on the apples cubes explains probably the absence of their deformation.

At cherries without kernels we determined also important increases of the dry soluble mater content at the infusion at high pressure, but not so big as in the apples case. Also, at atmospheric pressure we observed a slower speed of cherries infusion than for apples.

Also, at atmospheric pressure we observed a slower speed of cherries infusion than for apples, for reasons tied of fruits texture but especially the presence of the epidermis which is an important barier for the processes of diffusion and osmose.

In the preliminary studies, we tried the cherries infusion with kernels, without harming the fruits, both at atmospheric pressure and at high pressure. After 10 and respectively 20 minutes of infusion at a pressure of 600 bar, almost we didn`t observe increases of the dry soluble mater content of the fruits. In this case also, the infusion through the application of the pressure for 10 minutes in three steps led to results comparable with the maintaining of 600 bar pressure for 20 minutes.

CONCLUSIONS

The research studies made pointed out the possibility of speeding of the fruits infusion in the fruits candy process through the application of some high pressures (200 – 600 bar), which is required by production reasons.

The increase of the infusion speed is dependent, on the one hand by the fruits features – texture, thickness and features of the epidermis, size of the fruits, way of preliminary processing – and on the other hand by the conditions of pressure application – level of the pressure and time of application.

Through the study and improvement of the candy technology we can promote the candied fruits manufacture, products with relatively big added value, destined to diversify the food products offer, with the insurance of their superior quality on the entire flux of the food environment.

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Tables

Table 1 - Cherries and syrups dry soluble mater content

Variant	Apples initial dry soluble mater (%)	Apples dry soluble mater after infusion (%)	Increase of the dry soluble mater (%)	Syrup initial dry soluble mater (%)	Syrup dry soluble mater after infusion (%)
V1	12,3	22,2	9,9	70	64,2
V2	12,3	38,4	26,1	70	56,2
V3	12,3	26,8	14,5	70	61,8
V4	12,3	27,8	15,5	70	60,6
V5	12,3	28,2	15,9	70	59,4

Table 2 - Cherries and syrups dry soluble mater content

Variant	Cherries initial dry soluble mater (%)	Cherries dry soluble mater after infusion (%)	Increase of the dry soluble mater (%)	Syrup initial dry soluble mater (%)	Syrup dry soluble mater after infusion (%)
V1	9	19,6	10,6	70	62,8
V2	9	31,1	22,1	70	60,6
V3	9	13,8	4,8	70	65,0
V4	9	17,2	8,2	70	64,2
V5	9	17,8	8,8	70	63,9

Figures

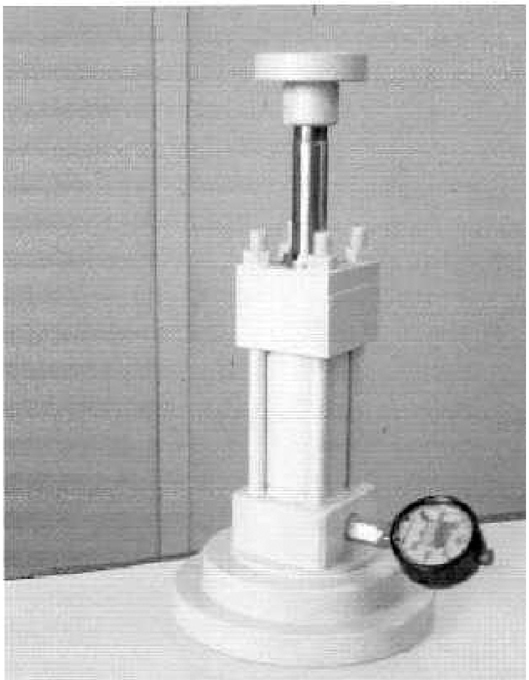

Figure 1 – Experimental equipment for the high pressure achievement.

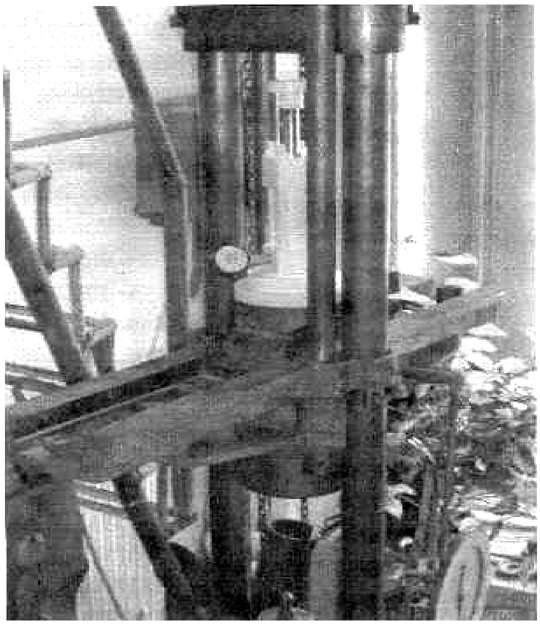

Figure 2 – Equipment of high pressure installed on a test machine of 30 kN.

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

RESEARCHES REGARDING NUTRIENT SOLUTION FERTILIZATION ON ACTINIDIA DELICIOSA

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Keywords: Kiwi, green cutting, nutrient solution.

OBJECTIVES

- Finding out the best nutrient solution type for shortening the necessary time to obtain plants ready for planting in the field
- Finding out the optimum substrate for planting the cuttings obtained through green cutting
- Studying the effect of the nutrient solutions treatment on the rooted cuttings on *Actinidia deliciosa*

INTRODUCTION

Actinidia deliciosa is a vigorous liana. The leaves are simple, with indented edge. The leaves' size and shape is common to almost all varieties. The fruit is a berry, witch hair, and it is consumed with removing the skin. In general it is green and dark green. The fruits' shape varies from prolonged and elliptical. The size varies too, depending on the variety and the cultural factors, from 100g to 20 0g.

This specie is considered to be a polymorph one, and in the growth area there are many types differentiated by shape, skin and pulp colour and flavour.

MATERIALS AND METHODS

In this experimental study there have been used rooted cuttings planted in 14 l containers, in two substrate types: manure, fallow soil, peat and sand. The recipes used were:

- first substrate: 50% manure, 20% peat, 20% fallow soil, 10% sand.

- second substrate: 40% manure, 50% fallow soil, 10% sand.

The components and the substrate obtained were tested from the agrochemical point of view (tab. 1).

The varieties used in this experience were *Hayward*, *AD 20, Kramer* and *Tomuri*. These are varieties with very big fruits (140-160 g), with bright green colour, and a maturity period at the mid October. The analyzes regarding the fruit composition pointed out 7.2-7.5% sugar, total acidity expressed in malic acid 0.482%, dry matter 18.84%, C vitamin 80-120 mg/100g comestible part.

The nutritive solutions were administrated with regularity at a 3 week period, in constant quantities.

These solutions composition is given in the table.

Table 1
Solutions compositions

Nutrient solution 1		**Nutrient solution 2**	
Macroelements		Macroelements	
Salt	**Conc g/l**	**Salt**	**Conc g/10 l**
$(NH_4)_2HPO_4$	0,145	NH_4NO_3	3
KNO_3	0,625	KNO_3	5
HNO_3	0,350	$(NH_4)_2HPO_4$	3.5
$Ca(NO_3)_2 \times 4H_2O$	0,127	$MgSO_4$	3
$Mg(NO_3)_2 \times 6H_2O$	0,18		
Microelements		Microelements	
Salt	**Conc g/l**	**Salt**	**Conc mg/l**
NH_4MoO_4	0,05	H_3BO_3	140
H_3BO_3	1,5	$ZnSO_4$	100
$MnSO_4 \times 5H_2O$	2,0	$FeSO_4$	250
$ZnSO_4 \times 7H_2O$	1,5	$MnSO_4$	100
$CuSO_4 \times 5H_2O$	0,25	$CuSO_4$	100
Fe-EDTA	0,6		

RESULTS AND DISCUSSION

Following the results of the analyses on plant and substrate, it is noticed that Hayward on second substrate assimilated in leaves less quantities of nitrates (2,15 %) compared with the plants on first substrate that had a nitrate content of 2,83%. The plant fertilization with nutrient solutions on the same second substrate showed positive effects upon N absorption in plant, in the solution I case the content was 2,54% and at the solution II – 2,68%.

Tomuri on first substrate showed at the control values of 0,72% P and a slightly positive reaction at II solution when the leaves content is 0.52%, while at the second substrate, the control shows inferior values – 0.52% and a positive reaction at the fertilization with II solution, when the P content is 0.47%.

On the first substrate, Katiuscia registered a high content in potassium for both the control and the fertilized variants, the values being practically equals – 2.25% at the variant fertilized with I solution and 2.55% at the plants from control and those fertilized with II solution. Katiuscia variety doesn't show different values regarding the potassium content in leaves, both in the case of culture substrates and in the case of nutrient solution fertilizations, the limits being o 0.25% K (control on second substrate) and maximum 2.90 % K (first substrate fertilized with II solution).

Table 2
N, P, K content (%) total forms in kiwi plants – First Substrate

Variety	Variant	%		
		N	P	K
Hayward	Mt	2,83	0,75	2,80
	Sol 1	2,54	0,77	2,90
	Sol.2	2,68	0,85	2,30
Tomuri	Mt	2,64	0,68	2,80
	Sol.1	2,63	0,52	2,45
	Sol.2	2,66	0,72	2,15
Katiuscia	Mt	1,92	0,47	2,75
	Sol.1	2,04	0,39	2,55
	Sol.2	2,09	0,40	2,25
Hibrid AD-20	Mt	1,93	0,73	2,25
	Sol.1	2,66	0,65	2,40
	Sol.2	2,44	0,72	2,30

Table 3
N, P, K content (%) total forms in kiwi plants – Second Substrate

Variety	Variant	%		
		N	P	K
Hayward	Mt	1,97	0,61	2,65
	Sol 1	2,15	0,35	2,60
	Sol.2	2,09	0,42	2,80
Tomuri	Mt	1,93	0,42	2,75
	Sol.1	2,09	0,43	2,60
	Sol.2	2,03	0,45	2,80
Katiuscia	Mt	2,07	0,45	2,75
	Sol.1	2,19	0,61	2,90
	Sol.2	2,37	0,49	2,60
Hibrid AD-20	Mt	1,85	0,47	2,60
	Sol.1	1,96	0,34	2,75
	Sol.2	2,39	0,41	2,55

CONCLUSIONS

1. Nutrient solutions fertilization on rooted cuttings of *Actinidia deliciosa* represents the best results regarding the N accumulation at the plants fertilized with I solution on second substrate at Hayward and Tomuri compared with the first substrate.
2. Regarding the P accumulations it is concluded that both nutrient solutions influenced positively the absorption on first substrate.
3. K content proved to be substantial high on the plants from second substrate, fertilized with both nutrient solutions.
4. II solution on second substrate showed the best results, and this is recommended to be used in order to obtain vigorous plants in short time, without transplantation problems.

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THE BEHAVIOUR OF SOME PERSIMMON'S VARIETIES IN THE ROMANIAN PLANE

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Keywords: grafting, scion, rootstock, budding, shoots.

INTRODUCTION

The introduction of some subtropical fruit-growing species (paw-paw, kiwi, fig-tree, date tree) represented the idea that other subtropical species can also adapt and normally fructify in the climate of Romanian Plane.

In the autumn of 1999, in the field of the Fruit Growing Department from U.S.A.M.V. Bucharest, a field was sowed with *Diospyros lotus*.

The seedlings of *Diospyros lotus* grew and fortified for grafting. In 2004 these rootstock have been grafted in spring budding and late summer budding.

The spring budding was made at the beginning of May and the late summer budding at the end of August, using *D. lotus* as rootstock.

The aims followed in this research are:

- The establishment of the compatibility for the grafting in spring budding and late summer budding.
- The appreciation of the adaptability capacity of some persimmon's varieties from different areas of Asia, North America and Europe.
- The precocity in fruit bearing of some persimmon's varieties.
- The registration of some phenophases regarding the prediction of the necessary vegetation time for the wood ripeing.
- The behaviour of some persimmon's varieties in the Romanian Plane.

MATERIALS AND METHODS

The varieties that have been grafted were: Fau-Fau, Giro, Hana Fuyu, Caroa Rei I, Caroa Rei II, Fuyu, Rojo Brillante, Portugalia, China, ANY, O'Gosho and Sharon, using 2 scions for each rootstock, at 50-60 cm high from the soil.

During the research it was pointed out: the behaviour of the grafting, the capacity of ramification (normal and anticipated shoots), the development of the leaf system, the strength of the tree and the particularities of the species growth.

Experimental conditions - During the vegetation, the soil was worked and irrigated.

At the beginning of the June was made a treatment with the herbicide Sanglypho. The soil has been mulched with hay in order to keep the humidity of the soil and the preventing of the weed growing. There were no treatments applied for the persimmon's varieties proved to be very resistant to diseases and pests. The growing and the maturation took place from June to October. From the middle to the end of October the fruit of persimmon were harvested. The end of the vegetation was marked by the leaves falling, of 25 October -10 November.

RESULTS AND DISCUSSION

The results of the research:

1. Regarding the influence of the grafting system .

The observations showed that there were great difference between the varieties and the grafting methods regarding the success of the grafting process as the surface of the leaf system and the strength of the trees.

On the grafting in spring budding was registered a bigger percentage of catching for the varieties: Hana Fuyu (94.44 %), Caroa Rei II (82.14 %), Giro (74.07 %), Rojo Brillante (70.97 %), Fau-Fau (61.11 %) and smaller for the varieties: Sharon (54.55 %), China (50.00%), Caroa Rei I (47.37 %) and O'Gosho (34.62 %).

For grafting in late summer budding all the persimmon varieties had good results, the percentage of catching being over 80 %. The medium percentage of catching by this method was of 93.09 % comparing with 53.21 from the grafting in spring budding (table 1).

2. Regarding the vigour of growing for the grafted varieties.

To the grafting in spring budding the report between the diametre of the rootstock and scions, established in Julie after the previous measurement, was between 1.44 and 1.32 being bigger for Sharon and O'Gosho and smaller at Fuyu and Fau-Fau .

The number of the shoots formed from a graft scion was bigger for the variety Caroa Rei I (5 shoots), Caroa Rei II (6 shoots), Rojo Brillante (7 shoots) and smaller for the Hana Fuyu, China (2 shoots) and Sharon (8 shoots).

The biggest grows were registered for Hana Fuyu (66.30 cm on the normal shoots and 21.83 cm on the anticipated shoots) and smallest for O'Gosho (29.19 cm on the normal shoots and 16.0 9 cm on the anticipated shoots).

For each fruit-tree the biggest length of the shoots was to Rojo Brillante (155.68 cm) variety and the smaller was to the Sharon (52.39 cm) – table 2.

3. Regarding the development of the leaf system for persimmon

On the normal shoots the medium surface of the leaves was of 155.38 square cm formed in 1/3 inferior, 234.9 square cm in 1/3 middle and 195.06 square cm in 1/3 superior.

The surface for the leaves from the anticipated shoots was smaller, having values between 37.03 square cm in 1/3 inferior, 86.2 square cm in 1/3 middle and 65.99 square cm in 1/3 superior (table 3).

The leaf system calculated for every varieties on normal and anticipated shoots was bigger for Giro (387.61 square cm on the normal shoots, 48 square cm on the anticipated shoots) and Hana Fuyu (303.75 square cm on the normal shoots, 60.39 square cm on the anticipated shoots) and smaller for the China (75.48 square cm on the normal shoots, 49.22 square cm on the anticipated shoots) and O'Gosho (92.40 square cm on the normal shoots , 44.34 square cm on the anticipated shoots). The total surface from the two shoots categories was of 436.45 square cm at Giro and only at 124.7 square cm at China.

The biggest leaves were to Giro, Hana Fuyu, Caroa Rei II and Caroa Rei I, and the smallest to Sharon and Fau-Fau.

CONCLUSIONS

The researches regarding the behaviour of *Diospyros kaki* varieties grafted on *Diospyros lotus* had the following results:

1. Hana Fuyu variety registered a bigger percentage of catching in spring budding. The others species had a catching percentage better in late summer budding.
2. The vigour of the trees and the number of the normal and anticipation ramifications were bigger in Giro, Caroa Rei II and Rojo Brillante.

3. The grafting of the tree to a bigger high on the trunk gave excellent results.
4. The varieties Giro and Hana Fuyu had bigger leaves and the richer leaf system and the varieties China and O'Gosho had smaller leaves and poorer leaf system.
5. The biggest growths were registered to Caroa Rei and Rojo Brillante.
6. The number of the shoots formed from a scion was bigger for the varieties Caroa Rei and Rojo Brillante and smaller for Hana Fuyu, China and Sharon.
7. The varieties from North America and from Portugal fructified, being more precocious than the others.

Table 1 – The influence of the grafting system

Variety	Grafting system					
	spring budding			late summer budding		
	Graft scion	Catches scion		Graft scion	Catches scion	
		Nr.	%		Nr.	%
Fau-Fau	18	11	61.11	15	15	100.00
Giro	27	20	74.07	14	14	100.00
Hana Fuyu	18	17	94.44	8	7	87.50
Caroa Rei I	19	9	47.37	14	11	78.57
Caroa Rei II	28	23	82.14	18	16	88.89
Fuyu	51	8	15.99	13	12	92.31
Rojo Brillante	31	22	70.97	22	21	95.46
Portugalia	10	10	0.00	137	117	85.40
China	26	13	50.00	5	5	100.00
ANY	-	-	-	5	5	100.00
O'Gosho	26	9	34.62	9	8	88.89
Sharon	22	12	54.55	4	4	100.00

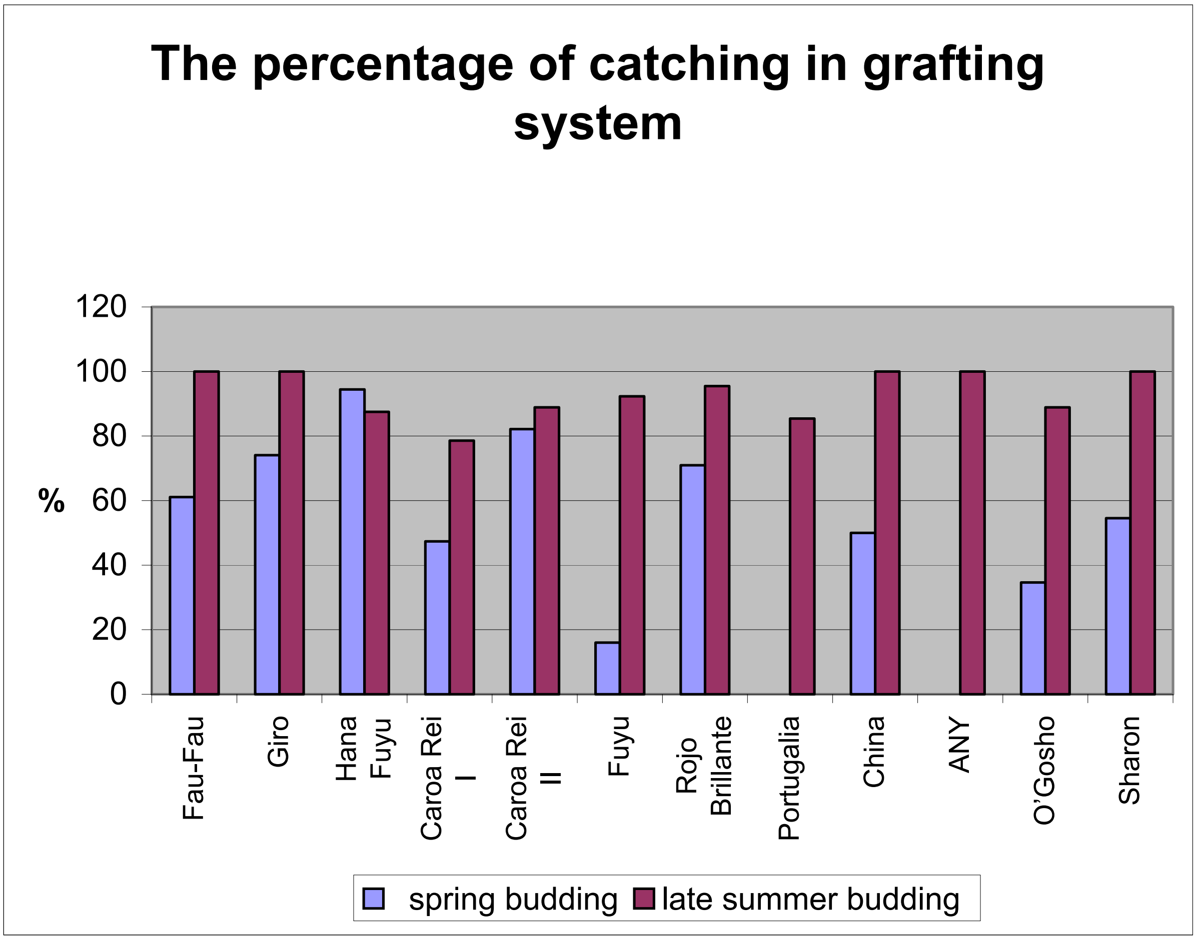
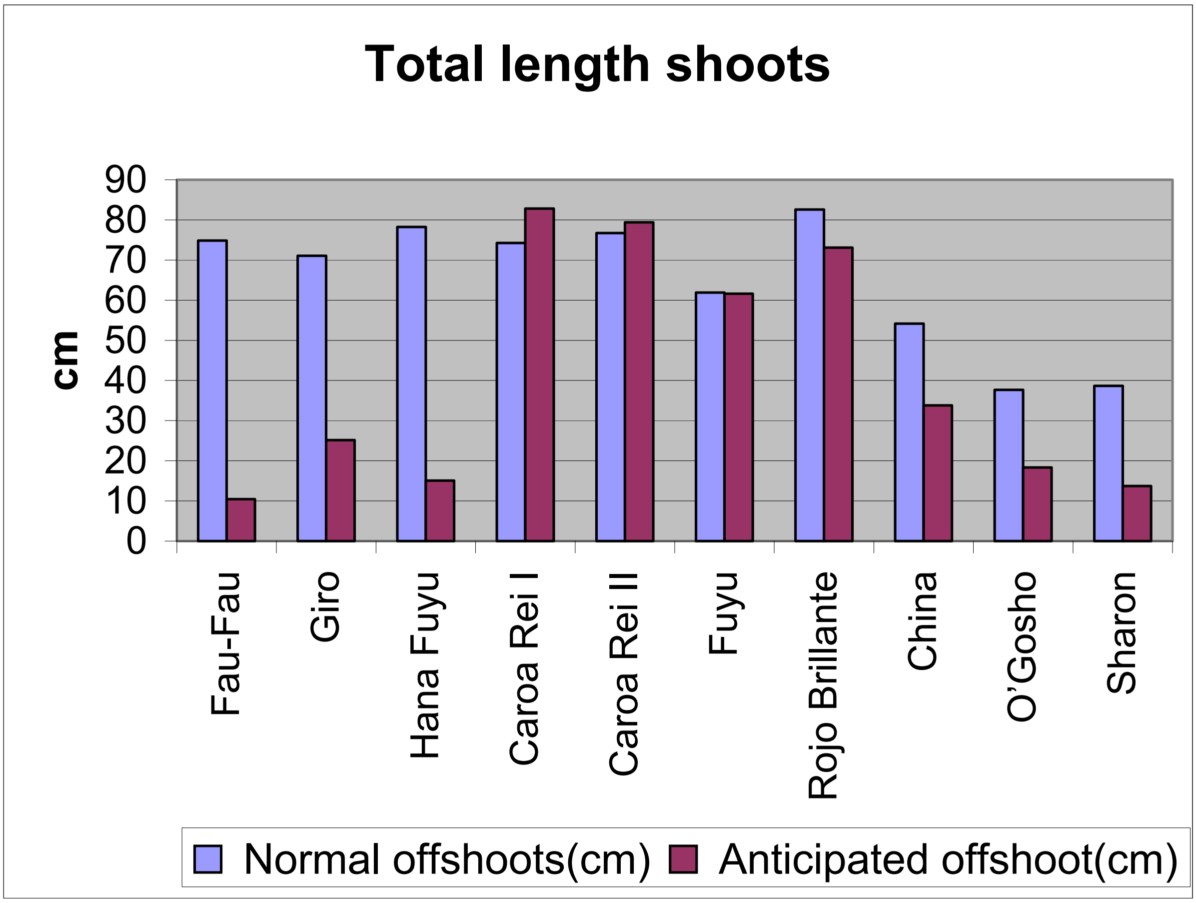


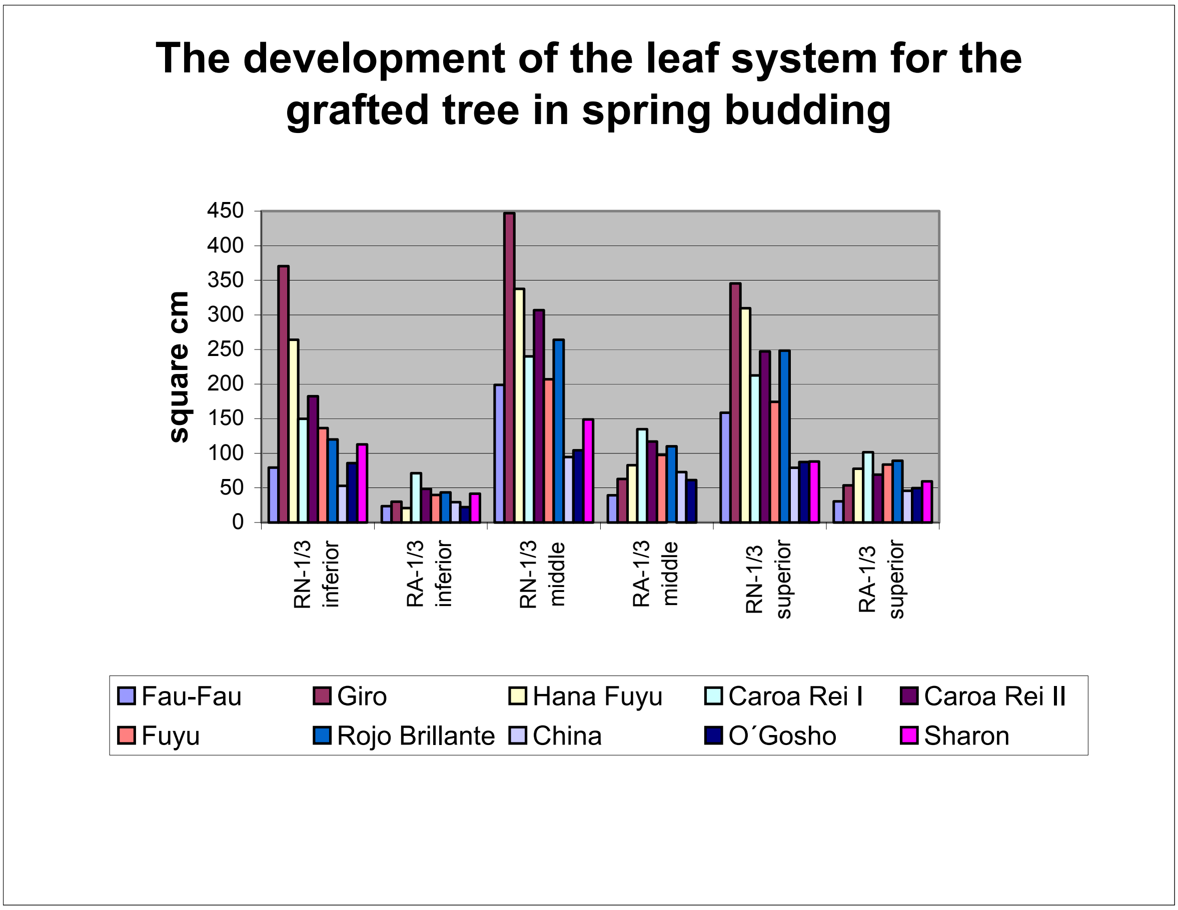
Table 2 – The total length of the persimmon shoots

Variety	Total length of the normal shoots (cm)	Total length of the anticipated shoots (cm)	Total length of each tree (cm)
Fau-Fau	74.85	10.43	85.28
Giro	71.05	25.15	96.20
Hana Fuyu	78.23	15.06	93.29
Caroa Rei I	74.27	82.83	157.10
Caroa Rei II	76.73	79.38	156.11
Fuyu	61.91	61.63	123.54
Rojo Brillante	82.59	73.09	155.68
China	54.15	33.78	87.93
O'Gosho	37.66	18.34	56.00
Sharon	38.67	13.72	52.39



Tabelul 3 –The development of the leaf system for the grafted tree in spring budding

Variety	The leaves surface for the normal shoots			The leaves surface for the anticipated shoots		
	1/3 inferior	1/3 middle	1/3 superior	1/3 inferior	1/3 middle	1/3 superior
Fuyu	79.22	198.84	158.73	23.60	39.36	30.50
Giro	370.29	447.07	345.46	30.05	62.90	53.56
Hana Fuyu	264.15	337.50	309.60	20.84	82.66	77.68
Caroa Rei I	149.89	239.78	212.52	71.18	134.82	101.68
Caroa Rei II	182.29	306.96	247.23	48.57	117.11	69.11
Fuyu	136.44	206.85	174.42	39.69	97.73	83.59
Rojo Brillante	120.06	264.22	248.46	43.36	110.22	89.05
China	52.96	94.55	78.93	29.21	72.77	45.68
O'Gosho	85.60	104.30	87.29	22.19	61.20	49.64
Sharon	112.90	148.90	87.97	41.64	83.21	59.36



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INFLUENCE QUANTIFICATION OF THE FACTORS IMPLIED IN THE *IN VITRO* KIWI FRUIT ORGANOGENESIS

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Keywords: *Actinidia deliciosa*, *Actinidia arguta,* explants, culture media, shoots, callus, regeneration,

ABSTRACT

Using four different explants: root segments, internode, petiole and leaf blade, excised from a kiwifruit hybrid (*Actinidia deliciosa* Chev. x *Actinidia arguta* Sieb. et Zucch.) cultured *in vitro*, the effects of culture medium, pH and subculture's number on callus production were studied. Zeatine used in 1 mg/l concentration, determined the callus formation, in all types of hybrid *Actinidia* explants used. The explants had a different reaction and the largest callus production was realised by petiole and leaf blade. The culture medium pH influenced the callogenetic process, the highest callus production being registered at the pH 7. The callus quality could be appreciated by the consistence and colour. The most consistent callus of dark green colour or glassy green with pink spots had a great growing speed and a superior organogenetic potential. Callus organogenetic ability was not constant during the studied subcultures: after one subculture with high callus production, followed another with high organogenetic potential, materialised in shoots and roots formation. The data was statistically analysed using the Pearson coefficient for parametric correlation and Kendall coefficient for non-parametric correlation. The results obtained, confirm the high indirect organogenetic capacity of *Actinidia* species. This depends on explant, culture medium, pH and subculture.

INTRODUCTION

The main objective of this research theme was the study of the culture medium content and pH influence on the direct and indirect organogenesis of a kiwi hybrid (*Actinidia deliciosa* Chev. x *Actinidia arguta* Sieb. e Zucch.). During all seven subcultures the proliferation and organogenetic capacity of the callus was studied.

MATERIALS AND METHODS

The researches were performed using the Z hybrid (*Actinidia deliciosa* Chev. x *Actinidia arguta* Sieb. e Zucch.), created by Giuseppe Zuccherelli – Vitroplant Cesena, Italy.

The cultures were initiated from 4 explant types, as follows:

- variant A – roots fragments of two cm length;
- variant B – shoots' internodes;
- variant C – petioles;
- variant D şi E – leaf blades.

Two types of culture media were used:

- a calogenetic medium MS (Murashige & Skoog, 1962), suplemented with 1.0 mg/l zeatine and 0.02 mg/l ANA (M1 medium)
- an organogenetic medium MS, suplemented with 0.2 mg/l ANA and 2.0 mg/l BAP (M2 medium)

Determinations:

- explants weighting (callus, shoots, roots) and calculation of the absolute grow (grams) and relative grow (grams callus/grams initial explant)
- the callus firmness was appreciated using a 1 - 5 scale (from 1 - friable callus to 5 – very consistent)
- the shoots regenerated through indirect organogenesis were counted and measured
- observations were performed regarding the appearance and colour of the regenerated callus and shoots

RESULTS AND DISCUSSIONS

Averages of the analyzed features as function of subculture (1-7) and pH (see fig. 1)

- all the features analysed registered higher average values on the culture medium with pH 7, compared to the one with pH 5,5

- the growing ratio of the callus and shoots number per explant are negatively correlated, as shown also by the Pearson correlation coefficient

- after the third subculture the growing ratio starts to diminish, its growing being negatively correlated, very significant, with the subculture number

Averages of the analyzed features as function of subculture (1-7) and explant type (see fig. 2)

- all the features studied registered higher average values on D variant (leaf blade), followed by C variant (petiole)

- B variant (internode) registered smaller values

- the callus firmness was not significantly changed in time on the A, C and D variants

Averages of the analyzed features as function of subculture (1-7) and the pH - explant type combination for the C and D variants (see fig. 3)

- the combination between the pH 7 and the D variant (leaf blade) proved to be higher than all the features analysed

- the callus growing rate decreasing beginning with the third subculture was compensated by an intensification of the shoots forming through indirect organogenesis

- the combination between the pH 5.5 and the c variant (petiole) was inferior compared to all the other combinations

CONCLUSIONS

The greatest callus production was accomplished by the petiole (C) and leaf blade (D)

The pH value of the culture medium radically influenced the calogenesis and indirect organogenesis processes, the best results being registered for all explant types at pH 7.

After forming, the callus differentiate adventives shoots and even roots. A reverse correlation occurred between the callus quantity and the organogenesis ratio, respectively between the produced callus and the number of the formed shoots.

The callus growing (callogenesis) alternates with the formation of a big number of shoots on that callus (indirect organogenesis).

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Tables

Table 1. Pearson Coefficient for parametric correlation

Pearson Coefficient	Callus firmness	Callus growing	pH	Indirect organogenesis	Shoots/ explant no.	Subculture
Callus firmness	1.00***	.345**	.217	.463***	.279*	.075
Callus growing	.345**	1.00***	.276*	.191	-.019	-.452***
pH	.217	.276*	1.00***	.247	.254	.000
Indirect organogenesis	.463***	.191	.247	1.00***	.552***	.071
Shoots / explant no.	.279*	-.019	.254	.552***	1.000	-.106
Subculture	.075	-.452***	.000	.071	-.106	1.00***

Table 2. Kendall Coefficient for non-parametric correlation

Kendall Coefficient	Callus firmness	Callus growing	pH	Indirect organogenesis	Shoots / explant no.	Subcultur e
Callus firmness	1.00***	.216*	.182	.368***	.254*	.046
Callus growing	.216*	1.000***	.233*	.136	.061	-.307**
pH	.182	.233*	1.000***	.207	.167	.000
Indirect organogenesis	.368***	.136	.207	1.000***	.601***	.030
Shoots / explant no.	.254**	.061	.167	.601***	1.00***	-.014
Subculture	.046	-.307***	.00	.030	-.014	1.000

Figures

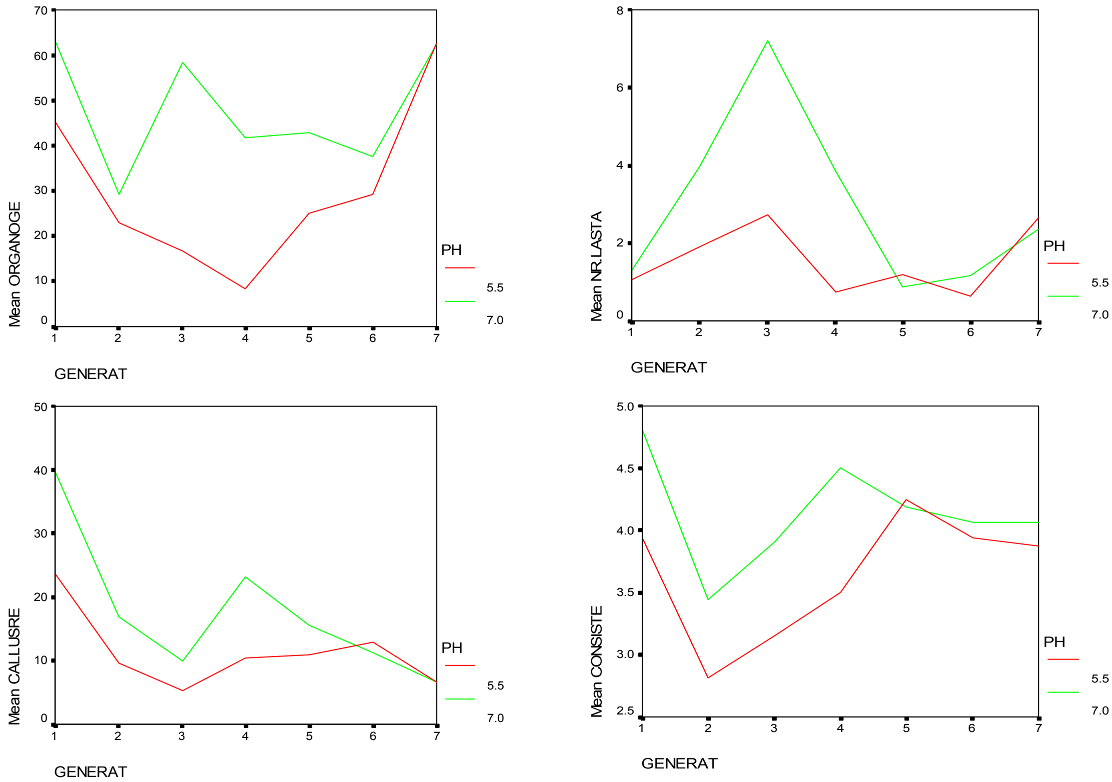

Fig. 1. Averages of the analyzed features as function of subculture (1-7) and pH

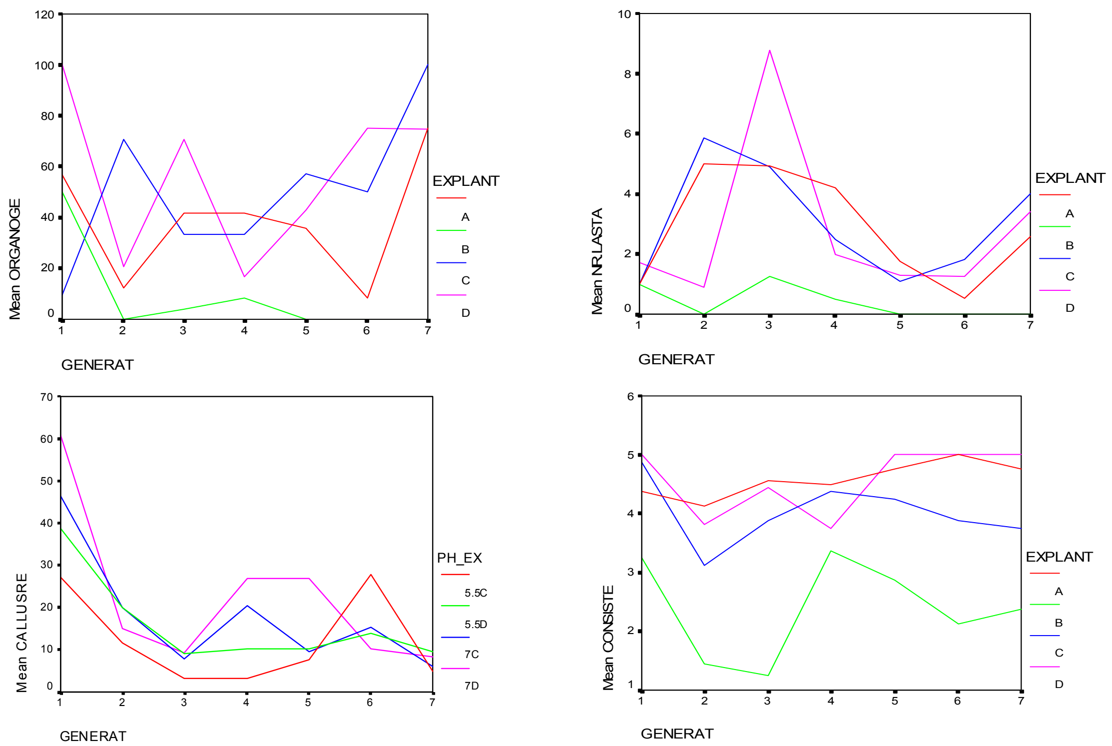

Fig. 2. Averages of the analyzed features as function of subculture (1-7) and explant type

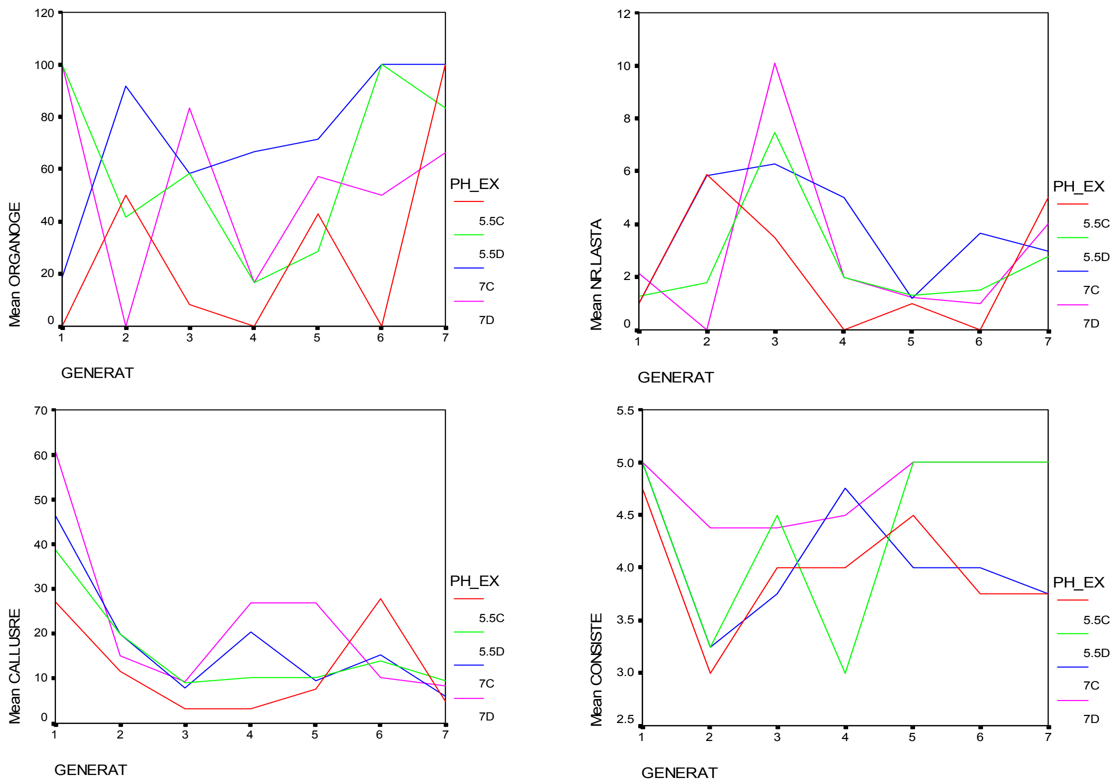

Fig. 3. Averages of the analyzed features as function of subculture (1-7) and the pH - explant type combination for the C and D variants

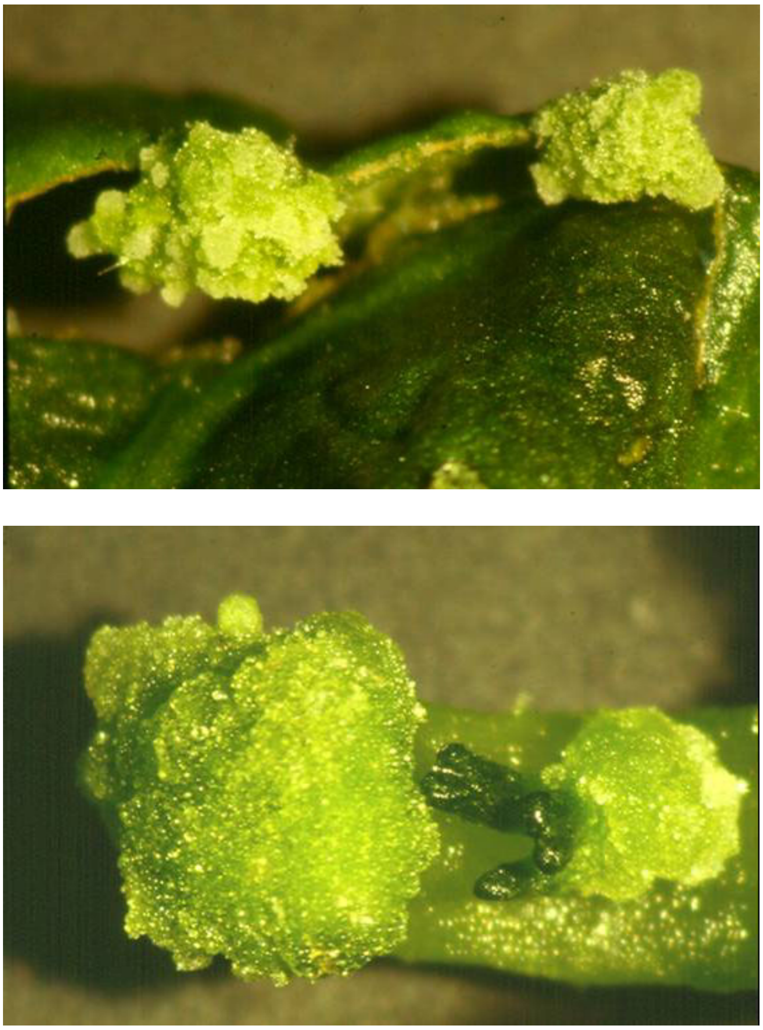

Fig. 4. Callus forming

Fig. 5. Organogensis from petiole

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

PROPAGATION OF NORTHERN BANANA (*ASIMINA TRILOBA* (L.) DUNAL) USING DIFFERENT GRAFTING METHODS

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Keywords: asimina, variety, rootstock, bark grafting, chip budding

ABSTRACT

Northern banana or asimina is new fruit specie that incited the interest of the specialists and growers in the native area – Northern America, but also in many European countries. Northern banana (*Asimina triloba* L.) belongs to the Annonaceae family and is known in America under the name of Paw-Paw, the Indians' banana or northern banana. In our country that fruit specie exists in few Botanical Gardens and in the North-Western part of Transylvania, in private gardens. In 2003, a small collection was established within the Faculty of Horticulture from Bucharest, with varieties and hybrids from America and Italy. The present paper shows the preliminary results of some researches regarding the best grafting methods suitable for nursery material production. The bark grafting method, using waxed scions preserved at 3-4°C was applied to a vigorous, 8 year old rootstock. Success percentage varied between 50% ('Howebat') and 100 % ('Vitroplant 2' and 'Vitroplant 3'). The length of the annual shoots varied between 18.0 cm to 31.5 cm, in the first year and, from 21.5 cm to 74.5 in the second one. The most vigorous was 'Vitroplant 1' selection. Since the first year after grafting, scion shoots formed flower buds, 'Vitroplant 2' being the most prolific. In the second year, this selection formed 9.25 fruits/scion. For 3 years old seedlings, bark grafting, chip budding and occulation methods were used. 100% of the grafted scions started to grow when bark grafting and chip budding were applied. The low average length of the annual shoots was caused by the slow growth of Asimina during the first year after grafting. To speed up the nursery production of grafted trees, chip budding is recommended, while bark grafting may be used for vigorous plants over graft.

INTRODUCTION

Asimina triloba (L.) Dunal (Annonaceae family), known as northern banana or pawpaw, is one of the native species widely spread in USA. *Asimina*, usually grows in 26 American states, from the border with the Mexico Gulf and Atlantic Ocean, spreading west till the middle of Nebraska and Oklahoma States, and in north from the New York and Michigan States till the south of the Canadian State Ontario.

Even if *Asimina* plants existed in Northern America from the Miocene times (fossils were found in New Jersey), only the American Indians discovered the culinary and medicinal uses of this plant.

The first studies regarding the fruity culture, taxonomy and selection of the native *Asimina* populations dates at the end of IXth century and beginning of the XXth one.

The interest for the widely promoting of this specie was increased just after 1960 in USA, Italy, China and Chile, where nurseries were set up and breeding and selection studies were performed in order to obtain new varieties.

After 1990 new organisations appeared in United States (PawPaw Foundation, PawPaw Growers Association) having as goals commercial activity intensification and sustaining the *Asimina triloba* culture promoting.

In Romania there are few isolated exemplars (approximately 25-30 years) in some private gardens from North-Western Transylvania, as well as in the Botanical Garden from Bucharest.

The first pawpaw exemplars were planted in the Fruit tree species Collection of the Faculty of Horticulture within University of Agronomic Sciences and Veterinary Medicine, from Bucharest in 1996-1997. Since then, the members of Pomology Department performed studies and researches on *Asimina*, regarding multiplication through seeds, suckers, *in vitro* micropropagation and grafting, as well as other promoting activities to widely popularize this specie.

Regarding the multiplication methods used nowadays, the American and Italian specialists recommend both, the seed multiplication (for seedling obtaining) and the vegetative multiplication by budding and grafting techniques (spring budding, chip budding) or branches (bark grafting).

This paper presents the preliminary results obtained on northern banana in the Collection of the Horticulture Faculty in Bucharest (2002-2004), after using several budding and grafting methods.

MATERIAL AND METHODS

Our first attempts to perform the grafting techniques were done in 2002 on two *Asimina triloba* rootstocks of three and respectively six years old, from the Collection of the Pomology Department.

One of the rootstocks originated from Italy and the other was obtained from a local population in North-Western Transylvania, Geoagiu, Hunedoara Region.

The grafting method performed in August was the summer budding technique with scions from the both adult exemplars (approximately 25-30 years old) from the Botanical Garden in Bucharest.

The scions were grafted in the vegetation period on two years, and respectively 5 years branches, close to their insertion point on the main trunks. Flexiband® grafting band was used to stick together the grafting partners.

After that, the plants were weekly observed for a month period, the final conclusion being that the rootstocks and the scion buds manifested incompatibility, all the buds dying.

New grafting methods were performed in 2003 using buds (spring budding) and branches (bark grafting).

The scions were taken from Sunflower and Howebat varieties and from some Italian selections: Vitroplant 1, Vitroplant 2 and Vitroplant 3. The scions, harvested in the 2002-2003 winter season, were kept at 3-4ºC in the refrigerator until the grafting time. During the cold storage the scions were protected against drying by waxing and covering in transparent film.

This time, the grafting were performed at the middle of May, when the Italian rootstock began to form 1-2 leaves, and the other one, from Geoagiu, was in full blossom.

The grafting operations number varied as well as the buds kept on the scion branches used on the bark grafting technique, as it is shown in table 1.

The grafting partners were bound with black self-adhesive band Bendaflex®, assuring also a supplementary heating of the grafting point [10]. The cut sections were protected with Arborinn® grafting wax.

After grafting, observation and measures were weekly performed regarding the grafting success and the scion shoots growing. At the end of the vegetation period all data were analysed.

In the second year after grafting the observation and measurements regarded the new shoots growing, the number of the formed flowers and the fruits number (tables 2 and 3).

In 2004, *Asimina triloba* seedlings grown in 8 l pots were used as rootstocks. These seedlings were obtained from the seeds of an Italian selection sown in 2001.

Three grafting methods were tested: chip budding, spring budding and bark grafting. The scion branches were from the Italian selection Vitroplant 1 and Vitroplant 2. This time we used for grafting only branch fragments with vegetative buds.

The grafting point was bound with Flexiband® and the observations regarding the grafting success were performed two months after the grafting time.

RESULTS AND DISCUSSIONS

As we mentioned before, the summer budding in 2002 had no success, the cambial tissues of the rootstock rejecting the scion buds. One of the main causes of that grafting incompatibility could be the difference of the vegetation stages for the two partners. At the grafting moment the rootstock had no lignified bark.

The bark grafting method used in 2003 gave pretty good results, the grafting success registered between 50% for the Howebat scions and 100% for Vitroplant 2 and 3 selections grafted on the 7 years old rootstock. The grafting success for the Sunflower scions grafted on the 4 year rootstock was only 66% (tables 2 and 3).

Regarding the bark grafting technique, two weeks after the grafting, the buds on the upper half of the scion branch opened. Thirty days after the grafting, the first leaves formed on the newly growing shoots.

The bud that started to grow was situated in the upper half of the branch, independent of the scions length used for grafting (2-6 buds). We also noticed that no flowering process occurred at the flowering buds situated on the scion branches.

The genotype influence on flowering buds formation and fruits setting was also manifested in the second year. The Vitroplant 2 and 3 selections formed the highest number of fruits. In the same time, Sunflower and Vitroplant 1 had the most vigorous growing.

Regarding the grafting performed in 2004, besides the bark grafting technique, we used also chip budding, introduced after 1977 in USA [13]. The chip budding method is the most recommended for *Asimina* commercial grafting and often is preferred by the American nursery men and researchers (i.e. The Gene Bank for *Asimina*, Kentucky State University).

The success grafting ratio for the scion buds was 100% for both Vitroplant 1 and Vitroplant 2 selections on chip budding and bark grafting methods.

But analysing the number of buds that started to grow, given the total number of the buds on the scion branch, we noticed that when using three buds scions (Vitroplant 2 selection) two of them started to grow (66.6%) and when using scions with 7 and respectively, 5 buds, the average number of the growing buds was only (41.45%) (table 4).

Right after grafting, 1-2 suckers were kept on the rootstocks, to consume the excessive sap and to prevent the scion rejection. Two-three weeks after the scion shoots started to grow, we graduated reduced the length of the suckers until their completely elimination.

CONCLUSIONS

The interest for northern banana remarkable grew in USA and few European and Asiatic countries (Italy, Spain, China and Japan), due to the permanent diversifying request of the assortment and to the increasing demand for ecological friendly products.

From this point of view, Asimina has several quality features: it is a rustic plant, easily adapted to biotic and abiotic stress factors: it doesn’t require plant protection treatments, produces fruits with great energetic value, distinctive taste, rich in vitamins, mineral elements and sugars. It is also recommended for ornamental purposes due to its rich crown with great intense coloured leaves, green during the summer and gold-yellow in fall.

The researches performed during 2002-2004 period tested several grafting techniques on *Asimina* exemplars with different ages and led to the following conclusions:

- in the first years the northern banana seedlings grow very slow, reaching the optimum dimensions for grafting only after three years from sowing;
- cold storage at 3-4ºC is recommended for the scions under plastic film;
- for the bark grafting methods, the optimal scion length is of two buds;
- the most efficient grafting methods proved to be chip budding technique, for the rootstocks with 10-15 mm in diameter and bark grafting for rootstocks thicker than 15 mm;
- the optimal moment for grafting is spring, 3-4 weeks after the bud breaking. Any delay will affect the grafting success because of the too intense sap flux;
- the presence of the suckers is essential for reducing the sap flux;
- the scion branches grow rapidly, form flower buds and set fruits next year after the grafting, when overgrafted on vigorous rootstocks.

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Tables

Table 1. Grafting methods performed in 2002-2004 on the *Asimina triloba* exemplars of different age and origin

Grafting year	Origin	Age	Grafting time	Scions	Grafting method	Grafting success (%)
2002	Local population	6	August	Local varieties (Bucharest Botanical Garden)	Summer budding	0%
	Sunflower rootstock	3			Summer budding	0%
2003	Local population	7	½ May	Vitroplant 1	Spring budding	0%
				Vitroplant 1	Bark grafting	66%
				Vitroplant 2		100%
				Vitroplant 3		100%
				Sunflower		75%
				Howebat		50%
	Sunflower rootstock	4		Sunflower	Bark grafting	66%
2004	Seedling rootstock	3	End of June	Vitroplant 1	Chip budding	100%
					Spring budding	0%
					Bark grafting	100%
				Vitroplant 2	Chip budding	100%
					Spring budding	0%
					Bark grafting	100%
				Vitroplant 3	Chip budding	100%
					Spring budding	0%
					Bark grafting	100%

Table 2. The bark grafting results (2003) and the scions behaviour during the growing and fructification processes

Rootstock/ Age	Grafting success (%)	Shoots length (cm)		Flower buds (no.)	Fruits (no.)	Flower buds (no.)
		2003	2004	2003	2003	2004
I / 7 years	Vitroplant 1 66.6%	34.5	74.5	2	5	7
	Vitroplant 2 100%	22.8	21.5	7	37	14
	Vitroplant 3 100%	25.1	37.3	1	8	12
	Sunflower 75%	18.2	64.1	-	-	13
	Howebat 50%	18.0	37.0	-	-	3
II / 4 years	Sunflower 66.6%	8.6	22.7	1	1	12

Table 3. The scion buds growing in the first two years after the bark grafting

Rootstock/Age	Scion branches	Annual growing - 2003			Annual growing - 2004		
		Formed buds	Scion shoots		Formed buds	Scion shoots	
		(no.)	(no.)	(%)	(no.)	(no.)	(%)
I / 7 years	Vitroplant 1	11	3	20.0	22	11	50.0
	Vitroplant 2	18	4	22.0	39	12	30.0
	Vitroplant 3	12	3	25.0	33	9	27.0
	Sunflower	16	4	25.0	37	21	56.7
	Howebat	10	1	10.0	9	4	44.0
II / 4 years	Sunflower	20	6	30.0	45	13	28.0

Table 4. The influence of the grafting method and scion length upon the shoots growing on the 3 years old *Asimina triloba* seedling

Rootstock	Selection	Grafting method	Grafting success	Buds /scion (no.)	Growing buds (%)	Shoots length (cm)		Total shoots growth (cm)	
						after 30 days	after 60 days	after 30 days	after 60 days
I series	Vitroplant 1	chip budding	100%	1	100.0	17.5	29	17.5	29
		spring budding	0%	1	0.0	-	-	-	-
		bark grafting	100%	7	42.9	4.8	8.43	14.3	25.3
II series	Vitroplant 1	chip budding	100%	1	100.0	6.6	10.5	20.0	31.6
		spring budding	0%	1	0.0	-	-	-	-
		bark grafting	100%	5	40.0	7.1	13.08	14.3	19.5
III series	Vitroplant 2	chip budding	100%	1	100.0	0.5	1.0	0.5	1.0
		spring budding	100%	1	100.0	0.3	-	-	-
		bark grafting	100%	3	66.6	5.9	25.75	11.8	45.5

Figures

Fig. 1. Chip budding on 3 years old *Asimina triloba* seedling

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE EFFECT OF DIFFERENT FERTILIZATION SYSTEMS ON PLUM NUTRITION

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Keywords: fertilizers, soil, leaves, macroelements, microelements, yield, fruit.

ABSTRACT

Research was carried out during the period 2001-2003, at the Fruit Research Station Bistrita, in a plum orchard with Silvia, Carpatin and Renclod Althan cultivars. The subject of the research was to evaluate the effect of different fertilization systems on plum nutrition in the pedoclimate conditions of Bistrita. The influence of different fertilization systems on the concentration of elements in soil and leaves, on the biochemical composition of fruit, yields and average weight of fruit was evaluated. The fertilization system with manure, in plum orchards with high soil acidity and low content of soil nutrients, influenced the nutrition processes of the trees through modification of the supply of plant nutritive elements. Fertilization systems with soil applied manure and mineral fertilizer had positive effects on plum fruit production. The fertilization of plum orchards without correcting the acidity of soil is not enough for an optimum nutrition of trees. Plum production on soil with high acidity is decreased and fertilization systems that do not protect the soil characteristics worsen plum nutrition.

INTRODUCTION

Europe remains the biggest producer of plums in world (34% of world production - FAO, 2003). In Romania, the plum species is predominant (Cociu *et al.* 1997), being the country in Europe with the highest plum production with 909,000 t in 2003 (26% of European production) and second in the world (9% of world production), after China. However, on plum yield, in 2003, Romania was in 16th place, with 9.62 t/ha (FAO, 2003).

Plum trees have a lot of advantages: they are a hardy species, have low demand from soil, climate, technology, are easy to propagate, have good yield, a long harvest period (about 90 days) thanks to a lot of cultivars with different ripening periods, a high food value and many potential fruit markets (fresh, dried, distillates, stewed).

The placement of tree plantations mainly on sloping areas with poor natural fertilization makes it necessary to take agrochemical measures to increase the soil fertility and ensure optimum conditions necessary for fruit production (Pasc, 1980; Marcelle, 1995). On soils with poor natural fertility a limiting factor for fruit production is the low content of plant nutritive substances.

Our research was directed toward soil fertility, with the main objective to study the influence of different fertilization systems in a brown alluvial clayey soil condition (acidity and low content of nutrients) on plum nutrition.

MATERIALS AND METHODS

Research was carried out in the period 2001-2003, at the Fruit Research Station Bistrita. The experiment was placed in an 8 year old plum orchard, with Silvia, Carpatin and Renclod Althan cultivars, grafted on myrobolan rootstock. The trees were planted at a distance of 5/5 m, and the density of the plantation is 400 trees/ha.

We studied the influence of different fertilization systems on available of elements in soil and leaves, on the biochemical composition of fruits, and on yields and average weight of fruits. The fertilization systems studied were the following:

V1- manure (control)

V2 - manure + N_{60}:P_{60}:K_{60}

V3 - manure +foliar fertilizer

V4 – N_{120}:P_{120}:K_{120}

V5 - N_{60}:P_{60}:K_{60} + foliar fertilizer.

The manure was applied in autumn each year at a rate of 20 t/ha. The mineral fertilizers (NPK) were applied in doses of 1/3 in autumn and 2/3 in spring. The foliar fertilizer (FertiLLilly) was applied four times; the first treatment was after flower fall then at 14 day intervals. As a control the organic fertilizer (manure) was used. We had two repetitions, with four trees on treatment, from each cultivar.

In autumn 2003, at Iowa State University, Department of Agronomy, Soil and Plant Analysis Laboratory, soil analysis (macroelements) using an ammonium acetate extract and leaf analysis (macro- and microelements) after microwave digestion with nitric acid, was conducted by ICP (Inductively Coupled Plasma) spectroscopy. Total-N content of leaf tissue was determined by combustion analysis using a LECO CHN-2000. Soil acidity, base saturation level (V%), nitrogen index (IN), and fruit biochemical analysis (soluble sugar, dry matter, acidity, and vitamin C) were analyzed at the Fruit Research Station Bistrita, each year, after agrochemical labs methodology.

The fruit production of each tree was recorded and calculated per hectare. The average weight of fruit was determined by weighing thirty pieces for each treatment.

The plantation is on a slope of 12%, with a southwest exposure in a brown alluvial clayey soil. When starting the experiment, the soil characteristics were: pH = 5.5, IN = 2.5, P-AL = 87 ppm, K-AL = 152 ppm (average 0-30 cm depth).

The climate in the area of Bistrița is continental temperate and is characterized by average yearly temperatures of 8.2°C, an average annual precipitation of 680 mm, and the relative humidity of the air is 76%. The years 2002 and 2003 were very dry (about 495 mm) and warm (about 9.25˚C).

RESULTS AND DISCUSSIONS

Table 1 shows the soil chemical composition two years from the beginning of experiment. The soil acidity was increased with treatments of mineral fertilizer (V4) and organic + mineral (V2), especially on 0-30 cm depth (pH = 4.62-4.67). Also, on these treatments the bases saturation level was lower than the other treatments, with values between 48.9% (V4) and 66.7% (V2), on 0-30 cm depth. For treatments with organic fertilizer alone (V1) and organic fertilizer with mineral foliar fertilizer (V3) the base saturation level was between 73.8 and 75.1% at 0-30 cm, and 70.1 and 72.6% at 30-60 cm. The organic fertilizer (manure) maintained the soil acidity at the 2001 level.

The nitrogen index was influenced by type of fertilization, the lower content recorded at V4 and the higher at V1, followed by V3. That means an increasing of nitrogen index in the soil treated with manure.

The soil phosphorus content of soil treated with only manure increased from 87 ppm in 2001 to 90 ppm in 2003 and decreased for all other treatments, and was 68 ppm (V4) and 82 ppm (V2) at 0-30 cm depth. In 2003, the soil had medium phosphorus content for all treatments studied.

Plum is a high potassium consumer. In autumn 2003, the potassium available from soil was between 107.1 ppm (V3) and 134.6 ppm (V1) at 0-30 cm depth, and between 84.5 ppm (V4) and 112.1 ppm (V1) at 30-60 cm depth. The 0-30 cm depth had medium concentration of potassium but the 30-60 cm depth had low concentration of potassium for all treatments.

The calcium and magnesium contents available in soil overall were medium to low, with the highest values at V1 (30-60 cm) and lowest values at V3 (0-30 cm). The calcium and magnesium content in soil increased with depth, except for V4 and V5.

Figure 1 shows a significant correlation between acidity of soil (pH_{H2O}) and base saturation level (V %) on studied treatments.

The chemical concentration of leaves from trees on different fertilization systems is shown in the Table 2. The nitrogen content is at optimum levels for all treatments at plum cultivars, with values between 2.14 and 2.54%. The highest values were recorded on V1 and V2 for all three cultivars.

The phosphorus content in plum leaves was medium to low with values between 0.147 and 0.182%, with higher values for the organic treatment (V1), 0.166% on Silvia cv., 0.178% on Carpatin cv., and 0.182% on Renclod Althan cv.

Manure alone and in combination with mineral fertilizer ensured the optimum content of potassium in plum leaves with concentrations between 2.02 and 2.08% on Silvia cv., 1.86 and 1.89% on Carpatin cv., and 1.87 and 2.10% on Renclod Althan cv. The other treatments showed lower values. The calcium and magnesium levels in leaves were into optimum values for plums.

The microelements analysis showed a high content of Mn in plum leaves, for all treatments, with values between 178.8 and 251.6 ppm. The high acidity of soil negatively influenced the availability of macronutrients and had a positive effect on the absorption of manganese by leaves. Figure 2 shows a negative correlation between soil pH and Mn absorption in plum leaves. The high Mn concentration in the leaves influenced negatively Fe absorption (65.7-114.4 ppm Fe in leaves). Concentrations of other microelements, Cu and Zn, were at optimum levels for plum species, but we can see higher values on V1 and V2 on Silvia cv., and on V1 and V5 on Carpatin and Renclod Althan cvs. The mineral fertilizers (both on ground and foliar) improved the microelement content in plum leaves.

Biochemical composition of fruits is shown in Figure 3 (at Silvia cv.). The mineral fertilizer (V4) increased the dry matter of fruits from all three cultivars studied. The average dry matter content in fruit was between 12.69 and 14.48% on Silvia cv., 12.42 and 13.51% on Carpatin cv., and 13.26 and 15.19% on Renclod Althan cv. The soluble sugar, malic acid and vitamin C in fruits were not significantly influence by fertilization systems. The soluble sugar content in fruits was between 55 and 72% from dry matter.

Table 3 shows the results of different fertilization systems on the plum fruit yield and average fruit weight. In climatic conditions of 2002-2003 (dry and warm) the average yield was between 5.96 and 8.60 t/ha on Silvia cv., 6.12 and 8.30 t/ha on Carpatin cv., and 5.80 and 8.86 t/ha on Renclod Althan cv. The most important increases of yield were achieved on V2 (manure + $N_{60}P_{60}K_{60}$) with 26.6% on Rencld Althan cv. and 14.7% on Silvia cv. comparative with control (only manure). Average fruit weight was not influenced by fertilization system, and was lower than genetic potential for the cultivars due to dry periods.

CONCLUSIONS

Fertilization system with manure, in plum orchards with high soil acidity and low content of nutrients, influenced the nutrition processes of the trees through modification of supply of nutritive elements and absorption conditions.

Fertilization system with manure and soil applied mineral fertilizer had positive effects on the plum fruit production.

The fertilization of plum orchards without correcting the acidity of soil is not enough for optimum nutrition of trees. The potential for plum production on soil with high acidity is decreased and the fertilization systems that do not protect the soil reaction worsen plum nutrition.

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Tables

Table 1. The agrochemical indices of brow alluvial-clayey soil on different fertilization systems on plums (autumn, 2003)

Treatment	Depth (cm)	pH_{H2O}	V%	IN	P-AL (ppm)	K-AL (ppm)	Ca^{2+} (ppm)	Mg^{2+} (ppm)
V1- manure (control)	0-30	5.52	75.1	2.7	90	134.6	1639	179.7
	30-60	5.33	72.6	2.6	58	112.1	1753	197.4
V2. manure + NPK (180)	0-30	4.67	66.7	2.3	82	130.4	1453	163.3
	30-60	5.17	75.2	2.5	71	89.7	1604	177.8
V3. manure + foliar fertilizer	0-30	5.22	73.8	2.6	75	107.1	1338	156.8
	30-60	5.17	70.1	2.5	73	86.8	1498	164.5
V4. NPK (360)	0-30	4.62	48.9	1.6	68	123.1	1403	166.7
	30-60	4.89	65.5	1.9	60	84.5	1378	162.2
V5. NPK (180) + foliar fertilizer	0-30	5.08	69.3	2.2	76	118.3	1340	160.8
	30-60	5.13	65.4	2.0	81	106.4	1344	156.3

Table 2. Leaf chemical composition of three plum cultivars for different fertilization systems (July, 2003).

Treatments / cultivars	Chemical composition of plum leaves (foliar diagnosis)								
	%					ppm			
	N	P	K	Ca	Mg	Mn	Fe	Cu	Zn
SILVIA									
V1- manure (control)	2.54	0.166	2.02	2.23	0.56	178.8	77.4	15.7	31.3
V2. manure + NPK (180)	2.49	0.157	2.08	1.97	0.52	251.6	74.1	16.6	32.3
V3. manure + foliar fertilizer	2.14	0.151	1.71	1.81	0.55	194.6	70.7	14.5	29.9
V4. NPK (360)	2.39	0.147	1.71	1.58	0.49	212.6	73.2	14.3	28.8
V5. NPK (180) + foliar fertilizer	2.30	0.160	1.31	1.60	0.48	217.4	77.7	15.8	29.8
CARPATIN									
V1- manure (control)	2.52	0.178	1.89	2.31	0.61	189.6	100.4	18.8	32.1
V2. manure + NPK (180)	2.53	0.169	1.86	2.16	0.56	206.6	101.6	18.6	28.8
V3. manure + foliar fertilizer	2.42	0.167	1.80	2.05	0.55	213.6	112.4	17.4	28.5
V4. NPK (360)	2.47	0.172	1.56	1.68	0.51	226.0	110.5	18.6	28.4
V5. NPK (180) + foliar fertilizer	2.49	0.170	1.79	2.23	0.59	241.0	114.4	18.6	31.7
RENCLOD ALTHAN									
V1- manure (control)	2.41	0.182	2.10	1.89	0.57	207.2	78.6	15.2	27.6
V2. manure + NPK (180)	2.53	0.179	1.87	1.64	0.49	206.6	80.2	15.3	24.1
V3. manure + foliar fertilizer	2.34	0.173	1.43	1.43	0.49	185.0	65.7	14.2	19.9
V4. NPK (360)	2.32	0.161	1.61	1.60	0.52	220.4	62.2	13.9	20.4
V5. NPK (180) + foliar fertilizer	2.38	0.170	1.60	1.83	0.49	212.4	77.2	15.3	29.0

Table 3. Yield and average weight of fruits on three plum cultivars (2002-2003)

Cultivars / Treatments	Yield			Average weight	
	kg/tree	t/ha	Difference (%)	gr.	Difference (%)
SILVIA					
V1. Manure (control)	18.75	7.50	-	28.30	-
V2. Manure + $N_{60}P_{60}K_{60}$	21.50	8.60	+14.7*	29.55	+4.4
V3. Manure + foliar fertilizer	15.40	6.14	-18.1^{o}	26.65	-5.8
V4. $N_{120}P_{120}K_{120}$	16.65	6.66	-11.2	24.50	-13.4
V5. $N_{60}P_{60}K_{60}$ + foliar fertilizer	14.90	5.96	-20.5^{oo}	23.65	-16.4
CARPATIN					
V1. Manure (control)	20.75	8.30	-	39.40	-
V2. Manure + $N_{60}P_{60}K_{60}$	20.75	8.30	-	34.90	-11.4
V3. Manure + foliar fertilizer	17.55	7.02	-15.4^{o}	30.75	-21.9
V4. $N_{120}P_{120}K_{120}$	16.65	6.66	-19.7^{o}	35.64	-9.5
V5. $N_{60}P_{60}K_{60}$ + foliar fertilizer	15.30	6.12	-26.3^{oo}	35.40	-10.2
RENCLOD ALTHAN					
V1. Manure (control)	17.15	7.00	-	25.45	-
V2. Manure + $N_{60}P_{60}K_{60}$	22.15	8.86	+26.6**	24.70	-2.9
V3. Manure + foliar fertilizer	18.15	7.26	+3.7	24.00	-5.7
V4. $N_{120}P_{120}K_{120}$	17.15	6.86	-2.0	23.90	-6.1
V5. $N_{60}P_{60}K_{60}$ + foliar fertilizer	14.50	5.80	-17.1^{o}	24.65	-3.1

Figures

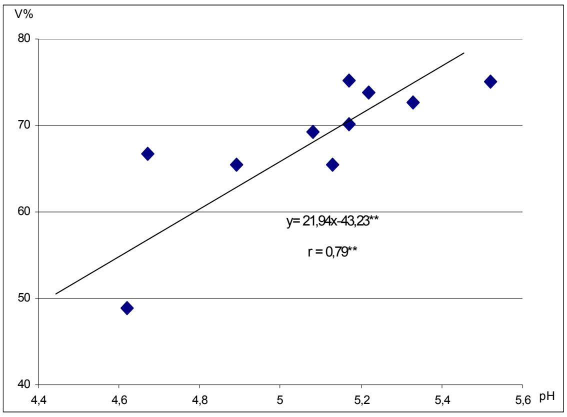


Fig. 1. The correlation between acidity of soil and base saturation level on studied treatments.

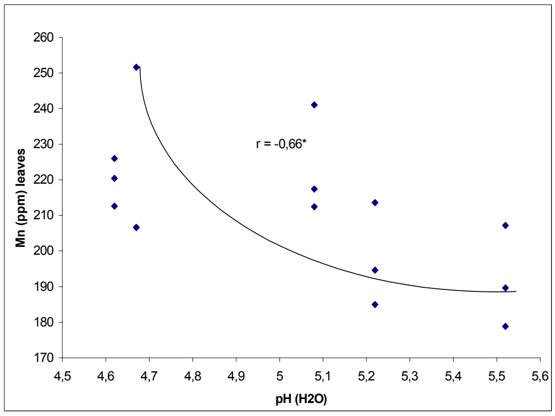
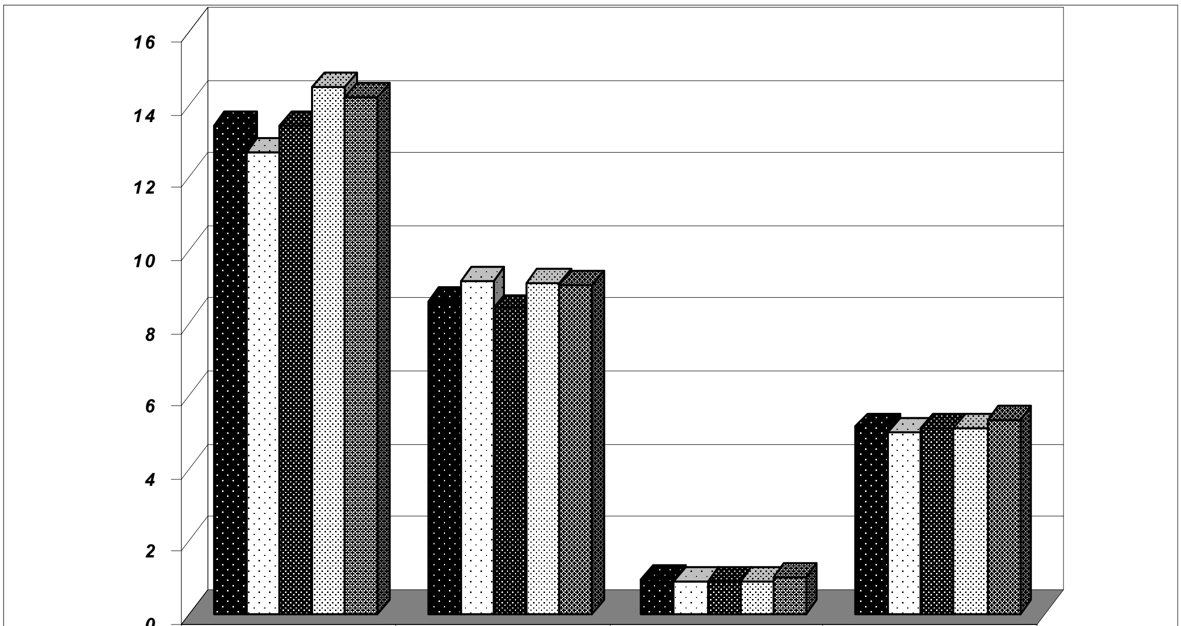


Fig. 2. The correlation between acidity of soil and Mn content in plum leaves.



	dry matter (%)	soluble sugar (%)	malic acid (%)	vitamine C (mg/100g)
V1	13,43	8,57	0,97	5,14
V2	12,69	9,14	0,92	5
V3	13,43	8,39	0,92	5,09
V4	14,48	9,09	0,9	5,09
V5	14,19	9,06	0,99	5,34

Figure 3. Biochemical composition of plum fruits on Silvia cv.

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VITICULTURE & OENOLOGY

EVALUATION OF THE PRESENT POTENTIAL OF SMALL PRODUCERS IN THE VRANCEA-BUZAU AREA: THE FIRST EDITION OF THE CONTEST „VINUL PODGOREANULUI”

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Keywords: viticulture, winemaking, small producers, wine contests

ABSTRACT

The paper presents the basic facts regarding the wine contest for small producers “VINUL PODGOREANULUI” which took place at Odobeşti between 15 and 17 of April 2004, in the frame of the project BM 2521/2003 “Active promotion of the quality criteria in the fields of production, control and marketing of horti-viticultural products aimed at regaining the internal market and improving export competitivity”, financed by the Ministry of Agriculture and the World Bank. The event’s first edition was an opprtunity for 120 independent producers and 13 associations of producers from Vrancea and Buzau counties to have their wines evaluated by a professional jury, in an official contest organized under the same principles with contests reserved for the large companies.

INTRODUCTION

The first edition of the Wine contest for small producers “VINUL PODGOREANULUI” was organized by USAMVB between 15 and 17 of April, 2004, at S.C.D.V.V. Odobeşti, within the frame of the project BM 2521/2003 “*Active promotion of the quality criteria in the fields of production, control and marketing of horti-viticultural products aimed at regaining the internal market and improving export competitively*”, financed by the Ministry of Agriculture and the World Bank. The event was intended as a chance for the small producers in the Vrancea and Buzau areas to have their products evaluated under conditions similar to those of the great national and international contests – to which, due to costs and logistic problems, such small producers cannot usually participate. The jury duty was assumed by the Association of Authorized Tasters of Romania (A.D.A.R.), and representatives were present from the Ministry of Agriculture, the county directorates for agriculture and the local authorities, along with mass media. The attendance was impressive; the total number of wine samples was 221. Below is a short account of the contest, as perceived from the viewpoint of the organizers.

STATISTICAL DATA AND CONTEST RESULTS

A total of 221 samples were entered into the contest (169 white, 49 rosé and red, and 3 special wines). Each producer was allowed to enter up to 3 wine samples, with no participation fee. The sample evaluation was performed by a committee of authorized tasters from A.D.A.R. using a 100 point system; the lowest and highest of the 7 grades granted to each sample were ignored and the median was computed; awards were than granted as follows: 85~100 points - diploma and gold medal; 75~84 points – diploma and silver medal;

65~74 points – diploma and bronze medal; 55~64 points – diploma of honour; 40~54 points – diploma of participation; under 40 points – eliminated.

The results of the contest, as far as the awards are concerned, are given in Table 1. White wines were the most numerous, in accordance with the geographic area addressed. Awarded sample were, in general, of the varieties *Fetească regală* (12, *Riesling italian* (10) *and Fetească Albă* (9), as well as some *Aligoté*, *Galbenă de Odobeşti* and *Sauvignon blanc* wines. Among red wines, most successful was *Merlot* (11 samples). In general there were young wines produced in 2003 (148 samples) and 2002 (52 samples). In spite of the young age, many samples displayed defects which question the capacity of these small producers to ensure a safe storage over a number of years. Before addressing the problem of aging their wines, the producers must significantly improve their winemaking technology.

Table 2 shows how the appreciation of the jury correlated with the sugar content of the wine samples. It can be seen that, contrary to the usual tendency, a larger proportion of awards went to wines with residual sugar. It is possible that sugar played its usual role, of hiding certain defects and improving the overall presentation of the wines, and the jury may have been slightly influenced by this.

A considerable number of samples (37, which is 16.7%) were eliminated from the contest, for grave deficiencies of production or storage, obvious addition of forbidden compounds or identification of hybrid characteristics. Even samples which were not eliminated presented a series of defects, the most frequent of which are shown in Table 3.

As seen in Table 3, most of the defects observed seem to be caused by grave deficiencies in the hygiene of the spaces and machinery used in winemaking, as well as to certain technological reasons, such as the lack or insufficiency of stabilization treatments.

At registration the producers were asked to provide data regarding the grapevine surface cultivated and the quantity of wine available for sale from each sample entered into the contest. Although the information thus gathered does not appear to be very accurate, here are a few comments regarding these data.

The grapevine surfaces vary within very large limits: from 0.5 ha (there were 6 such producers) to 124 ha (for a company in Buzau county). The wine samples registered in the contest appear to come from a surface of over 850 ha.

As for the quantities of wine available for trade, they are between 210 litres and 1,500,000 litres (the latter value corresponds to the rather large company which owns 124 ha of grapevine). Excluding the samples which were not documented, calculations show that for 179 wine samples which entered the contest there were 2,729,000 litre of wine available for trade, stored at the producers' facilities. Further calculations – not necessarily accurate, but still with a certain value – lead to the conclusion that for each of the 850 ha mentioned above there was a production of wine destined for trade of 3210 litres – which might indicate a productivity problem.

Another way to look at these data takes into consideration the wine quality. Assuming that only the wines awarded with gold, silver and bronze medals are suitable for trading, it is worth noting that only 1,926,000 litre of such wines are available at the producers. This means that only around 70% of the wines obtained by these producers can hope to reach the organized wine market – not forgetting that the wine samples were judged with a certain degree of indulgence.

CONCLUSIONS

The first edition of this contest was, most of all, a participation success, as the producers displayed a high degree for such a professional event and understood its aim and usefulness. Such aspects indicated that it might be a good idea to extend such events into other viticultural areas of the country.

As expected, the contest underscored a number of diseases, defects and deficiencies of the wines obtained by small producers. Most of these problems appear to stem from inadequate working conditions (spaces, containers, machinery) or from mistakes and failure to obey minimal conditions stipulated by the technologies accepted nowadays. While consistent progress can be achieved easily regarding the compliance with norms and regulations, more difficulties are to be expected as far as the material endowment, spaces and installations are concerned, since most small producers do not have the capital means needed for a significant overhaul. Perhaps the grouping of small producers in associations might represent a first step on the way to the obtaining of stronger financial support for this purpose.

Tables

Table 1. Awards granted in the contest

	Gold	Silver	Bronze	D.H.	D.P.	Elim.
Total: 221	1	19	37	42	85	37
- white wines	1	16	27	27	69	32
- rosé and red wines	0	2	10	15	14	5
- special wines	0	1	0	0	2	0
Total: 100%	0,45%	8,60%	16,74%	19,00%	38,46%	16,74%
	25,79%					

(D.H. = diploma of honor; D.P. = diploma of participation)

Table 2. Number and percentage of awards granted, correlated with the content of residual sugar in wines

Wine samples	Total	Gold	Silver	Bronze	D.H.	D.P.	Elim.
Dry	168	1	10	28	29	67	33
	100%	0,6%	6,0%	16,7%	17,3%	39,9%	19,6%
With sugar (half dry, half sweet)	53	0	9	9	13	18	4
	100%	0,0%	17,0%	17,0%	24,5%	34,0%	7,5%

Table 3. Most frequently used terms employed by the 7 authorized tasters of the jury to designate the deficiencies and defects of the wine samples.

Type of defects	Category of defects	Description	Number of occurrences
Defects of aspect	Colour defects	Stained	48
	Limpidity defects	Opalescent, badly filtered	36
Defects of smell, aroma	Foreign smells	Plastic, stiren, polstif	33
		Petrol, gas, solvent, tar	7
Technology related defects	Poliphenols in excess	Bitter – other than tannin-bitter	93
		Rough, astringent	56
	Insufficient extract	Watery; thin; low extract	82
General defects (colour, smell, taste)	Oxidation	Oxidation, maderization	100
	Aeration	Aired, tired, in decline	74
Storage deficiencies	Vessels-related defects	Dirty vessels, badly washed vessels	124
		Rot	46
	Sulphitation defects	Inadequate SO_2 amounts, pickle smell, mercaptane, H_2S	76
Unwanted fermentations	Acetic fermentation	Volatile acidity; vinegar smell	44
	Other fermentations	Malolactic fermentation	5
	Foreign smell or taste	Foreign, atypical	22
		Mouse smell, degraded, rotten	45
Forbidden additions	Foreign substances	Artificial substances, sweeteners	14
	Hybrid presence	Hybrid characteristics, DPH	12

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INFLUENCE OF THE MATERIAL OF THE STORAGE CONTAINER (GLASS, STAINLESS STEEL) ON THE CONTENT OF CHROMIUM AND NICKEL IN WINES

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Keywords: wine storage containers, metal content, heavy metals, chromium, nickel

ABSTRACT

The effect of the material of the storage container on the metal content of wines was investigated, with emphasis on the accumulation of heavy elements such as chromium and nickel. Values of the metal concentration in wines aged at least 1 year in glass and stainless steel containers were determined. In different experiments, glass powder and stainless steel blades were added to wines, in order to artificially increase the contact surface, and thus speed up the process of metal intake for study purposes. It was found that the content of chromium and nickel in wines is influenced by the characteristics of the material of the container wall, the duration of contact, as well as by the pH and the presence of other chemicals in wines.

INTRODUCTION

The content of metals in wines is a matter of increasing interest for the scientists and professionals in the wine industry, as well as for the consumers. Among the many metals usually found in wines, two categories are more important for specific reasons: the first includes copper and iron, which create frequent stability problems; and the second represents the so-called “heavy elements”, such as cadmium, arsenic, mercury, lead, zinc, chromium and nickel, which are particularly dangerous from the viewpoint of human health. Continuing efforts are necessary in order to better identify and characterize the sources of wine contamination with these elements, and the means for controlling their concentrations.

DATA AND METHODS

The study was carried out in two directions. First, the contents of chromium and nickel were determined in a series of red and white wines stored for various periods of time in glass and stainless steel containers. Secondly, the process of metal intake was speeded up artificially, by inserting a number of stainless steel blades in the wine, and by adding glass powder to the wine. The samples thus prepared were kept for 3-12 months at 20-22°C, and the content of metals was determined at various intervals. In the case of stainless steel blades, the total surface of contact with wine was 1.04 dm^2/l; two different steel brands were used, denominated as W4541 and W4016 (characterized by a Ni content of 9.87 and 10.32%, respectively, and Cr content of 18.75 and 18.83%, respectively). In case of glass powder, green glass (containing chromium oxide), as well as ordinary (white) and brown glass was used The determinations were made by atomic absorption spectrometry with graphite oven.

RESULTS AND DISCUSSIONS

1. Stainless steel

In the case of wines stored in stainless steel tanks the ratio of the contact surface and the volume of wine is relatively small (for tanks of 100, 500 and 1000 hl this ratio is 0.26, 0.15 and 0.12 dm^2/l, respectively). The measurements performed on wines stored for at least 1 year in such tanks provided the values given in Table 1, which are relatively small and do not raise legislation or toxicity problems.

The experimental study was done at a much higher ratio of the contact surface and wine volume, that is 1.04 dm^2/l, created by immersing a number of stainless steel blades into the wine. Two different steel brands were used, denominated as W4541 and W4016. Determination of the content of chromium and nickel in such sample after 3, 6 and 12 months led to the results given below.

The comparison between Figs. 1 and 2 and the data in Table 1 clearly indicate that the content of Cr and Ni depends on the steel properties and on the storage time, as well as on the extent of steel surface in contact with wine. White wines extract more chromium and less nickel than red wines. The results obtained also indicated that the intake of Cr and Ni is more intense at the beginning of the storage, and that the intake rate decreases in time; deposits of pigments on the steel blades, under the form of protective films, may be responsible for this. Other factors found to increase the rate and amount of Cr and Ni intake from the stainless steel blades were: the presence and dimensions of welding stripes on these blades, the presence of oxygen (contact with air), and the decrease of pH due to various wine treatments.

These results suggest certain measures which can be taken to lower the wine content in Cr and Ni. Special care should be taken when choosing the stainless steel brand for storage tanks. The welded joints area should be kept as small as possible. Wine treatments which decrease the pH and the contact of wine with air should be avoided.

2. Glass

Glass is a much more stable and chemically inert material, and the literature indicates that the intake of metals from the container glass walls during the normal storage of wines is insignificant. In order to study the phenomenon, glass powder was added to wines (15 g of glass powder to a 750 ml bottle). Three types of glass were used – green, brown and ordinary, transparent glass. The measurement of chromium and nickel content of the wines after 3 and 6 months of contact with the glass powder led to the results shown in Figs. 3 and 4.

The experimental results indicated a certain increase in the chromium content of white and red wines when green glass was used. (Green glass is prepared using certain amounts of chromium oxides as pigments.) Brown and transparent glass had no effect on the chromium content. As for nickel, its content decreased in the case of white wines, almost in the same manner for all three types of glass tested. In case of red wines, a small increase was observed with green glass, and no change for the other two types of glass. These findings confirm a reported tendency towards a certain ion exchange between glass and wines.

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Tables

Table 1. Chromium and nickel content in wines stored in stainless steel tanks. The values are in µg/l.

Content	White wines		Red wines	
	Cr	Ni	Cr	Ni
Minimum	9.00	13.00	8.00	10.00
Maximum	23.00	29.00	17.00	19.00
Average	14.32	19.08	11.80	13.34

Figures

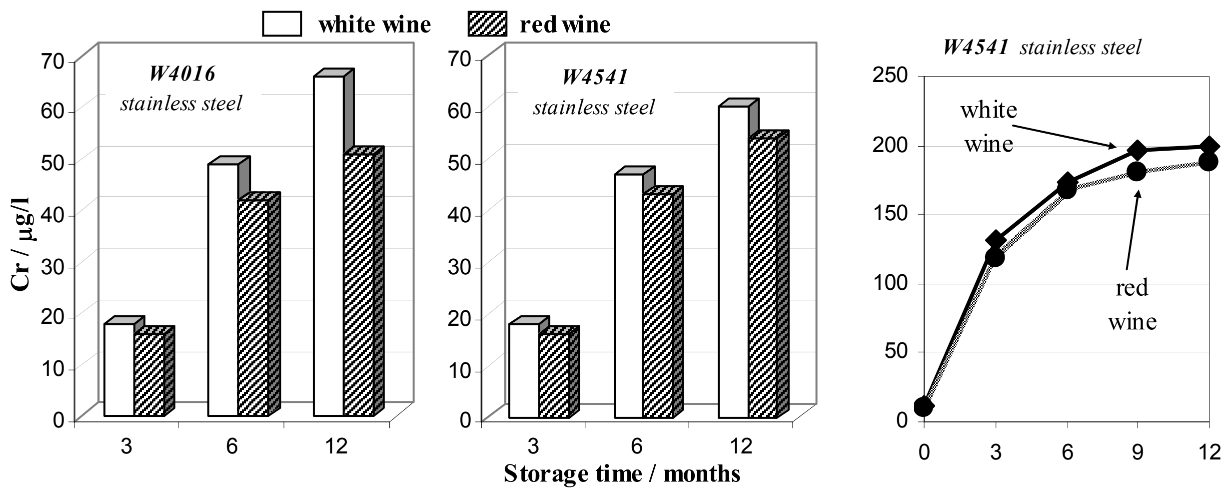

Fig. 1. Evolution of chromium content in wines kept for up to 12 months in contact with stainless steel blades.

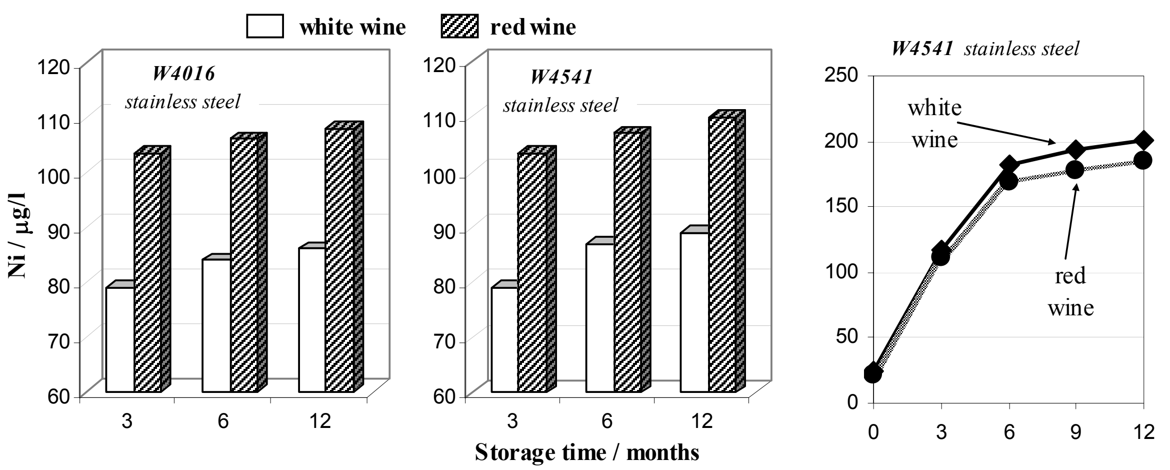

Fig. 2. Evolution of nickel content in wines kept for up to 12 months in contact with stainless steel blades.

Fig. 3. Content of chromium in wines kept for up to 6 months in contact with glass powder.

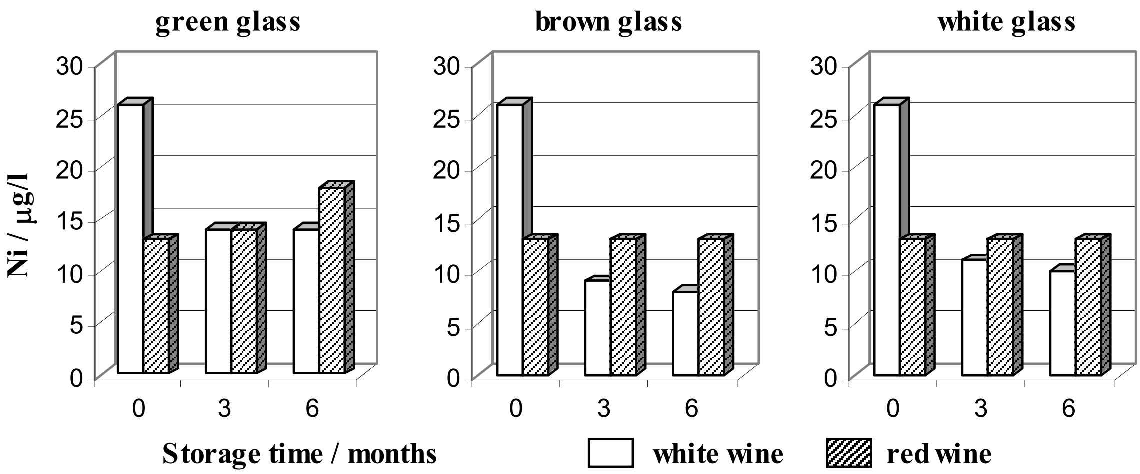

Fig. 4. Content of chromium in wines kept for up to 6 months in contact with glass powder.

THE CHARACTERISATION OF THE SANDY SOILS FROM THE VINE PLANTING OF DABULENI

ABDEL MAJID AHMAD MOHAMMAD BISHTAWI, A. POPA

Keywords: sandy soils, vine planting, Dabuleni

ABSTRACT

There were made soil profiles on the sandy soils from the Dabuleni vine centre both on dunes and interdunes uncropped as well as on soils cropped with vine.

There also taken soil samples in order to determine the main physical and chemical soil features. As a results of the analyzing the data there was established the suitability of the vine crop on these soils.

The vine crop, a plant with large ecological opportunities, is grown on all continents in both Earth hemispheres. Practically, for the vine crop, as a perennial crop with monoculture characteristics, the ecological offer is very important in order to obtain good quality products (I. Olteanu, 2003, Martin T, 1982). The crop conditions and tradition conducted to the specialization of the production, in Europe, America and Africa being cropped mostly the wine vine and in Asia the table and currant ones.

The choosing of the right place and its organization, preparing for planting and plantation care is made according with the ecological conditions, especially the soil fertility and environmental factors. This why actually the soil condition is very important and its improvement.

The Sadova –Corabia vinery comprises the sandy soils from the left side of the River Jiu from Dolj and Olt Districts which form the vine centers Dabuleni and Tamburesti. The sandy surface from the left side of the River Jiu has a triangular shape limited in South by the Danube lowland, between Bechet and Corabia and in North by the Amaradia River. The margin of these sands is very irregular with several narrow thongs formed under the influence of the Austru wind which blows oppositely (Mira Elena Ionica, 2003). In this area, the sandy dune material is the youngest deposits from quaternary and it was carried and deposited more recently upon the loess cover.

Because of the sand dunes the terraces delimitation is often hard to distinguish. The sand carrying and depositing phenomena of the Danube and Jiu are much slower than in the past. Nevertheless, this action is continuing (Puiu St., 1980, Chirita D.C., 1974).

MATERIAL AND THE METHOD

There were made 3 soil profiles on the sandy soils from the Dabuleni vine centre both on dunes and interdunes uncropped as well as on soils cropped with vine (levelled and unlevelled). There also taken soil samples in order to determine the main physical and chemical soil features. As a results of the analyzing the data there was established the suitability of the vine crop on these soils.

RESULTS AND DISCUSSIONS

The description of the soil profiles is shown below:

The first profile – interdune – typical psamosoil.

0-25 cm A_o horizon, colour brown, sandy texture, unstructured, friable, uncompacted, slow passing.

26-101 cm A_c horizon – colour light brown-yellowish, sandy texture, unstructured, friable.

The soil has weak gleysation deepward, strongly decarbonated, is formed on aeolian deposits consisting of thick materials with sandy texture.

The analyzes show (table 1) that the soil has a weak acid reaction (pH) on the whole profile, an average content at the surface and extremely low on the profile. The macroelements N, P, K, is low and very low under 18 cm. As the bases saturation degree, the soil is mezobasic at the surface and eubasic under 25 cm.

The soil is loosened At the surface and weak compact under 25 cm. The soil has a low water capacity , the Moisture Equivalent values being between 5.8-3.4 and a very lowfield water capacity (FC) (tables 2, 3).

The second profile – dune – typical psamosoil strongly levigated, formed on aeolian sands with sandy texture.

A_o horizon (0-18 cm), colour brown-yellowish, sandy texture, unstructured, slow passing.

A/C horizon (18-56 cm), transition horizon, colour brown-grey, sandy texture, unstructured, friable.

C horizon (under 56 cm), colour brown-grey, sandy texture, unstructured, friable.

The soil has a weak acid reaction (table 1) on the whole profile, The humus content is low at the surface and extremely low under 18 cm.. The N, P, K, content is low at the surface and very low in A/C and C horizons. The bases saturation degree, classifies the soil as eubasic.

The granulometric analysis show a sandy texture. The bulk density emphasize that the soil is uncompacted at the surface and in the A/C horizon and weak compacted under 56 cm. The soil has a very large water permeability and a very low water capacity.

The third profile – leveled, modulated – Typical psamosoil covered moderated antropic, with lamellar character at the base, formed on sandy deposits with sandy/sandy-silty/sandy texture.

Horizon A_p (0-16 cm), plowed horizon, consisting of muddy material resulting from the levelling process, colour brown-yellowish, sandy texture, porous with frequent small roots, slow passing.

Horizon A_c (16-31 cm) covered horizon (transported and deposited during the levelling process), colour dark brown-grey, sandy-silty texture, uncompacted, weak structured, porous, slow passing to the next horizon.

Horizon A_o(31-53 cm), colour brown-grey, sandy texture, unstructured, friable, weak compacted with slow passing to the next horizon.

Horizon C (under 53 cm) colour light gray-yellowish, sandy-sandy-silty texture and finer texture to the base of the profile where are located the strips which give the lamellar character (have darker colour in reddish) unstructured, weak compacted.

The soil reaction (table 1) is weak acid into the shallow horizon, moderated acid in AC horizon and weak acid on the profile.

The humus content is medium into the first horizon and low into the others. The N, P, K, contents are low except phosphorus within the A_p horizon where is good. The bases sum has low values; the soil is classified as mesobasic as bases saturation degree and eubasic under 53 cm.

The soil is uncompacted within the first two horizons and weakly compacted below. The permeability is high and very high.

CONCLUSIONS

Within the Dabuleni the soil is sandy consisting in dunes, interdunes and modulated and levelled soil.

The soil type is typical psamosoil. Lithologically, the terraces are formed of quaternary deposits of 10-20 cm consisting of loess deposited upon sands and gravel layers of different thickness. Under the quaternary deposits of terraces appears the levantine age material as dark-blue clays or clays along with marl enriched in calcareous spots. The levelled and modulated soil is covered antropic, with lamellar character at the base, formed on sandy (aeolian) deposits, with sandy/sandy-silty/sandy texture. Its reaction is weak acid into the shallow horizon, medium acid in AC horizon and weak acid on profile. The humus content is medium in the first horizon and low in the others. The N, P, K contents are low excepting the phosphorus within the A_p horizon where the content is good. The bases sum has very low values; the soil is classified as mesobasic as bases saturation degree and eubasic under 53 cm. The soil is uncompacted in the first two horizons and weak compacted deepward. The permeability is high and very high. This soil type is classified as having medium suitability for the vine crop.

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Table 1
The granulometric analysis of the studied soil profiles

Profile	Horizon	Thick sand 0,2-2,0 mmф %	Fine sand 0,2-0,02 mmф %	Silt I 0.02-0,01 mmф %	Silt II 0,01-0,002 mmф %	Silt total %	Clay sub 0,002 mmф	Physical clay Sub 0,002 mmф %	Hygroscopicity Coefficient
I	A_0 0-25 cm	55,0	38,7	2,0	1,1	3,1	3,2	4,3	0,70
	AC 25-101 cm	65,8	27,1	1,5	2,8	4,3	2,7	5,5	0,54
	C under 101 cm	67,2	29,1	0,6	1,3	1,9	1,8	3,1	0,42
II	A_0 0-18 cm	70,8	23,6	1,9	1,2	3,1	2,5	3,7	0,48
	A/C 18-56 cm	70,2	24,3	1,2	1,7	2,9	2,6	4,3	0,52
	C under 56 cm	73,7	22,1	1,0	1,8	2,8	1,4	3,2	0,31
III	A_p 0-16 cm	52,0	38,9	1,8	1,9	3,7	5,4	7,3	1,42
	A_c 16-31 cm	53,4	33,8	2,3	2,8	5,1	7,7	10,5	1,94
	A_0 31-53 cm	76,5	18,9	0,7	1,2	1,9	2,7	3,9	0,52
	A under 53 cm.	47,7	39,5	3,6	4,2	7,8	5,0	9,2	1,53

Table 2
The physical features of the studied soil profiles

Profile	Horizon	Bulk density g/cm^3	Specific density g/cm^3	Total porosity %	ME %	Permeability mm/hour	Penetration resistance kgf/cm^2
I	A_0 0-25 cm	1,36	2,68	49,3	5,8	>35,1	under 10
	AC 25-101 cm	1,50	2,70	44,4	4,8	>35,1	under 10
	C under 101 cm	1,55	2,71	42,8	3,4	>35,1	under 10
II	A_0 0-18 cm	1,39	2,67	47,9	5,3	>35,1	under 10
	A/C 18-56 cm	1,51	2,72	44,5	4,4	>35,1	under 10
	C under 56 cm	1,58	2,76	42,8	2,8	>35,1	under 10
III	A_p 0-16 cm	1,45	2,70	46,3	9,0	~33	under 10
	A_c 16-31 cm	1,50	2,68	44,0	10,2	~30	under 14
	A_0 31-53 cm	1,57	2,74	42,7	4,2	>35,1	under 10
	A under 53 cm.	1,51	2,73	44,7	8,1	>35,1	under 10

Table 3
The main chemical features of the studied soil profiles

Profile	pH	Humus %	Total nitrogen %	mobile phosphorus ppm	mobile potash ppm	EBS Me/100 g. sol	HS Me/100 g. sol	T Me/100 g. sol	V with pH 8,3
A_0 0-25 cm	5,82	1,72	0,088	19,5	45	2,4	1,0	3,4	70,5
AC 25-101 cm	6,46	0,36	0,020	16,5	24	1,8	0,4	2,2	81,8
C under 101 cm	6,61	0,12	0,007	14,0	12	2,0	0,2	2,2	90,9
A_0 0-18 cm	6,22	0,84	0,116	67	50	2,8	0,7	3,5	80,0
A/C 18-56 cm	6,48	0,48	0,028	61	22	3,0	0,6	3,6	83,3
C under 56 cm	6,81	0,40	0,022	38	34	-	-	-	-
A_p 0-16 cm	5,97	1,48	0,084	94	106	4,4	1,6	6,0	73,3
A_c 16-31 cm	5,32	0,76	0,040	45	58	3,6	1,9	5,5	65,4
A_0 31-53 cm	5,65	0,44	0,024	41	38	2,0	0,8	2,8	71,4
A under 53 cm.	6,48	0,40	0,024	15	54	3,0	0,5	3,5	85,7

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UNCONVENTIONAL AGRO-TECHNIQUE VITICULTURE IN THE STEFANESTI-ARGES VINEYARD

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Keywords: grape marc, wine distillation residue, minim tillage, green fertilizers.

ABSTRACT

The improvement in the relative short time of the hydro-physics characteristics of soil and the improvement its nutrition dowry by renunciation at classic methods of chemical fertilization and mechanic maintenance by repetition mobilization of soil from the interval between the rows of grape-vine.

Reconstruction and improvement of micro-flora and micro-fauna from soil, supplementation reserve mineral-organic of soil and improvement features hydro-physics by the impact of system “no tillage” and or “minim tillage” a maintenance of soil.

Reaffirm the concept of ecological viticulture at the place which must to occupy in the framework of viticulture technology used viticulture producers of viticulture from Romania.

INTRODUCTION

By extension, transfer and effective application of these modern ecologic techniques in the production, will can be realize a series of immediate results:

- The improvement hydro-physics features of soil, which will lead at insurance good conditions of growing and development of system of root from plants of grape-vine
- The growing capacity of resistance from soil at hydrical erosion from surface, bring by the impact of drop of rain, by improvement intern drain, by reduction natural and artificial of settle and compaction, by reduction hydrical instability of soil structure
- the reduction of chemical pollution of soil, by total elimination of chemical fertilizers and them substitution with green fertilizers and ecologic fertilizers, but and by using leaf fertilizers applied in the same time with the phyto-sanitation treatments, fertilizers which have second produces (residues) proceeding from vinification (wine distillation), by one hand, or macro and microelements soluble in the small quantities, but enough for completing mineral deficit from soil, by another hand.

MATERIAL AND METHODS

Experimental variants:

Fertilization “in tandem” with grape marc and wine distillation
Fertilization with green fertilizers
V1 – unfertilized witness;
V2 – fertilization with grape marc and wine distillation residue
V3 – green fertilizers
V4 – stable garbage

Organic fertilization with residue industrial compost from wood industry
V1 – unfertilized witness;
V2 – fertilization with 40 t/ha stable garbage;
V3 – fertilization with 40 t/ha residue industrial compost from wood industry
V4 – fertilization with chemical complex fertilizers: N P K.

RESULTS AND DISCUSSION

In this meaning, can be remembered the following results

- the improvement features physics – chemical of soil
- the reduction of financial expenses for mechanic maintenance of soil from the interval between rows of plants;
- the reduction of soil pollution, of the water land and air
- the transfer of some macro and microelements from grape marc and wine distillation in the soil solution and in plants;
- the increasing the resistance capacity of grape vine to the thermical stress (low temperature) and at the specific diseases (Plasmopara viticola, Uncinula necator), this positive impact being identified by increased fertilization of plants, so in an improved productivity.
- The increasing maturation degree of annual elements of crop, through great viability of crop eyes, due whole keeping of the leafs plants in a healthy and vigorous state
- The reduction of costs unconventional technology by using with the purpose of the grape vine fertilization of the food residues that came from grapes, vine and wood industry, fertilizers token at a low price much smaller than that of the chemical fertilizers or even stable garbage
- The increasing of financial aspects of vineyard surface, by using some fragments of viticulture technology at a lower price

a) The medium values at the soil compacted in experimental variants fertilized with second products and with green fertilizers presents a reduction of density and settle and compacted degree the fact which induce in soil an good air degree for growing and developing root system of grape vine

b) From the second graphic result's the link between settle and compacted degree on one side with total porosity values; high values of the porosity are reversed proportional with low values of main indicators hydro-physics of compacted degree, this correlation confirming the laws of soil physics through at a high settle corresponds a low porosity

These two aspects come to support the adopting the agro-techniques unconventional applied the soil because:

- ensured in the soil un equal ratio between air and water
- in soil it's producing an air quantification degree through low values of the DA, GT, GC;
- root systems of plants receives much more water from rains, it's possible because the soil have a better drain.

c) It has been determined the porosity degree of the soil by pores diameter, variants which are components of unconventional agro-techniques it is detaching from experimental block, the high values of porosity ensure in the soil a good regime agro-hydrical and it ensures good conditions for growing and developing of root system

d) The drain porosity, formed from pores with large diameters representing in fact that categories of pores through which the water flows gravitational (water excess) and that in all the cases is filled with air ; in this sense the fourth graphic shows the correlation between total and drain porosity, that in the case of variants fertilized with green fertilizers and residues presents also the higher values, and also a positive and direct correlation.

e) The microbiological activity of the soil it is direct and positive correlating with the aerohidric regime, this state is created due the organic fertilization incorporation. The coefficient of air degree of the soil ensures a best supply of the soil with air, and it also gives best conditions of life for micro flora. This porosity has grown both in green fertilization variants as in the one with wine distillation The maintaining system “no tillage” but also the quantity of wine distillation gives a good air degree.

f) The sixth figure shows the impact of vegetal carpet installed at the interval surface between the rows of vine plants(the variant with green fertilizers) about both two indicators which quantified the capacity of restraint of water from soil. It is observed in both fertilization variants the high values of total capacity for water and for total porosity. This modern system, ecologic and in the same time no-pollution to maintenance of soil representing a important step of this agro – technique system unconventional characterized by eliminated of work superficial mobilization to soil (fertilization with green fertilizers) but and through ensuring an surplus organic nutritive compatible with soil solution.

g) The impact positive of incorporation in soil of residue industrial compost from wood industry shows a state at superior air degree with impact positive about intern superior drain, so it is ensuring good conditions for micro flora and micro fauna. Seventh graphic shows the positive purpose of the physical values quantified through high values of conductivity hydraulic saturated which involve the same good values of compacted and porosity.

CONCLUSION

After three years of experiment, modern technologies applied in the Institute for research and developing for Viticulture Stefanesti-Arges, showed:

- the eco-biological fertilization of vineyard with second products providing from Complex of vinification and from wood industry, contribute at the improved features chemical-physics of soil, at reduction pollution degree of environment(soil, water, atmosphere).
- Applied in tandem of grape marc at soil and a wine distillation at leaf but and a second products from wood industry contributed in the same time at increasing the viticulture productivity through reduction the financial cost for applied chemical fertilizers
- The eco-biological fertilization with green fertilizers and applied the maintenance system of soil “minimum tillage”.
- This agro-technique segment to maintenance of soil, through vegetal carpet of interval between rows of vine plants constituted from mix annual plants with a great vegetative mass influenced positive all the hydro-physics and physics indicators. In the same time the organic rest annually incorporated in the soil bring their surplus at improvement nutritive balance of soil, through his compensation with macro and microelements and organic materials.

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Figures

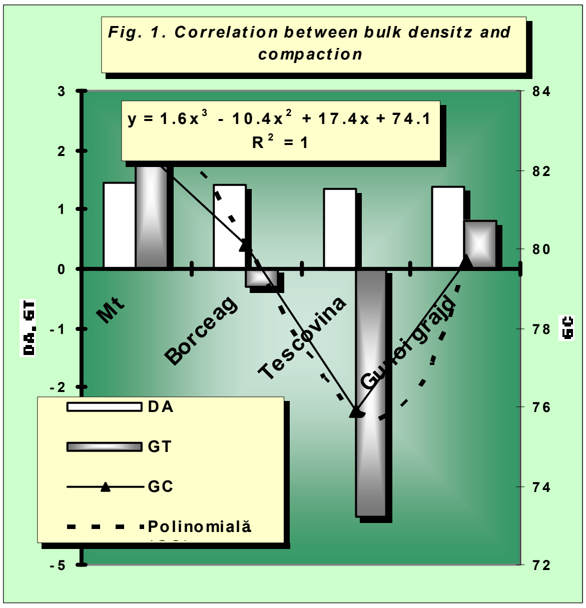


Fig. 1. Correlation between bulk densitz and compaction

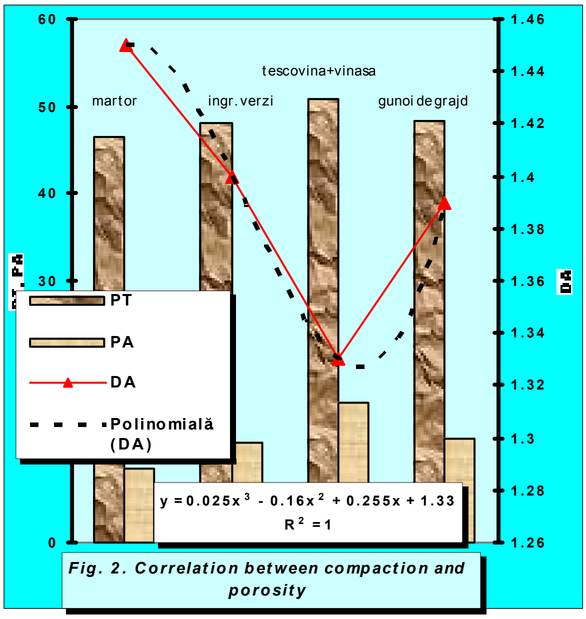
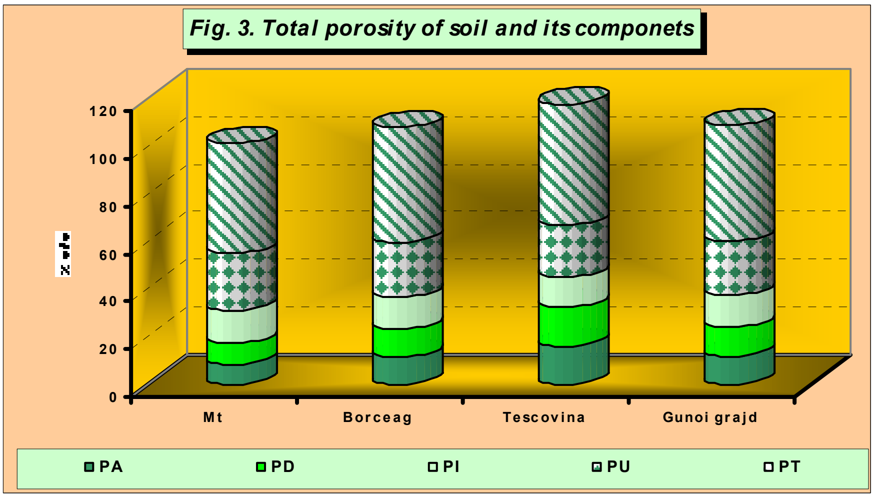


Fig. 2. Correlation between compaction and porosity

Fig. 3. Total porosity of soil and its componets



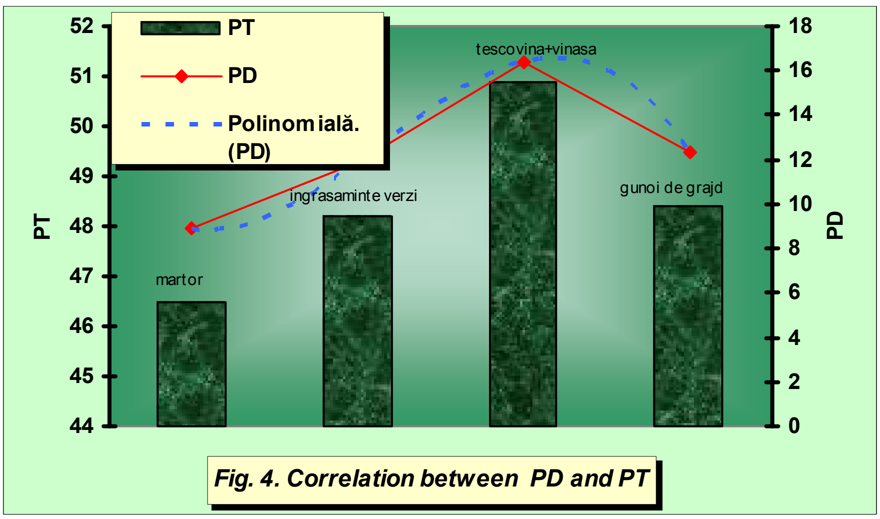


Fig. 4. Correlation between PD and PT

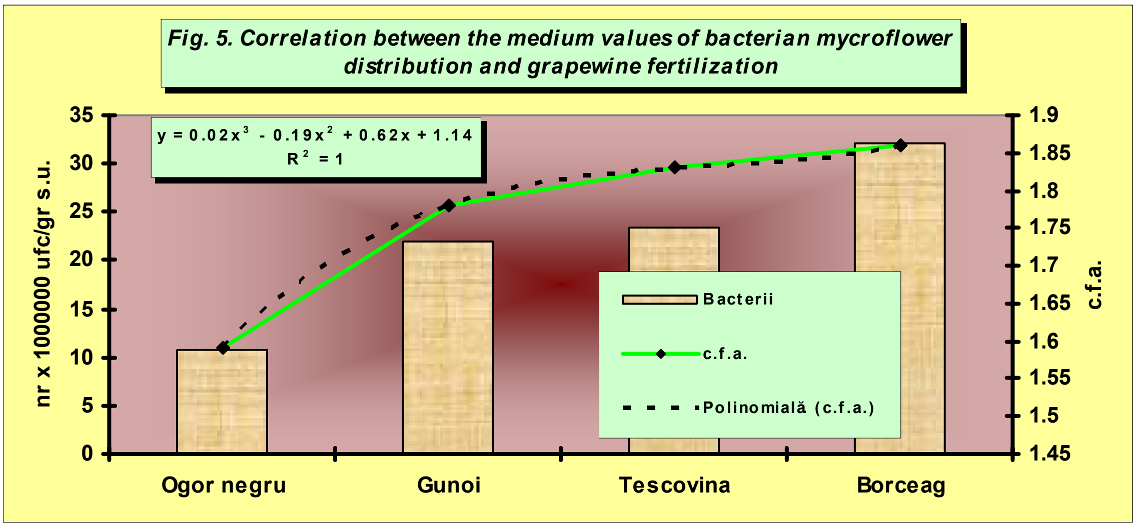


Fig. 5. Correlation between the medium values of bacterian mycroflower distribution and grapewine fertilization

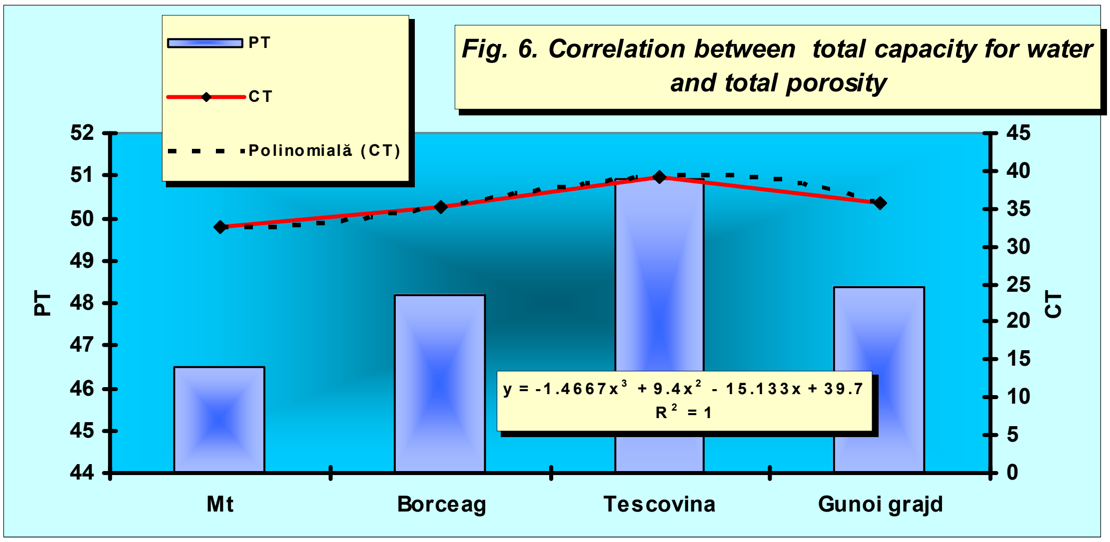


Fig. 6. Correlation between total capacity for water and total porosity

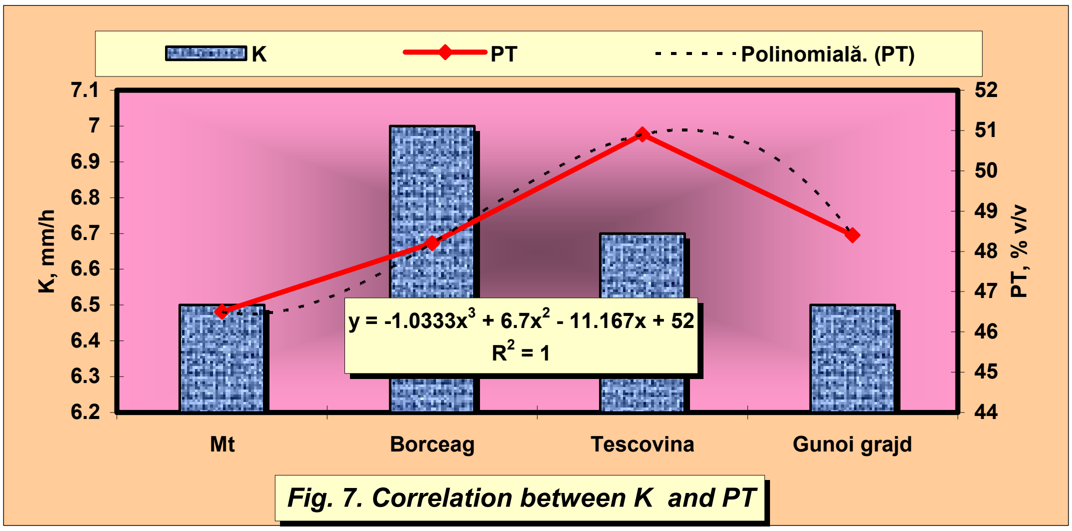


Fig. 7. Correlation between K and PT

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RESEARCH CONCERNING THE DRY MATTER ACCUMULATION AT GRAPEVINE AND ITS INFLUENCE ON GRAPE QUALITY

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Keywods: *Vitis vinifera*; Fetească regală cultivar; pruning; bud load; biomass, leaf area.

ABSTRACT

The experiments were realized in 2003-2004 with Fetească regală cultivar, 21 Bl clone, grafted on Kober 5 BB, usind five types of pruning (multiple Guyot; Guyot with periodically renewed arms; Guyot on demi-high stem; Cazenave cordon and spur-pruned cordon) and three bud loads (10; 15 and 20 buds/m^2). The productivity of the leaf area was proven to be optimal at values of 7-12 cm^2/gram fruit, corresponding to a dry matter quantity of 4 500-6 000. The greatest sugar accumulation at grape maturation in 2003, were registered at renewable dry matter values of 3 500-4 500 kg/ha.

INTRODUCTION

The whole biomass accumulation at grapevine, as a perennial wooden plant presents a special importance not only on the quality of the grapes, but also for the environmental unfavorable conditions. It also influences the behavior of the grapevine within the following annual vegetation cycles (Martinez de Toda F., Sancha J.C, 1998; Carbonneau A., Cargnello G., 2003; Delpuech X. et al., 2004).

The different training forms of the grapevine, pruning types and bud loads given at pruning have determined important modifications concerning the distribution and accumulation of dry matter in different parts of the vine (Pelaez H. et al., 2000; Carbonneau A., 2003).

As a result of the nutritive deposits in the plant, the grapevine has a high adaptation potential at different stress periods (Keller M., 1995).

The objective of this study is represented by the qualification of the influence of different pruning types and bud load on the renewable dry matter accumulation in the aerial part of the plant and its influence on the grape quality.

MATERIALS AND METHODS

The research was done between 2003 and 2004 in the didactic field of the Viticulture and Enology Department from the Faculty of Horticulture, U.S.A.M.V. Bucharest.

The experimental plantation was established in 1995 with Fetească regală cultivar, 21 Bl clone, grafted on Kober 5 BB rootstock, spacing at 2.2/1.2 m.

The determinations realized considered the quantity of wood removed at pruning (kg/vine), the grape yield (kg/vine), the sugar concentration at grape harvest (g/l), the leaf area (m^2/vine), the renewable dry matter of the aerial part (kg/vine) and the sugar yield (kg/vine).

Five types of pruning were studied (multiple Guyot; Guyot with periodically renewed arms; Guyot on demi-high stem; Cazenave cordon and spur-pruned cordon) and 3 bud loads (10; 15 and 20 buds/m^2).

The renewable dry matter of the aerial part has been estimated by summing up the value of dry matter of the pruning wood with the one of the grapes (Carbonneau A., 2003).

The pruning dry weight (kg/vine) was determined as follows: pruning weight x 0,50 (dry weight/pruning weight).

The dry weight of cluster was calculated as follows: yield x 0,20 (cluster dry weight/cluster fresh weight).

Total sugar production per vine (g) was determined as the product of "sugar concentration (g/l) x yield/vine (kg) x 0,72 (l/kg)", after Martinez de Toda F. and Sancha J.C. (1998).

The leaf area productivity has been determined by reporting leaf area (cm^2) to the grape yield (g), obtaining, this way, the leaf area necessary for realizing a gram of fruit.

Considering the qualitative level of the yield, the leaf area productivity has been estimated by rapport of the leaf area (cm^2) to the sugar production (g). This way, the leaf area necessary for realizing a gram of sugar has been obtained.

RESULTS AND DISCUSSIONS

Following different types of pruning and bud loads given at pruning, in 2003 there has been obtained a quantity of renewable dry matter of aerial parts of the vine comprised between 2 330 and 6 630 kg/ha. Following the relation between the renewable dry matter and the leaf area productivity expressed through the index "leaf area necessary for realizing a gram of matured fruit" (figure 1), it can be noticed that at higher values of the dry matter, a more reduced leaf area is needed (of only 7-12 cm^2), comparative to the situation in which the vine has accumulated less dry matter.

The climatic conditions in the second half of the vegetation period in 2003 have lead to obtaining high sugar concentrations in the grapes, rarely encountered with Fetească regală cultivar, more precisely between 197 and 220 g/l.

Between the renewable dry matter of the aerial parts of the vine and the sugar accumulations in the fruit at grape maturity, there has been evinced the existence of a parabolic correlation (figure 2). The maximal sugar concentration was registered at dry matter values of 3 500 - 4 500 kg/ha, values which are close to those announced by Carbonneau A. (2003).

Correlating the dry matter (kg/vine) with the sugar production (kg/vine), there has been obtained a linear correlation represented in figure 3, following the conditions of a correlation coefficient distinctly significant ($r = 0,88^{**}$). This way, while the dry matter grows almost thrice (from 0,6 to over than 1,7 kg/vine), the sugar production obtained in the grapes of a vine is double (from 0,35 to 0,70 kg/vine).

Following the character of the relation between the dry matter (kg/vine) and the leaf area productivity, considering the qualitative side of the yield (cm^2 leaf area/g sugar), there can be noticed the existence of a linear correlation (figure 4) distinctly significant negative ($r = - 0,82^{**}$). Thus, while the dry matter on the vine raises, the leaf area necessary for the production of a gram of sugar lowers from 100 to 50 cm^2 leaf area/g sugar.

CONCLUSIONS

1. The grapevine behaves differently in its repartition and accumulation of the dry matter in different vine parts in function of many factors.
2. Practicing different types of pruning and bud loads with Fetească regală cultivar, there has been noticed an accumulation of considerable quantities of renewable dry matter in the aerial parts of the vine (grapes and wood), comprised between 2 330 and 6 630 kg/ha.

3. The productivity of the leaf area was proven to be optimal at values of 7-12 cm^2/g fruit, corresponding to a dry matter quantity of 4 500 – 6 000 kg/ha.
4. The greatest sugar accumulations at grape maturation, in 2003, were registered at renewable dry matter values of 3 500 – 4 500 kg/ha.
5. The production of sugar on vine is in direct correlation with the renewable dry matter of the aerial part of the vine.
6. While the dry matter of the aerial part is growing, there can be noticed a lowering of the rapport values "cm^2 leaf area/g sugar"; for the accumulation of one sugar gram we need a reduced foliar surface.

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Figures

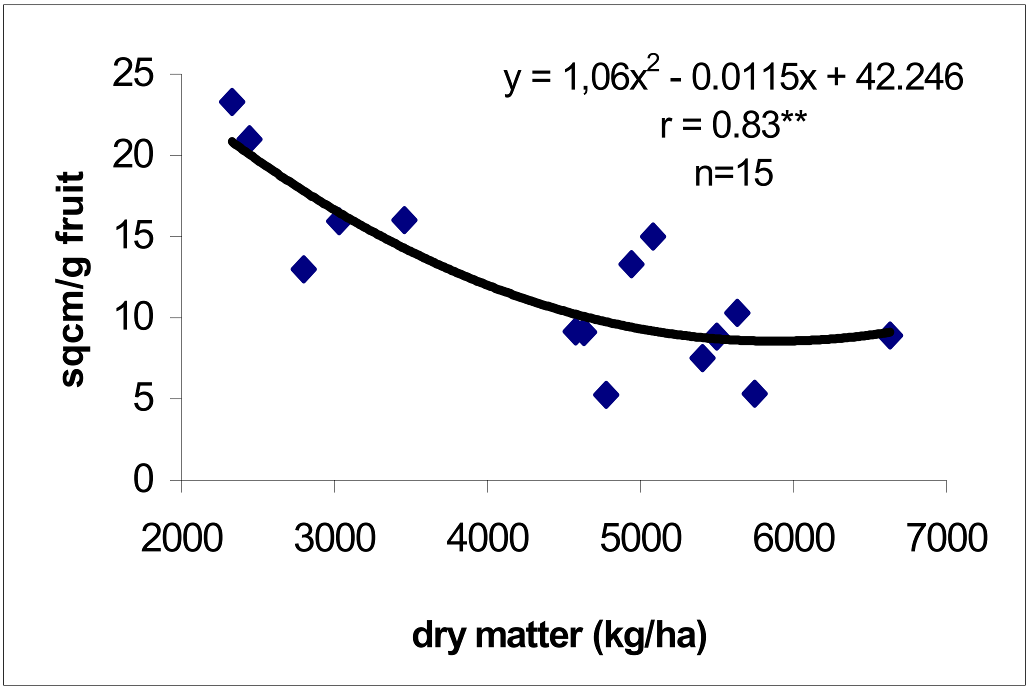

Fig. 1 – The correlation between the renewable dry matter of the aerial part (kg/ha) and the proportion "cm^2 leaf area/gram fruit" – 2003

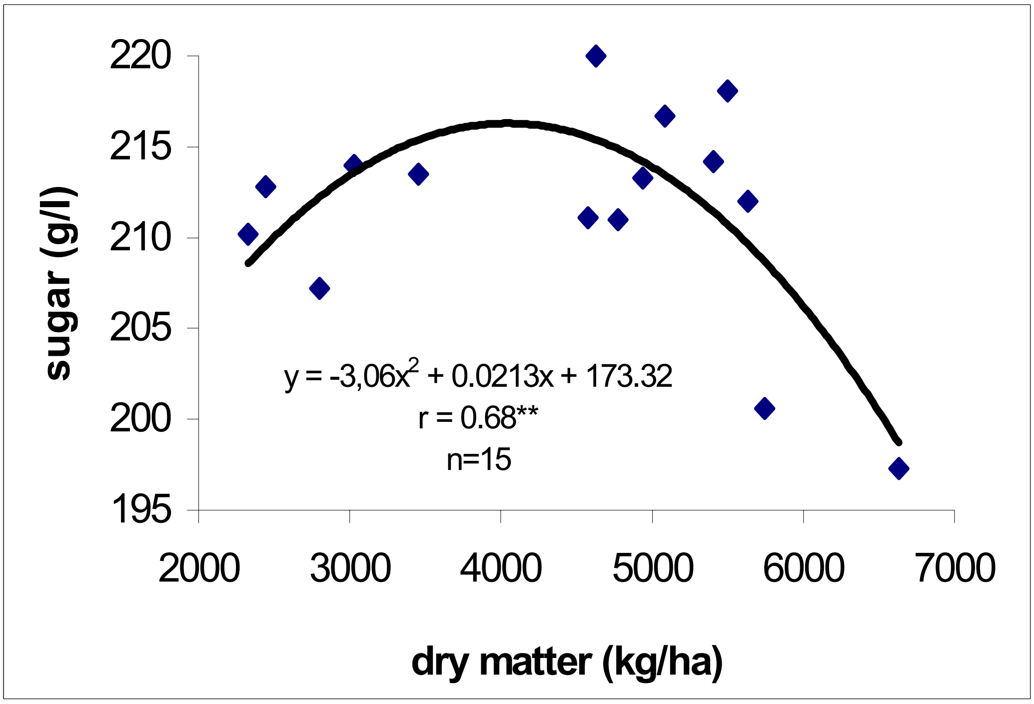

Fig. 2 – The correlation between the renewable dry matter of the aerial part of the vine (kg/ha) and the sugar accumulations in the fruits (g/l) - 2003

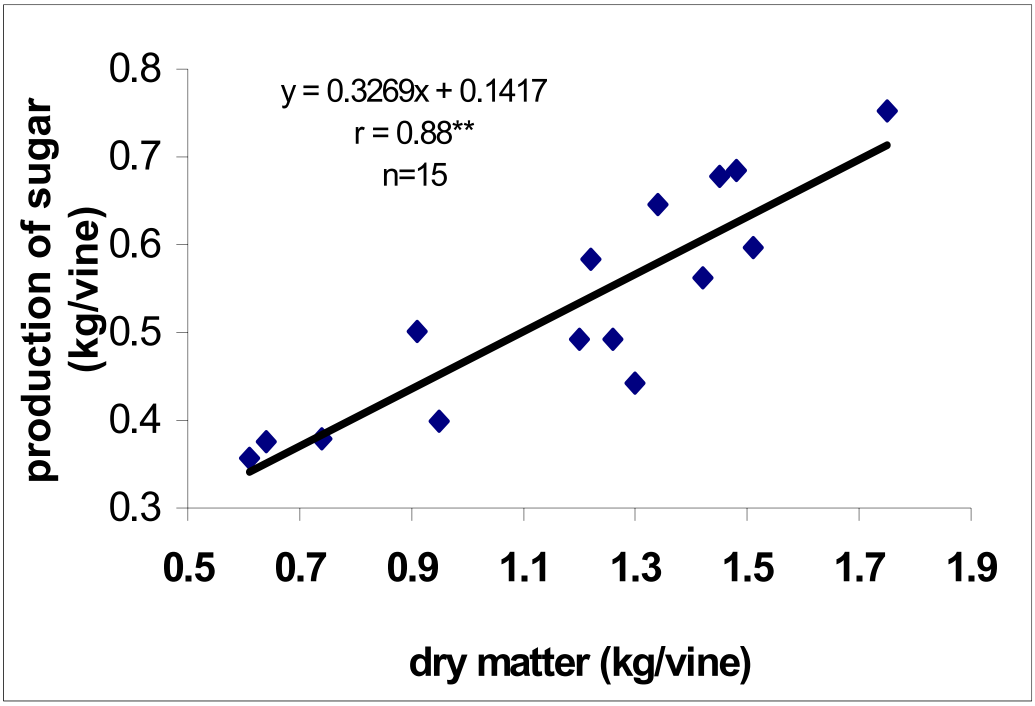

Fig. 3 – The correlation between the renewable dry matter of the aerial part (kg/vine) and the production of sugar (kg/vine) 2000-2003

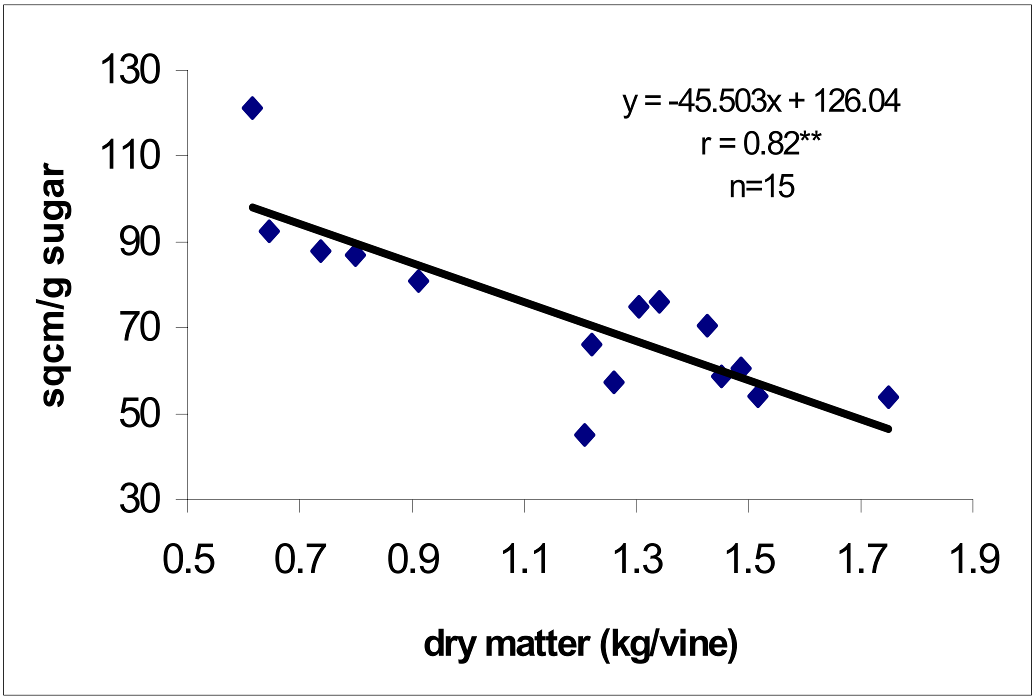

Fig. 4 – The correlation between the renewable dry matter of the aerial part (kg/ha) and the leaf area productivity under a qualitative level (side) (cm^2 leaf area/gram sugar) – 2003

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

ASPECTS CONCERNING THE SOME FACTORS WHICH DETERMINED THE EROSION PROCESSES IN THE VITICOL PLANTATIONS PLACED ON SLOPING AREAS, WITH REFERENCE AT THE "DEALU BUJORULUI" VINEYARD, DISTRICT GALATI

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Keywords: rainfall, intensity, soil, viticultural, terraces, grassing bands.

ABSTRACT

The paper presents the research obtained in 2001-2002 period, in the Bujoru vineyard, with reference by the some factors which determined the erosion process. After the observations and determinations effectuated, it my draw the conclusion that the erosion process is determined in principal, by the: a) rainfall intensity and spot of the torrent core; b) area with the slopes between 12-18%; c) slope protection system (grassing bands, terraces with horizontal platform). The rainfall, through fall frequency, intensity and quantitative various and also the manner of soil working in experimental plots, determined a erosion of the soil in the wine vegetative period. In the examined period of time a monotonous distribution of rainfall can be mentioned, with short periods of rains and long periods of pluviometrical lean. The rainfall in the examined period had a strong critical aspect, especially about their repartition uniformity, uncorrelated with vegetation phenophases. The pluviometrical lean cumulated with different intensity of the rainfall had evil effects on erosion processes.

INTRODUCTION

On the gradient lands, cultivated with vine, as a result of the consecutive and torrential rainfall in the vegetative period, take place erosion processes materialized through solid/liquid runoff.

The extension of the viticol plantation placed on the sloping imposes the improvement of the arrangement method for the land, which guarantee the control of the soil erosion processes. Also, as a result of the erosion processes on the slope, changes on some of the ecopedologic determining (humus, texture, total porosity) appear. It is necessary using methods of system, which are not to lead at erosion and weathering the environment and application of the length of time agricultural strategy and consolidation of the rules of the soil conservation. The vine is a plant, which uses the best eroded ground, but it must look that, on these, the soil erosion processes is manifested with big intensity.

MATERIALS AND METHODS

The experiment was effected in a vine plantation established in 1986 year, on the slope ground 12-18%, with a E and W-exhibition. The ground is arranged in terraces with horizontal platform and grassing band placed by the 20 m distance. It was followed the aspects in the connection with the some factors which determines the erosion processes as results of the precipitations in the active vegetative period, between the 2001-2002years.

Obsevations and determination:

1.The climatic annual conditions, rainfall.

2.The characterization of the rainfall with torrential character in the active vegetative period, during the 2001-2002 years.

3.The estimation of the erosion of the soil through the measure of gutters volume produced (m^3/ha/year).

4.The colmataged area (m^2).

RESULTS AND DISCUSSIONS

The viticol centre of Bujoru represents a part from the "Dealu Bujorului" vineyard, which, generally, is characterized by low hydrous resources (CH=0,91) in the conditions of sufficient high temperatures. To illustrate suggestive the evolution of the rainfall and of average temperatures in the active vegetative period these values represented graphically (Fig.1, Fig.2).

The soil characteristics in the experimental plot are correlated with the soil type (chernozem).

A part of the precipitation in the vegetative period (2001-2002) had a torrential character with a maximum intensity I_{15}, between 0,80mm/min/16VIII/2002 and 0,93mm/min/5VI/2001 (table 2). The maximum intensity I_{30} and I_{60} was registered in 5.VI.2001 (I_{30} =0,68mm/min and I_{60} = 0,50 mm/min). In this period when we make the observations, the spot of the torrent core is generally placed in the first 15min of the rainfall in the Bujoru vineyard. The precipitations with torrential character in this period created erosion in the experimental plot (table 1):

- the maximum erosion of the soil for the clean fallow (3,2 m^3/ha/year);
- the minimum erosion of the soil for terraces variant (1,5 m^3/ha/year/2001).

The average of the colmataged area balanced between 1,7m^2/2001/grassing bands and 10,8m^2/2001-12,5m^2/2002/clean fallow.

CONCLUSIONS

1. The erosion processes of the soil on the experimental plot are heavy influenced from the rainfall intensity, spot of the core and side slope.
2. The spot of the torrential core in generally was placed in the first 15min of the rainfall in the Bujoru vineyard.
3. The soil erosion in the experimental plot has average values of 0,5….3,2 m^3/ha and year with maximum values for the clean fallow end minimum values for terraces variant.

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Figures

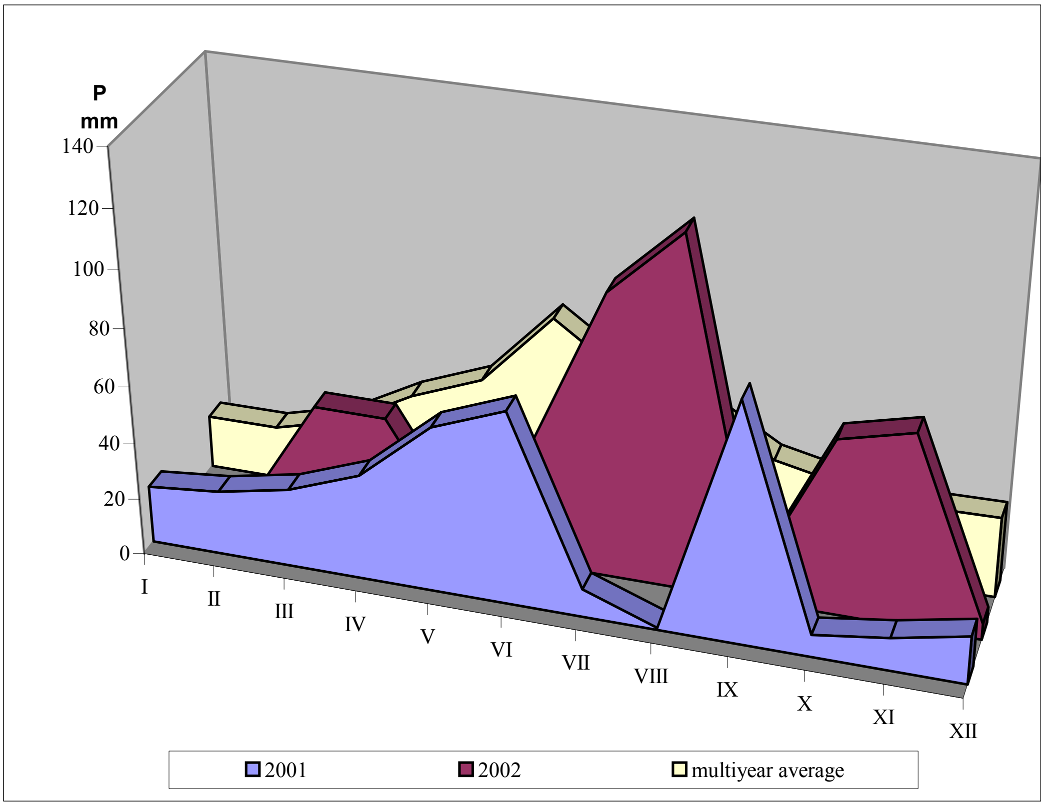

Fig. 1 The dynamic of the rainfall (mm)

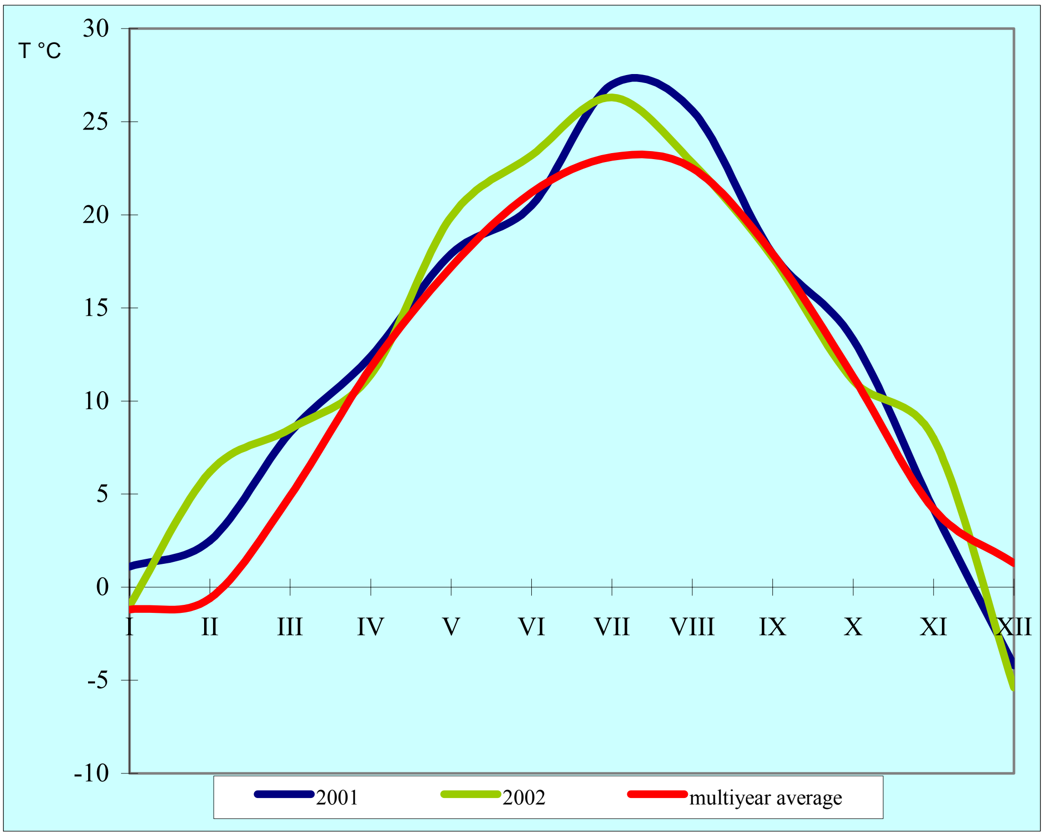

Fig. 2 The average temperature (°C)

Tables

Table 1 The Average Quantity of the Soil Yearly Eroded and Colmataged Area

Variant	Grassing bands		Terraces		Clean fallow	
year	2001	2002	2001	2002	2001	2002
Quantity of the soil eroded(m^3/ha/year)	1,9	0,5	1,5	-	3,2	3,2
Colmataged area (m^2)	1,7	-	-	-	10,8	12,5

Table 2 The Characterization of the Rainfall Torrential Character in the Vegetative Period

Date	Total quantity (mm)	Duration of the rainfall (min)	Average intensity mm/min	Duration of the maximum intensity (min)	Imax. (mm/min)	I_{15} (mm/min)	I_{30} (mm/min)	I_{60} (mm/min)
2001								
13 IV	20,3	65	0,31	7	0,98	0,64	0,41	0,33
23 IV	9,8	48	0,20	10	0,72	0,53	0,30	-
5 VI	48,2	320	0,15	15	0,93	0,93	0,68	0,50
21 VI	10,0	70	0,14	6	0,88	0,53	0,29	0,16
30 VI	10,9	55	0,19	6	0,86	0,46	0,27	0,14
6 IX	36,4	230	0,11	15	0,87	0,87	0,62	0,42
11 IX	26,8	115	0,23	7	0,71	0,69	0,65	0,32
2002								
12 VI	12,2	45	0,27	7	0,68	0,37	0,30	-
26 VI	13,0	30	0,43	10	0,63	0,56	0,43	-
21 VII	31,4	240	0,13	15	0,77	0,77	0,62	0,43
26 VII	39,5	185	0,21	20	0,70	0,70	0,63	0,35
16 VIII	44,2	155	0,28	15	0,80	0,80	0,60	0,40

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE BEHAVIOUR OF SOME VARIETIES AND HYBRIDS FROM THE EXPERIMENTAL VINEYARD FROM SC DVV MURFATLAR AT THE DOWNY MILDEW, OIDIUM AND BOTRYTIS IN THE NATURAL INFECTIONS CONDITIONS

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Keywords: vine varieties, phitosanitary status, main diseases attacks

ABSTRACT

In the 2004 year, in SCDVV Murfatlar centre was made studies on some varieties from the experimental plots and from ampelographic collection, concerning their behaviour of the downy mildew, oidium and botrytis attacks – in natural conditions of the infection. After the attack degree on the each variety and using own method for to appreciate the level of resistance and/or sensibility, the behaviour of the varieties had 6 estimation levels, as following: OR – variety or hybrid with some resistance, MR – variety or hybrid medium resistant, PR - variety or hybrid few resistant, MS - variety or hybrid medium sensible, FS - variety or hybrid very sensible. Following these classes of appreciation was obtained results concerning the behaviour of these variety or hybrid at the downy mildew, oidium and botrytis attacks. In the table group (new variety or perspective hybrids) was remarked the varieties Victoria, Azur, Silvana, Greaca, Cuzovski, Splendid, Sevka, Tamina, Dobrogea and hybrids: Italia x Perlette, Coarna alba x Afuz Ali, Alphonse L. x Italia, Cardinal x Afuz Ali, Cardinal x Perlette, Italia x Afuz Ali. In the wine group (new varieties) was remarked with some resistance the varieties: Mamaia, Magaraci,, Blauerzweigelt and Cramposie Selection. Concerning the resistant varieties like Brumariu, Chambourcin, Garonnet, Dattier de S. Vallier, Varousset, Roucaneuf, Perla de Zala, Seyve Villard 18402, in the condions of 2004 year was sensible at downy mildew not only on the leafs but also on the clusters, having however a god resistance at oidium and botrytis on the clusters. Between the basis varieties of the vineyard, only varieties Riesling Italian, Sauvignon, Pinot noir and Muscat Ottonel prouved some resistance at the diseases attack and the varieties Feteasca neagra, Cabernet Sauvignon, Merlot, Pinot gris and Chardonnay was very and medium sensible, especially at the downy mildew attack on the leafs and clusters.

INTRODUCTION

The promotion into vineyard of the varieties with resistance at the main disease attack is important in the context of the implementation of the integrated fight concept in viticulture.

The systematic observation made on the area and the diseases evolution help directly the producers by supplying data concerning the long and short term prognosis and a correct notifying for the next treatments who must be applied (Banita, 1977; Oslobeanu, 1980, 1991; Filip, 1994; Neamtu, 1994; Ciami, 2001; Ilie, 2004: Filip and Guluta, 2004; Ranca, 2004).

In this paper are presented the results concerning the behaviour of some varieties and hybrids of the main diseases attack in the natural (strong) infection conditions of the year 2004 in the Murfatlar vineyard.

MATERIAL AND METHODS

In the 2004 year, in SCDVV Murfatlar research centre was made observations concerning the resistance of the main diseases attack.

The observations on the downy mildew attack on leaf and clusters were made in 25-26.08 period and the oidium attack on the clusters was observed in 27-28.08 period, checking 500 organs in the 0-6 scale.

The attack of botrytis was noted before harvest with 3-4 days, using the same scale. With the obtained data was calculated the frequency (F) and intensity (I) of attack. The expression of the attack was presented by calculating the degree of the attack (GA% = F x I/100).

Because the GA values was between 0-100, was considered suitable to use the own scale of assessment of the behaviour of varieties and hybrids at the main disease attacks, as if presented: OR - variety or hybrid with some resistance (0-10 GA%), MR – variety or hybrid medium resistant (11-20 GA%), PR - variety or hybrid few resistant (21-30 GA%), MS - variety or hybrid medium sensible (31-50 GA%), FS - variety or hybrid very sensible (51-100 GA%).

RESULTS AND DISCUSSIONS

From the data presented in table 1, resulting that the climatic conditions of the 2004 year – vegetative period (May-September) in the Murfatlar centre the average air temperature was between 15,8 ^{0}C and 23,9 ^{0}C, the atmospheric humidity between 72 and 83% and the precipitations summed 382,5 mm from which 140,4 mm in May, 65,2 mm in June 31,0 mm in July and 144,0 mm in August. Was registered a high number of days with dew and mist.

In these conditions, rich in precipitations and atmospheric humidity, with numerous days with dew and persistent mist the downy mildew, oidium and botrytis attack was very strong, affecting mainly the clusters.

From the analysis of results it's came out that the studied varieties aren't immune at these diseases, even those from the varieties known like resistant.

The relationship between vine and diseases is in dependence of the specific features of varieties and the climatic conditions. From the specific features of varieties most important are the content in tannin, phitoalexines, antocyannes, sugar, acidity, nitrogen, the plant habitus, the density of berries on the cluster, the tickness, elasticity and resistance of berry skin, the thickness of the pruine shell, ... (Oslobeanu, 1980, 1991).

In the table 2 is presented the behaviour of some table varieties and perspective hybrids from the experimental plots at the main diseases attacks, in the conditions of 2004 year.

More resistant where the next varieties: Victoria, Azur, Silvania, Greaca, Cuzovski, Splendid, Sevka, Tamina and Dobrogea. From the hybrids category, more resistant are: Italia x Perlette, Coarna alba x Afuz Ali, Alphonse L. x Italia, Cardinal x Afuz Ali, Cardinal x Perlette, Italia x Afuz Ali.

The wine varieties and perspective hybrids behaviour is presented in the table 3.

Its came out that some resistance at diseases attack are the next varieties: Mamaia, Magaraci,, Blauerzweigelt and Cramposie Selection.

In table 4 is presented the behaviour of varieties with biological resistance at the mains diseases. Very sensible at the downy mildew attack, on the leafs, was the varieties: Chambourcin and Garonnet. The attack on the clusters was important at Perla de Zala and Seyve Villard 18402. The majority had some resistance at the oidium and botrytis attacks on the clusters.

Concerning the behaviour of the basis varieties from the vineyard at the mains diseases attacks it was observed a high sensibility of Feteasca neagra, for botrytis: Sauvignon and for oidium: Merlot (table 5).

Generally the red varieties were less attacked of oidium, being more resistant at the botrytis attack

CONCLUSIONS

1. The climatic conditions of the year 2004, at Murfatlar was favourable for the main diseases attacks: downy mildew, oidium and botrytis in naturals conditions of infections
2. Was marked a number of varieties and perspective hybrids that are some resistance at the attacks.
3. The futures programmes for the phytosanitary treatments must keep in consideration these data

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Tables

Table 1. The climatic conditions from vegetative period May-September 2004, Murfatlar centre

Month	The average temp. ^0C	Precipitation mm	No. of raining days	The atm. humidity %	Days with dew and mist
May	15,8	140,8	14	83	25
June	21,4	65,2	7	82	16
July	23,9	31,9	7	78	14
August	22,8	144,0	7	72	26
September	18,1	0,6	1	85	9

Table 2. The behaviour of some table varieties and perspective hybrids from the experimental plots at the main diseases attacks, in the conditions of 2004 year – Murfatlar centre

Crt. No.	Variety	Downy mildew/ leafs		Downy mildew/clusters		Oidium/clusters		Botrytis/clusters	
		GA%	Classification	GA%	Classification	GA%	Classification	GA%	Classification
Table varieties									
1	Muscat timp. de Buc	36,0	MS	59,2	FS	6,0	OR	14,9	MR
2	Aromat de Iasi	49,5	MS	38,9	MS	7,6	OR	4,4	OR
3	Calina	47,5	MS	32,0	MS	7,2	OR	13,4	MR
4	Timpuriu de Cluj	61,0	FS	49,0	MS	8,6	OR	9,5	OR
5	Cetatuia	70,0	FS	60,0	FS	16,0	MR	11,2	MR
6	Napoca	49,0	MS	49,0	MS	10,1	MR	11,3	MR
7	Augusta	57,3	FS	46,0	MS	8,5	OR	10,6	OR
8	Victoria	10,0	OR	8,3	OR	5,0	OR	9,3	OR
9	Azur	5,6	OR	9,3	OR	3,1	OR	5,7	OR
10	Splendid	14,1	MR	4,7	OR	2,5	OR	14,1	MR
11	Dobrogea	3,70	MR	5,6	OR	4,6	OR	8,6	OR
12	Silvania	4,0	OR	6,9	OR	2,0	OR	8,1	OR
13	Tamina	27,0	PR	8,2	OR	6,4	OR	17,9	MR
14	Greaca	5,6	OR	3,7	OR	5,2	OR	12,7	MR
15	Sevka	3,3	OR	12,2	MR	2,2	OR	13,4	MR
16	Cuzovski	6,0	OR	3,5	OR	3,8	OR	13,6	MR

Crt. No.	Variety	Downy mildew/ leafs		Downy mildew/clusters		Oidium/clusters		Botrytis/clusters	
		GA%	Classification	GA%	Classification	GA%	Classification	GA%	Classification
Table perspective hybrids									
1	Italia x Perlette	2,0	OR	2,0	OR	2,0	OR	3,8	OR
2	Sultanina x Aromat de Iasi	27,3	PR	23,0	PR	37,4	MS	11,1	MR
3	Perlette x Grasa de Cotnari	53,0	FS	53,0	FS	30	PR	8,8	OR
4	Coarna alba x Afuz Ali	8,3	OR	7,8	OR	3,6	OR	14,8	MR
5	Italia x Tam. rom.	2,7	OR	17,6	MR	17,8	MR	5,4	OR
6	AlphonseL.x Af.Ali	4,0	OR	11,0	MR	17,0	MR	2,5	OR
7	Alphonse L. x Italia	7,6	OR	15,0	MR	27,0	MR	3,4	OR
8	Cardinal x Perlette	14,0	MR	19,0	MR	10,0	OR	2,3	OR
9	Cardinal x Afuz Ali	1,8	OR	4,5	OR	2,0	OR	4,4	OR
10	Bicane x M.Ottonel	39,0	MS	59,0	FS	2,7	OR	3,4	OR
11	Afuz Ali x M. Hamburg	44,5	MS	49,0	MS	3,0	OR	3,1	OR
12	Afuz A x Perla de Csaba	44,5	MS	44,5	MS	4,0	OR	1,9	OR

Table 3. The behaviour of some wine varieties and perspective hybrids from the experimental plots at the main diseases attacks, in the conditions of 2004 year – Murfatlar centre

Crt. No.	Variety	Downy mildew/ leafs		Downy mildew/ clusters		Oidium/clusters		Botrytis/clusters	
		GA%	Classification	GA%	Classification	GA%	Classification	GA%	Classification
Wine varieties									
1	Blauerzweigelt	3,1	OR	7,2	OR	2,5	OR	2,6	OR
2	Magaraci	0,6	OR	1,8	OR	1,1	OR	10,1	OR
3	Mamaia	1,1	OR	1,4	OR	0,5	OR	5,6	OR
4	Cramposie Selection.	8,0	OR	31,5	MS	5,0	OR	15,3	MR
5	Furmint liber fecundat	37,0	MS	41,0	MS	5,1	OR	10,4	OR
6	Columna	49,0	MS	59,8	FS	5,1	OR	7,0	OR
7	Ozana	50,4	FS	69,6	FS	31,5	MS	6,8	OR
8	Babeasca gri	57,3	FS	65,4	FS	3,4	OR	10,9	OR
9	Codana	68,2	FS	67,8	FS	4,6	OR	12,6	MR
10	Miorita	72,0	FS	66,9	FS	3,5	OR	8,1	OR
11	Sarba	76,0	FS	75,0	FS	3,2	OR	4,7	OR
Wine perspective hybrids									
13	B.N x PN 111/50	43,4	MS	50,5	FS	6,2	OR	3,4	OR
14	Riesling I x Furmint	48,9	MS	59,1	FS	4,3	OR	2,9	OR

Table 4. The behaviour of some resistant varieties at the main diseases attacks, in the conditions of 2004 year – Murfatlar centre

Crt. No.	Variety	Downy mildew/leafs		Downy mildew/clusters		Oidium/clusters		Botrytis/clusters	
		GA%	Classification	GA%	Classification	GA%	Classification	GA%	Classification
1	Brumariu	36,3	MS	47,4	MS	4,0	OR	5,2	OR
2	Chambourcin	53,6	FS	43,8	MS	6,4	OR	5,9	OR
3	Garonnet	50,3	FS	39,7	MS	4,0	OR	3,7	OR
4	Dattier de S.	30,1	PR	32,4	MS	44,0	MS	4,1	OR
5	Verousset	36,0	MS	44,0	MS	3,6	OR	3,7	OR
6	Roucaneuf	46,0	MS	24,7	PR	3,9	OR	3,9	OR
7	Perla de Zala	43,5	MS	69,2	FS	1,7	OR	4,4	OR
8	Seyve Villard 18402	48,0	MS	52,6	FS	5,4	OR	3,4	OR

Table 5. The behaviour of the basis varieties at the main diseases attacks, in the conditions of 2004 year – Murfatlar centre

Crt. No.	Variety	Downy mildew/leafs		Downy mildew/clusters		Oidium/clusters		Botrytis/clusters	
		GA%	Classification	GA%	Classification	GA %	Classification	GA%	Classification
1	Chardonnay	46,0	MS	44,0	MS	1,2	OR	10,6	OR
2	Pinot gris	45,0	MS	39,0	MS	2,4	OR	7,3	OR
3	Riesling italian	3,5	OR	4,0	OR	1,3	OR	8,1	OR
4	Sauvignon	2,2	OR	1,0	OR	2,0	OR	19,7	MR
5	Muscat Ottonel	2,9	OR	34,0	MS	2,0	OR	2,0	OR
6	Merlot	2,7	OR	49,0	MS	2,9	OR	7,1	OR
7	Pinot noire	3,4	OR	6,4	OR	7,6	OR	7,3	OR
8	Cabernet Sauvignon	64,0	FS	30,1	PR	23,7	PR	10,3	OR
9	Feteasca neagra	64,0	FS	64,0	FS	17,0	MR	21,7	MR

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ACCLIMATIZATION OF GRAPEVINE EXPLANTS OBTAINED *IN VITRO*

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Keywords: *vitis,* rootstock, cultivars, micropropagation, explants, shoot

ABSTRACT

In vitro grapevine micropropagation it used for cloning and rapid multiplication of biological material resulting by improvement and virus free plants. It was studied two cultivars of *Vitis vinifera* L. (*Chardonnay*, *Pinot noir*) and one rootstock *Kober 5 BB.* A vegetative material represented by annual shoots was prelevating from the Ampelographic Collection of Viticulture and Oenologie Department - USAMVB. Biological material (meristematic apexes and axillary buds) was subject to many stages of *in vitro* multiplication: preparing, initiation and stabilization, multiplication, rooting and acclimatization.

INTRODUCTION

Grapevine can by multiplied by generative (seed) and vegetative methods (cutting, layering grafting, and *in vitro* cultures). *In vitro* multiplication supposed obtained the new plants and a good healthy state. The vegetative explants have a different origins: meristematic tissue, organs (buds, anthers, ovaries), callus cells or cells regenerated from protoplasts (Popescu V., Chira Lenuţa, Dejeu L., 2001)

This paper presents the results of using a disinfecting method and culture medium for obtained a great number of explants; the influence of nutritive mixture about vegetative and roots growths; the capacity of plants to adaptation in vivo conditions.

MATERIALS AND METHODS

Biological material (meristematic apexes and axillary buds) was prelevating to the *Vitis vinifera* L., cultivars *Chardonnay, Pinot Noir* and one rootstock *Kober 5 BB* The vegetative material was proceeded by Ampelographic Collection of the Viticulture and Oenologie Department. The explants prelevating has been performed from the annual shoots exposed to a forced process or from the offshoot prelevated during the vegetation period. Thereafter, explants have been supposed to many disinfecting agents in different time and concentration (mercury clorure 0,05%, ethanol 70º, DOMESTOS® 20%)

The culture medium used from explants inoculation was Murashige α Skoog (1962) with different hormone concentrations. These explants cover the many stage of *in vitro* multiplication: initiation, stabilization, multiplication, rooting and acclimatization. The last stage is progress in two phases:

- phase -I-plants was passed in sand and perlite protects by the bells of glass keeping in growth room at 18-24 °C, for 18-21 days;
- phase-II-transplanting in pot with nutritive mixture represented by: manure, peat, celery soil, sand and perlite (2:1:1:1:1) keeping in growth room at 18-24 °C (Emilia Vişoiu, 2003)

RESULTS AND DISCUSSIONS

In this paper was effecting different observations and determination about rooting and vegetative regeneration. By supplement the culture medium with different hormones (β indolilacetic acid and 6 benzilaminopurin) was increased a number and length roots and shoots. This observation was effecting by passed on *in vitro* from *in vivo* stage. (Table 1 a. and 1.b.).

In this two stages of acclimatization measured were performed. In end of the first stage is not note the significantly growth shoots of the studies plants. This is the result of difficult process to adapt of *in vivo* conditions. This problem appeared the most at shoots. In *vivo* condition the roots registered values from 44% (*Chardonnay cv.*) to 70% (rootstock *Kober 5 BB*)(Figures 1).

The measured realized in fore week after transplanting on nutritive mixture (manure, peat, celery soil, sand and perlite) showed the vegetative growth compared with the first stage, between 8,35%(*Kober 5 BB* rootstock) and 37,7%(*Chardonnay* cv.) (Figures 2).

CONCLUSIONS

These results showed the influence of culture medium composition (growth hormones) on development the vegetative organs and the roots.

De regeneration methods influence the plant reaction on this passed *in vivo* stage.

The compositions nutritive mixture influences a new development of roots and shoots.

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Tables

Table 1.a. Vegetative and root development registered in acclimatization of *vinifera* cultivars

Nr. Crt.	Cultivar	Substrat (sand, perlite)	Nr. Shoots/Plant	Lenght shoots (cm)				Nr. Leafs/Shoot				Nr. roots	Mean length of roots (cm)
				S1	S2	S3	S4	S1	S2	S3	S4		
1	Chardonnay (axillary bud)	sand	2	7	6	0	0	10	7	0	0	4	14.4
2	Chardonnay (axillary bud)	perlite	2	7	5	0	0	9	6	0	0	5	14
3	Chardonnay (axillary bud)	sand	1	3	0	0	0	5	0	0	0	5	7.5
4	Chardonnay (axillary bud)	perlite	4	3	4	3	3	4	3	3	4	6	10.4
5	Pinot noir (axillary bud)	sand	3	3	7	4	0	5	9	6	0	5	13.4
6	Pinot noir (axillary bud)	perlite	2	3	6	0	0	3	9	0	0	2	11.7

Table 1.b. Vegetative and root development registered in acclimatization *rootstock Kober 5 BB*.

Nr. Crt.	Rootstock	Substrat (sand, perlite)	Nr. Shoots /Plant	Length shoots (cm)					Nr. Leafs-Shoot					Nr. roots	Mean length of roots (cm)
				S1	S2	S3	S4	S5	S1	S2	S3	S4	S5		
1	Kober 5 BB (axillary bud)	perlite	3	5	4	3	0	0	7	7	5	0	0	2	4.25
2	Kober 5 BB (axillary bud)	sand	5	2	4	4	2	3	6	7	7	3	4	5	1.74
3	Kober 5 BB (axillary bud))	perlite	3	2	4	4	0	0	3	8	5	0	0	3	2
4	Kober 5 BB (axillary bud)	sand	1	3	0	0	0	0	6	0	0	0	0	5	2.04
5	Kober 5 BB (axillary bud)	perlite	2	8	11	0	0	0	9	12	0	0	0	5	6.54
6	Kober 5 BB (axillary bud)	sand	2	8	2	0	0	0	11	4	0	0	0	4	4.25
7	Kober 5 BB (axillary bud)	perlite	2	8	3	0	0	0	9	4	0	0	0	4	3.86
8	Kober 5 BB (axillary bud)	sand	2	6	4	0	0	0	9	10	0	0	0	7	2.38
9	Kober 5 BB (axillary bud)	perlite	1	6	0	0	0	0	5	0	0	0	0	5	3.34

Table 2 Influence of substrate about shoots and roots developments.

Nr. Crt.	Cultivar/ Rootstock	Acclimatisation date	Substrat (sand, perlite)	Nr. Shoot/Plant	Length shoots (cm)				Mean length of roots (cm)
					S1	S2	S3	S4	
1	Chardonnay	27.07.04	sand	2	5	1	0	0	21
2	Chardonnay	27.07.04	sand	2	5.5	7.5	0	0	14.5
3	Chardonnay	27.07.04	perlite	3	9	7	3	0	27.5
4	Chardonnay	27.07.04	perlite	1	2	0	0	0	19.7
5	Pinot noir	27.07.04	sand	3	9.5	5	3.5	0	28.5
6	Pinot noir	27.07.04	perlite	2	4	6	0	0	29
7	Kober 5 BB	2.08.04	sand	3	6	8.5	2	0	16
8	Kober 5 BB	2.08.04	sand	2	7	6	0	0	18.5
9	Kober 5 BB	2.08.04	sand	4	8.5	4	3	4	17.5
10	Kober 5 BB	2.08.04	perlite	2	4.2	2.8	0	0	13
11	Kober 5 BB	2.08.04	perlite	1	3	0	0	0	12.2
12	Kober 5 BB	2.08.04	sand	1	4.2	0	0	0	5
13	Kober 5 BB	2.08.04	perlite	3	2.5	5	3	0	6.5
14	Kober 5 BB	2.08.04	perlite	1	4.5	0	0	0	8
15	Kober 5 BB	2.08.04	perlite	1	3.3	0	0	0	4.6

Table 3 Influence of nutritive mixture about vegetative growth.

Nr. Crt.	Cultivar/Rootstock	Length/shoots (cm)			Nr. leafs/shoot		
		S1	S2	S3	S1	S2	S3
1	Chardonnay	6.2	2.5	0	6	4	0
2	Chardonnay	10	15	0	6	11	0
3	Chardonnay	11	9	6.5	10	6	7
4	Chardonnay	4	0	0	3	0	0
5	Pinot noir	10	8	5.5	12	6	6
6	Pinot noir	5	9.5	0	4	6	0
7	Kober 5 BB	11	12	5	6	6	3
8	Kober 5 BB	8	8	0	4	3	0
9	Kober 5 BB	10	8	0	4	6	0
10	Kober 5 BB	6	0	0	4	0	0
11	Kober 5 BB	4	0	0	3	0	0
12	Kober 5 BB	4.5	0	0	5	0	0
13	Kober 5 BB	2.5	5	0	2	4	0
14	Kober 5 BB	5	0	0	2	0	0

Figures

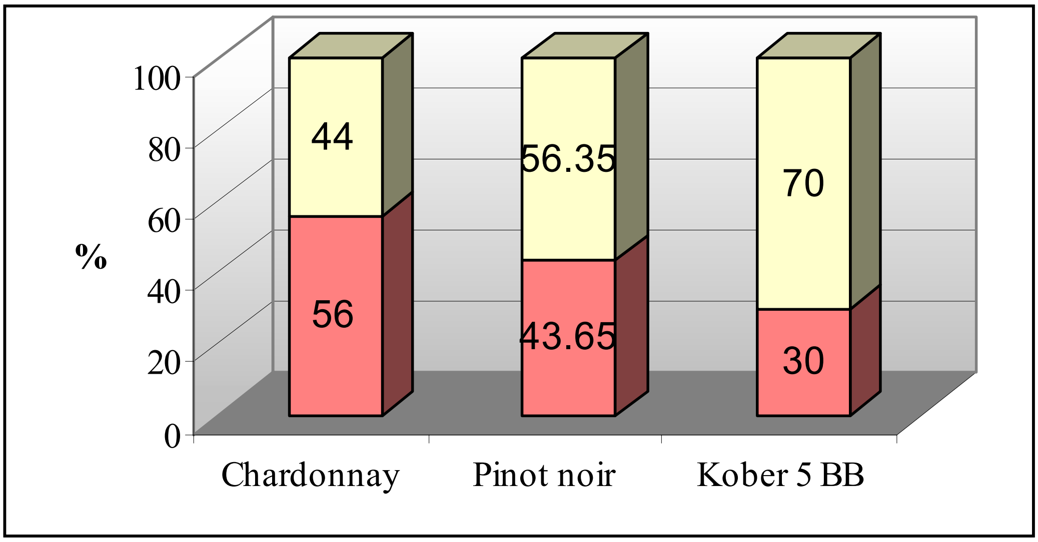

Fig. 1 Roots developments registered in 27.07.04-6.09.04

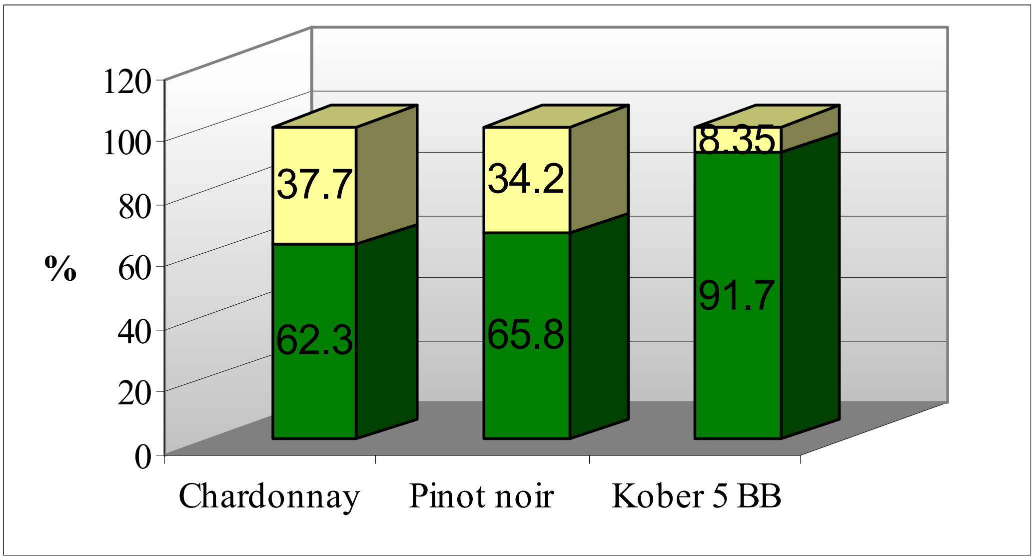

Fig. 2 Vegetative developments registered in 6.09.04-6.10.04

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RESEARCH REGARDING THE INFLUENCE OF THE DISINFECTING AGENTS ON GRAPEVINE EXPLANTS USED FOR *IN VITRO* CULTURE

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Keywords: *vitis,* rootstock, cultivars, micropropagation, explants.

ABSTRACT

The present paper has been performed with a view to initiate grapevine *in vitro* culture, to establish a method for biological material disinfecting. For this research it was used: ethanol 70º, mercury clorure 0,05% and a detergent - DOMESTOS® 20% (the active substance being natrium hypochlorite) The were used the following cultivars : *Pinot Noir, Chardonnay* and the *rootstock Kober 5 B*B. The vegetative materials have been obtained from the Ampelographic Collection of the Viticulture and Oenology Department - USAMVB.

The following experimental variants have been established: V1- ethanol 70º, 5 seconds + mercury clorure (HgCl) 0,05%, 6 minutes; V2- ethanol 70º, 3 seconds + DOMESTOS® 20%- 2 minutes.

INTRODUCTION

Micropropagation is a modern vegetative method having a higher rate of multiplication then the traditional ones (cutting, grafting, and layering). In this method it is used explants from different origins: meristematic tissue, organs (buds, anthers, ovaries), callus cells or cells regenerated from protoplasts (Popescu V., Chira Lenuţa, Dejeu L., 2001)

Using biotechnological modern methods is following obtains the values genotypes, with high productivity, stress resistant factors (drought, frost, salts, cations) and biologic resistant (disease and pests). Interesting results regarding plant regeneration using *in vitro* culture of cells and tissues, were obtained for *Vitis vinifera* species

The advantage for *in vitro* culture are: elimination of viruses, rapid multiplication, stoking and preservation planting material of grapevine to formatting a permanent source of value and healthy material using for micropropagation for anytime of year (Emilia Vişoiu, 2003).

The purpose of this paper was to present the research resultants to establish a method for disinfecting biological material

MATERIALS AND METHODS

The biological material has been represented by meristematic apexes and axillary buds prelevated from *Vitis vinifera* (L.), cultivars *Chardonnay, Pinot Noir* and the rootstock *Kober 5 BB.* The explants prelevating has been performed from the annual offshoots exposed to a forced process or from the prelevated shoots during the vegetation period. Thereafter, explants have been supposed to a disinfecting treatment using two experimental variants:

V_1- ethanol 70º - 5 seconds, mercury clorure 0,05% - 6 minutes, and washing with distillate water three times;

V_2- ethanol 70º -3 seconds, DOMESTOS® 20% - 2 minutes, and washing with distillate water three times;

The culture medium that has been used for explants inoculation was Murashige α Skoog (1962), with different hormone concentrations.

RESULTS AND DISCUSSIONS

The observations carried out after six weeks from in vitro cultures initiation showed significantly differences between inoculated cultivars explants and the used disinfecting experimental variant.

For the first disinfecting variant, the starting explants range:

- from 76,92% (*Chardonnay* cv.) to 5,56% (*Kober 5 BB* rootstock).- meristematic apex;
- from 94,4% (*Kober 5 BB* rootstock) - 23,1% (*Chardonnay* cv.)- axillary buds.

For the second variant, because of the high detergent concentration (DOMESTOS® (20%)), there was noticed the meristematic apex explants have been affected (*Chardonnay* and *Pinot noir* cvs., while in the case of the rootstock *Kober 5 BB* it was emphasized 37,5 % meristematic apex and 62,5% axillary buds sound explants (Table 1).

The mathematical correlation for the studied explants is presented by two functions:

- polynomial, for the sound meristematic apex explants;
- logarithmic, for the sound axillary buds explants (Figure 2).

The correlation coefficient for the first disinfecting variant was R^2= 1, for meristematic apex and R^2= 0,9998, for axillary buds. (Figure 2).

A ratio burns explants for first disinfecting variant was from 10% (*Chardonnay* and *Pinot Noir* cv.) to 25 % (*Kober 5 BB* rootstock) and for second disinfecting variant was from 20% (*Kober 5 BB* rootstock) to 70% (*Chardonnay* and *Pinot noir* cv.). (Figure 3)

A percentage infections explants for first disinfecting variant was from 15% (*Chardonnay* and *Pinot noir* cv) to 60%(*Kober 5 BB* rootstock) and for second variant just explants provided from rootstock *Kober 5 BB* was infected (12%). (Figure 4)

CONCLUSIONS

Our results demonstrated that the best disinfecting variant for the studied cultivars was V1 (ethanol 70º, 5 seconds + mercury clorure (HgCl) 0,05%, 6 minutes).

At *Pinot noir* cv. and the rootstock *Kober 5 BB*, using the axillary buds as biological material, it was the best method, for in vitro cultures initiation and stabilization.

In the case of *Chardonnay* cv., the meristematic apexes emphasized good results for in vitro culture.

Mathematical correlation between cultivars and explants types (meristematic apex and axillary bud) initiated *in vitro* cultures obtained the best correlation coefficients

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Tables

Table 1. The influence of the disinfecting variant regarding inoculation type explant

Cultivar	Disinfecting explants (%)			
	Variant1		Variant2	
	Meristematic apex	Axillary bud	Meristematic apex	Axillary bud
Chardonnay	76.92	23.1	0	41.17
Pinot Noir	14.29	85.71	0	35.71
Kober 5 BB (rootstock)	5.56	94.4	37.5	62.5

Figures

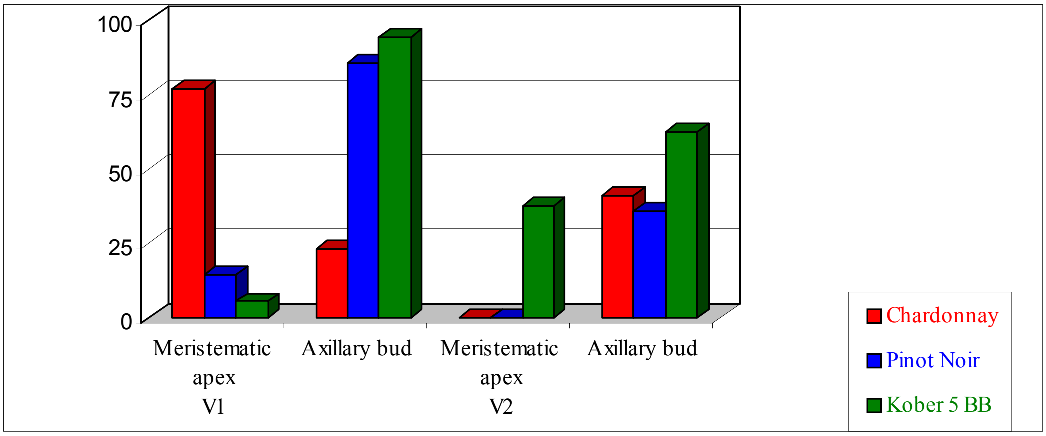
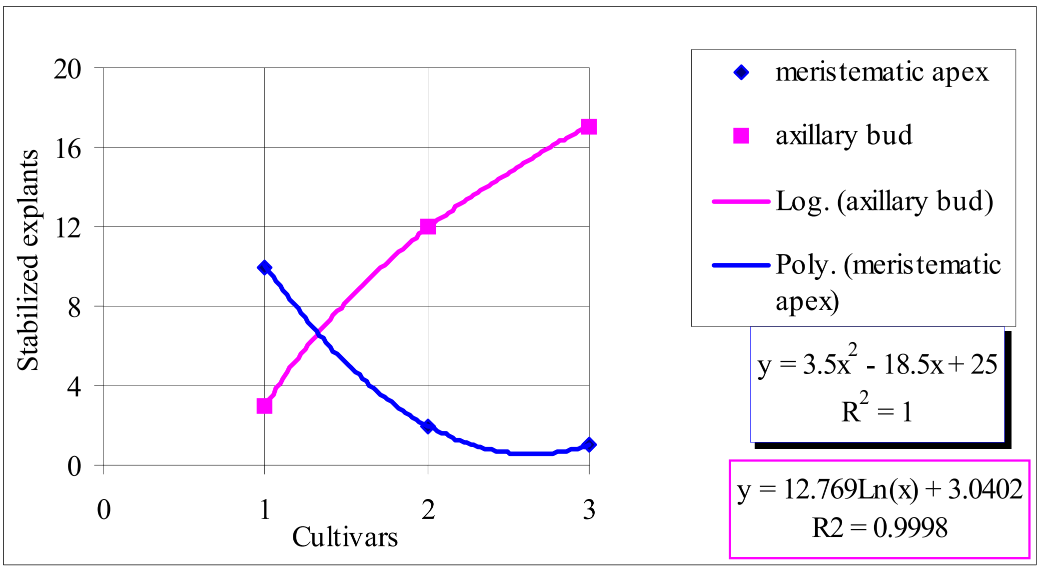


Fig. 1 Disinfecting explants the end of stabilization stage.



* 1- *Chardonnay*; 2- *Pinot noir*; 3- *Kober 5 BB*

Fig 2 Variation type of disinfecting explant depending on cultivar

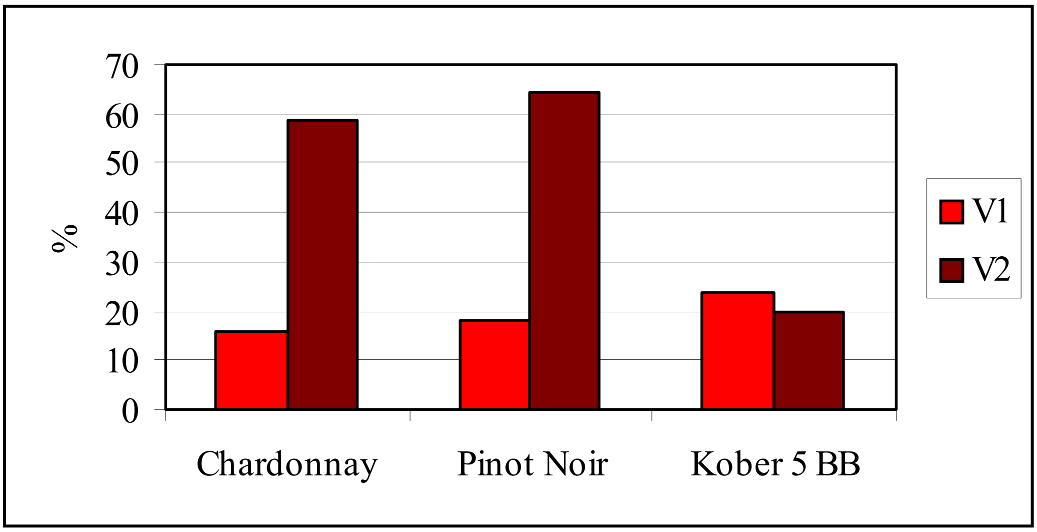


Figure 3 Explant burns depending on disinfecting variant

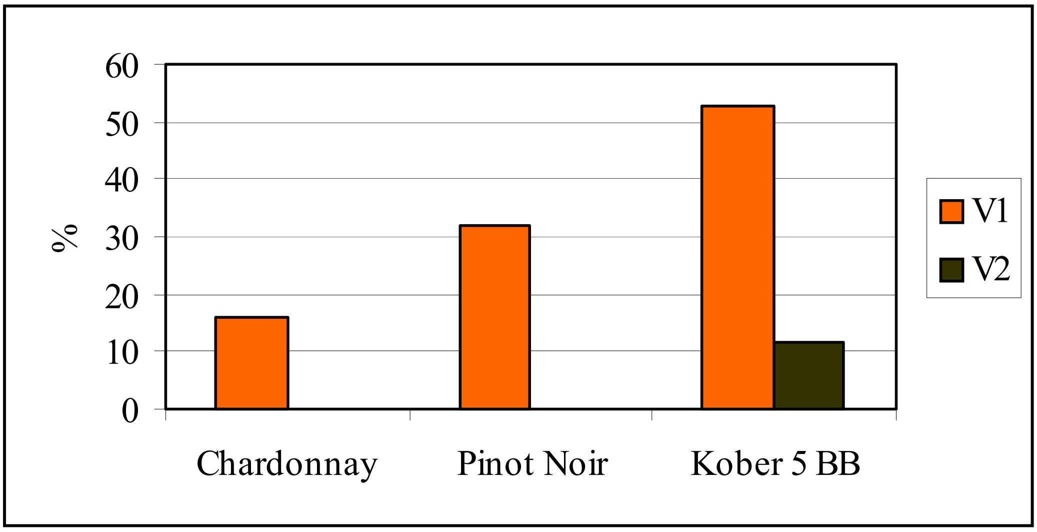


Figure 4 Infections explants depending on disinfecting variant

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

BIOCHEMICAL MODIFICATION INDUCED BY THE PRESENCE OF GRAPEVINE LEAFROLL ASSOCIATED VIRUS 3 ON MATURE PLANTS *(V. VINIFERA* L., FETEASCA NEAGRA CV.)

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Keywords: polyphenols, assimilating pigments, glucides, dDAS-ELISA, GLRaV-3

ABSTRACT

In order to study the biochemical and morpho-anatomical modifications of the grapevine in the presence of virus infection, a comparative investigation between healthy and GLRaV-3 infected mature plants belonging to Feteasca neagra cv. has been done. Virus infected grapevines showed perturbances of the growth concerning in down-rolling and reddning of the mature leaves on the low part of the bunches. No significant modifications of biochemical composition of infected leaves have been found. The quality of the grapes has occurred in correlation with the presence of the virus. Low amount of sugar in juice and higher acidity have been registered with virus infected grapes.

INTRODUCTION

Grapevine represents one of the most infected horticultural crop with different kind of viruses; the number of virus species which infects grapevine is 55, included in 20 genera and 6 families (Martelli, 2003). The presence of virus infection on grapevine leds to growth and metabolism perturbances with the *in vivo* (Walter, 1988; Walter and Martelli, 1996) and the *in vitro* (Barba et al., 1993; Visoiu and Buciumeanu, 2003) cultivated plants. Leafroll is second only to fanleaf in economic importance and is probably the most widespread virus disease of grapevine. Several viruses have been associated with the disease. Their presence in grapevine either separately or in various combinations is sufficient and necessary for the disease symptoms to appear (Bovey and Martelli, 1992).

The paper deals with the comparative investigations of healthy and grapevine leafroll associated virus serotip 3 (GLRaV-3) infected grapevine mature plants belonging to Feteasca neagra cultivar from the point of view of the biochemical aspects.

MATERIALS AND METHODS

Mature plants of GLRaV-3 infected grapevine and healthy plants (control) belonging to Feteasca neagra cv. were analysed under biochemical aspects. Infected plants in the field showed morpho-anatomical modifications and the presence of the virus was confirmed by dDAS-ELISA method (Clark and Adams, 1977), using commercial reagents produced by BIO-RAD France.

Biochemical modification were concerned with the determination of the content of polyphenols, soluble glucides, assimilating pigments in leaves; juice acidity and sugar accumulation in grapes.

RESULTS AND DISCUSSIONS

Observation concerning the GLRaV-3 infection upon the morpho-anatomical modifications with the Feteasca neagra cv.

GLRaV-3 infection produced the modification of the growth of the grapevines which did not influence the characteristics of the cultivar. Infected plants showed down-rolling and reddning between the major veins, while the major veins remain green.

Infected plants showed systemic infection on leaves, canes and clusters. The symptoms were observed specialy on mature leaves on the low part of the bunches (Fig. 1).

The symptoms of the leafroll diseases were not observed on healthy plants.

Observation concerning the GLRaV-3 infection upon the biochemical composition of the Feteasca neagra cv.

The polyphenols content of leaves has indicated low fluctuations at three stages of vegetation (before blosoming, after blosoming, veraison) and no signifficant differences between the healthy and virus infected material have been recorded (Table 1).

Following this results there is no evidence that polyphenols can used as biochemical indicator of phytosanitary state of grapevine. Differences between the healthy material and infected one have not always occurred by the increasing of the polyphenols content under the influence of the viral infection.

The glucides contents has been higher with the healthy leaves or the values were very close in the two type of biological material (Table 1).

The content of assimilating pigments (chlorophyll *a*, chlorophyll *b*, carotenoids) has fluctuated from one stage of vegetation to another within the same kind of material. No significant differences have been observed between the virus infected and virus free material regarding to the total amount of assimilating pigments. The total amounts of assimilating pigments in virus infected material was sometimes higher than in the healthy one when the carotenoids content increased (Fig. 2).

Observation concerning the GLRaV-3 infection upon the on quality of the grapes of the Feteasca neagra cv.

The quality of the grapes has occurred in correlation with the presence of the virus. The samples were prelevated three times after veraison (10.8; 10.09: 20.09.2004). Low amount of sugar in juice and higher acidity have been registered with virus infected grapes. Also, the weight of 100 berries was lower in GLRaV-3 infected fruits comparatively to the healthy grapes (Table 2).

CONCLUSIONS

1. Biochemical analysis helps to complete the range of investigations useful to a viral infection. As such modification represent a general response of plants to a virus and also another pathogene or factor of stress, virus detection based on the plant biochemical composition cannot be used as diagnosis method.
2. Grapevine leaf roll associated virus serotipe 3 infected grapevines showed specific symptoms of the virus disease. The modifications of the growth of the plants were not correlated with the biochemical content of the leaves.
3. The characteristics of the grapes were modified in the presence of virus infection; low amounts of sugar in juice and higher acidity have been registered with virus infected grapes.

4. Accurate studies of the disturbances induced by the virus infection in grapevine will allow a better understanding of virus – plant interactions mechanisms.

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Tables

Table 1. The polyphenols and soluble glucides content of GLRaV-3 infected leaves of Feteasca neagra comparatively with the control (healthy plants)

Stage of vegetation	Phytosanitary state	Polyphenols (mg % gallic acid)	Glucides (mg %)
Before blosoming	healthy	5,82	7,90
	infected	6,11	6,67
Blosoming	healthy	16,18	12,40
	infected	16,30	9,76
Veraison	healthy	21,53	15,20
	infected	22,04	15,97

Table 2. The influence of GLRaV-3 infection of Feteasca neagra on crop quality

Data of samples prelevation	Phytosanitary state	Weight of 100 berries (g)	Sugar in juice (%)	Juice acidity (g/l H_2SO_4)
10.08.2004	healthy	78,0	44,0	18,5
	infected	60,0	31,9	19,4
10.09.2004	healthy	126,4	167,2	8,5
	infected	107,3	187,5	8,4
20.09.2004	healthy	145,0	202,0	6,9
	infected	130,3	195,0	8,0

Figures

Fig. 1 Mature plants of Feteasca neagra cv.
(up – healthy plant; down – plant with leaf roll disease symptoms)

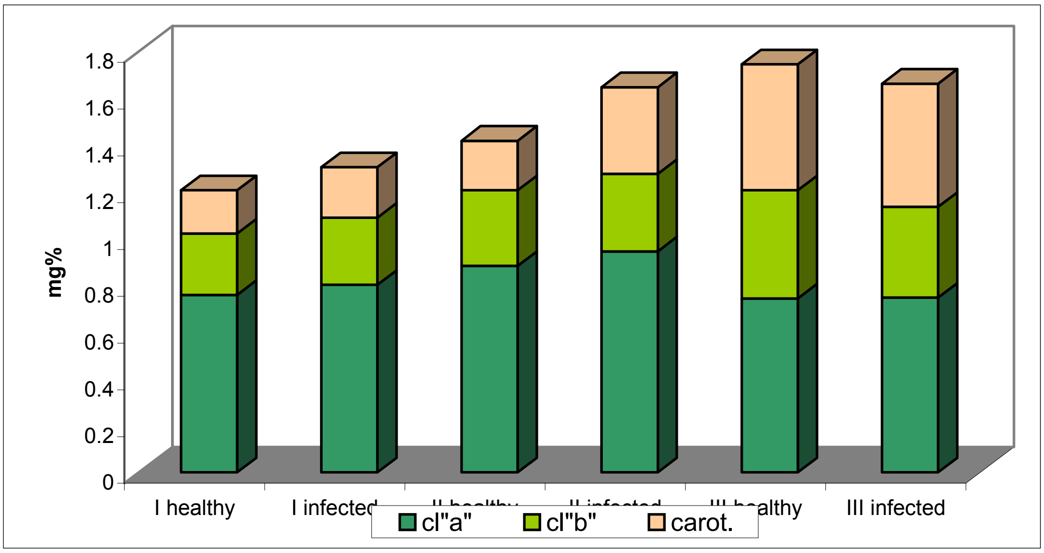

Fig. 2 The content of assimilating pigments in GLRaV-3 and healthy leaves of Feteasca neagra cv. (I – before blosoming, II – after blosoming, III – veraison)

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

SELECTION OF *SACCHAROMYCES ELLIPSOIDEUS* STRAINS FOR WINEMAKING USING A COMPARATIVE STUDY OF THEIR GROWTH AND FERMENTATION CAPACITY ON VARIOUS CULTURE MEDIA, INCLUDING GRAPE MUST

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Keywords: yeasts, strain selection, wine production, must fermentation, liquid and solid growth media

ABSTRACT

Modern winemaking requires the use of carefully selected yeast strains, which must be chosen based on thorough laboratory work, after extensive characterization of the strains' behavior on various growth media and under various conditions. In this work a study was performed to characterize the fermentative capacity of 8 strains of *Saccharomyces ellipsoideus* on two kinds of artificial growth media as well as on grape must. The performance of the yeast strains was evaluated based on various criteria: shape and size of the yeast cells, colony aspect on liquid and solid growth media, metabolism and fermentation of sugars, fermentation rate, biomass accumulation and the analytical parameters of the fermented musts obtained. The study allowed the identification of strains with valuable properties, which recommend them for use in winemaking technologies.

INTRODUCTION

Because the fermentation of grape musts by the spontaneous microflora does not usually lead to favorable results, the need has arisen for the identification of valuable yeast strains, with known properties, which can be added on purpose to the musts in order to guarantee a good fermentation. Modern winemaking requires the use of the best suited yeast strain, depending on the characteristics of the grape must and other technological factors. For this purpose, from the multitude of existing yeast strains, researchers must detect and avoid the strains which affect negatively the fermentation process, and prepare pure cultures of useful strains, which must be characterized as fully as possible. In recent years efforts have been directed to the identification and selection of useful yeast strains from the various viticultural centers in the country. In other countries, too, due to the importance of the yeast strain for the success of fermentation, similar work is being carried out on a regular basis, for the isolation, purification, characterization and classification of yeast strains of the viticultural microflora. This paper presents part of the results of a comparative study of 8 strains of *Saccharomyces ellipsoideus*, aimed at the identification and characterization of useful strains from this species which could be applied with good results in winemaking technologies.

MATERIALS AND METHODS

The strains subjected to study were isolated from the spontaneous microflora of various viticultural centers in Romania. They were identified as belonging to the species *Saccharomyces ellipsoideus* and were denominated by the codenames *S.e.8*, *S.e.12*, *S.e.14*, *S.e.19*, *S.e.21*, *S.e.M*$_1$, *S.e.M*$_2$ and *S.e.M*$_3$.

The following properties were studied for the characterization of the strains:

- shape and size of the yeast cells (oval cells, round or slightly oval spores)
- colony aspect on liquid medium: shape and aspect of sediment, pellicle at the surface of the liquid, degree of limpidity
- colony aspect on solid medium: shape and aspect of colony, degree of transparency
- sugar fermentation and metabolism: glucose, galactose, saccharose, maltose
- biomass accumulation
- fermentation rate (daily measurement of CO_2 released)
- parameters of the fermented musts.

Both artificial and natural growth media were used, as follows:

- Classic yeast-peptone-glucose growth media (YPG) for *Saccharomyces* yeasts contains 5 g yeast extract, 10 g peptone, 20 g glucose, 20 g agar in 1 l solution prepared with distilled water. The pH is initially 5.5~6, later adjusted to 7. Vials are prepared with 10 ml of medium and sterilized for 15 min at 121°C. The media with grown yeast strains were stored as stock cultures at 4°C, and fresh culture were prepared for the fermentation experiments.
- Malt-agar medium (MMA) contained malt extract 30 g and agar 20 g in 1 l of solution prepared with distilled water. After pH adjustment to 7, 10 ml of medium are poured in glass vials which are then sterilized 15 min at 121°C.
- A medium based on grape must was used for pre-cultivation of the yeast strains. The medium was prepared by diluting grape must with distilled water down to a sugar concentration of 80 g/l. After pH adjustment to 7, vials are prepared with 10 ml of medium and sterilized 15 min at 121°C.
- The fermentation medium was grape must with 120 g/l sugar, total acidity 3.67 g/l tartaric acid, pH 5.2, and sterilized 15 min at 121°C.

The wines (fermented musts) obtained with these strains were analyzed using standard methods prescribed by the O.I.V. and national regulations (STAS). The analyses performed were:

- ethanol – determined by ebuliometry;
- sugar concentration – determined by refractometry;
- pH – using an automatic pH-meter Horiba F13 with a combined electrode;
- total acidity – determined by titration with NaOH 0.1n in presence of a pH indicator.

RESULTS AND DISCUSSION

The first aspect studied regarding the 8 strains was the growth behavior in liquid media – grape must with 120 g/l sugar, at 20°C, without agitation. The results regarding this item – observations made after 48 hours of incubation – are concentrated in Table 1. There it can be seen that *S.e.12*, *S.e.14* and *S.e.M*$_1$ displayed a fast rate of must fermentation, which also predicts a high rate of sugar conversion into alcohol. These 3 strains also formed a sediment which did not stick to the glass wall; therefore the cultures were characterized by a superior degree of limpidity compared to the other strains studied. Also, it was observed that *S.e.8* and *S.e.19* did not form a sediment, a phenomenon which correlates with the small biomass accumulation and the total absence of fermentation (Table 2) observed for these strains. This result indicates a total inadaptation of these strains to the growth medium employed in this study. *S.e.21* is the only strain which presented a granular aspect; in itself, this behavior would recommend it for the secondary fermentation in sparkling wine production – but, unfortunately, the fermentation rate achieved was small, while the sedimentation rate was slow.

On solid media in glass vials, after 48 hours after the inoculation, all the 8 strains displayed a good capacity of adaptation and multiplication. The formed colonies were of S-type (smooth), with ondular growth, circular in appearance, with undulated margins. The colony section was semi-circular. An interesting finding was that *S.e.M$_1$* also created colonies of an opaque red color, probably due to carotenoid pygments synthesized within the cells (a property usually found in *Rhodotorula* yeast species).

Table 2 shows the results of the fermentation experiments. The study indicated that the optimum pH for growth was 4.5~5, while the optimum pH for the fermentation rate was 3.3~4, and the maximum alcoholic yield was achieved at pH 2.8~3.

From the above considerations, correlated with the results of the determination of biomass (Table 2), it could be derived that only 3 strains displayed satisfactory properties: *S.e.12*, *S.e.14* and *S.e.M$_1$*.

CONCLUSIONS

Three strains studied (*S.e.12*, *S.e.14* and *S.e.M$_1$*) stood out from the others, by producing wines with more alcohol and less total acidity. The wines obtained with these strains cleared very quickly, and the degree of limpidity of these wines was higher than for the others, while the sediment did not adhere to the walls. The most limpid sample was obtained with *S.e.12*.

The fermentation for these 3 strains was over in 5 days; for the other strains the fermentation was incomplete, or even absent (in case of *S.e.8* and *S.e.19*).

The strains *S.e.12*, *S.e.14* and *S.e.M$_1$* showed enological properties which recommend them for the use in winemaking technologies, for the following reasons:

- the must is fermented rapidly; the fermentation is complete, and foaming is limited;
- the alcohol concentration obtained was 0.5~1% higher than that achieved with other strains;
- the wine obtained is les acid and clears more rapidly.

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Tables

Table 1. Observed aspect of the strains grown at 20°C on still liquid medium (grape must) after 48 hours from the inoculation.

Strain used	Sediment		Turbidity		Veil on the whole surface	
	compact	granular	flocons	uniform	thin	ascendent
S.e.8	absent	--	×	--	wrinkled aspect	--
S.e.12	×	--	--	×	--	foam formation
S.e.14	×	--	--	×	--	foam formation
S.e.19	absent	--	×	--	wrinkled aspect	--
S.e.21	--	×	--	×	mucous aspect	--
S.e.M_1	×	--	--	×	--	foam formation
S.e.M_2	×	--	--	×	--	foam formation
S.e.M_3	×	--	--	×	--	foam formation

Table 2. Physico-chemical analyses of the fermented musts obtained with the studies strains.

Strain used	pH	Total acidity, g/l		Sugar % dried substance	Biomass g/l	Alcohol % v/v
		tartaric acid	acetic acid			
S.e.8	5.9	0.60	0.48	12.8	12.40	--
S.e.12	4.3	0.97	0.78	4.60	28.13	7.2
S.e.14	4.4	1.20	0.98	4.40	24.42	7.2
S.e.19	6.1	0.60	0.48	12.9	13.46	--
S.e.21	4.5	1.01	0.81	4.60	26.93	6.7
S.e.M_1	4.8	0.75	0.60	4.30	36.40	6.9
S.e.M_2	4.3	1.65	1.32	4.30	36.00	6.8
S.e.M_3	4.6	1.28	1.02	6.00	36.00	6.2

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RESEARCH WORKS ON THE INFLUENCE OF GRAPEVINE CUTTINGS OVER SOLAR ENERGY

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Keywords: illumination, foliar covering, caloric power.

ABSTRACT

This paper includes the results of research studies made regarding the way that elements defining the foliar covering may influence the accumulation of organic substances at this level. The study points out the influence of the vine stem height, the cuttings and the illumination level of the vine shoots. It was noticed the superiority of the variants with semi-tall stem and the short cutting system with the highest values of the accumulated dry substance, caloric power and potential chemical energy. Also, the correlation existing between those elements was established.

INTRODUCTION

The solar radiation is one of the climate components representing the main source of energy received by the surface of the soil. Getting to know the way that the solar energy is intercepted and used by the foliar covering of the vine shoot is what has aroused the interest for the investigation of this process. (Belancic A., 1998; Carbonneau A., 1983, 1984; Olteanu I., 1994, 2002).

MATERIALS AND METHODS

The study was made in the viticultural centre of Banu Maracine, the Dealurile Craiovei (Craiova Hills) Vineyard. The vine variety used for the study was Feteasca Regala (Royal Feteasca) grafted on the Kober 5 BB using plantation distances of 1.2 m between the plants on the row and 2.2. m between the lines, as well as a plan field for the experiment. The following factors were considered: the training system, the cutting system and the vine shoot illumination. In order to determine the dry substance, we used the roundel method and their caloric power resulted by calorimetric techniques.

RESULTS AND DISCUSSION

The determination of the dry substance accumulated in the leaves and its caloric power emphasized the difference existing between the vine shoots, according to their illumination level. Thus, one could notice that, in case of all cuttings, the sunny vine shoots were characterised by a stronger accumulation of dry substance (see Table 1).

At the same time, the caloric power of the dry substance accumulated was higher in case of sunny vine shoots compared to the sunless ones, so that high energetic elements, like glucids, would synthesise there in larger quantities.

This fact is obvious, irrespective of the variant characteristics or the climatic conditions of the respective year. It was noticed that, in case of the variants with semi-tall stem, there was the strongest accumulation of dry substance It varied between 116.56 and 134.05 mg s.u./dm^2/day, in case of sunny vine shoots, and it went between 99.82 – 107.82 mg s.u./dm^2/day, in case of sunless vine shoots. Thus, it comes out the importance of the energetic microclimate of the vine stock in organic synthesis.

The data shown in graphics 1 and 2 point out the caloric power of the accumulated dry substance, according to the illumination level of the vine shoot. On may notice that, in case of sunny vine shoots, the illumination had the highest levels varying between 3,624 cal/g and 4,320 cal/g, compared to 3,385 – 4,277 cal/g, in case of sunless vine shoots. Given the fact that the energetic microclimate of the studied leaves is not identical, a clear superiority of a certain cutting from this respect was not possible to determine.

That is why the values of the same variant vary from one year to another, but we may consider that, in the given situation, the energetic microclimate of the vine stock is what has determined the accumulation of the dry substance with high caloric potential. One may notice the predominance of the short-cutting system as to the energetic composition of the dry substance accumulated in case of semi-tall training. At the same time, the string cutting recorded high values in this respect, in case of using the same cutting type.

The same variation line may be also noticed in case of potential chemical energy, which always had higher values for sunny vine shoots compared to the sunless ones, being influenced by the two components used for its calculation.

One may say that there is a positive correlation amongst the potential chemical energy, the dry substance accumulated and the caloric energy resulted from 1 gram of combustible material. This correlation is much more determined by the dry substance (see graphic 3) rather than its caloric power (see graphic 4).

CONCLUSIONS

Sunny vine stems provide a superior synthesis of organic substance, irrespective of the characteristics of the variant. Variants with semi-tall training showed more intense accumulation of dry substance and higher caloric power compared to the short-stem variants.

The short cutting determined synthesises with superior quality and quantity, both in case of short and semi-tall vine shoots.

Among the potential chemical energy, the dry substance accumulated and the caloric energy there is a positive correlation, which is much more determined by the dry substance rather than its caloric power.

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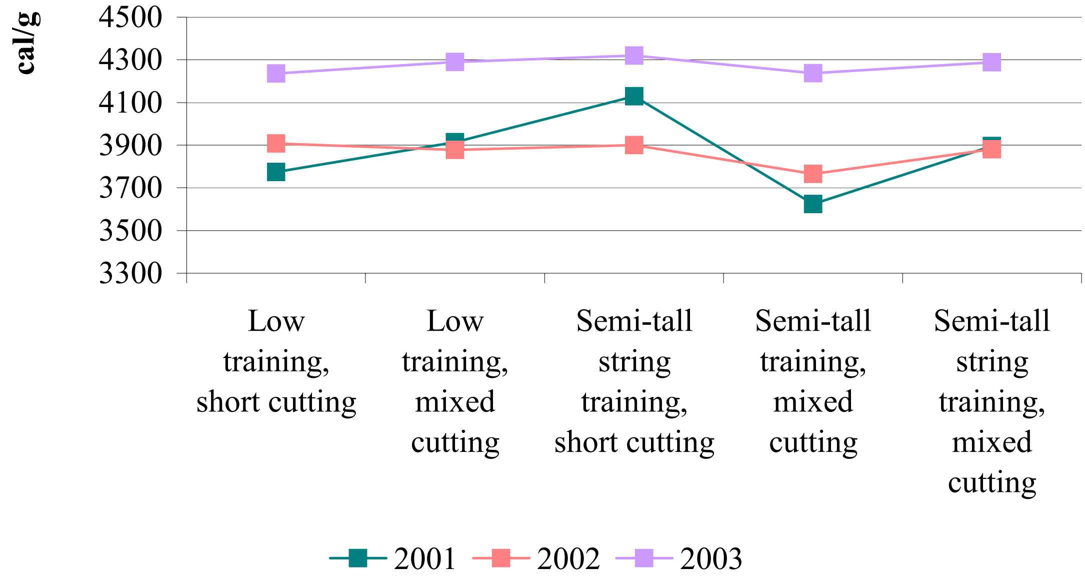
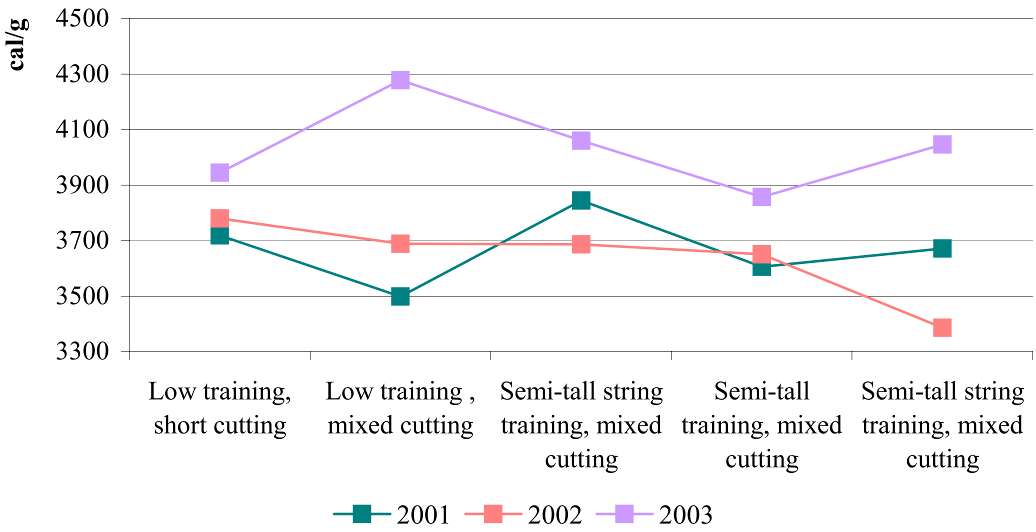
Table 1 – The accumulation of dry substance and its caloric power, according to the variant (the average of years 2001 –2003)

Characteristics of the variant	Accumulated dry substance (mg s.u./dm^2/day)	Caloric power (cal/g)	Potential chemical energy (kcal/day)
Low training, vine stems, sunny vine shoots *	98,68	3972,30	391,98
Low training, short cutting, sunless vine shoots **	83,72	3814,00	319,30
Low training, mixed cutting, sunny vine shoots *	96,72	4026,60	389,45
Low training, mixed cutting, sunless vine shoots **	81,95	3821,00	313,13
Semi-tall training, string, short cutting, sunny vine shoots *	134,05	4116,66	551,74
Semi-tall training, string, short cutting, sunless vine shoots **	104,43	3863,33	403,41
Semi-tall training, mixed cutting, sunny vine shoots *	116,56	3875,66	451,60
Semi-tall training, mixed cutting, sunless vine shoots **	99,82	3704,00	369,73
Semi-tall training, string, mixed cutting, sunny vine shoots *	122,37	4021,33	492,04
Semi-tall training, string, mixed cutting, sunless vine shoots **	107,82	3700,33	398,93

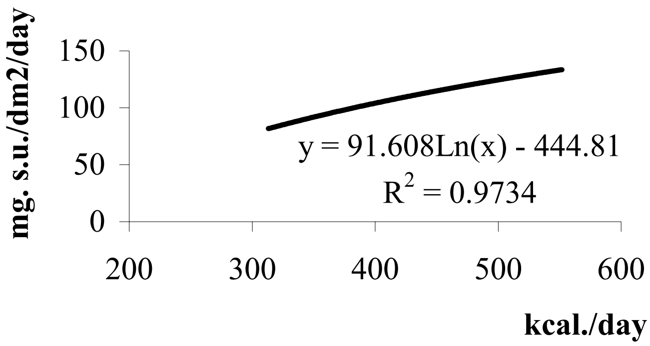
* illumination of over 1000 lx; ** illumination below 1000 lx.



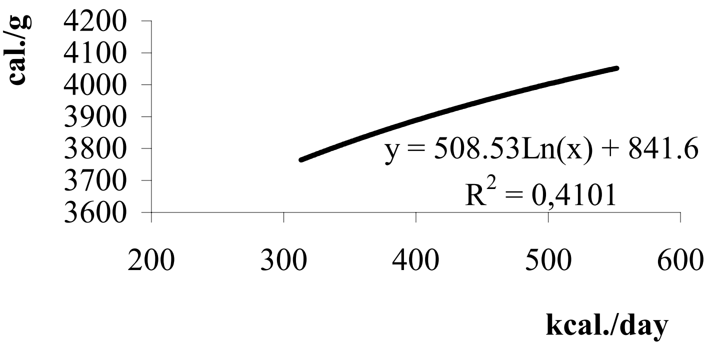
Graphic 1 – The caloric power of the dry substance accumulated by sunny vine shoots



Graphic 2 – The caloric power of the dry substance accumulated by sunless vine stems



Graphic 3 – The correlation between the potential chemical energy and the accumulated dry substance



Graphic 4 – The correlation between the potential chemical energy and the caloric power

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

MERLOT CULTIVAR BEHAVIOUR IN VITICULTURAL ECOSYSTEM OF TOHANI PRAHOVA DEPARTMENT

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Keywords: Merlot, bud load, production, quality.

ABSTRACT

The Merlot cultivar cultivated on big surfaces within the assortment for the production of black grapes used for the red wines behave slightly different in the continental temperate climate conditions from the Romanian vineyard. They have been choose for fortifying out of charges from 13,8 buds /m^2 to 18,5 v/m^2. The cutting type was Casenave cordon. Out of the experimental data, it results that the Merlot cultivar can support higher load than 18,5 buds/m^2.

Considering the requirements for the wines quality it is recommended the charge of 15,0 buds /m^2 which can allow a sugar concentration of about 210 g/l in must as a necessary condition for a superior wine.

INTRODUCTION

Dealu Mare vineyard includes almost the entire Meridional Subcarpathian Hills. The specific areas cultivated with vine are subdivided in different microclimates.

Because of the fact that the obtained wines have specific characteristics one proposed to initiate the present experiment in order to put in evidence the particularity of the cultivar and of wines obtained in Tohani viticultural centre.

MATERIALS AND METHODS

The observation, determination and analysis used the Merlot variety whose vines were at the distance of 2/1.3m. The utility charge and its repartition were the following: V_1 =13.8 buds/m^2; V_2=15.4 buds/m^2 ; V_3 =16.1 buds/m^2 ; V_4 =18.5 buds /m^2. The recorded data ,during the four study years (1992, 1993, 1994 and 1995), used the following quantification means: the direct comparison; Fischer sample; the significance of limit difference and the correlation method expressed by the report significance of squares regressions.

RESULTS AND DISCUSSIONS

Out of the fig. 1, it results that the grapes yields had been obviously superior to the sample with 18,5 buds /m^2 towards the other extreme experimental register: 112,8% (1992), 114,3%(1993), 111,9%(1994), 134,5%(1995); the regression equations, statistically assured a very significant level, it acknowledges that no matter the year, the load of 18,5 buds /m^2 cannot represent a limit towards the capacity of Merlot variety, cultivated in the vineyard.

Out of the figure 2, one can notice, the inverse correlation among the sugars amount in the sweet wine and the fructification charges applied to the trunk.

The regression equations assured to a very significant level emphasize this rule however out of the same figure, one can notice the influence of favourability level of the crop year. One determine the fact that 1993 year is really different than the other years, recording superior sugar amount from 242g/l to 14,0 buds /m^2, lowering up to 230g/l to 18,5 buds /m^2.

CONCLUSIONS

1. Merlot variety can support the buds load bigger the ones adopted within the experimental register in the present work (18,5 buds /m^2).
2. From the point of view of wines quality, come from must, Merlot grapes one must maintain a charge of about 15,0 buds /m^2 or even less in order to analyzed sugars amount of minimum 210g/l.
3. In order to optimize the charges, it is necessary a analysis of the yields in the previous year but also a prognosis of the present year, as the Merlot cultivar has important potential reserves, but it is obvious sensitive to the minimum temperature in the continental-temperate climate of the year.

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Table 1. Analysis of the variance for yield

Year	Variability causes	SP	GL	SP/GL	Probe F
1992	TOTAL	1526.86	15.00		–
	Replicates	5.90	3.00		–
	Variants	3.09	3.00	1.03	0.335
	Error	27.65	9.00	3.072	–
1993	TOTAL	1885.73	15.00		–
	Replicates	6.44	3.00		–
	Variants	4.36	3.00	1.45	0.398
	Error	32.88	9.00	3.653	–
1994	TOTAL	1867.54	15.00		–
	Replicates	5.69	3.00		–
	Variants	3.16	3.00	1.05	0.337
	Error	28.13	9.00	3.126	–
1995	TOTAL	1713.96	15.00		–
	Replicates	3.06	3.00		–
	Variants	15.97	3.00	5.32	5.162[x)]
	Error	9.29	9.00	1.032	–

Table 2. Synthesis of experimental data

Year	Bud load (ochi/m^2)	Yield (t/ha)	Relative yield (%)	Difference (t/ha)	Significance
1992	18.50	10.38	106.21	0.61	–
	16.10	9.95	101.86	0.18	–
	media (x)	9.77	100.00	Mt	–
	15.40	9.55	97.76	-0.22	–
	13.80	9.20	94.18	-0.57	–
		DL 5% = 2,80	DL 1% = 4,03	DL 0,1% = 5,92	
1993	18.50	11.60	106.85	0.74	–
	16.10	10.98	101.09	0.12	–
	media (x)	10.86	100.00	Mt	–
	15.40	10.70	98.56	-0.16	–
	13.80	10.15	93.49	-0.71	–
		DL 5% = 3,05	DL 1% = 4,39	DL 0,1% = 6,46	
1994	18.50	11.38	105.29	0.57	–
	16.10	11.00	101.82	0.20	–
	media (x)	10.80	100.00	Mt	–
	15.40	10.68	98.81	-0.13	–
	13.80	10.17	94.09	-0.64	–
		DL 5% = 2,83	DL 1% = 4,06	DL 0,1% = 5,98	
1995	18.50	11.75	113.53	1.40	–
	16.10	10.40	100.48	0.05	–
	media (x)	10.35	100.00	Mt	–
	15.40	10.33	99.76	-0.03	–
	13.80	8.93	86.23	-1.43	–
		DL 5% = 1,62	DL 1% = 2,33	DL 0,1% = 3,43	

Fig. 1. The correlation between the winter buds load and the grapes average yield to the cultivar Merlot – cutting type "*Cordon Cazenave*".

(1992) – $y = 1,84 + 0,73x – 0,014x^2$; $r = 0,98^{xxx)}$
(1993) – $y = 1,52 + 0,859x – 0,017x^2$; $r = 0,99^{xxx)}$
(1994) – $y = – 2,16 + 1,36x – 0,0034x^2$; $r = 0,97^{xxx)}$
(1995) – $y = – 10,9 + 2,07x – 0,046x^2$; $r = 0,98^{xxx)}$

Fig. 2. The correlation between the winter buds load and the sugars accumulations in must for the cultivar Merlot – the cutting type *"Cordon Cazenave"*.

1992 – $y = 327,37 – 11,04x + 0,25x^2$; $r = – 0,84^{000)}$
1993 – $y = 373,85 – 14,86x + 0,39x^2$; $r = – 0,91^{000)}$
1994 – $y = 155,58 + 7,43x – 0,25x^2$; $r = – 0,89^{000)}$
1995 – $y = 14,10 + 28,13x – 0,95x^2$; $r = – 0,88^{000)}$

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STUDY CONCERNING THE CONTENT IN RESVERATROL AND ANTOCYAN AT THE VARIETY MERLOT OBTAINED IN BANU MARACINE AND TAMBURESTI VITICULTURAL CENTRES

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Keywords: phytoalexin, phenolic componds, cis and trans-isomer forms, pathologenic attach, system HPLC.

Abstract

Resveratrol has been fond in a multitude of dietary plants, and it is present in relatively hight concentrations in grape juice and especially, in red wine.

Several clinical studies have demonstrated that phenolic componds such as resveratrol (especially trans-resveratrol) are responsable for the health benefits of red wine.

The researce was undertaken to evaluate a comparativ study between resveratrol content of grape and wine the variety Merlot from Banu Maracine and Tamburesti viticultural centres in 2003.

As well, it well be determined the antocyans contents and it will be established the corelations between two componds (antocyan and resveratrol).

INTRODUCTION

Chemically, resveratrol (3,4,5´-trihydroxystilbene) is a substance of a polyphenolic character from the group of phytoalexins and exist in cis and trans-isomer forms (Karel Melzoch and c.-2001).

Because resveratrol is present especially in red wine, it has been studied this compound which is produced by grapewins in response to pathologenic attach (Botrytis cinerea).

This substance is synthesized by several plants in response to adverse conditions such as environmental stress or fongal infection.

In 1992, Siemann and Creasy, have reported that resveratrol could also occur, in grape products and particularly in wine is thought to be responsible, at least in part, for the productive effects of wine against coronary heart disease (Philippe Jandet et al.- 1994).

Growing evidence suggest that resveratrol plays a role in the prevention of uman pathological processes, suchasinflamation, atherosclerosis and carcinogenesis (Lucia A. Stivala and c. - 2001).

MATERIALS AND METHODS

For analysis it is used grapes and red wine produced in 2003 from the variety Merlot in Banu Mărăcine and Tâmbureşti.

Identification of the two resveratrol (cis and trans) was carried aut by HPLC analysis.

For HPLC analysis au aliquot of 100 ml of wine was extracted whith ethyl acetate. The ethil acetate was remover in vacuo (40˚C). The residue obtained is redisseved in 5 ml methanol was remover in vacuo. After realised dilution whit 5 ml acetonytril 50 % of wine were analyzed by HPLC Agilent 1100, using a Merch Lichrocart C_{18} 10 U column (250 x 4,6 mm), with acetonytril (for HPLC) and water (for HPLC) as aluant at a flow rate of 1 ml/min.

Detection was at 280 nm corresponding to the cis-resveratrol absorbance maxima and 307 nm corresponding from trans-resveratrol absorbance maxima respectively.

Determination the antocyans from grapes the variety Merlot obtained used method Poissant Leon.

RESULTS AND DISCUSSION

The content in resveratrol, from grapes the variety Merlot located in Banu Maracine and Tamburesti viticultural centres fallowed descendent curve during obtained maturation process, obtained in maximum phase 29,6 μg/g in Banu Mărăcine and 33,5 μg/g in Tamburesti (table 1). At maturity phizyologic contents in resveratrol were diminished (1,2 μg/g in Banu Maracine and 0,9 μg/g in Tamburesti).

The Merlot red wine obtained in 2003 in Banu Maracine contained high levels of trans-resveratrol (3,34 mg/l) while lower amounts of the cis-resveratrol (2,74 mg/l) were found in the samples analysed (table 3).

The Tamburesti red wine contained 2,52 mg/l trans-resveratrol and 1,43 mg/l cis-resveratrol

This phenomen can be the explanation for the pathologenic attach of Botrytis cinerea during maturing process of grapes.

Conclusions

Resveratrol from grapes the variety Merlot obtained in Banu Maracine and Tamburesti viticultural centres fallow ed descendent curve during maturation process.

The results shows that resveratrol and antocyans contents obtained in Tamburesti are higher that the same contents obtained in Banu Maracine at the beginning of maturation process (30VII) at it will decrease till the second part of september.

While the antocyans contents are rising, the resveratrol contents are diminished.

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Tables and figures

Tab. 1. Resveratrol content (µg/g) from grapes the variety Merlot in Banu Maracine and Tamburesti viticultural centres, on the time maturation process in 2003

Located	CALENDARISTIC DATE							
	10 VII	20 VII	30 VII	9 VIII	19 VIII	29 VIII	8 IX	18 IX
Banu Mărăcine	29,6	24,8	17,3	11,2	6,4	4,9	3,8	1,2
Tâmbureşti	33,5	30,8	19,3	10,2	6,6	3,9	2,6	0,9

Tab.2. Antocyans content (mg/Kg) from grapes the variety Merlot in Banu Mărăcine and Tamburesti viticultural centres on the time maturation process in 2003

Located	CALENDARISTIC DATE							
	10 VII	20 VII	30 VII	9 VIII	19 VIII	29 VIII	8 IX	18 IX
Banu Mărăcine	211	232	268	791	1083	1341	1388	1381
Tâmbureşti	300	325	584	621	941	1148	1332	1361

Tab. 3. Resveratrol content (mg/l) from red wine the variety Merlot in Banu Maracine and Tambureşti viticultural centes in 2003

resveratrol	located	quantity (mg/l)
Cis-resveratrol	Banu Mărăcine	2,74
	Tâmbureşti	1,43
Trans-resveratrol	Banu Mărăcine	3,34
	Tâmbureşti	2,25

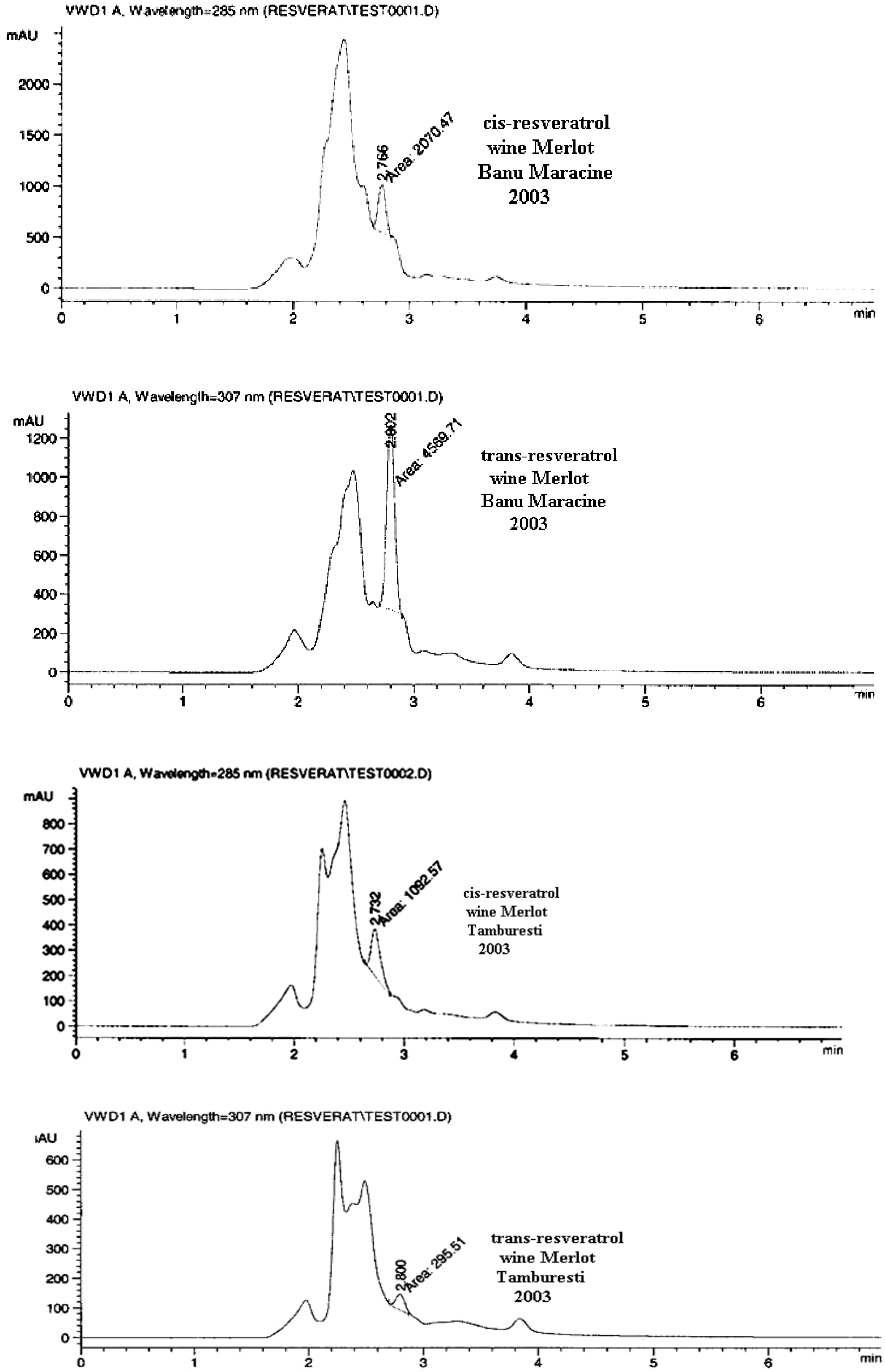

Fig. 1 Determination the cis and trans resveratrolul from red wine the variety Merlot

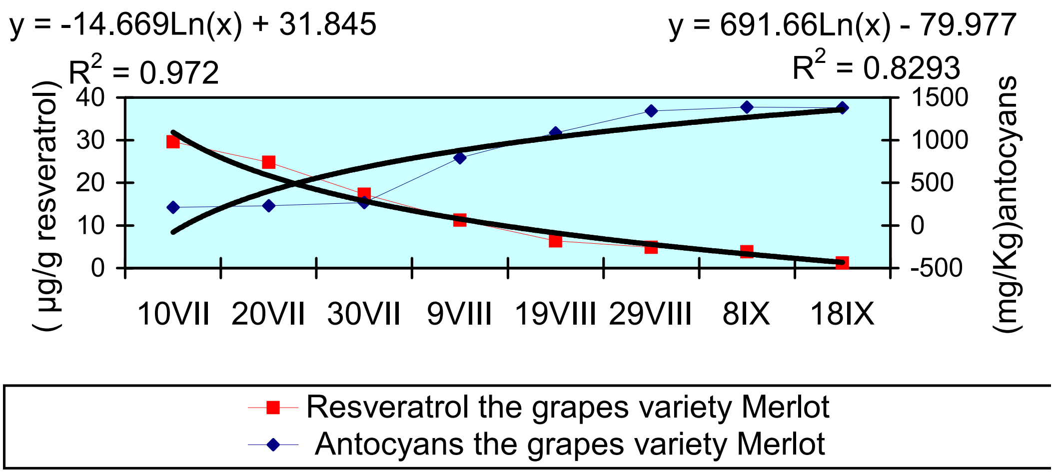

Fig. 2 Comparativ determination the grapes variety Merlot in resveratrol and antocyans-Banu Maracine-2003

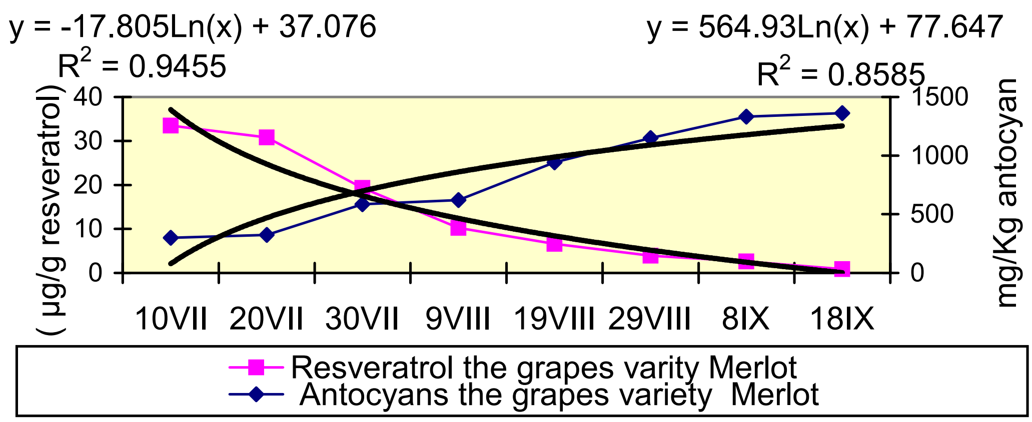

Fig. 3 Comparative determination the grapes variety Merlot in resveratrol and antocyans-Tamburesti-2003

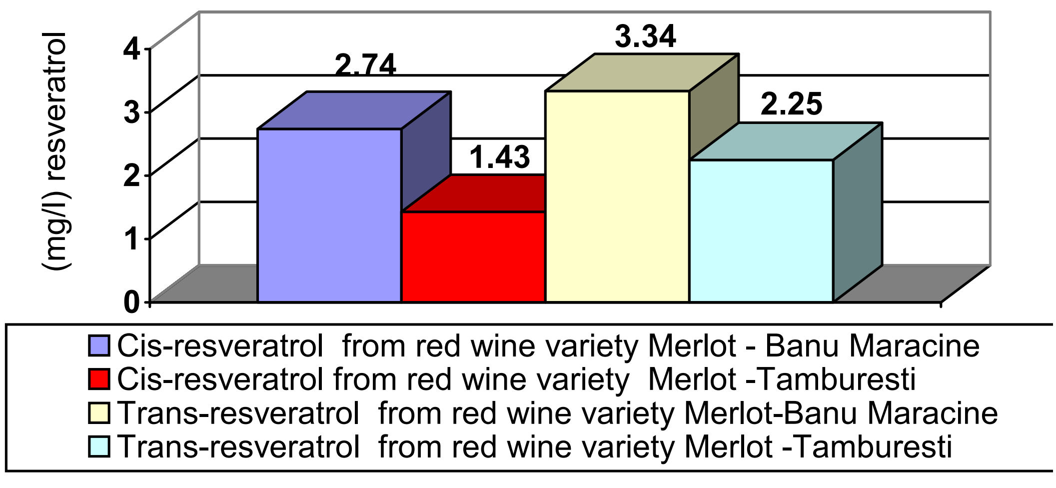

Fig. 4 Determination the resveratrolul (cis and trans) from red wine variety Merlot in Banu Mărăcine and Tâmbureşti viticultural centres - 2003

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THE RESPONSE OF FETEASCA NEGRA VARIETY TO DIFFERENT WINTER-EYES CHARGES AS A RESULT OF A DRY-CUT

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Key words: Feteasca Neagra, winter-eyes charge, production, quality

ABSTRACT

The main goal of the experiments it was to establish the influence of the fertility charges on the production level and its quality in correlation with the Feteasca Negara variety requirements. It was statistically established that the optimal eyes charges touch the value of approximately 15,0 eyes/ m^2, arriving to a production of 10,0 t/ha, waging the obtained wines in the DOCC category. In most of the study years, the sugar accumulations did not decrease lower than 225 - 227 g/l, even if the fertility charges were amplified until 19 - 20 eyes/m^2.

INTRODUCTION

Feteasca Neagra is an old local variety, considerate as a Dacian one (Constantinescu, 1962). Because of their genetics characteristics (vigorous, low fertility, late bud differentiation) it was cultivated on relatively small surfaces comparing with are red varieties for red wines (Merlot, Cabernet Sauvignon, Pinot Noir). This variety can be found in the following viticultural centers: Urlati, Tohani, Valea Calugareasca (Dealu Mare county), Stefanesti, Topoloveni, Valea Mare (Stefanesti - Arges county), Uricani, Tutova, Nicoresti (south of Moldavia). As a result of its genetics particularities the literature recommend to keep during the cut period a number of 4 -6 cords/vine, having a length of 14 - 16 eyes, and the annual wood should be kept in a higher quantity as follow: semi-high stems or high stems, girdles or branches of 20 - 40 cm length (Macici, 1974; Oslobeanu ,1980; Kontek, 1983; Dejeu, 1984; Pomohaci, 2000; Oprea and Indreas, 2000; Badea, 1998; Indreas and Visan, 2000; Marin, 2003, etc). To establish the behavior of Feteasca neagra variety on different eyes charges they were been organized studies in the viticultural center Tohani during a longer period of time (1992 - 1995).

MATERIALS AND METHODS

The main working material were vines from Feteasca Neagra variety grafted on Kober 5BB grafting stock. The experimental culture it have been situated on luvic redish brown soil, with a plantation interval of 3,2/1,2 m (2604 vines/ha). This has permit to use the Guyot on high stem cutting type. The fertility charge and its repartition were de follow: V1 = 10.4 eyes/m^2 (3K*x 12) + (2c**x 2); V2 = 13.5 eyes/m^2 (4K x 11) + (4c x 2); V3 = 16.7 eyes/m^2 (4k x 14) + (4c x 2);
V4 = 19.8 eyes/m^2 (6K x 11) + (5c x 2).

*) K = fertility branch

**) c = replacing spigot

The setting mode of the experiment it was the "subdivized lots"; in each of the four years of study (1992,1993,1994 and 1995) they have been determined the level of the proudctions (tone/ha), the sugar accumulation (g/l in must) and the total acidity of the must (g/l tartaric acid). All the registred data regarding the eyes charges on the vines (10.4 eyes/m^2, 13.5 eyes/m^2, 16.7 eyes/m^2 and 19.8 eyes/m^2) have been analyzed using the following methods: direct comparison, Fischer test, significance of the limited differences (DL), and the direct correlation express as a square or linear regression.

RESULTS AND DISCUSSION

As we can notice in the table 1, under the influence of the fertility charges applied to the vines, they have been important differences between the average production which have touch significant levels in 1993, the second year of the experiment.

In the table 2 they have been analyzed the production results from 1992 to 1995 by the comparison between the calculated limited differences, as follow:

- in 1992, the eyes-charges of 16,7 eyes/m^2 induced a level of the production with 127, 1% bigger than the one of 10, 4 eyes/m^2;
- in 1993 it could be noticed significant and distinct significant differences comparing with the average ($\underline{x}$) of the experiment and the production increased from the charge of 10, 4 eyes/m^2 to the charge of 19, 8 eyes/m^2 with 180, 1%;
- in 1994 the production differences are with 138, 9% higher for a 16,7 eyes/m^2charge, comparing with the charge of 10, 4 eyes/m^2;
- in 1995 it have been registered a relative production of 130, 0%.

The bellowed results are confirmed also by the regression curves from the Figure 1, sustained by the statistical calculations, only for three years of experiments.

A particular case is represented during the year 1993 when the increases of the production are more rapid in correlation with the amplification of the fertility charges, while during the years 1992, 1994 and 1995 the grape productions increase following the fertility charge until a level and than, because of the outrun of the sustaining power of the plant it has been registered decreased of the productions towards the maximal charges (19,8eyes/m^2).

Regarding the sugar accumulations in the must, the data shows that the influence of the applied fertility charges is not significant comparing with the native sugar accumulation of Feteasca Neagra variety; the general tendency noticed during all the experimental years shows a decrease of the sugar concentrations in must while the fertility charge it was amplified (Fig.2).

Concerning the organic acid accumulations it was noticed that the values of 7,8 g/l (1992), 7,9 g/l (1993), 8,2 g/l (1994) and 8,5 g/l (1995) have not been significantly affected by the applied fertility charges.

CONCLUSIONS

1. Appling fertility charges of 10, 4; 13,5; 16,7 and 19,8 eyes/m^2 to the Feteasca Neagra variety they have been registered important increases of the productions, between 9 and 10 t/ha, even higher.
2. The increases of the production are the results of the adapted technical methods following the variety requirements. For example:
    - for the compensation of the fertility deficiency and the excess of the vigor they have been kept on the vine high level winter eyes charges, till 12 – 19 eyes/m^2;
    - to increase the productivity of the vines they have been choose fertile branch with a length of maximum 14 eyes;
    - to stimulate the bud differentiation and to equilibrate the vegetative growths it has been adapted the Guyot cutting type on high stem having as support the reserves of the plastic substances of the variety.

3. Even if the Feteasca Neagra variety, by its genetically aptitudes, can sustain very high productions, the quality require the limitation of the charges to a level of about 15.0 eyes/m^2 which induce a production of approximate 10 t/ha. In this case the sugars from the must can be higher than 230 g/l wagging the obtained wines in the superior quality category of wines (DOCC)
4. A special remark is that, independently of the eyes charge applied or the experimental year, the Feteasca Neagra variety has the capacity to touch a suitable total acidity in order to obtain superior red wines.

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Table 1. Analysis of the variance for yield

Year	Variability causes	SP	GL	SP/GL	Probe F
1992	TOTAL	1400.63	15.00		–
	Replicates	3.98	3.00		–
	Variants	10.02	3.00	3.34	0.843
	Error	35.68	9.00	3.964	–
1993	TOTAL	1253.16	15.00		–
	Replicates	7.46	3.00		–
	Variants	57.06	3.00	19.02	17.109 xxx)
	Error	10.00	9.00	1.112	–
1994	TOTAL	1115.56	15.00		–
	Replicates	0.62	3.00		–
	Variants	16.63	3.00	5.54	1.944
	Error	25.67	9.00	2.852	–
1995	TOTAL	1421.29	15.00		–
	Replicates	17.89	3.00		–
	Variants	15.04	3.00	5.01	1.272
	Error	35.50	9.00	3.944	–

Table 2. Synthesis of experimental data

Year	Bud load (ochi/m^2)	Yield (t/ha)	Relative yield (%)	Difference (t/ha)	Significance
1992	19.8	9.50	101.54	0.14	–
	16.7	10.40	111.16	1.04	–
	media (x)	9.36	100.00	Mt	–
	13.5	9.35	99.93	-0.01	–
	10.4	8.18	87.37	-1.18	–
		DL 5% = 3,18	DL 1% = 4,58	DL 0,1% = 6,73	
1993	19.8	11.80	133.33	2.95	xx
	16.7	8.35	94.35	-0.50	–
	media (x)	8.85	100.00	Mt	–
	13.5	8.70	98.31	-0.15	–
	10.4	6.55	74.01	-2.30	0
		DL 5% = 1,68	DL 1% = 2,42	DL 0,1% = 3,56	
1994	19.8	8.20	98.20	-0.15	–
	16.7	9.38	112.28	1.03	–
	media (x)	8.35	100.00	Mt	–
	13.5	9.08	108.68	0.73	–
	10.4	6.75	80.84	-1.60	–
		DL 5% = 2,70	DL 1% = 3,88	DL 0,1% = 5,71	
1995	19.80	8.98	95.23	-0.45	–
	16.70	9.18	97.35	-0.25	–
	media (x)	9.43	100.00	Mt	–
	13.50	11.05	117.24	1.63	–
	10.40	8.50	90.19	-0.92	–
		DL 5% = 3,17	DL 1% = 4,56	DL 0,1% = 6,71	

Fig. 1. The correlation between the winter buds load and the grapes average yield to the cultivar Feteasca neagră – cutting type "*Guyot on high stalk"*.

1992 – $y = -4,52 + 1,76x - 0,0531x^2$; $r = 0,71^{xx)}$
1993 – $y = 8,64 - 0,51x + 0,0333x^2$; $r = -0,91^{xxx)}$
1994 – $y = -13,21 + 2,85x - 0,0896x^2$; $r = -0,51^{x)}$
1995 – $y = -5,52 + 2,11x - 0,0704x^2$; $r = -0,05$

Fig. 2. The correlation between the winter buds load and the sugars accumulations in must for the cultivar Feteasca neagră – the cutting type *"Guyot on high stalk"*.

1992 – $y = 279,94 - 5,68x + 0,156x^2$; $r = -0,87^{000)}$
1993 – $y = 248,16 - 1,05x - 1,18x^2$; $r = -0,92^{000)}$
1994 – $y = 270,88 - 2,65x - x^2$; $r = -0,93^{000)}$
1995 – $y = 240,03 - 0,86x + 0,019x^2$; $r = -0,97^{000)}$

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AN ANATOMICAL SURVEY OF STEMS IN SOME *VITIS VINIFERA* L. CULTIVARS

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Keywords: *Vitis*, stem, anatomy, grapevine cultivars, Cabernet Sauvignon, Feteasca Neagra, Afuz Ali, Cardinal, taxonomic characters.

ABSTRACT

Stem anatomy is compared for several *Vitis vinifera* L. cultivars. The range of variation within cultivars of *Vitis* (*Vitaceae, Rhamnales*) is described for a number of stem characters including the cortex, colenchyma, pericycle, primary and secondary vascular systems and pith. The results provide important taxonomic characters (variables) for the separation within grapevine cultivars. One synoptic table with anatomical character's similarity in *Vitis* cultivars, several graphs and original anatomical photos are shown.

INTRODUCTION

The various cvs of *Vitis* have long been the object of morphological, physiological, oenological, genetical, horticultural, biochemical, structural and technological studies. The shoot of *Vitis vinifera* cvs has been studied with respect to primary vascular patterns (Gerrath et al. 2001), bark anatomy in stem segments (Angels and Leon-Gomez, 1997) or primary and the secondary structure of shoot anatomy (Zanoschi and Toma 1985; Reynier, 1986; Hidalgo, 1993). Morlova (1960) showed that the cork appears in the anatomy of the stem starting with July, at the indigenous and precocious cultivars, and beginning with the end of August, for the adventitious and late ripening cultivars. Manaresi and Oprea considered that the appearance of the hard phloem is a sign that the vine cane is mature (Alexei et al., 1970).

After differentiation of the primary vascular tissue in shoot anatomy, the cells towards the centre of each vascular bundle enter into division to produce a cambial layer known as interfascicular cambium.

The secondary phloem is then produced by this cambium in the direction of the epidermis, and secondary xylem is produced in the direction of the pith. Later, an interfascicular cambium is formed between the vascular bundles, and this too produces phloem to the outside and xylem to the inside. Together, the intrafascicular cambium and the interfascicular cambium comprise the vascular cambium. The secondary phloem consists of two tissues: soft phloem, composed of sieve tubes, companion cells, parenchyma cells and phloem fibres, and hard phloem, composed of thick-walled fibres. Hard phloem and soft phloem are formed in alternating bands, and this gives the bark a ringed appearance when viewed in transverse section (Mullins, 1994).

The secondary xylem is diffuse-porous and the vessels have scalar form or ladder-like thickening. These vessels are surrounded by living cells of xylem parenchyma. The predominant elements of the xylem are thick-walled septate fibres with bordered pits and living protoplasts. There are prominent rays. Medullary rays, those which separate the original primary vascular bundles, and rays of the second order, those which were initiated subsequently by the interfascicular cambium, traverse both the xylem and phloem and are widest towards the epidermis (Mullins, 1994).

The objective of this study is to find and evaluate the taxonomic value of anatomic stem characteristics in some *Vitis* cvs for a simple and quick differention between them. Our study will complete the existing gaps in stem anatomy in *Vitis* cvs.

MATERIALS AND METHODS

We studied four cvs of *Vitis* regarding stem anatomy in cross section. Material was collected from the field from Valea Călugărească Viticulture Research Station, in June 2004. Several cvs of grapevines represented by *Precoce, Kobber, Afuz-Ali* and *Cardinal* and were studied from anatomical point of view. All anatomical data were obtained from observations of transverse sections made at the different levels of stem, in different stages at the internode level. The fresh fragments of stems were free hand sectioned.

The sections were cleared with chloral hydrate (24h), stained in carmine alaunate (24h) and green iodine (5min.) and mounted in gelatinized glycerin. Numerical characteristics of stems were undertaken at ML-4M IOR microscope. The prepared material was viewed and photographed at MC-7 microscope with a Canon Digital Camera. The original photographs of *Vitis* cultivars (Fig. 5-7) and comparative graphs (Fig. 1-4) are presented. Anatomical characteristics are presented and discussed in detail (Table 1).

RESULTS AND DISCUSSIONS

In stem structure the largest anatomic component, with the biggest distribution, is represented by pith, whose half measures the lowest value of 1299,6 µm in *Cardinal*, where its distribution stands for 41,55%, and the biggest value of 1892,35 µm in *Afuz Ali*, meaning a 56,77% distribution. The pith distribution counts for more than 50% in *Afuz Ali* (Fig. 3), *Cabernet Sauvignon* (Fig.1) and *Fetească Neagră* (Fig. 2).

The second largest anatomic element in shoot anatomy is the secondary xylem (vascular bundle). The average length of this component measures 484,38 µm (the lowest value) in *Fetească Neagră* and 812,5 µm (the biggest value) in *Cardinal*. The distribution of the secondary xylem ranges from 16,87 % in *Afuz Ali* (Fig. 6) and 25,73 % in *Cardinal*.

The average length and distribution of the phloem (primary and secondary) spreads between 134,76 µm, respectively 4,90% in *Cabernet Sauvignon* (Fig. 1) and 250,0 µm, respectively 7,92% in *Cardinal*.

The pericycle has its lowest average length and distribution in *Cabernet Sauvignon* (Fig. 5) stems, 156,13 µm and 5,68 %, and it is largest and widest in *Cardinal* (Fig. 7), 265,63 µm and 8,41%.

The cortex, (including colenchyma), ranges from 125,0 µm and 4,55%, in *Cabernet Sauvignon*, and to 234,38 µm and 7,03% in *Afuz Ali*.

The cambium zone has the lowest average length in *Fetească Neagră*, 46,88 µm, and the highest average length in *Cardinal* (Fig. 4), 109,38 µm, whereas the percentage distribution of the cambium ranges from 1,59% in *Afuz Ali* (Fig. 6) stems and 3,46% in *Cardinal*.

The epidermis ranges in average thickness between 8,91 µm in *Cabernet Sauvignon* and 14,5 µm in *Cardinal*. Its one layer of cells counts for 0,29 % of the overall diameter of the stem in *Afuz Ali* up to 0,46 % in *Cardinal*.

There can be drawn a classification of the four cultivars, regarding the eight anatomic characteristics that were studied. The cultivars are ordered from the highest value of the anatomic characteristic to the lowest, as follows:

- Epidermis: *Cardinal, Afuz Ali, Fetească Neagră, Cabernet Sauvignon*;
- Cortex: *Afuz Ali, Cardinal, Fetească Neagră, Cabernet Sauvignon*;
- Pericycle: *Cardinal, Afuz Ali, Fetească Neagră, Cabernet Sauvignon*;
- Phloem: *Cardinal, Afuz Ali, Fetească Neagră, Cabernet Sauvignon*;
- Cambium zone: *Cardinal, Cabernet Sauvignon, Afuz Ali, Fetească Neagră*;
- Secondary xylem: *Cardinal, Cabernet Sauvignon, Afuz Ali, Fetească Neagră*;
- Primary xylem: *Cabernet, Fetească Neagră, Afuz Ali, Cabernet Sauvignon*;
- Half pith: *Afuz Ali, Cabernet Sauvignon, Fetească Neagră, Cardinal*.

CONCLUSIONS

The results provide important taxonomic variables from the anatomical point of view for the separation within the investigated cultivars. This ongoing study can complete the morphological characters for a simple and quickly differentiation between grapevine cultivars. Otherwise, the obtained data fill the existing gaps from literature.

ACKNOWLEDGMENTS

We wish to thank *Prof. Dr. Burzo Ioan* for making the photographs for this study; and *Prof. Dr. Dejeu Liviu* for bibliographical resources that he kindly made them available to us.

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Table 1 Comparative anatomical characteristics of stem in four *Vitis vinifera* L. cultivars.

Nr. Crt	Measured anatomic characteristic	Cabernet Sauvignon	Fetească Neagră	Afuz Ali	Cardinal
1.	**Epidermis thickness**	8,1-9,72# 8,91* 0,32%	8,1-11,34 9,72 0,37%	8,1-11,34 9,72 0,29%	8,1-21,06 14,58 0,46%
2.	**Cortex thickness**	93,75-156,25 125,0 4,55%	125,0-187,5 156,25 5,98%	187,5-281,25 234,38 7,03%	125-187,5 156,25 4,95%
3.	**Pericicle**	125-187,25 156,13 5,68%	200-250 225 8,61%	218,75-281,75 250,25 7,51%	187,5-343,75 265,63 8,41%
4.	**Primary and secondary phloem length**	125-143,75 134,76 4,90%	143,75-187,5 156,63 5,99%	125-218,75 171,86 5,16%	187,5-312,5 250 7,92%
5.	**Cambium zone length**	50-68,75 59,38 2,16%	31,25-62,5 46,88 1,79%	43,75-62,5 53,13 1,59%	93,75-125 109,38 3,46%
6.	**Secondary xylem length**	625-687,5 656,25 23,89%	406,25-562,5 484,38 18,53%	500-625 562,5 16,87%	750-875 812,5 25,73%
7.	**Primary xylem length**	93,75-156,25 125 4,55%	131,25-250 190,63 7,29%	68,75-250 159,38 4,78%	218,75-281,75 250,25 7,92%
8.	**Pith (half thickness)**	1459,2-1504,8 1482 53,94%	1231,2-1459,2 1345,2 51,45%	1869,5-1915,2 1892,35 56,77%	1185,6-1413,6 1299,6 41,15%

Range of variation [µm]
* Average value [µm]

Figures

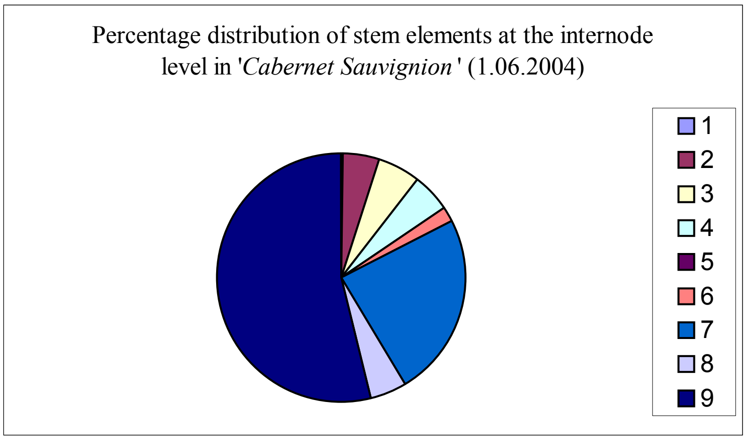

Fig. 1. Legend of stem elements 1 to 9: Epidermis, Cortex, Pericycle, Primary & secondary phloem and cork, Cork, Cambium, Secondary vascular bundle (xylem), Primary bundle (xylem), Pith (half diameter)

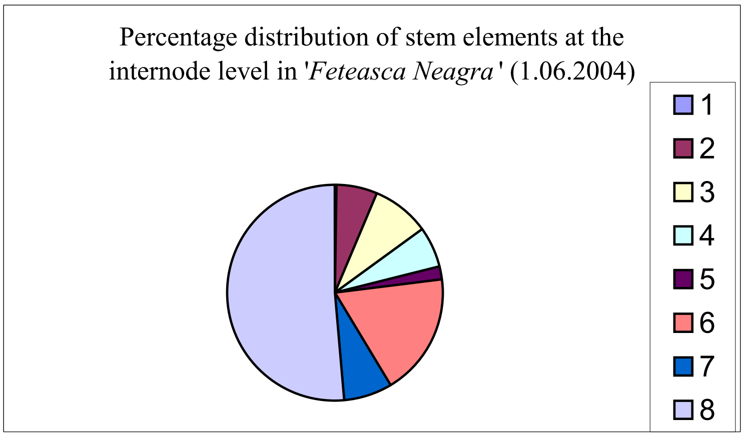

Fig. 2. Legend of stem elements 1 to 8: Epidermis, Cortex, Pericycle, Primary & secondary phloem and cork, Cambium, Secondary vascular bundle (xylem), Primary bundle (xylem), Pith (half diameter)

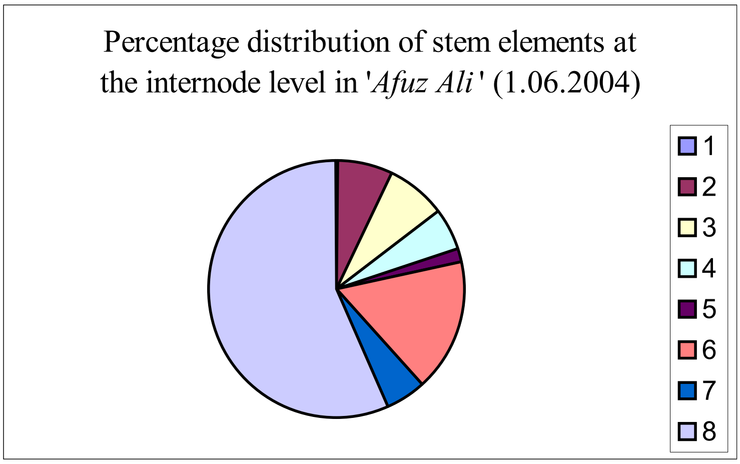

Fig. 3. Legend of stem elements 1 to 8: Epidermis, Cortex, Pericycle, Primary & secondary phloem and cork, Cambium, Secondary vascular bundle (xylem), Primary bundle (xylem), Pith (half diameter).

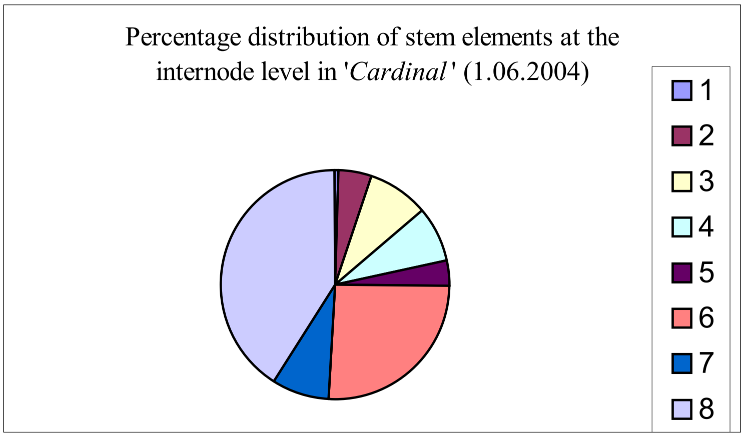

Fig. 4. Legend of stem elements 1 to 8: Epidermis, Cortex, Pericycle, Primary & secondary phloem and cork, Cambium, Secondary vascular bundle (xylem), Primary bundle (xylem), Pith (half diameter).

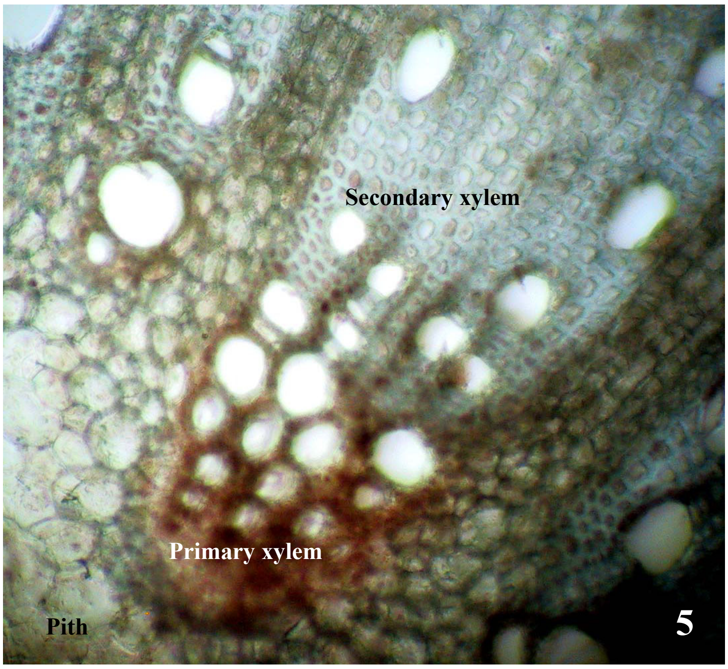

Fig. 5. Stem anatomy at the internode in '*Cabernet-Sauvignion*' (orig., oc. 12,5x; ob. 10x)

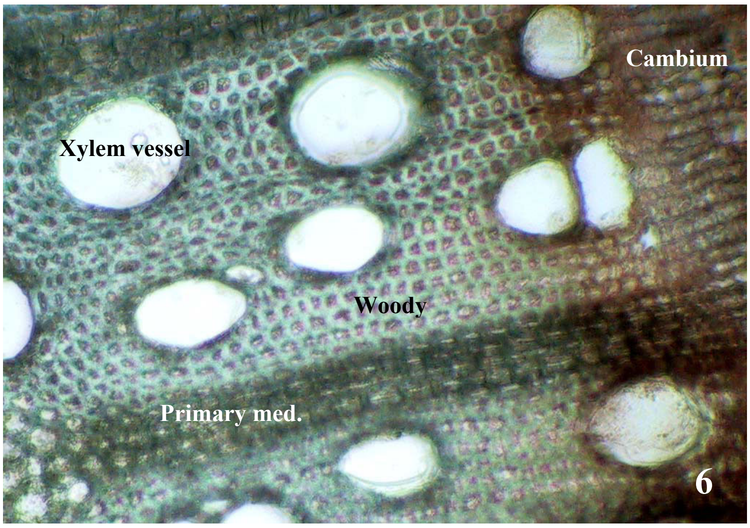

Fig. 6. Stem anatomy at the internode level in ‘*Afuz Ali*’(orig., oc. 12,5x; ob. 10x)

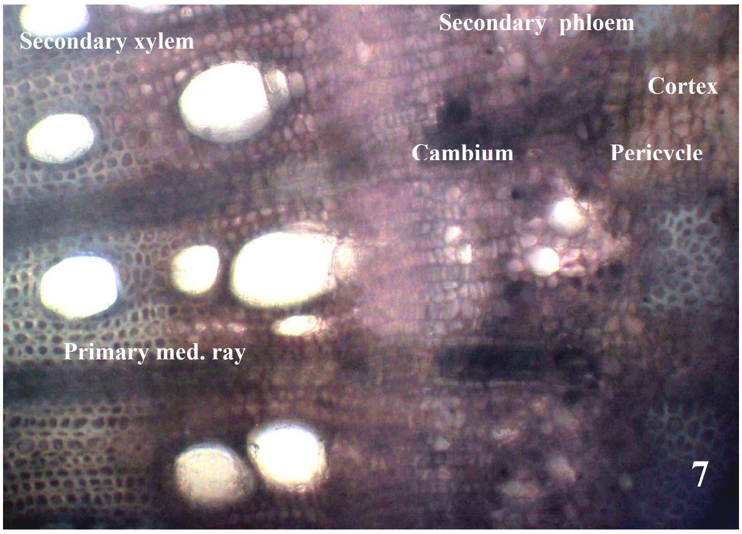

Fig. 7. Stem anatomy at the internode level in ‘*Cardinal*’ (orig., oc. 12,5x; ob. 10x)

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

THE IMPORTANCE OF EQUALIZING YEAR FOR THE EXPERIMENTAL TECHNIQUES IN VITICULTURE

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Keywords: fructification load; cutting type

INTRODUCTION

The factors which may influence the yield results may be divided this way: genetically factors - belonging to the variety; ecological factors determined by climate or microclimate and agrotechnical factors presented by the vine cultivator.

In order to make obvious the influence of the latter factors (agrotechnical) one feels the need that the experiments be watched for a good number of years. The results of the first year or even of the first two years may be taken out, taking into account especially the data of the last years which meet a more important precision degree; these are used for the yield recommendations.

In the perennial plants generally and in the vine especially, in order to organize experiences or specialization scientific studies, one can see, multiple influences which are important for the achieved results.

This phenomenon covers at least the contribution of agrofitotechnical measures adopted by the cultivator. That's why, by the present work, we try to underline the importance of equalizing year (or many years, just for being able to distinguish the problems of each factor of influence upon the experimental results.

The introduction of data, from the first year of experience, as consequence of the statistical calculus may lead to errors which are due to influence factors in the previous years.

MATERIALS AND METHODS

As materials, there were used the varieties: Merlot, Black Feteasca, Cabernet Sauvignon, all of them being grafted on the father plant.

For these varieties, one has chosen the following cutting types: Guyot for halfstalk, Guyot for high stalk, cordon Casenave, cordon Lenz Moser, the long cutting on halfstalk.

The level of fructification charges applied to vines were the following:

– for Guyot for halfstalk: V_1 = 13,5 buds/m^2; V_2 = 19,2 buds/m^2;.
V_3 = 25,0 buds/m^2; V_4 = 30,8 buds/m^2;

– for Guyot for high stalk: V_1 = 7,3 buds/m^2; V_2 = 10,4 buds/m^2;
V_3 = 13,5 buds/m^2; V_4 = 16,7 buds/m^2;

– for cordon Casenave: V_1 = 17,3 buds/m^2; V_2 = 19,2 buds/m^2;
V_3 = 20,2 buds/m^2; V_4 = 23,1 buds/m^2;

– for cordon Lenz Moser: V_1 = 9,4 buds/m^2; V_2 = 10,4 buds/m^2;
V_3 = 10,9 buds/m^2; V_4 = 12,5 buds/m^2;

– for the long cutting on halfstalk: V_1 = 11,5 buds/m^2; V_2 = 15,4 buds/m^2;
V_3 = 17,3 buds/m^2; V_4 = 19,2 buds/m^2;

– for the cutting on high stalk: V_1 = 6,2 buds/m^2; V_2 = 8,3 buds/m^2;
V_3 = 9,4 buds/m^2; V_4 = 10,4 buds/m^2

The working methods which have allowed the interpretation of experimental data have been the following: the direct composition; Fischer sample; the method of significances regarding the limit differences (D. L.) and the correlations methods expressed by the square regression.

RESULTS AND DEBATES

Within the following, one exemplifies the importance of the experimentation first year as so -called equalizing year (equalizing, levelling) one knows precisely that the derouling year carries the burden of previous year, not only from the climate point of view (especially as influencing way upon the bud distinction) but also as receiving some technical influences which were preview to experience formation which present an interest to us.

In the fig. 1 one clearly notices the difference between the curve shape representing the year 1992, in comparison with the following years in which one can see the developments or tendencies, estimated as similar. The same aspect may be discovered in the fig. 2 until 4, to which the debates may be similar.

CONCLUSIONS

1. For the perennial plants like the vine (probably for the fruit trees too), the experiences which may constitute recommendations for production in the multianual exploitations (15-30 years) must be organized on a number as big as possible. This way, one may have equivalent results which may surpass the others which came from the non-technical factors.
2. Behaviour diversity of cultivars in different ecosystems represents one more motivation for keeping on sustaining the year importance (the equalizing year).

Fig. 1. The correlation between the winter buds load and the sugars accumulations in must for the cultivar Merlot – the cutting type *"Guyot on high stalk"*.

1992 – $y = 7,45 + 0,28x – 0,003x^2$; $r = – 0,96^{000)}$

1993 – $y = – 4,23 + 2,10x – 0,069x^2$; $r = – 0,80^{000)}$

1994 – $y = 4,50 + 0,45x – 0,003x^2$; $r = – 0,99^{000)}$

1995 – $y = 8,83 – 0,24x + 0,023x^2$; $r = – 0,97^{000)}$

Fig. 2. The correlation between the winter buds load and the sugars accumulations in must for the cultivar Feteasca neagră – cutting type "*Cordon Cazenave"*.

1992 – $y = 190,28 + 4,89x – 0,182x^2$; $r = – 0,97^{000)}$

1993 – $y = 224,97 + 3,49x – 0,113x^2$; $r = – 0,97^{000)}$

1994 – $y = 275,87 – 3,99x + 0,053x^2$; $r = – 0,98^{000)}$

1995 – $y = 224,38 + 2,26x – 0,099x^2$; $r = – 0,98^{000)}$

Fig. 3. The correlation between the winter buds load and the grapes average yield to the cultivar Feteasca neagră – cutting type *"Guyot holfstalk"*.

1992 – $y = -0,72 + 1,56x - 0,0289x^2$; $r = 0,97^{xxx)}$

1993 – $y = -2,36 + 0,99x - 0,0222x^2$; $r = -0,95^{xxx)}$

1994 – $y = 9,62 - 0,57x + 0,0277x^2$; $r = -0,96^{xxx)}$

1995 – $y = 1,31 + 0,86x - 0,0205x^2$; $r = -0,92^{xxx)}$

Fig. 4. The correlation between the winter buds load and the sugars accumulations in must for the cultivar Cabernet Sauvignon – the cutting type *"For the long cutting on holfstalk"*.

1992 – $y = 173,59 + 7,39x - 0,7300x^2$; $r = -0,97^{000)}$

1993 – $y = 186,59 + 8,24x - 0,6150x^2$; $r = -0,92^{000)}$

1994 – $y = 183,61 + 10,34x - 0,8664x^2$; $r = -0,93^{000)}$

1995 – $y = 198,5 + 1,91x - 0,2206x^2$; $r = -0,82^{000)}$

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SUPERABSORBANTE FITPOL-C USED TO OBTAIN THE MATERIAL VITICULTURE

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Keywords: super absorption, Fitpol-C, aerohidric regime, root system, copse and leafs of grape-vine plants.

ABSTRACT

Reduction of some expensive elements concerning the financial aspect from the nutritive mixture (fallow land, peat) is representing the main objective of this research, substitution which is made with a synthetic product named Fitpol, characterized through a large capacity of storing water (1:80) which it can give up in the moments of hydrical stress of the root system of grafting cutting of grape vine. This product, Fitpol, is creating in the nutritive mixture a favorable condition for a good growing and developing of plants, both at level of root system as well as at the level of copse and leafs.

INTRODUCTION

The substitution of some expensive elements concerning the financial aspect from the nutritive mixture (fallow land, peat) is representing the main objective of this research, substitution which is made with a synthetic product named Fitpol, characterized through a large capacity of storing water (1:80) which it can give up in the moments of hydrical stress of the root system of grafting cutting of grape vine.

This Fitpol has a positive impact to the growing and developing plants improving also the features hydro-physics and physics of soil, characterized by a favorable aerohidric system.

This product, Fitpol, is creating in the nutritive mixture a favorable condition for a good growing and developing of plants, both at level of root system as well as at the level of copse and leafs.

MATERIALS AND METHODS

The experimental block in which has been made the research- experience has three experimental factors, each one representing the following aspects:

- A factor means a nutritive mixture:
  - a1 witness – PMN 1/3
  - a2 – P2/3 N1/3
  - a3 – P1/3 N2/3
  - a4 – P2/3 M1/3
  - a5 – N3/3

(P- soil, N – sand, M – old manure)

- B factor means the system of plantation:
  - B1 – flower pot PVC
  - B2 – nutritive cubs (20/10 cm)
  - B3 - semibilon

- C factor means the Fitpol doze
  - C1 – 0g.
  - C2 - 0,5g.
  - C3 – 1g.
  - C4 - 1,5g.

The main observation and determination made on the vegetable material planted in experimental conditions were:

- the length and number of roots;
- the length and number of copses;
- the mature length of copse;
- the photosynthetic activity by determination of chlorophyll a, b and of chlorophylls pigments;
- the biochemical features of the mature copses (total glucose and water)

RESULTS AND DISCUSSIONS

a) from the first graphic in which are represented the determinations biometrics of the root system (number and length of roots) we can see that the variants planted in flower pots PVC is detaching, under those two aspects, by the other two variants of planting (cubs and semibilon). If in P2/3 M1/3 variant, the purpose of Fitpol is take over by the presence of superabsorbant. in a mixture, than in P1/3 N2/3 variant and P2/3 N1/3 variant (photo 1) where the purpose of Fitpol ensure at the level of root system favourable conditions for growing and developing, respective an best aerohidric ratio.

In these variants the dozes of Fitpol are useful especially the economical doze of 0,5 g/plant where the growing were at least 25-30 roots/plant and represented an insertion concordant the STAS.

The length of roots as a biometric indicator has correlated directly and positively with the land conditions from the nutritive substratum, conditions influenced directly by the presence of Fitpol in all the four experimental dozes.

Values over 25 cm were found in the nutritive cub variant at the doze of the 0,5 g Fitpol/cub and values in about 15 – 18 cm at those two planted variants in flower pots PVC at the doze of 1 g /plant.

b) The number and length of copses quantificated on the vegetable material can be seen in the second graphic. This two biometrics indicators presents directly and positive correlated values between them, as well as with land conditions use by plants through experimental variants of plantation. The planting variants of nutritive cubs, …, and from flower pots PVC/P3/2 M1/3 it is characterized by high values of these two biometrics indicators, values which confirm the aerohidric conditions but also the high volume of nutritive substratum in which are characterized. However under economical aspect at the planted variants in flower pots PVC P1/3 N2/3 and P2/3 N1/3 we meet a best physiological number of copses between 1 and 3 but also normal size of these over 30 cm.

c) The maturate length of the copses, fundamental biometric indicator for the grape vines STAS of first category is directly and negative correlating with the copses of length in the meaning that at the large sizes of the copses corresponds mature low sizes, and the other way around.

The third graphic confirms the affirmations above, in the meaning that the variants with the largest sizes of the copses presents lower sizes of maturation, and planted variants in flower pots PVC P1/3 N2/3 and P2/3 N1/3 presents a maturation length of the copses at about 10 cm in the first variant of plantation at the 0,5 g Fitpol doze and aver 15 cm at the second variant of nutritive mixture, at the same doze of Fitpol. Also from this graphic can be seen the fact that the maximum doze of Fitpol (1,5 g/plant) inducing also large sizes of maturation of the copses.

d) The fourth graphic shows the variation of the values of photosynthetic calculated by determination in a laboratory to chlorophyll a, b, and to chlorophyll pigments. The highest values can be found in the planted variant on semibilon but also in the variant planted in the sand (100%), both being influenced positively by the presence of Fitpol at the root system level.

e) Specific biochemical indicators of the dry vegetable material (mature copse) synthetic restored in the fifth graphic which emphasis the planted variants in the nutritive mixture types which confers to the root system am high land volume but also an favourable aerohidric volume.

CONCLUSIONS

1. The land volume of the root substratum correlated with the experimental doze of Fitpol, which is economical under financial aspect (0,5 g Fitpol/plant) is constituting main elements to obtain an viticulture planting material with physiological features concordant to STAS.
2. The photosynthetic activity of the graft cutting vine grape, but also in the content of the glucose, tannins and phenols from maturated portion of the copse, these are correlated directly and positively with favourable land conditions at the root system of the plants, conditions which also are correlated with Fitpol doze applied.

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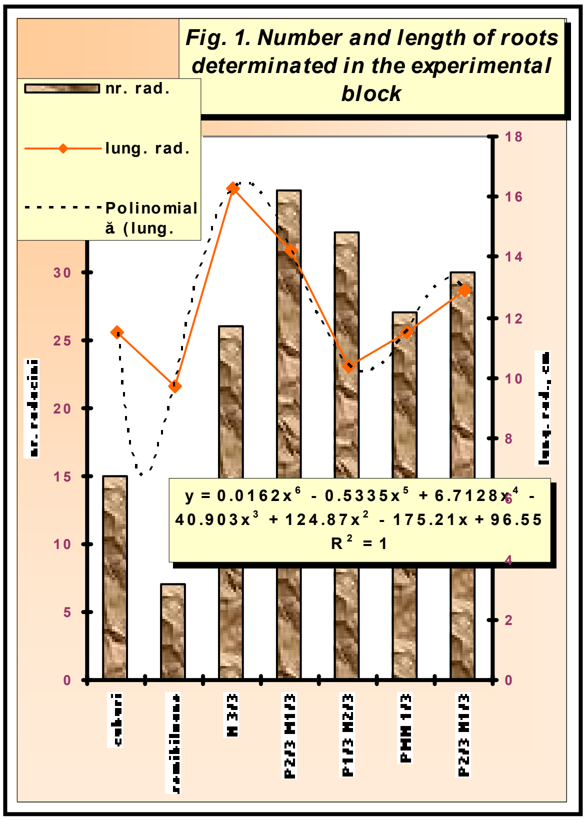

Fig. 1. Number and length of roots determinated in the experimental block

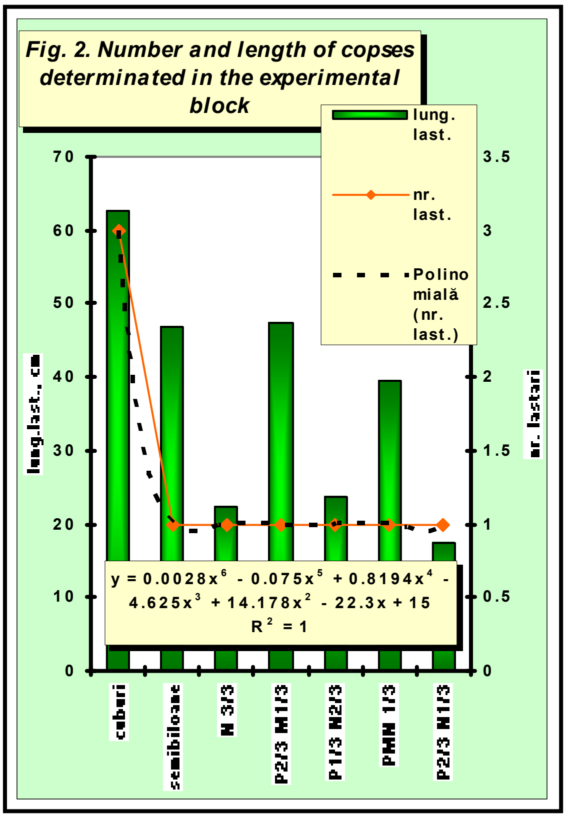

Fig. 2. Number and length of copses determinated in the experimental block

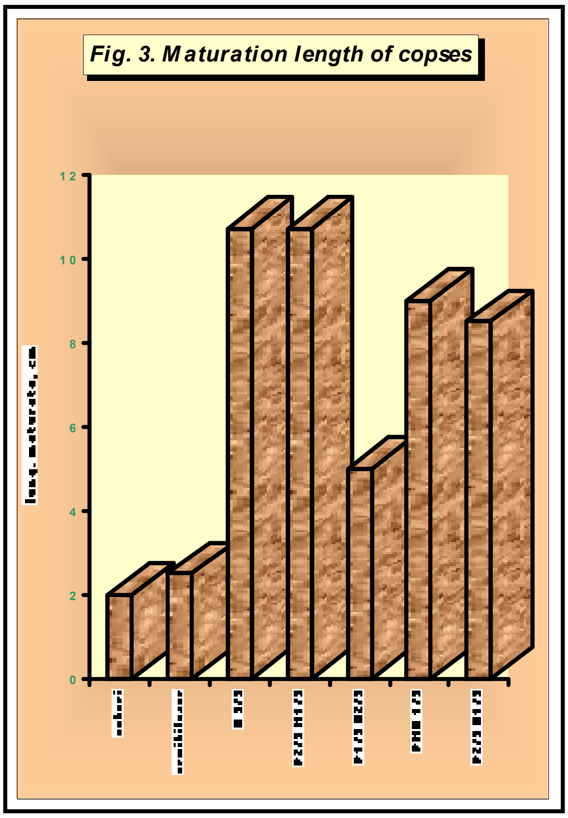

Fig. 3. Maturation length of copses

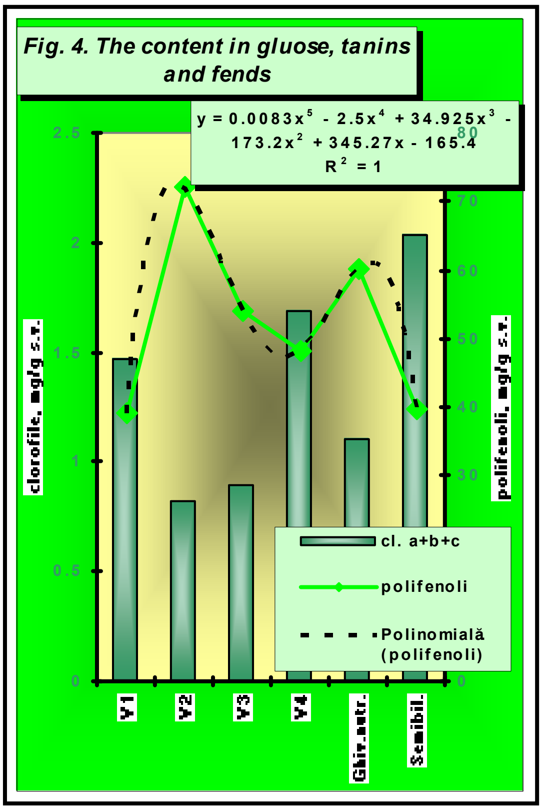

Fig. 4. The content in gluose, tanins and fends

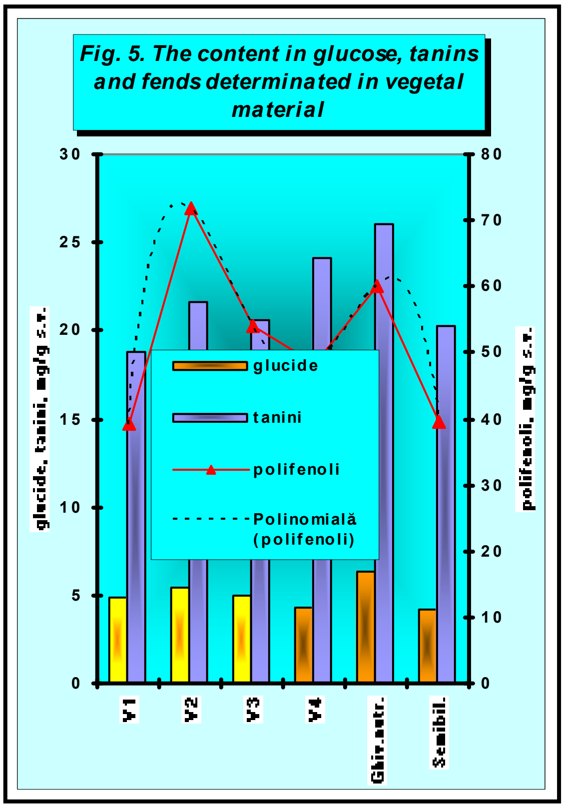

Fig. 5. The content in glucose, tanins and fends determinated in vegetal material

Foto 3. Influence of planting on the semibilon under copses maturation

Foto 1. The purpose of Fitpol under developing root system

Foto 2. The impact of the planting system in the nutritive cubs under copses growing

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, Vol. XLVII, 2004

STUDY ON THE POTENTIAL IN PHENOLIC COMPOUNDS OF SOME PINOT NOIR CLONES UNDER THE CONDITIONS OF THE VITICULTURAL CENTER STEFANESTI-ARGES IN 2002-2003

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Keywords: viticulture, winemaking, phenols, grapevine clones, quality wines

ABSTRACT

In a former paper a first batch of experimental data has been presented concerning the potential of phenolic compounds of some Pinot noir clones grafted on the rootstock SO_4-5 (a) in the vineyard Stefanesti. This work presents the same issue under the same conditions, except that the clones were grafted on a different rootstock (3309-111). The experiments indicated that, among the three clones studied, the one denominated as 115 stands out from the others as far as the quantity of phenolic compounds is concerned, but also from the viewpoint of the quality of the harvest.

INTRODUCTION

The spreading in culture of certain new grapevine clones, obtained in our country or abroad, has the purpose to diversify the wines products, which aims to stimulate and satisfy the market demand for the essential wine and must products, in particular for high quality red wines. The wine quality, in turn, depends generally on the obtaining technology, on the treatments applied to the grapevine, on the quantity and quality of the grape production, and, last but not least, on the characteristics of the vintage year.

In this work the phenolic compounds evolution during the maturation process was followed in the grapes of three Pinot noir clones – denominated as **777, 115,** and **375**. The amount of pigments extracted in the wines obtained from these clones was also determined.

MATERIALS AND METHODS

The experimental plantation which represented the object of scientific research was a comparative field which includes three Pinot noir clones having as a partner the roostock 3309-111. Thus, 3 experimental varieties and the control variety were available for study, as presented in Table 1. The training system chosen was the Guyot semihigh, the planting distance was 0.9/2.5 (that is 4445 vines/ha). The determinations were made every ten days since the complete appearance of the colour until the technological maturity. Besides the evolution of the basic characteristic (such as sugar and acidity), measurements were made on the content of polyphenols and anthocyans from different constitutive parts of the berries. At the harvest moment the technological supply of colouring matters was determined, as a measure of the proportion in which the colouring matters can be extracted from unfermented wine, during the processing (method C. Asselin, L. Puisant).

RESULTS AND DISCUSSIONS

The specific weather conditions of the two years of culture analyzed, 2002-2003, presented a series of characteristics which affected the course of the vegetative cycle of the grapevine, and the quantity and quality of the grape harvest. In 2002 there were low temperatures in winter, and lack of precipitations during the vegetation period; in 2003 again there were low temperatures in winter, and low precipitation amounts during all the vegetation period. All these conditions influenced in a great degree the ripening of grapes; as far as the dynamic of ripening is concerned, an advance of 7-10 days was observed in the year 2003 compared to 2002. The most important grape parameters determined during the maturation time are presented in Table 2 for the calendar years of study. Regarding the basic grape and must characteristics (sugar, acidity), all the experimental varieties displayed adequate values, suitable for the obtaining of high quality wines (217 g/l - 223.6 g/l sugar and (5.25-6.40 g/l tartaric acid), typical to the Pinot noir varieties. The analyses, carried out at precise dates, indicated that clone 115 had the best performance from the viewpoint of the concentration of unfermented sugar in wine and the content of colouring matters, followed by clone 777. These two clones showed good adaptability to the ecopedoclimatic conditions of the Stefanesti vineyard and, also, good affinity for the rootstock 3309-111.

However, the clones did not exceed the performance of the control variety (Pinot noir population). Figure 1 presents the evolution of the anthocyans content during the maturation of grapes of the experimental varieties. The research indicated that the accumulation of anthocyan pigments in the grapes of the Pinot noir follows an ascendent curve, which has a maximum near the full maturity. The full maturity was reached at different dates for the two years of culture analysed (Sep. 17. for 2002, Sep. 7, for 2003) once again underlining the influence of the culture year upon the development of the phenolic spectrum. In the year 2002 the rate of accumulation is relatively constant; from this point of view the clones displayed a high degree of similarity, compared to the control. The control variety presented a special evolution in the dynamic of the ripening, with a high accumulation of anthocyans right from the beginning, the decrease recorded after full maturity being insignificant. The situation in the year 2003 was very special, as the accumulations were high until the moment of the appearance of colour (Aug. 8), situation valid for all the experimental varieties. However, as far as the rate of accumulation is concerned, a relatively constant rate was observed at clone 115, which in the end recorded the highest concentration of pygments (940.5 mg/l), although still under the control. Clone 777 b followed, with 838.7 mg/l. Clone 375b recorded smaller concentrations in both years, but the values reached are still sufficient for the obtaining of high quality red wines, suitable for the present demand on the market.

To obtain high quality red wines, not only the quality of anthocyans, but also the polyphenols content in the grapes is important. In Figure 2 we can observe that, from this point of view, clone 115 stand out, with the highest concentration of total polyphenols (2339.9 mg/l galic acid), followed by the combinations 375b and 777b. It is obvions that when full maturity is reached, a high concentration of total polyphenols translates into high concentrations of anthocyans; the ratio of this transformation is relatively constant at the clonal level, without important differences.

Using the C. Asselin, L. Puissant method the technological reserve of colouring matters at the moment of harvest has been determined, as a measure of the degree to which the colour can be extracted from the must (and later into the wine). This determination is of great practical interest in the obtaining of red wines. For each individual clone the result was different; but the differences are not very significant at clonal level, as the extracting percentage varied between 47.6% for the control and 65.7% for clone 777b. It can be obseved that, although it accumulates smaller amounts of anthocyans than clone 115, clone 777b has a greater extraction efficiency. Therefore we can estimate that the technological reserve of colouring matters is relatively similar for clones of same variety, beeing influenced by the different distribution of anthocyans in the peel, as well as by the different degree of solubility at harvest time.

CONCLUSIONS

1. The specific weather conditions recorded for each culture year influence the evolution of phenolic compounds, at the level of the accumulation rate but also regarding the quality of the pygments accumulated and extracted into wine.
2. The grapes content in phenolic compounds, as well as the basic characteristics (sugar, acidity), in both years of culture, reached superior levels, suitable for the production of high quality wines.
3. The content of phenolic compounds, as well as the technological reserve of colouring matters, vary insignificantly among the clones of the same variety. From thes point of view of these parameters we can remark clone 115, followed by 777 and 375.
4. The technological reserve of colouring matters is characteristic to the variety and also to its clones, very well suited for the obtaining of quality red wines.
5. From all points of view related to colour, pygments, anthocyans (quantity, quality, technological reserve) clone 115 displayed good adaptability to the edopedoclimatic conditions of the vineyard Stefanesti and a good afinity with the rootstock 3309-111.
6. The Pinot Noir clones 777, 115 and 375, obtained in France and cultivated in the vineyard Stefanesti-Arges, behave in a similar manner and reached values of quality parameters which are very close to those of the control (Pinot noir).

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Tables

Table 1. Tested Pinot noir clones

Clone of Pinot noir	Origin / description
Control	Pinot noir/ Kober 5 BB (M)
777b	High quality clone Origin: Morey St. Denis (Cote d'or) Selection center: A.N.T.A.V., 1981
115b	Quality clone Origin: Morey St. Denis (Cote d'or) Selection center:I.N.R.A., 1971
375b	Quality clone Origin: St. Denis de Vaux (Saone et Loire) Selection center: A.N.T.A.V., 1974

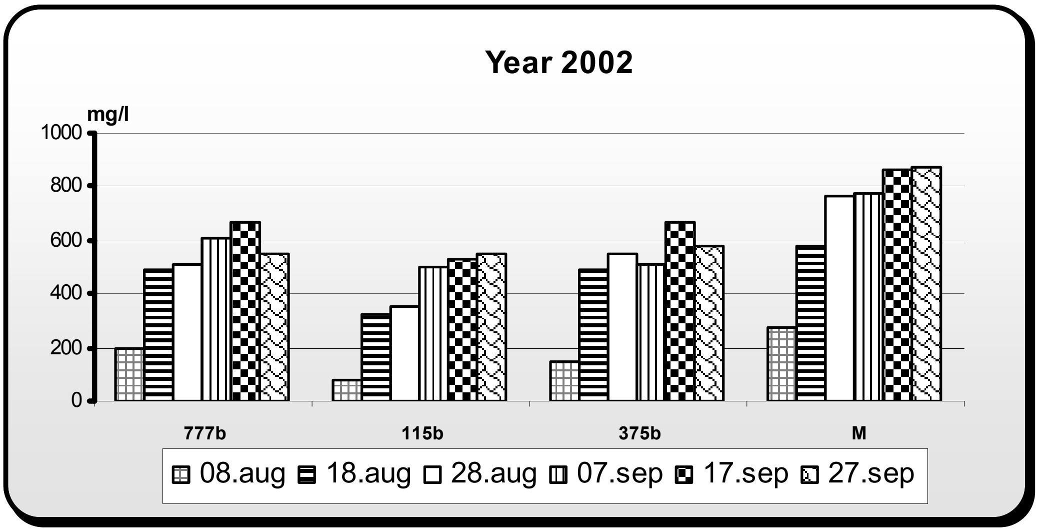
Table 2. Measured parameters of the Pinot noir clones in the Stefanesti-Arges vineyard in 2002.

Experimental varieties 2002	Moment I (at colour appearance)			Moment II (at full maturity)			Moment III (at full technological maturity)		
	Sugars g/l	Total acidity g/l	Anthocyans g/l	Sugars g/l	Total acidity g/l	Anthocyans g/l	Sugars g/l	Total acidity g/l	Anthocyans g/l
Control (M)	121.55	14.78	273	236.25	6.06	866.5	251.12	5.25	871.6
777b	96.5	16.09	194	198.2	6.64	662	210.76	5.74	545
115b	93.94	16.94	74	193.7	5.16	532.2	223.61	5.33	545
375b	102.44	17.37	151	198.2	6.72	666	215	6.2	576

Table 3. Measured parameters of the Pinot noir clones in the Stefanesti-Arges vineyard in 2003.

Experimental varieties 2002	Moment I (at colour appearance)			Moment II (at full maturity)			Moment III (at full technological maturity)		
	Sugars g/l	Total acidity g/l	Anthocyans g/l	Sugars g/l	Total acidity g/l	Anthocyans g/l	Sugars g/l	Total acidity g/l	Anthocyans g/l
Control (M)	128.99	14.28	576.7	228	6.7	887.9	236	5.4	993.2
777b	187	8.8	485.2	225	6.5	941.3	219	6.4	838.7
115b	178	9.76	320.6	24	6.6	821.16	221	6.3	940.5
375b	172	9.76	438.8	211	6.5	788.5	217	6.3	837.9

Figures



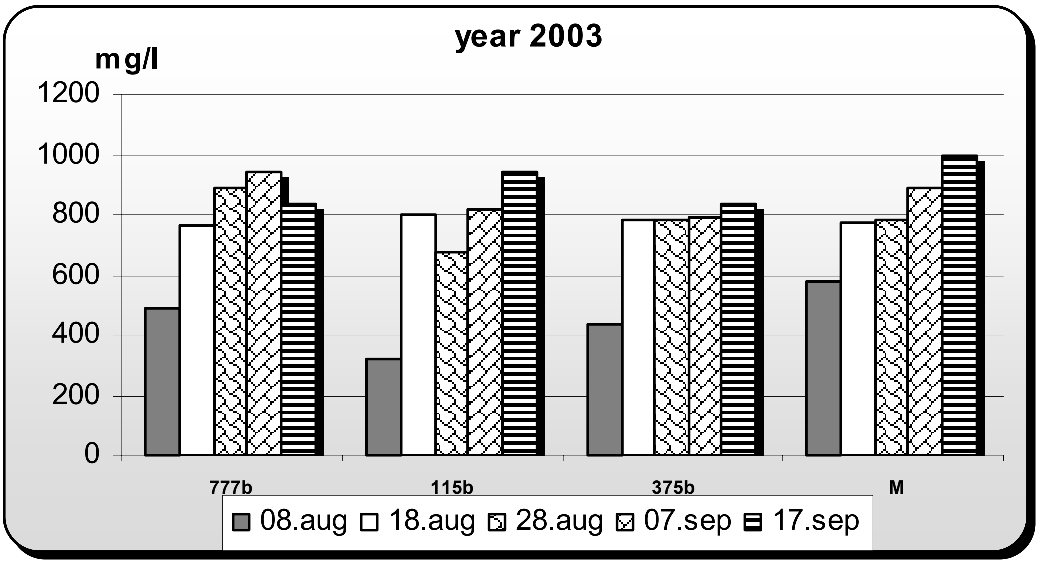


Fig. 1 The dynamic of the maturation of grapes and the content in anthocyans of Pinot noir clones (values 2002-2003).

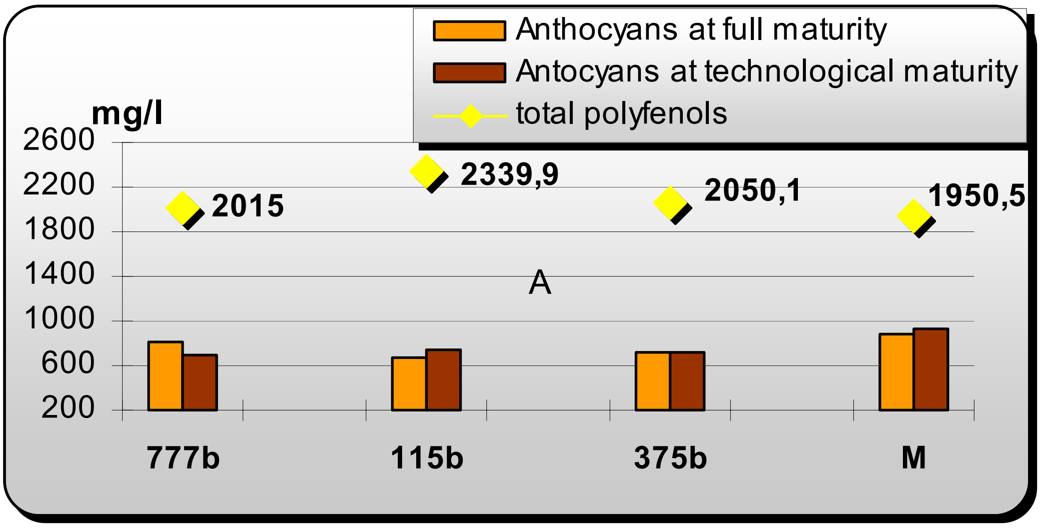


Fig. 2. The content in anthocyans and total polyphenols in the peel
at full ful maturity and technological maturity.

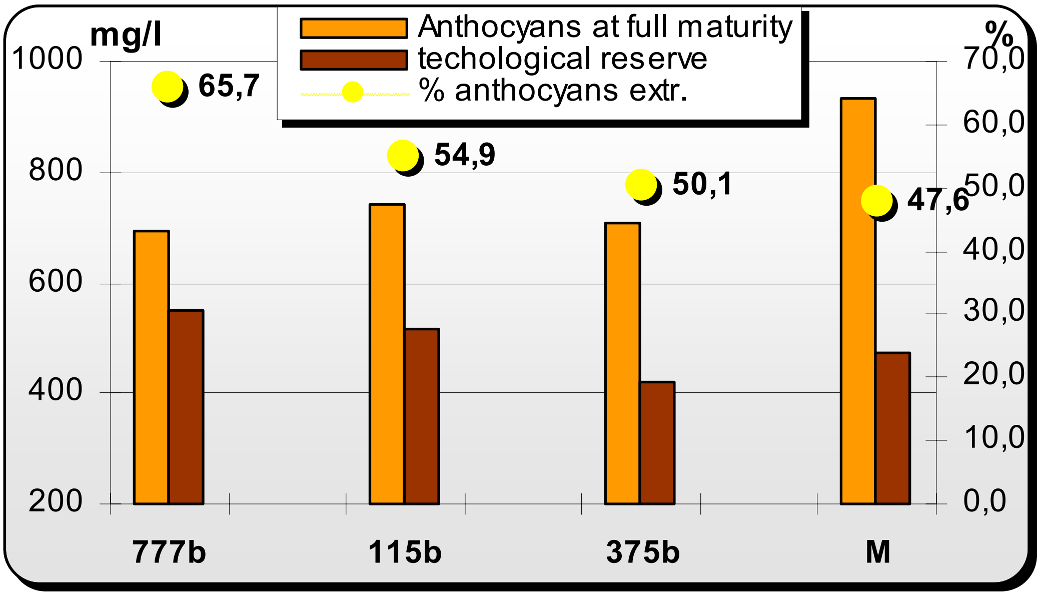


Fig. 3. The content in anthocyans and the technological reserve
of colouring matters of Pinot noir clones cultivated
in the same vineyard at harvest time (average data of 2 years)

RAPID TESTING METHOD FOR SCION – ROOTSTOCKS COMPATIBILITY USING IN VITRO MICRO GRAFTING

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Keywords: micro propagation, *in vitro*, viticulture, vine varieties, micro grafting

ABSTRACT

The goal's research was to obtain directly grafted and rooted vine grape plants.

INTRODUCTION

Studies regarding this topic (Martino, 1991; Ozzambak and Schmidt, 1991; Ben Abdalah and all., 1996) showed that this method was inefficient because the percentage of the obtained plant was reduced. Another inconvenience appeared because the proprieties of the plants were not in concordance with STAS. Seeing all the results we tried to find out which is the role of the grafted point in micro grafting (figure 1)

MATERIALS AND METHODS

Biological material was selected from vine grape variety collection obtained through virus free technology which was conserved in Research and Development Centre for Viticulture and Winemaking S.C.D.V.V. Stefăneşti in an isolated greenhouse. We selected for research three vitis vinifera clones which belong three genotypes used like scion (Sauvignon 62Dg, Riesling italian 3 Bl and Merlot 17Od) and four rootstocks (V.Berlandieri x V.Riparia Kober 5BB, selection Crăciunel 26 and SO4-4, and Precoce) used like rootstocks.

From the rootstock varieties 2 – 2,5cm shoots length were detached, in aseptical condition. In the same way scion varieties 0,2 – 0,3cm apex length were detached. Micro grafting was done in slit without protecting the grafted point.

Micro grafted plants were inoculate on the rooting media (½ Murashige –Skoog (M&S, 1962) and as hormonal added it was used 0,022mg/l kinetin and 1,8 mg/l AIA.) and were maintained until the solder was approached (figure 2).

The whole operation took place in controlled conditions: temperature 25 ± 1^0C, photoperiod 16 hours and 3000 – 3500 lx. During the period (30 – 50 days) we analyzed solder achievement, scion growing, advent roots from rootstock and some rejected action between scion and rootstocks.

RESULTS AND DISCUSSIONS

We had 12 combinations between scion-rootstock to study the solder around grafting point without protecting it. Because of the *in vitro* conditions all the three specific phases (callusing, solder and vascularization) were achieved in a short time (10 – 15 days).

Due to i*n vitro* culture, physiological processes regarding the rootstocks were restarted in a short time and we recorded a sudden release of rooting process and scion grew up in 10 – 28 days (chart 1).

The results of the experiment are similar with the results obtained by Oslobeanu and all. (1975) using classical graft method regarding the rootstock capacity to issue bazal roots. Differences observed depended on the scion variety (figure 3). In order to obtain grafted plants the important thing was the cohabitation between partners (chart 2).

The rejected phenomenon was demonstrated by keeping separate scion from rootstock and appeared due to the conditions created by *in vitro* technique. The phenomenon was stimulated by the physiological processes rhythm.

In the most cases there was a correlation between this phenomenon and decreasing the number of the plants obtained by micro grafting. Regarding the fact that shoots appeared on the rootstocks, this situation was also determined because of the existence of buds on the shoots (chart 3 and 4).

CONCLUSIONS

We appreciate the efficiency to produce plants using micro grafting technique is around 45 -50 % (figure 4). To increase this percent is necessary to take away all the roots growth from the scion and all the shoots growth from the rootstock.

Concluding, we can use this method to investigate in a short time grafting affinity between two partners. We also recommend this technique when we need new valuable genotypes and it is necessary to put them to produce in a very short time.

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Figure 1
Micro grafting plant

Figure 2
Section in a grafted point

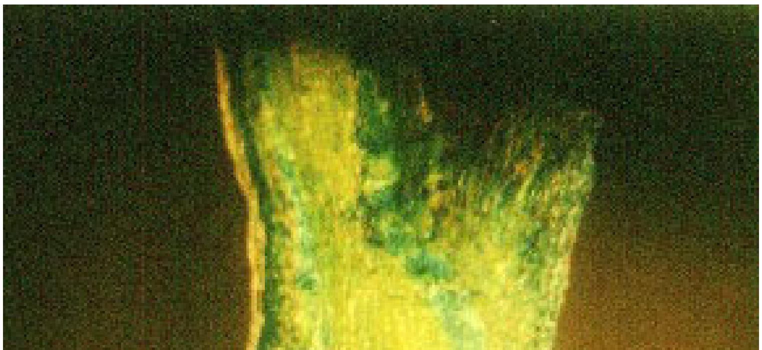


Figure 3
Rejected phenomenon

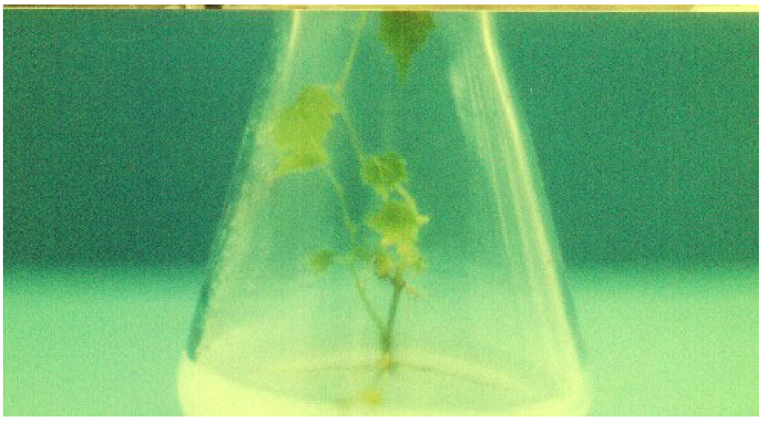


Figure 4
Micro grafting and acclimatized plants

Chart1
Rooting moment in rootstock

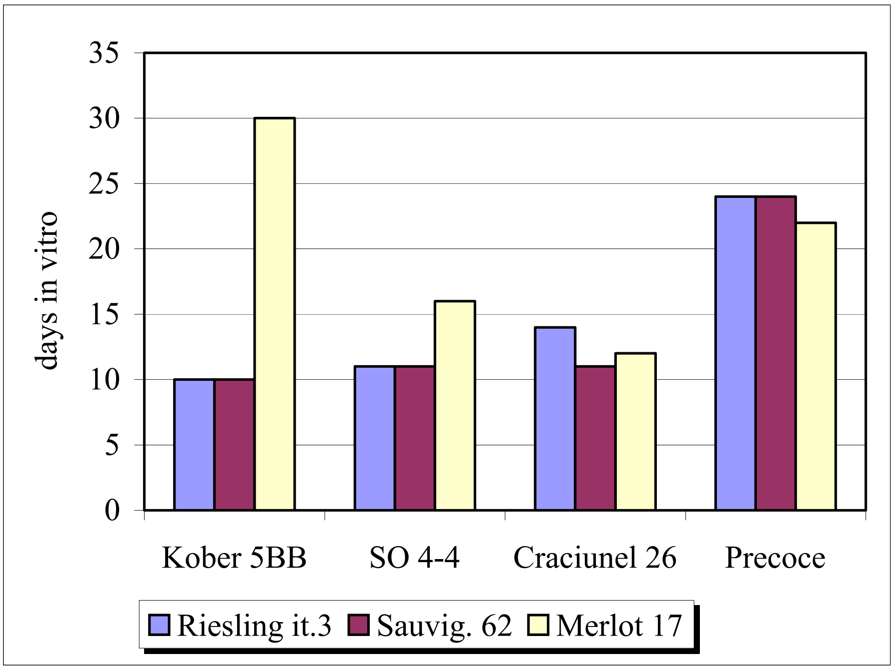


Chart 2
The scion influence in micro grafting process

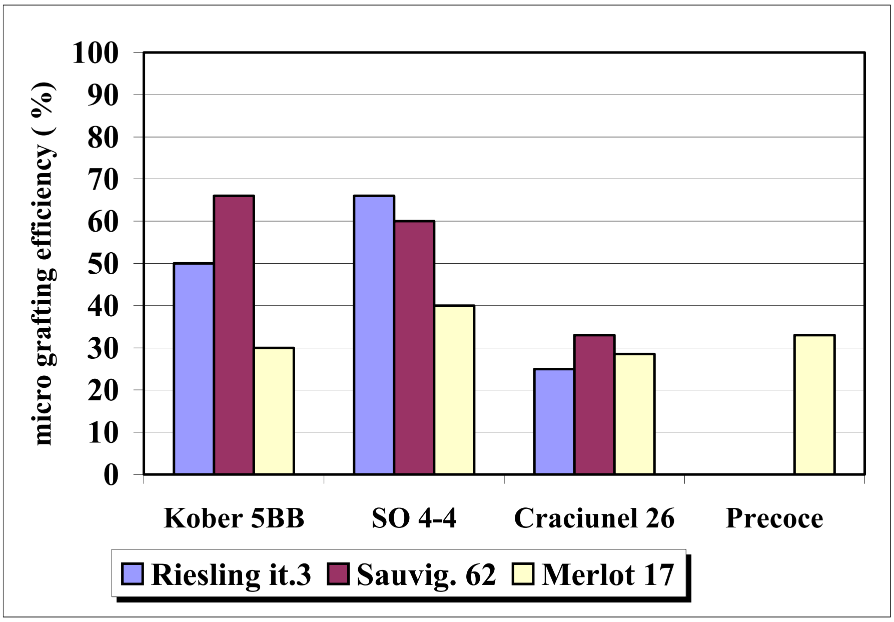


Chart 3
Rejected phenomenon – rooting process

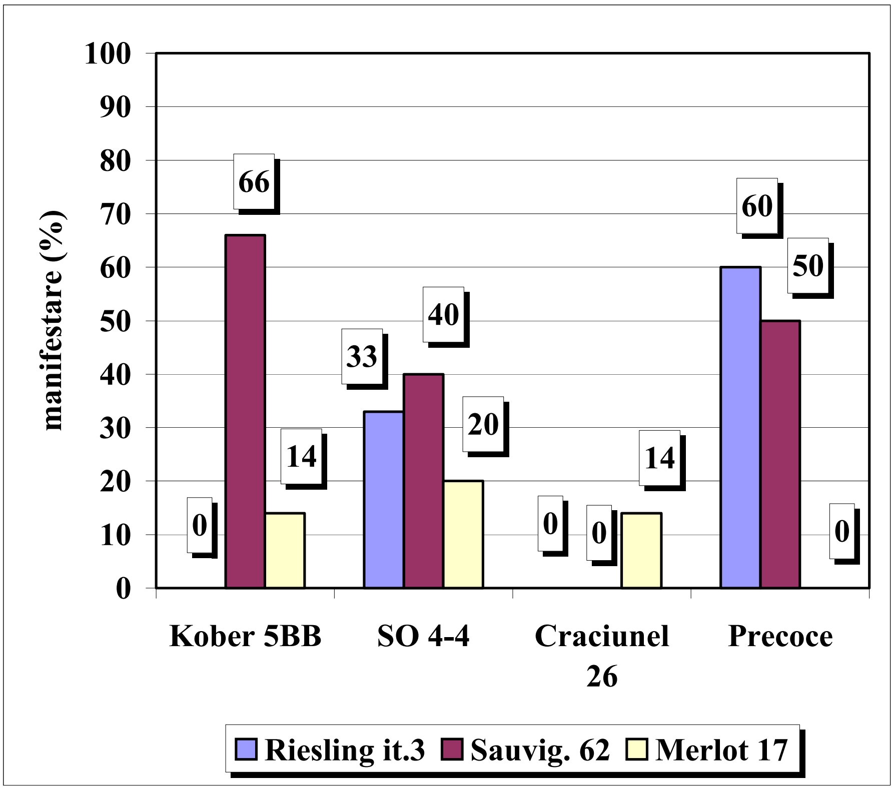
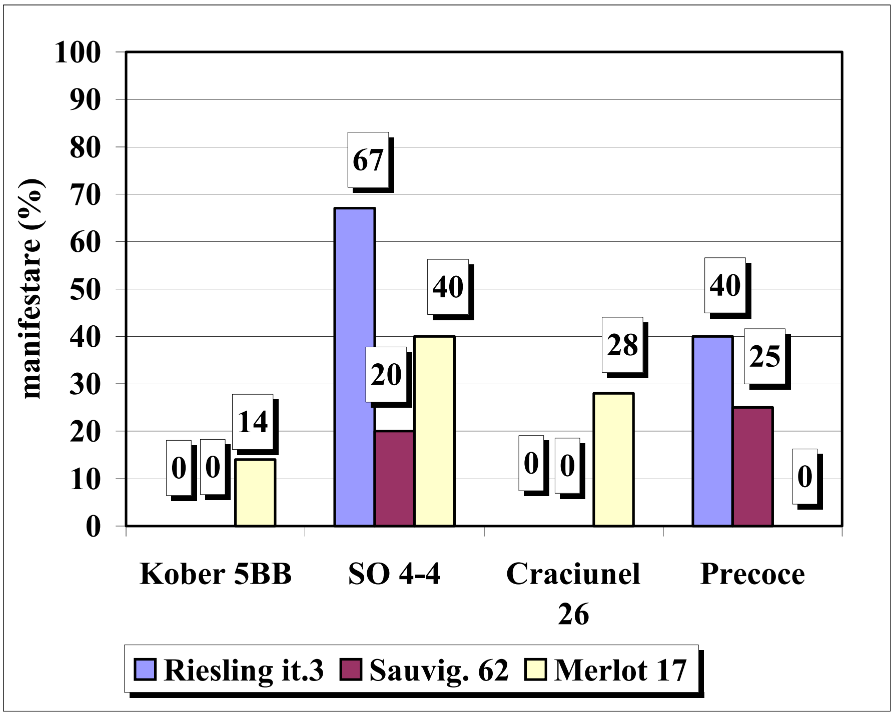


Chart 4
Rejected phenomenon – shooting process



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VALUABLE VINE VARIETIES AND ROOTSTOCKS FOR SUPERIOR WINES OBTAINED BY *IN VITRO* MULTIPLICATION

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Keywords: micro propagation, *in vitro*, viticulture, vine varieties, rootstocks, vine

ABSTRACT

The goal's research was to see the regenerative potential through *in vitro* culture method of some valuable varieties of vine grape and rootstocks in order to use this technique to produce planting material.

INTRODUCTION

All the studies were done using *in vitro* techniques applied to three vitis vinifera clones which belong three genotipes used to obtain superior wines (Sauvignon 62Dg, Riesling italian 3 Bl şi Merlot 17Od) and five rootstocks (V.Berlandieri x V.Riparia Kober 5BB, selection Crăciunel 26 and SO4-4, V.Berlandieri x V.Rupestris 140 Ruggeri and Precoce). We tried to establish an optimum culture media in order to obtain a higher number of shoots and better rooting process, in fact a vine grape plant in a short time.

MATERIALS AND METHODS

Biological material was selected from vine grape variety colectin obteined through virus free technology which was conserved in Research and Development Centre for Viticulture and Winemaking S.C.D.V.V. Stefăneşti in an izolated greenhouse. There were selected for research three vitis vinifera clones belong three genotipes used for obtaining superior wines (Sauvignon 62Dg, Riesling italian 3 Bl şi Merlot 17Od) and five rootstocks (V.Berlandieri x V.Riparia Kober 5BB, selection Crăciunel 26 and SO4-4, V.Berlandieri x V.Rupestris 140 Ruggeri and Precoce).

The explants used for *in vitro* multiplication, apex with a higher regenerativ potential (0,3 – 0,5cm) and axilar buds (0,5-0,6cm), where harvested from plants in an intensive shoots growth phase cultivated in soil. The young shoots were 3-4 cm lenght and were sliced in two tipes of explants (apex and axilar buds) (figures 1).

Biological material sterilization was done with $CaCl_2O_2$ - 6% in aseptically conditions (laminar air flow), depending of explants type (figures 2). The apex was kept 4 minutes in sterilizing agent and axilar buds 8 minutes. But first time our biological material was washed with normal water and after that was drop in 80% alcohol. The sterilizing agent was washed with distillate sterile water 3-4 times.

To see the regenerative and multiplication capacity of our varieties, the culture media used for initiating and multiplication was Murashige – Skoog (M&S, 1962) added with 1mg/l (BAP) and 0,5 mg/l (AIA). During the multiplication phase, for some vigorous varieties the ratio citokinin/auxin turned into 1:1. As a carbon source it was used commercial sugar (20g/l) and to solidify the culture media it was used agar-agar (0,8%).

The rooting of shoots detached from the multiplicated groups was done on the culture media used for vine grape rooting. The composition of this culture media is ½ Murashige – Skoog (M&S, 1962) and as hormonal added it was used 0,022mg/l kinetin and 1,8 mg/l AIA. Carbon source was decreased to 10g/l during the agar was 0,8%.

According to general references regarding vine grape *in vitro,* multiplication, pH is 5,7 – 5,8 before the autoclave. Dishes with culture media were sterilized during 20 minutes at 120^0C (1atm) using the autoclave.

Organogenesis and multiplication processes of biological material coming from explants proliferation took place in controlled conditions: temperatures 25 ± 1^0C, photoperiod 16 hours and 3000 – 3500 lux.

From the point of protecting against desiccate and substratum used the plants obtained by *in vitro* multiplication were acclimatized during few phases.

Nutritiv substratum used in the first aclimatization phase was sterilized (sand and perlit in equal ratio), the higroscopisity was assured covering the plants with jars and the temperature was around 18 - 24°C (figures 3). To combating *Pytium debaryanum* if was necesar we used Micodifol 0,2%.

In the second aclimatization phase it was used hotchpotch with better nutritiv substratum (figure 4). During 15 – 18 days the plants were protected against fungal infections with tretments using fungicide substances (Calidan or feeding tannins).

RESULTS AND DISCUSSIONS

Using an unique culture media to initiate and multiplicate the both tipes of explants belongs to vinifera genotipes (Sauvignon 62Dg, Riesling Italian 3Bl. and Merlot 17 Od) and to rootstocks (V.Berlandieri x V.Riparia Kober 5BB, selecțiile SO4-4, and Crăciunel 26, V.Berlandieri x V.Rupestris 140 Ruggeri and Precoce), allowed us to divide the varieties in 3 clases: low, medium and higher regenerating potential. As we can see axilar buds have a higher regenerative potential due to apical dominate effect in principal bud under hormonal balance influence. (see chart 1 and 2).

In order to obtine a higher number of shoots to be transfered on the rooting media it was necesary to decrese the BAP quantity to 0,5mg/l which stimulated shoots elongation to 2,5 – 3cm. The vitrification fenomens and morfological changes weren't observed during the explants proliferation.

The rhizogenic process was observed after 10 – 12 days regardless genotype. The shoots growth and rooting development were observed after another 10 – 15 days, depending of the variety, obtaining a higher rooting process percentage (85 - 100). (Tables 1 and2).

In order to decrease the period for obtaine a plants using *in vitro* culture we tried to do in the same time both rooting and aclimatization phase.

CONCLUSIONS

Concluding, keeping strict all the technological conditions by *in vitro* technique regarding to vine grape increase the regeneration, rooting and acclimatization efficiency, regardless what kind of explants and genotype we used.

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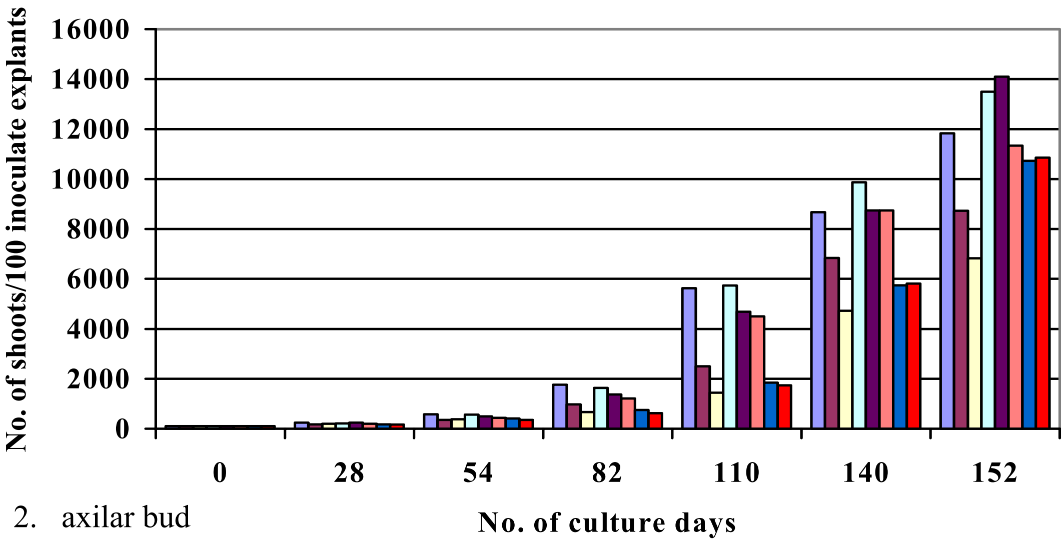
Regenerative explants potential by genotype isolated from:

1. apex



2. axilar bud

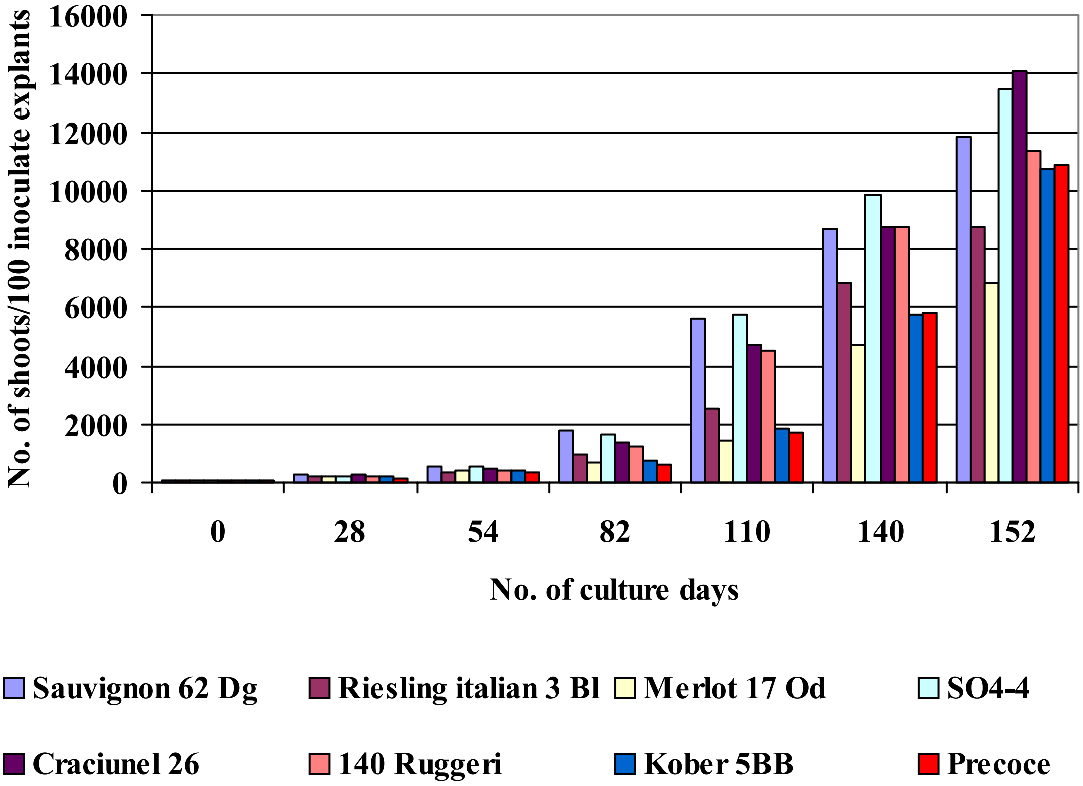


Table 1. Rooting potential in vine grape genotypes

Nr. crt.	Varieties	Rooting plants (%)
A. Vinifera variety		***x***
1.	Sauvignon 62 Dg	100
2.	Riesling Italian 3 Bl.	95
3.	Merlot 17 Od.	98
B. Rootstocks variety		***x***
1.	V.Berlandieri x V. Riparia selecția SO 4-4	100
	V. Berlandieri x V. Riparia Kober 5 BB	100
2.	V. Berlandieri x V. Riparia Kober 5 BB selecția Crăciunel 26	95
3.	V. Berlandieri x V. Rupestris 140 Ruggeri	85
4.	Precoce	90

Table 2. Acclimatization capacity in some vine grape genotypes

Nr. crt.	Varieties	Acclimatizated plants (%)
A. Vinifera variety		***x***
1.	Sauvignon 62 Dg	90
2.	Riesling italian 3 Bl.	88
3.	Merlot 17 Od	90
B. Rootstocks variety		
1.	V.Berlandieri x V.Riparia selecția SO 4-4	90
2.	V.Berlandieri x V.Riparia Kober 5 BB	92
3.	V.Berlandieri x V.Riparia Kober 5 BB selecția Crăciunel 26	86
4.	V.Berlandieri x V.Rupestris 140 Ruggeri	80
5.	Precoce	85

Figure 1

Apex

Axilar bud

Figure 2. Intensive shoots growth phase

Figure 3. Air flow operations

Figure 4. Using jars to assure higroscopisity

Figure 5. Second acclimatization phase

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RESEARCH WORKS CONCERNING THE LEAD CONTENT OF WINES IN SOME WINE-GROWING CENTERS OF TÂRNAVE VINEYARDS

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Keywords: lead, content, soil, wine.

ABSTRACT

The problem of the heavy metals presence in the environment and particularly the lead in wine-growing area is a major problem of the ecological research. Generally the lead content in wines of Târnave vineyards has been found to be quite low, and the results show that a high pollution degree is reached in the Copşa Mică area and the pollution level diminished with the distance from the source. In view to obtain good wines for consumer is also important to know the lead content in soil. This one is an important source of lead in the wine because represent the nourishing medium for vineyard.

INTRODUCTION

The presence of the heavy metals, in environmental and especially of lead in our alimentations became a major problem for the services which supervise the quality of food and the health of the population. The toxicology of lead is know for very long time and a lot of researches have been made in time, as a result of his capacity to bioaccumulation in organism.

Today, the wine is considerate one of the important alimentation source in lead and other heavy metals for the humans. The lead content determinations showed an bigger bioaffinity of lead with beverages in comparison with foods .

The problems of the environment pollution, especially about lead, cadmium, zinc and copper presents in Târnave vineyards, is the result of the emission in atmosphere, over 50 years, of sulphoxides and particles charged with heavy metals, by the factory with metallurgical profile Copşa Mică (Iliescu M.,2000).

In time those powders sedimentation enriched the soils, leaves and grapes with heavy metals. For wine, the soils, which preserve great quantities of heavy metals, are the principal source in its metals contents. In soils the persistence of heavy metals (Pb, Cd, Cu) is for a very long period, because the accumulation of those are in the superficial layers of soil (Răuţă C.,1992).The soil can be considerate like a double source of lead in wines: one endogen and other exogenous. In naturals way, the lead content in mineralization forms (like sulfide, sulfite, carbonate) has an average of 16 mg/kg. and limits between 3 to 350 mg/kg of soil (Teissedre P.I., 1993).

Others lead sources possible in wine are: the variety, the atmosphere pollutions the climatically factors, the produces use in vineyards treatments and technological processing of grapes and wines.

Henich-Kling (1993) found the medium lead content of wines in different countries between 0.022 to 0.227 mg/l. Cotea specify that the lead content in Romanian wines is 0.1-0.4mg/l and OIV admit as maximum limit 0.3mg/l Pb. Giosanu and colab., 1989 and Avramescu M., 1984 improved the analyses methods for lead content of wine.

MATERIALS AND METHODS

The research works were made at the Viticulture Research and Development Station Blaj, in wine-growing centres place at different distance to the source of pollution (Copşa Mică). The samples were taken in three places:

-Axente Sever (wine-growing situated at 2 km. from source);

-Blaj situated at 32 km. from Copşa Mică;

-Aiud placed at 64 km.

In the this paper it was followed two directions, one which reveal the lead content in soil and an other which show the lead content in wine.

The heavy metals content of soil has been determinate with the methods established at I.C.P.A. Bucharest. The samples of soil were taken in each wine-growing centre at three different deepness : 0-20 cm., 20-40 cm. and 40-60 cm.

In case of wine samples, the grapes processing has been made in laboratory conditions, so as to avoid a grater expose of the wines to lead during winemaking. The winemaking procedure and winery equipment may contribute to a slightly higher lead concentration in wine.

There were used the specifics methods for analyze the physical- chemicals characteristics of the wines.

The determination of lead was obtained with two methods: graphite furnace atomic absorption spectrophotometry and flame absorption spectrophotometry.

It has determined the lead content of wines obtain from the followings grapes varieties: Fetească regală: Riesling italian; Sauvignon; Fetească albă and Muscat Ottonel.

RESULTS AND DISCUSSIONS

The dust and the metallurgical smog from Copşa Mică contain fine particles of lead, cadmium, zinc which are transported by the blasts air on a large area. Therefore the wine-growing centres Axente Sever and Blaj are as influence by this pollution.

This paper presents the results of research on the contents in macronutrients (N, P_2O_5, K_2O_5) and heavy metals (Pb, Zn, Cd) of soil in three wine-growing centres. The following elements were determinate: pH, humus, nitrogen, available phosphorus and potassium, lead, zinc, cadmium.

The soil contents of the above mentioned elements in three areas were as follows: 1.38-2.91%; N:0.124-0.191%; P:25-89 ppm; K:133-314 ppm; pH: 6.73-7.81. These values were obtained in the upper layers of soil 0-60 cm. At those elements the content lowers with the deepness.

The same situation is present for the lead, zinc and cadmium in all three centres. In Axente Sever centre the level of heavy metals are higher than normal and the values overpass the maximum admitted. The lead content shows a decreasing tendency from 204 ppm at 0-20 cm depth to 105 ppm at 40-60 cm. depth, but maximum admitted limit is 100 ppm. In other two centres Blaj and Aiud the lead level is lower then 100 ppm. In Blaj centre the lead content(15- 28 ppm) had a slight overpass of the normal concentration (15 ppm).

The results show that a high pollutions degree is reached in the Copşa Mică area and the pollution level diminished with the distance from the source. Near by the industrial platform, the content of heavy metals from soils is great; overpass the maximum admitted limit in agricultural soils. The value of the normal content in soil for heavy metals is overpasses at greater distance from the pollution source, above 30 km.

There are three lead sources possible in wine: soil, atmosphere and processing. Heavy metals are naturally present in soil, but plants accumulate only small amounts of them. The toxicity of heavy metals is well documented and many countries have set maximum tolerable limits. For example in Romania, lead limit for wine is 0.3 mg/l; 0.01 mg/l for cadmium; 5 mg/l for zinc.

The lead content of wines in three wine-growing from Târnave vineyard is present in table 2 for two years of harvest (2001-2002). The values obtained to lead content are normal in centres Blaj and Aiud almost for all the wines and had no connections with the varieties (0.07-0.28 mg/l Pb). The exception is the wine from Riesling Italian obtained in wine-growing Blaj at lawn Câmpul Libertății with 0.31-0.32 mg/l.

In Axente Sever centre the values for lead (0.28-0.38 mg/l) of wines are higher then maximum admitted limit (0.3mg/l) for all the grapes varieties. The influence of the road pollution in lawn Câmpul Libertății determinate a higher lead level of wines comparing with the lead content of wines obtained in lawn Crăciunel.

CONCLUSIONS

1. The results show that the lead content is reached in the Copşa Mică area (Axente Sever wine-growing centre) and the lead level demised with the distance from the source of pollution (Blaj and Aiud centres).
2. The values have been found to be quite lower, so there were no problems with toxicity of wines in Târnave vineyards, , excepting the wines obtained in wine-growing Axente Sever were the results are near by the maximum admitted limit. The smaller lead content was obtained in Aiud centre.
3. In all the wine-growing centres studied there are not significant differences between the lead concentration of wines obtained from different grape varieties.
4. The lead content of wines is higher in the plot of land placed near by the road.

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Tables

Table 1. The agrochemical characteristics of soil and average lead content

Wine-growing centre	Depth (cm)	pH	Humus %	N %	P (ppm)	K (ppm)	Zn (ppm)	Cd (ppm)	Pb (ppm)
Axente Sever	0-20	7,50	2,66	0,145	89	281	316	3,9	204
	20-40	7,35	1,92	0,138	33	207	255	2,7	143
	40-60	6,90	1,38	0,124	25	134	173	2,0	105
Blaj	0-20	7,81	2,81	0,178	83	314	87	2,3	28
	20-40	7,83	2,15	0,165	61	224	81	1,4	19
	40-60	6,93	1,83	0,143	34	133	79	0,8	15
Aiud	0-20	7,68	2,91	0,191	80	295	69	2,0	18
	20-40	6,98	2,10	0,183	57	232	55	1,2	15
	40-60	6,73	2,04	0,148	38	142	45	0,9	12
Normal concentration		-	2,50	0,200	65	250	50	1,0	15
Maximum admitted limit		-	-	-	-	-	300	3,0	100

Table 2. The lead content of wines in Târnave vineyard (mg/l)

Wine-growing centres	Axente Sever		Blaj				Aiud	
			Câmpul libertății		Crăciunel			
Year / Variety	2001	2002	2001	2002	2001	2002	2001	2002
Fetească regală	0,28	0,32	0,26	0,28	0,16	0,19	0,07	0,09
Riesling italian	0,37	0,35	0,32	0,31	0,25	0,21	0,09	0,10
Sauvignon blanc	0,28	0,33	0,27	0,22	0,23	0,25	0,11	0,08
Fetească albă	0,33	0,30	0,23	0,19	0,23	0,20	0,07	0,09
Muscat Ottonel	0,36	0,38	0,28	0,25	0,27	0,22	0,09	0,12

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BOTANY & PHYSIOLOGY

THE DYNAMIC OF SOME BIOCHEMICAL CONSTITUENTS IN THE SEABUCKTHORN (*HIPPOPHÄE RHAMNOIDES* L.) BERRIES DEPENDING ON THE CULTIVAR

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Keywords: seabuckthorn, berries, flavonoids, carotene, dry weight, ripening

ABSTRACT

The quality of cultivated seabuckthorn plants depends on the cultivars, climatic characteristics during the maturation and, not in the last order, the applied technology. This paper is a study concerning the evolution of the *dry weight, carotene* and *flavonoids* contents during the growing stages in the four seabuckthorn (*Hippophäe rhamnoides* L.) cultivar berries. The flavonoids concentration decreases during berries growth, while the carotene level increases until the full maturation. Moldova Orange and Delta GOM cultivars have the highest accumulation of carotene at full maturation, at the beginning October. The results showed that the accumulation of the dry weight is a specific feature of the cultivar.

INTRODUCTION

Seabuckthorn is a rich source of natural health products and, consequently, it was beginning to be cultivated in our country, too. The most important active constituents of seabuckthorn berries are: carotenes, flavonoids, essential fat acids, vitamins, polyphenols, etc.

There are many references about the flavonoids and carotene contents in cultivated and wild seabuckthorn berries (Einenhart, 1998), but in our country there is a opened research field to characterise the <u>local</u> cultivars. Mironova (1958) was determined 5,6 % carotene in the seabuckthorn berries from Siberia. There were identified more red and yellow pigments in the carotene composition, such as α-, β- and γ-carotene, chryptoxanthine, licopine, luteine, zeaxanthine, violaxanthine (Brad et al., 2002).

Flavonoids represent physiological active constituents with great importance for human health (antioxidative, anti-inflammatory, antiviral, antitumoral and immunostimulatory effects). The main flavonoids effect is on the heart illnesses and regulation of the lipids level in blood.

Carotene is known as yellow-orange pigments, that colour many fruits and vegetables (Burzo et al., 1999). The humans converts β-carotene into vitamin A, recognised as vital for human growth and development. As a potential immunosystem booster and a powerful antioxidant, it counteracts the effects of cell-damaging molecules called free radicals and play an important role in human health (Einenhart, 1998, Sulyman et. al, 2001).

The aim of this study was to investigate the dynamics of several biochemical compounds (flavonoids, carotene, dry matter and water) during the berries maturation at four cultivated seabuckthorn cultivars. The determinations were made comparatively on the cultivars: *Moldova Orange, Moldova Yellow, Delta GOM and Delta 6*.

MATERIALS AND METHODS

The studies were carried out between 2003-2004 and the measurements were made in dynamic beginning with August till October. As biological material there were used fresh harvested berries from four seabuckthorn cultivars: Moldova Orange, Moldova Yellow, Delta GOM and Delta 6, that belong to the collection of I.C.D.P. Mărăcineni-Argeş.

The *carotene* content was determinate by extraction in petrol ether and measured spectrophotometrically at *λ=451 nm*. The method bases on the properties of *carotene,* which are soluble in the nepolare solvents. The intensity of colour of this extract is proportional with the concentration of those pigments. The results are expressed as mg/100 g fresh weight material.

For determination of the *flavonoids* content, the fresh material was boiled 30 minutes into methanol 50%. The flavonoids from methanolic extract were determined spectrophotometrically at *λ=430 nm*, after a colour reaction with aluminium chloride and sodium acetate; the results are expressed in mg/g fresh weight material.

To determine the *dry matter and water content*, the fresh seabuckthorn berries were dried at 105 ^{o}C for 4 hours. The results are expressed as percentage of dry matter.

RESULTS AND DISCUSSIONS

The carotene and flavonoids content depend on cultivar and the harvest time.

The *flavonoids* content of *Moldova Orange* cultivar berries decreases quickly from the beginning of maturation – 0.07 mg/g fresh weight in August to 0.03 mg/g fresh weight in September. Then the decrease is much slow in the next month (Figure 1). The *carotene* contents has a slow continuous increase, from 6.42 mg/100g fresh weight in August to 9.34 mg/100g in October. This is one of the cultivars with the most intense orange colour.

The *carotene* accumulation in the *Moldova Yellow* cultivar berries is small at the maturation beginning (from 1.43 mg/100g fresh weight in August to only 1.96 mg/100g in September) but in October get to 7.26 mg/100g at full maturation. The *flavonoid* content decreases, but not so quickly as Moldova Orange cultivar, from 0.11 mg/100g to 0.06 mg/100 g fresh weight in the last month (Figure 2).

The berries of *Delta GOM* cultivar have the highest content of *carotene* pigments. The concentration increase during the maturation period is constant, different from the other three cultivars. The accumulations from one month to another are high: 0.99mg/100g in August, 5.08mg/100g in September and 10.04 mg/100g in October. The concentration of *flavonoids* decreases in exactly the same way like Moldova Orange cultivar, from 0.07 mg/100g in August at the begining of fruit ripening to 0.02 mg/100 g in October, with a slower decrease in the second period of maturation then the first one (Figure 3).

The concentration of *flavonoids* in the berries of *Delta 6* cultivar has a high decrease from August (0.10 mg/g) to September (0.04 mg/g), then get to 0.02 mg/g at the full maturation. The *carotene* content has the same evolution like the other cultivars: it increases from the maturation beginning, from 1.35 mg/100g to 1.65 mg/100g and 7.80 mg/100 g at full maturation (Figure 4).

The *carotene* content depends not only on the cultivars, but also on the place and the harvest time.The *carotene* contents increase continuously from August till September to all four cultivars, probably because of the higher content of γ-carotene, criptoxanthine, licopene and zeaxanthine. Also, the seabuckthorn berries are a more intense orange colour and the oils obtained from berries, at the second and the third harvest, too (Bălan, unpublished paper). Moldova Orange and Delta GOM cultivars have the highest accumulation of carotene at full maturation, at the beginning October. For all four cultivars, the best moment of harvest is the first decade of October, when the concentration of carotene pigments is the highest. Accordingly with these data, the carotene level could be a parameter for the seabuckthorn berries full maturation and harvest.

The dynamic of *flavonoids* content decreases during the maturation period because of the continous water content increase and, probably of the decrease of phenolic compounds. The astringent taste of berries decreases during ripening from August to October, too.

The *water content* increase during the maturation period for all of four cultivars. The Moldova Orange cultivar has a higher accumulation in the first month, from 79.37 % to 82.95 %. The Moldova Yellow cultivar has a constant accumulation rate (about 1.7 % per month). The Delta GOM cultivar accumulates more water in the second period of maturation, from 81.27% to 83.10%, while the Delta 6 cultivar has the lowest accumulation of water, only 1.17%, from the beginning of maturation to full maturation. The water content increases during the berries maturation because of their continue growing and the pectine solubilisation, that decreases the fruit firmness.

CONCLUSIONS

The content of *carotene* pigments depends not only of cultivars, but also of the harvest time.

Moldova Orange and Delta GOM cultivars have the highest accumulation of carotene at full maturation, at the beginning October. The best moment of harvest for Moldova Yellow and Delta 6 is, also, in the first half of October, when all cultivars accumulated the highest content of carotene pigments.

The flavonoids concentration in the berries decreases from one month to another, probably because of the phenolic compounds decrease. At full maturation three of four cultivars (Moldova Orange, Delta GOM and Delta 6) have the same flavonoids concentration – 0.02 mg/g, while the Moldova Yellow has the highest concentration - 0.06 mg/g.

During the berries maturation, for all of the cultivars, the water content increases, while the dry matter decreases, because of their continue growing and the pectine solubilisation, that decreases the fruit firmness.

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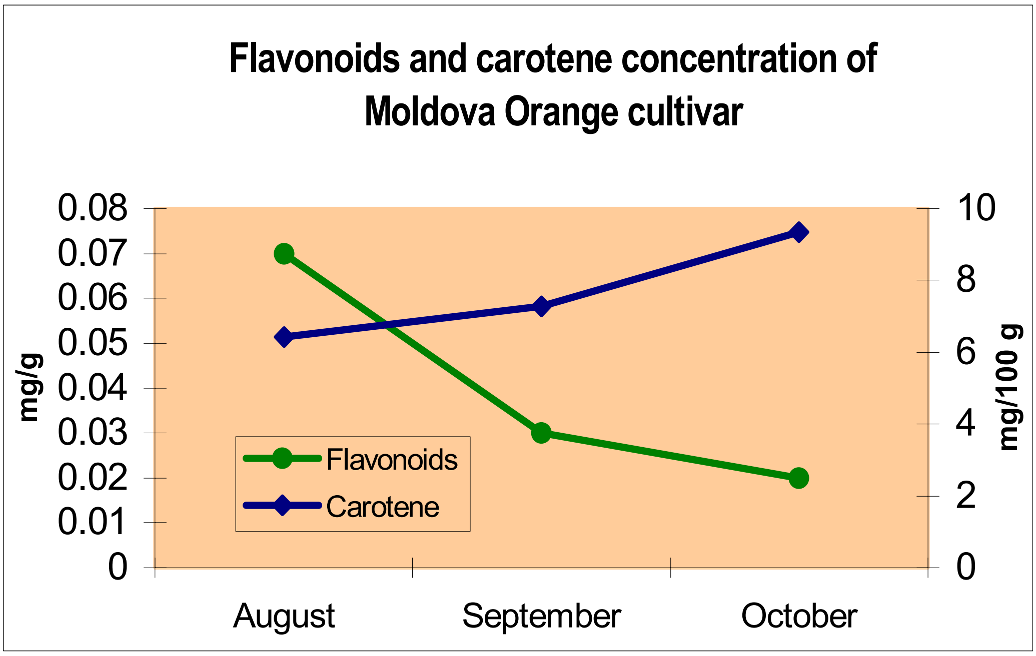

Figure 1. The dynamic of carotene and flavonoids
in the berries of Moldova Orange cultivar

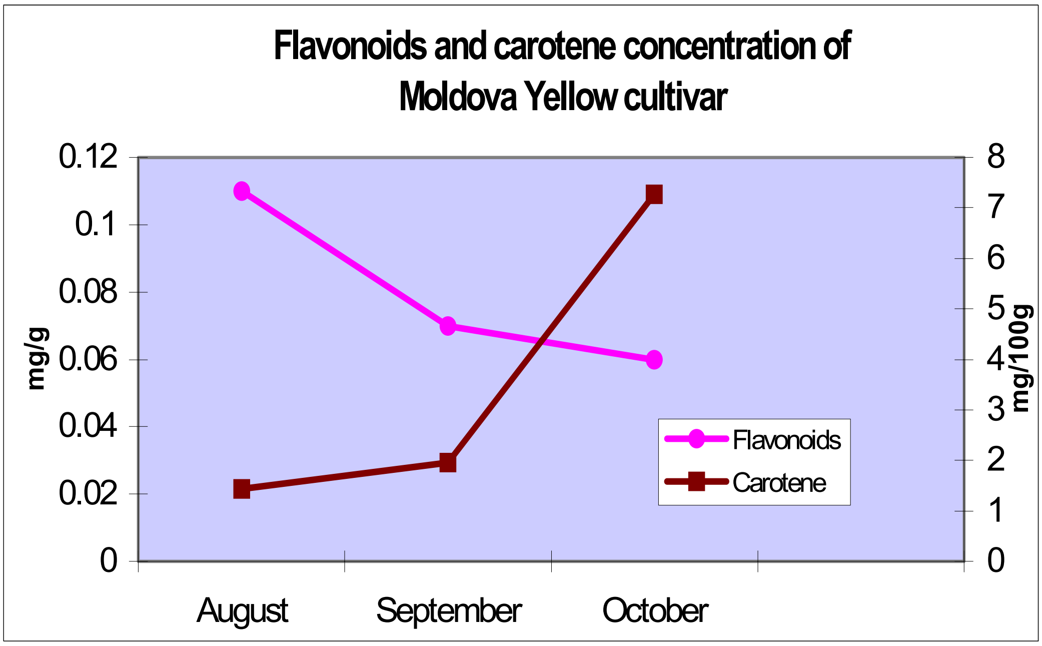

Figure 2. The dynamic of carotene and flavonoids
in the berries of Moldova Yellow cultivar

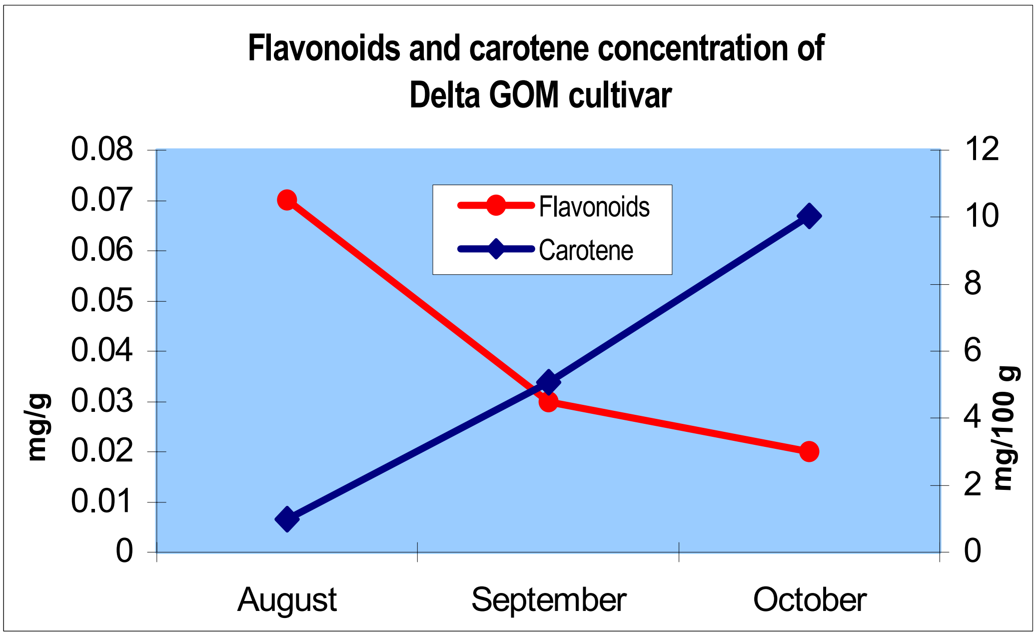

Figure 3. The dynamic of carotene and flavonoids
in the berries of Delta GOM cultivar

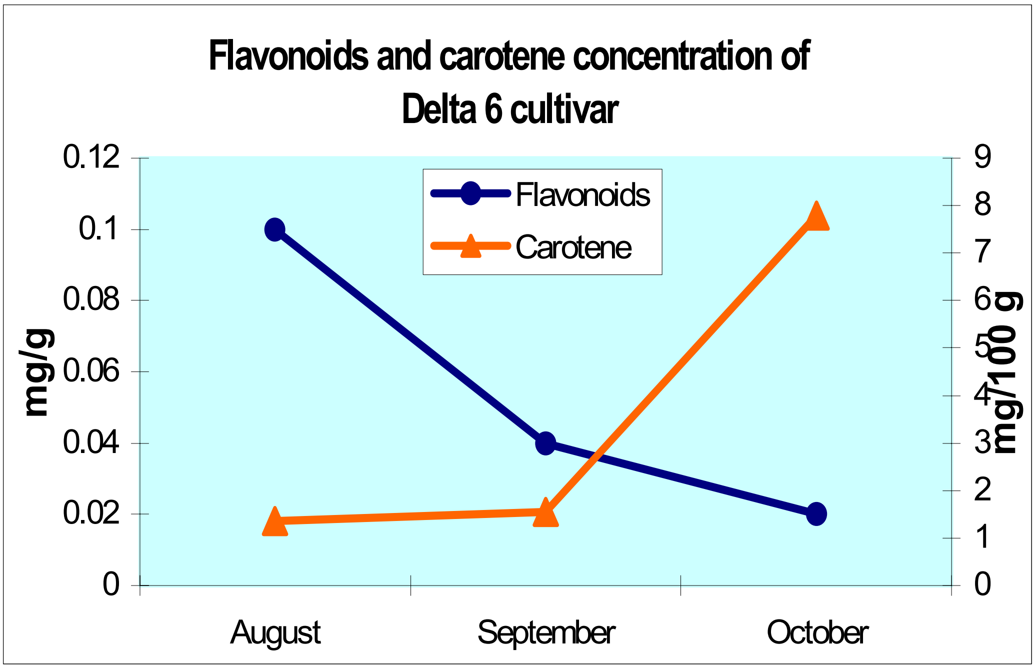

Figure 4. The dynamic of carotene and flavonoids
in the berries of Delta 6 cultivar

Table 1

The evolution of dry weight and water content during the berries maturation.

Cultivar	August		September		October	
	dry weight (%)	water (%)	dry weight (%)	water (%)	dry weight (%)	water (%)
Moldova orange	20.63	79.37	17.15	82.85	16.87	83.13
Moldova yellow	21.83	78.17	20.13	79.87	18.44	81.56
Delta GOM	18.91	81.09	18.73	81.27	16.90	83.10
Delta 6	19.62	80.38	18.42	81.58	18.45	81.55

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PHYSIOLOGICAL PARTICULARITIES OF THE SEABUCKTHORN (*HIPPOPHÄE RHAMNOIDES* L.) LEAVES

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Keywords: seabuckthorn, leaves, photosynthesis, transpiration, chlorophyll pigments, permeability indices

ABSTRACT

The aim of this study is to investigate the variation of *photosynthesis, transpiration* and *assimilating pigments* content during the growing stages on the wild seabuckthorn leaves *(Hippophäe rhamnoides L.).* The photosynthesis rate varied between 1.44 and 6.42 µmol $CO_2/m^2/s$ and the transpiration was 1.32 mmol $H_2O/m^2/s$, depending on the harvest time. The highest intensity of the photosynthesis was registered in May, when leaves almost had the maximum size and the temperature was about 27 ^oC, correlated with a low level of transpiration. In August, when the temperature was over 30 ^oC, the intensity of photosynthesis decreases to 1.44 µmol $CO_2/m^2/s$ and in September increases to 4.06 µmol $CO_2/m^2/s$ at temperature about 30 ^oC.

The *total chlorophyll* content has a small variation from May to September (from 212.9 to 240.50 mg/100g f.w), but the *chlorophyll a / chlorophyll b* ratio increases in July then decreases till September.

INTRODUCTION

The seabuckthorn leaves represents a very important source of vitamins, phytosterols (sytosterol and avenasterol) and flavones. Tibicova (1975) found a high concentration of amino acids (arginine, treoline, aspartic acid etc). The concentration of active compounds in leaves depend very much of the development stage and the geographic location (R.Kala, s.a., 1992 and Singh and Singh, 1999).

The intensity of photosynthesis and transpiration processes in leaves are conditioned by many factors such as genetic ones (variety, assimilating pigments concentration), biological ones (leaf age, growing stage, the presence of hairs), climatic ones (light intensity, temperature, wind, humidity) and soil characteristics.

The temperature and the transpiration rate varied in direct ratio. Burzo et. al. (1999) found that the water loss has the highest values between 30-40^oC and that the high temperature associated with a low level of the air humidity increases the transpiration rate with 35-40%. The total chlorophyll measurements established any correlation between its level and photosynthesis rate for the most plants (Burzo et. al., 1999).

The highest level of membranes permeability is in the young cells and dormant dry seeds. The mature cells have the lowest level of membrane permeability, correlated with a high selectivity level for ion transport. In the old cells, the permeability increases because of the ultrastructural damages, which is influenced by three factors: the enzyme activity, ethylene and lipid peroxidation.

On the both sides of the seatbuck leaf, especially on the inferior one, there are many star shape hairs. The cells of superior side have the external wall thicker then the lateral ones. The mesophyl is constituted from three layers, with long cells on the superior side (Toma and Rugină, 1998).

MATERIALS AND METHODS

The studies were carried out between 2002-2003 .The measurements were made in dynamic beginning with May till September on the leaves from wild seabuckthorn plants, growing on the Prahova Valley, near Campina.

The rates of photosynthesis and transpiration processes, the photosynthetic active radiation and leaves temperatures were established automatically with ADC-LCA 4 analyser.

The chlorophyll pigments concentration was determined in an acetone extract 80% and measured spectrophotometrically at three wavelengths: 663nm, 646nm and 470nm. The method is based on the properties of chlorophyll that is soluble in polar solvents and the colour intensity of this extract is proportional with the concentration of those pigments. The results are expressed as mg/100 g fresh weight material.

The permeability indices were determined indirectly. The tissues were kept into the distillate water for 210 min and the conductibility of this solution was measured. The results are expressed as µS/g fresh weight material/20 ml distillate water.

RESULTS AND DISCUSSIONS

The *photosynthesis process* had the highest intensity in May (6.42 µmol $CO_2/m^2/s$) when the *temperature* was about 27 ^oC. In July and August, the *intensity of photosynthesis* decreased to 1.78 and 1.44 µmol $CO_2/m^2/s$, then increased in September to 4.06 µmol $CO_2/m^2/s$ in direct ratio with the temperature variation.

The *transpiration rate* varied in a reverse ratio with the photosynthesis rate - it increased from May to September (from 1.32 to 3.48 mmol $H_2O/m^2/s$). The highest values of transpiration rates depending on the highest level of the temperature - over 33 ^oC in July and August) and 30 ^oC in September. These data are direct correlated with the literature (Burzo et.al, 1999).

The *total chlorophyll* content had a minimum in July (190.45 mg/100 g f.w.), as well as the total carotenoids (1,69 mg/100 g f.w.). Then the pigment contents (chlorophyll a, chlorophyll b and carotenoids) had a great increase until September to 150.85 mg/100 g f.w., 89.65 mg/100 g f.w., respectively 3.05 mg/100 g f.w. The decrease of the pigment levels in July might be due the high light intensity and probably the highest measured temperature. These could also explain the low photosynthesis rate registered in the same period, too.

The *electrolyte leakage* values increase from May (1400 µS/g f.w./20 ml d.w.) till August (2250 µS/g f.w./20 ml d.w.) and then decrease in September (1855 µS/g f.w./20 ml d.w.) during the leaf full maturity. The increasing values of *electrolyte leakage* had a specific variation, probably, because of the specific seabuckthorn leaf ultrastructure with star shape hairs.

CONCLUSIONS

The highest photosynthesis rate was measured in May, when the temperature was 27 ^oC and the lowest was in July when the temperature riched to 35 ^oC.

The transpiration process is more intense in the middle of the summer, in July and August, when air temperature is over 30^oC.

The temperature is the most important factor that influences these two processes.

The total chlorophyll and carotenoids contents registered the lowest values in July.

The *electrolyte leakage* values of the intact leaves had a specific variation during the growth stage, probably because of the special leaf ultrastructure with star shape hairs.

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Table 1. The variation of assimilating pigments and total chlorophyll content (mg/100g f.w.)

Month	Chlorophyll a	Chlorophyll b	Yellow pigments	Total chlorophyll	Chll a/ Chll b
May	145.5	67.4	2.16	212.90	2.16
July	134.4	56.05	1.69	190.45	2.39
August	145.45	79.15	2.62	224.65	1.84
September	150.85	89.65	3.05	240.50	1.68

Table 2. The electrolyte leakage of the intact seabuckthorn leaves

Month	Electrolyte leakage (µS/g f.w. /20 ml distilled water)
May	1400
July	2070
August	2250
September	1855

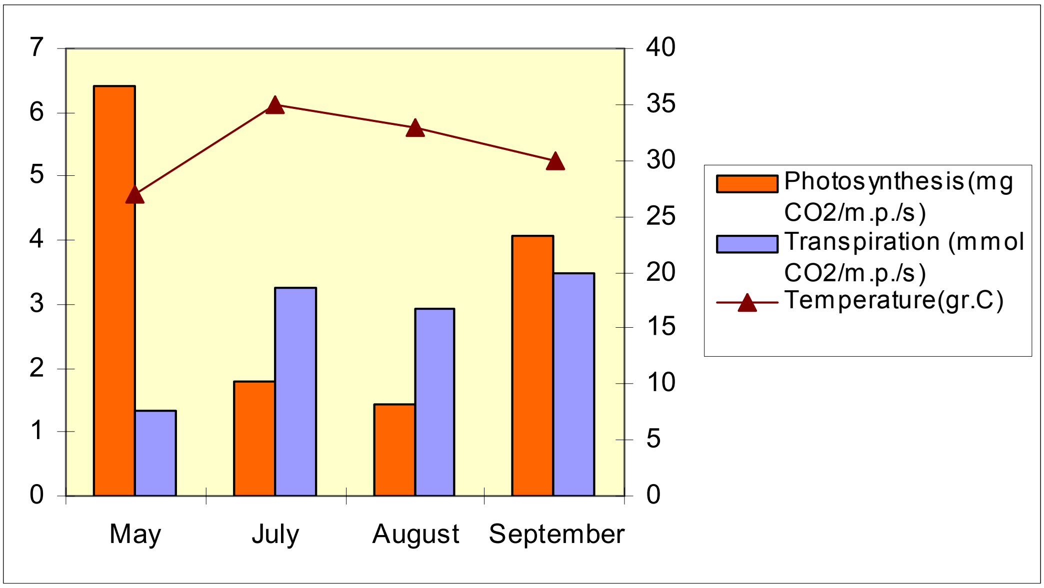

Figure 1. The dynamic of photosynthesis and transpiration of seabuckthorn leaves depending on temperature

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GENOTYPE INFLUENCE ON RESPIRATION PROCESS, ENDOGENOUS ETHYLENE PRODUCTION AND ELECTRICAL CONDUCTIVITY OF FLASH TISSUE OF SIX MELON CULTIVARS

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Keywords: melons, climacteric, postharvest, shelf ripening

ABSTRACT

The fresh melon fruits are eaten as deserts being praised for their flavour, sweetness and high content in ascorbic acid. Respiration intensity, ethylene synthesis and electrical conductivity of flesh tissue seem to have a strong influence in maintaining a good quality for a long time. This research shows the genotype influence on some physiological parameters (respiration, ethylene and conductivity). We chose these parameters because of their importance during transport and storage conditions.

INTRODUCTION

Melons show an enormous diversity of fruit types varying in flash colour (from green pink to orange); skin colour (green, white, yellow, orange and grey); skin texture (smooth, with ribs or net suber), size (little lemon like or several kilos melons). The most popular groups of melons are *reticulatus* (with thin reticulated rind and sweet green flash fruits), *cantalupensis* (a muskmelon variety having fruits with tan rind and orange flash) and *inodorus* (with smooth skin and unlike the cantaloupe, not aromatic). These varieties vary also from the physiological point of view.

The aim of this paper is to show the differences existing between the three *Cucumis melo* groups, differences regarding the respiration process intensity, ethylene production and electrical conductivity. These parameters are involved in maintaining a proper quality for a long period of time. They are also important for choosing the right moment to harvest and the right storage period for each melon group.

MATERIALS AND METHODS

The experiments were conducted for three years: 2002-2004 at the Vegetable Research Station Bacau. The melon plants were grown under greenhouse natural conditions. Our investigations were performed during the ripening process. We studied three different melon groups and two varieties for each group: *reticulatus* (Galia, Halle Best Jumbo), *cantalupensis* (Ogen, Magico) and *inodorus* (Nabucco, Amarillo oro). All melons were grown in greenhouse conditions using the same technology.

We used detached fruits and RIKEN analyser in order to determinate the respiration intensity, expressed in mg CO_2/kg/hour.

The endogenous ethylene content was determined by GS 9000 series. We analysed 10 ml of gas from seminal cavity using plot fused silica 10m x 0.53mm coated with carboplot P7, DF=25.0 and express the content in ethylene in ppm.

In our research we detected the electrical conductivity in tissues using the conductometer with special tissue detector. We tested the conductivity in four different fruit areas (peduncle, apical, near skin, near seminal cavity). The tissue conductivity is expressed in μS/cm.

RESULTS AND DISCUTIONS

There is wide variation in ripening behaviour among melons. *Cantalupensis* and *reticulatus* group tend to have rapid climacteric and high respiration rate. In *inodorus* group the climacteric may extend over several days or may be absent. The first two groups (*cantalupensis* and *reticulatus*) reach the climacteric peak before the *inodorus* group.

The major respiration intensity was registered at Ogen (64.07 mg/kg/hour) and Magico (44.94 mg/kg/hour). The average for this group was 54.50 mg/kg/hour. Comparing the two first groups we can detect a minor respiration intensity for the *reticulatus* group (33.22mg/kg/hour for Galia and 34.95 mg/kg/hour for Halle Best Jumbo). In this case the respiration was lower 1.64 times compared to *cantalupensis* group.

At *inodorus* group the respiration intensity was inferior to the other groups. The average was 16.68 mg CO_2/kg/hour which signifies a lower rate, 3.27 times, comparing to *cantalupensis* and 1.99 times comparing with *reticulatus*.

The rate of ethylene production remains below the critical level until the fruit is mature for all three varieties.

Ethylene production accompanies ripening for the first two groups. Ogen, Magico, Galia and Halle's Best Jumbo fruits produced appreciable contents of ethylene near or at harvest, but the *inodorus* type may not produce ethylene until after 20 days since harvesting.

The average ethylene production for Ogen and Magico was 23.04 ppm, definitely the biggest values in all cases. Regarding *reticulatus* group, we achieved no important ethylene content. The common value for this group was 8.63 ppm (2.67 times lower than *cantalupensis* group). At harvest moment the ethylene content for *inodorus* group was insignificant.

Electrical conductivity was analysed in four different fruit areas: peduncles zone, apical zone, and equatorial zone (near seminal cavity, and near skin). One of the most popular indexes for the right harvesting moment is the circular incisions occurring in peduncles zone. As we can see in table 2, for this area we obtained the biggest electrical conductivity for all analysed cultivars (1300 μS/cm at *cantalupensis*, 1150 μS/cm at *reticulatus* and 1100 μS/cm at *inodorus*). This means that the cell wall is destroyed, the conductivity level is high and the fruit is fully ripened. No important differences were reported between cultivars. Anyway, we obtained the prevalent values for conductivity for all cultivars in the peduncle area (100-1300μS/cm), near seed cavity (1025-1050 μS/cm), next in apical zone (825-1125 μS/cm). Near skin region inferior values of conductivity (775-925 μS/cm) were obtained.

CONCLUSIONS

1. The melons from *cantalupensis* and *reticulatus* groups have a shorter storage life than *inodorus* group because the first two groups have higher respiration rates than *inodorus* group.
2. The fruits with high respiration rate reach the maturity before those with a low respiration rate.
3. *Cantalupensis* and *reticulatus* groups produce more content of ethylene during ripening process than *inodorus* group.
4. Presence of ethylene (maturation hormone) indicates the maturity stage.
5. At all varieties electrical conductivity has major values in peduncle zone, reason for what in this area at harvest moment incisions occurred.

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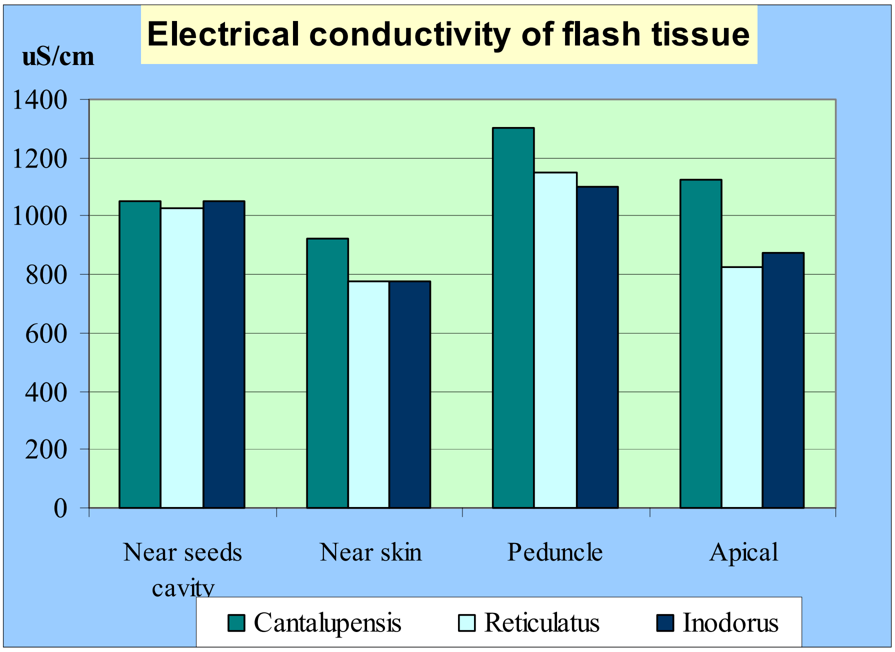
Tables

Table 1. Respiration rate and endogenous ethylene of some melon cultivars

Group	Varieties	Respiration intensity (mg CO2/kg/ora)	Endogenuos ethylene (ppm)
Cantalupensis	Ogen	64.07	24.74
	Magico	44.94	21.39
	Average	54.50	23.06
Reticulatus	Galia	31.49	9.11
	Halle Best Jumbo	34.95	8.15
	Average	33.22	8.63
Inodorus	Nabucco	11.52	-
	Amarillo oro	21.85	-
	Average	16.68	-

Table 2. Electrical conductivity in four different points in flash tissue

Group	Varieties	Electrical conductivity (µS/cm)				
		Near seeds cavity	Near skin	Peduncle	Apical	Average
Cantalupensis	Ogen	1100	1000	1400	1150	1162.5
	Magico	1000	850	1200	1100	1037.5
	Average	**1050**	**925**	**1300**	**1125**	**1100.0**
Reticulatus	Galia	950	850	1000	900	925
	Halle Best Jumbo	1100	700	1300	750	962.5
	Average	**1025**	**775**	**1150**	**825**	**943.75**
Inodorus	Nabucco	1200	900	1250	950	1075
	Amarillo oro	900	650	950	800	825
	Average	**1050**	**775**	**1100**	**875**	**950**



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PHYSIOLOGICAL AND BIOCHEMICAL CHANGES DURING THE RIPENING PROCESS IN *CUCUMIS MELO CV.*

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Keywords: melon, respiration, carotene, soluble solids

ABSTRACT

Maturity and quality in melon are usually evaluated from different point of views by consumers, farmers and traders. Usually, consumers recognise good fruits regarding their corresponding shape, colour and weight and appreciate them for their sweetness, flavour and flash texture. Other features like skin resistance, some components biosynthesis and biodegradation and pest resistance are of major interest for traders, but for the farmers the quantitative and qualitative efficiency, precocity and pest resistance are also important. In this research paper we discuss the physiological and biochemical changes during the last days of maturation and the increasing or decreasing manner of the content in total dry matter, water, soluble dry matter, β carotene, ascorbic acid and respiration intensity.

INTRODUCTION

This paper presents the variation of some physiological and biochemical parameters during the ripening process. Fruit quality and consumer acceptability in melon are strongly related to the concentration of soluble solids content in the ripened fruits. It is well-known the fact that melons need 10% soluble solids at the harvesting moment. The size and the quality of mature melons are also determined by the accumulation of water and total dry matter. Flesh colour represents another important feature regarding fruits quality assessment. In this research paper we discuss the physiological and biochemical changes during the last days of maturation and the increasing or decreasing manner of the content in total dry matter, water, soluble dry matter, β carotene, ascorbic acid and respiration intensity.

MATERIALS AND METHODS

Three sets of experiments were conducted in summer of 2002, 2003 and 2004 using five cultivars of melon. The melon plants were grown under greenhouse ordinary conditions, at the Vegetable Research Station in Bacau. The experiments were carried out for 21 weeks, from April 15 to September 22. The melon seedlings were planted in the greenhouse soil 35 days after the sowing time. Main temperature ranged from 28°C to 38.5°C.

All investigations were performed during the ripening process. The physiological and biochemical changes concerned the content in total dry matter, water and minerals, soluble dry matter, β carotene, ascorbic acid and respiration rate. We analyzed these parameters because of their importance in melons quality.

Total dry matter and water content were determined by drying the fresh flash (of known weight) at 105°C for 24 hours, after that the values being expressed in percents.

The soluble dry matter content was determined using refractometer method, and then, expressed in percents.

Respiration intensity ($mgCO_2$/kg/hour) was assessed in the detached fruits by measuring the CO_2 volume using RIKEN analyser.

The most important pigment in melon flash, responsible for orange colour (β carotene), was extracted in petrol ether and determined at spectrometer at λ=415 nm. Content of β carotene is expressed in mg/100g.

Acid ascorbic content was extracted in oxalic acid and determined with Nexus spectrometer (FT-IR). The quantity of ascorbic acid is expressed in mg/100g.

RESULTS AND DISCUSSIONS

Melons are known like climacteric fruits. We observed in table 1 how the respiration rate increased from 35.48 mg CO_2/kg/hour (at 59 days from anthesis) to 58.92 mg CO_2/kg/hour at second determination (74 days after anthesis). Between the first two determinations we noticed an increasing of 1.66 times and between the first and last determination the increase was only 1.29.

After 74 days from anthesis all fruits reached a climacteric point. Later on, the respiration intensity decreased 1.29 times in eleven days until the next determination.

Concerning the flash colour we observed the manner how the chlorophyll content drops gradually with a final rapid decline, coinciding with carotenes synthesis and ripening process. The most important carotene is β carotene. This one was determined with spectrometer at λ= 451 nm.

Pigmentation process commences in the centre of the fruits, near seminal cavity and progress outward trough the skin until the flash is uniform, more or less orange (depends of cultivar) at fully maturity.

In our first determination, after 59 days from antesis the middle content in carotene was 0.53 mg/100g. The highest content was registered at cv. Jingu 4 (1.10 mg/100g) and the lower at cv. LD 999 L35 (0.19 mg/100g). After 74 days from anthesis we can see an increasing of 1.47 times. Cv. LD 999 L35 registered the highest increasing (0.9 times). At the last determination, after 85 days from anthesis, β carotene content increased 2.48 times compared to the first determination after at 59 days from anthesis (table 2).

Ascorbic acid is the most important vitamin in melon fruits, reason for what these fruits are strongly recommended in human nutrition.

We noticed that the ascorbic acid content in melon fruits decreased during the maturation process, due to its oxidation and transformation in other compounds.

The degradation speed depends on the intensity of metabolic process, its perishable and storage conditions. Our study relives that the ascorbic acid content decreased during ripening process from 7.41 mg/100g (59 days after anthesis) to 6.75 mg/100 g (85 days from anthesis). The decreasing was 1.19 times at 85 days after anthesis (table 2).

The melon fruits are known like very juicy fruits. The water content in melon fruits was very high. Through the ripening process we observed a diminishing of water content from 94.83% in our first determination (59 days after anthesis) to 92.35% (85 days after anthesis). In the same time, the content in total dry matter amplified from 5.17 % to 7.65% (table 3).

As we can see in table 4 the content in soluble dry matter is enlarged during ripening process. At first determination the average was 4.4%. We observed an increasing of 1.3 times at the second determination and 1.6 times between the first and the third one. It is considered that from the moment when melons reach minimum 10% soluble dry matter they are mature enough for harvesting, being able to respond to exogenous ethylene treatment.

In spite of all these, there is no significant change in the total sugar content, because melons have essentially no starch reserve so there is no source of carbohydrate to convert to sugar.

CONCLUSIONS

1. Melons are climacteric fruits, so respiration reaches a maximum peak and after that the process intensity decrees.
2. β carotene content increased during ripening process, the increasing between the first and last determination was 2.43 times.
3. Regarding ascorbic acid content, we observed 1.19 times decrees between the first and last determination.
4. Water content decreased 1.02 times in 26 days, between the first and the last determinations. In opposite, the content of total dry matter increased during the ripening process, around 1.47 times in the same period.
5. Soluble dry matter rose during maturation process, from 4.40% to 7.14% in 26 days.

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Figures and Tables

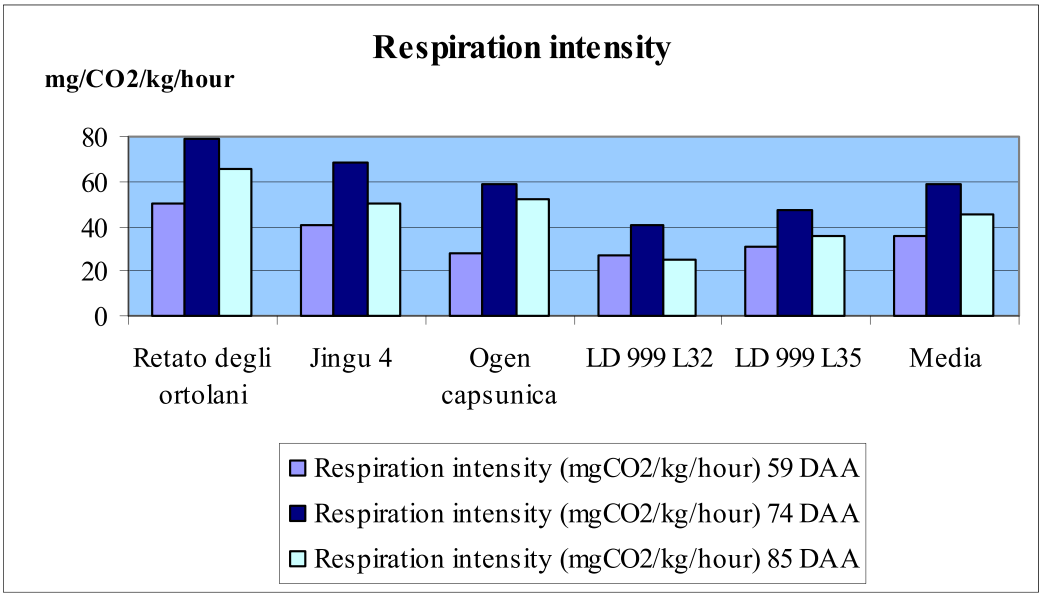

Fig. 1. Respiration intensity of five melon cultivars

Table 1 Respiration rate of five cultivars of melon

Cultivars	Respiration intensity ($mgCO_2/kg/hour$)		
	59 DAA	74 DAA	85 DAA
Retato degli ortolani	50,50	79,30	65,40
Jingu 4	40,50	68,90	50,30
Ogen capsunica	28,38	59,03	52,28
LD 999 L32	26,88	40,54	24,93
LD 999 L35	31,15	46,81	35,42
Average	35,48	58,92	45,67

Table 2 Variation of β carotene and ascorbic acid content during fruit ripening

Cultivars	Caroten (mg/100g)			Ascorbic acid (mg/100g)		
	59 DAA	74 DAA	85 DAA	59 DAA	74 DAA	85 DAA
Retato degli ortolani	0,90	1,50	2,08	10,80	10,58	9,14
Jingu 4	1,10	1,50	2,85	6,50	5,80	5,20
Ogen capsunica	0,27	0,41	0,71	7,81	7,14	7,01
LD 999 L32	0,21	0,30	0,49	5,16	5,06	5,02
LD 999 L35	0,19	0,21	0,33	6,77	5,20	4,75
Average	0,53	0,78	1,29	7,41	6,75	6,22

Table 3 Variation of water and total dry weight in melon fruits during ripening process

Cultivars	Water content (%)			Total dry weight (%)		
	59 DAA	74 DAA	85 DAA	59 DAA	74 DAA	85 DAA
Retato deli ortolani	93,20	92,15	91,44	6,80	7,85	8,56
Jingu 4	94,10	93,89	93,13	5,90	6,11	6,87
Ogen capsunica	94,39	92,11	89,34	5,61	7,89	10,66
LD 999 L32	96,30	96,15	95,70	3,70	3,85	4,30
LD 999 L35	96,15	93,70	92,12	3,85	6,30	7,88
Average	94,83	93,60	92,35	5,17	6,40	7,65

Table 4 Variation of soluble dry matter in melon fruits during the ripening process

Cultivars	Soluble dry matter (%)		
	59 DAA	74 DAA	85 DAA
Retato deli ortolani	5,90	6,70	8,20
Jingu 4	5,10	6,00	6,40
Ogen capsunica	5,00	6,90	9,90
LD 999 L32	3,00	3,40	3,60
LD 999 L35	3,20	6,00	7,60
Average	4,44	5,80	7,14

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VARIATION OF PHOTOSYNTHESIS INTENSITY AND CHLOROPHYLL PIGMENTS CONTENT IN SOME PLUM CULTIVARS

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Keywords: plum, cultivars, rootstocks, physiology

ABSTRACT

This paper has the aim to study variation of photosynthesis intensity and chlorophyll pigments content in plum. Four cultivars were studied (‘Tuleu gras’, ‘Centenar’, ‘Anna Späth’, ‘Stanley’), and were grafted on 3 rootstocks (‘Oteşani 8’, ‘Pixy’, ‘Miroval’). Variation of chlorophyll pigments content was found out, depending on phenophase, cultivar, and on cultivar-rootstock combination.

It was also studied the relationships between photosynthesis and chlorophyll pigments content. An increase was recorded in photosynthesis process intensity, at the same time with the increase in chlorophyll content, up to a certain value, after which the intensity of that process remained constant.

INTRODUCTION

Photosynthesis is the process in which primary organic compounds are produced, to be used for organic matter biosynthesis in plants. Chlorophyll amount is one of the factors that has influence on photosynthesis process.

Studies on chlorophyll content in leaves in fruit tree species have shown that it varied depending on phenophase, species, cultivar, light intensity etc. Hoza, 1996) found out that the highest amount of chlorophyll was found in plum leaves, in mid July. Muleo and Scalabrelli, 1992 have shown that chlorophyll ratio a/b increases until September. Ratio between chlorophyll and carotenoid pigments content varied depending on light intensity.

This paper has the aim to study carotenoid and chlorophyll pigments, during shoots growth, in 4 plum cultivars, and also the photosynthesis intensity variation, depending on that content.

MATERIAL AND METHOD

Four cultivars were under study (‘Tuleu gras’, ‘Centenar’, ‘Anna Späth’, ‘Stanley’), grafted on 3 rootstock (‘Miroval’, ‘Pixy’, ‘Oteşani 8’). Plantation is located in a hilly area of Oltenia region (SC Craiova), the planting year being 1994, under temperate climate conditions, on brown-reddish soil. Average yearly temperatures in the area are 10.3-11^0 C, and rain regime range is 500-550 mm.

Observations made during vegetation period were focused on the amount of chlorophyll pigments, in correlation with photosynthesis intensity. Working methods and observations made were specific to this domain, and determinations were made during period May-July.

RESULTS AND DISCUSSION

Chlorophyll content in leaves has varied, depending on cultivar and phenophase. Research in this domain was made by other researchers too (Hoza et al., 1998, Bădescu, 1993, Moing, 1997), who found out variation in chlorophyll amount, depending on cultivar and cultivar-rootstock combination .

Determinations made in dynamics, during vegetation period have shown that chlorophyll ratio a+b in plum has recorded maximum value during phenophase of shoot's intensely growth (between 20th of May and beginning of June), with values that varied between 233.9 mg/100g vegetal matter in cultivar 'Anna Späth'/'Oteşani 8', and 264.6 mg/100 vegetal matter in cultivar 'Stanley'/'Miroval' (Table 1).

The highest values for chlorophyll pigments amount were recorded in 'Stanley' cultivar, on all rootstocks used, irrespective of period studied. As regards rootstock's influence, it was found out an increase in chlorophyll amount in 'Miroval' rootstock. The lowest values were recorded in 'Oteşani 8' rootstock.

Data regarding carotene content, chlorophyll ratio a/b and total amount of chlorophyll pigments are all presented in Table 2. Carotene content in plum leaves has varied during vegetation period, the highest values being recorded in 'Miroval' rootstock. As regards cultivar, the highest values were recorded in 'Stanley' cultivar, 69.1 mg/100 g leaves on 'Oteşani 8' rootstock, 73.1 mg/100 g leaves on 'Pixy' rootstock, and 72.5 mg/100 g leaves on 'Miroval' rootstock (Table 2).

Total content in chlorophyll pigments has varied, depending on cultivar-rootstock combination and phenophase. The highest values were recorded in 'Stanley' cultivar, at the beginning of June (328.7 mg/100 g leaves, in 'Oteşani 8', and 330.8 mg/100 g leaves, in 'Pixy' rootstock, and 337.0 mg/100 g leaves, in 'Miroval' rootstock).

The lowest content was recorded in 'Tuleu gras' cultivar on rootstocks 'Oteşani 8' (273.0 mg/100 g leaves) and 'Miroval' (276.2 mg/100 g leaves) and 'Anna Späth' cultivar on 'Pixy' rootstock (277.6 mg/100 g leaves). Content in chlorophyll pigments is increasing until around the date of June the 1st, after which we can notice a slightly decrease in chlorophyll pigment amount.

Ratio between chlorophyll a and b has varied in cultivars studied between 2.62 ('Anna Späth') and 3.66 ('Tuleu gras'). It was found out that the value of this ratio is increasing until the 2nd half of June, and then it decreases. Constant increase in ratio value that is occurring in June, is due to biosynthesis, to a higher extent in chlorophyll a, as compared to chlorophyll b. As regards rootstock influence, it was found out that differences are quite low. Higher values of that ratio were recorded in 'Tuleu gras' cultivar (Table 2).

It was also found out that photosynthesis process intensity is growing at the same time with chlorophyll content increase, up to 220–250 mg/100g leaves, and then the intensity of this process remains constant. Chlorophyll content in leaves and photosynthesis intensity process were not in all cases correlated. It was found out positive correlation between chlorophyll content a +b in leaves in plum cultivars analysed, and photosynthesis process intensity (Table 1).

As regards cultivar influence on photosynthesis process intensity, the highest values were recorded in 'Tuleu gras' cultivar, irrespective of rootstock. The other 3 cultivars analysed ('Stanley', 'Centenar' and 'Anna Späth') had close values for that process. Maximal values for photosynthesis intensity were recorded in mid June, in all combinations cultivar-rootstock.

Rootstock influence on photosynthesis phenomenon was studied too. It was found out that 'Tuleu gras' cultivar recorded the highest values on 'Miroval' rootstock, with a maximal value of 305 mg $CO2/dm^2$, recorded in mid June. In the other 2 rootstocks too ('Pixy' and 'Oteşani 8') the maximal values were recorded in mid June too, ie 293 mg $CO2/dm^2$ in 'Pixy' rootstock , when chlorophyll content a and b was 224.8 mg/100 g leaves and 270 mg $CO2/dm^2$ in 'Oteşani 8' rootstock, for chlorophyll a and b content of 222. 4 mg/100 g leaves (Table 1).

CONCLUSION

1. Chlorophyll pigments content in plum is being influenced by cultivar, rootstock and phenophase.
2. The highest values in chlorophyll pigments amount were recorded in 'Stanley' cultivar, on all rootstocks used, irrespective of period studied.
3. It was found out an increase in chlorophyll amount in 'Miroval' rootstock.
4. Photosynthesis process intensity recorded the highest values in mid June, in 'Tuleu gras' cultivar, irrespective of rootstock.
5. Photosynthesis process intensity is increasing at the same time with the increase of chlorophyll content, up to 220 – 250 mg/100g of leaves, then intensity value of that process remained constant.

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Table 1: Chlorophyll content (mg/100 g leaves) and photosynthesis intensity ($mgCO_2/dm^{2)}$ in cultivars analysed

Rootstock	Cultivar	Specification	Analysis date					
			4.05	18.05	1.06	15.06	1.07	15.07
Oteşani 8	Stanley	Chlorophyll a+b	228.5	256.4	253.5	246.3	242.8	239.8
		Photosynthesis intensity	205	208	210	228	221	218
	Tuleu gras	Chlorophyll a+b	219.2	235.7	234.0	222.4	218.5	214.7
		Photosynthesis intensity	246	252	258	268	270	267
	Anna Spath	Chlorophyll a+b	216.8	237.5	233.9	229.5	225.3	222.8
		Photosynthesis intensity	185	205	210	227	224	221
	Centenar	Chlorophyll a+b	216.9	236.3	240.4	234.7	229.4	224.3
		Photosynthesis intensity	183	196	210	220	217	215
Pixy	Stanley	Chlorophyll a+b	229.9	256.3	257.7	251.2	245.6	242.4
		Photosynthesis intensity	202	210	216	237	226	220
	Tuleu gras	Chlorophyll a+b	220.5	235.6	242.9	224.8	220.7	218.1
		Photosynthesis intensity	266	286	286	293	289	286
	Anna Spath	Chlorophyll a+b	217.5	238.5	236.6	229.8	227.5	222.8
		Photosynthesis intensity	205	210	216	239	236	237
	Centenar	Chlorophyll a+b	220.5	238.7	248.2	234.5	228.8	225.3
		Photosynthesis intensity	186	190	216	227	221	220
Miroval	Stanley	Chlorophyll a+b	232.9	256.3	264.6	249.8	245.3	241.5
		Photosynthesis intensity	210	216	224	239	231	228
	Tuleu gras	Chlorophyll a+b	223.1	239.9	242.5	228.1	224.7	220.1
		Photosynthesis intensity	280	283	286	305	302	294
	Anna Spath	Chlorophyll a+b	218.0	241.2	237.0	233.3	228.5	223.5
		Photosynthesis intensity	209	219	221	248	242	239
	Centenar	Chlorophyll a+b	223.1	241.6	242.4	236.8	232.9	229.3
		Photosynthesis intensity	212	218	232	247	243	240

Table 2: Carotene content (mg/100 g leaves), total chlorophyll (mg/100 g leaves) and a/b ratio in cultivars analysed

Root-stock	Cultivar	Specification	Analysis Date					
			4.05	18.05	1.06	15.06	1.07	15.07
Oteşani 8	Stanley	Carotene	58,6	67,2	75,2	69,1	66,0	63,2
		Total chlorophyll	287,1	323,6	328,7	315,4	308,8	303,0
		Chlorophyll a/b	2,99	2,87	2,99	3,05	2,88	2,94
	Tuleu gras	Carotene	56.8	63.5	66.1	63.1	60.4	58.3
		Total chlorophyll	276.0	300.6	300.4	285.5	278.9	273.0
		Chlorophyll a/b	2.91	2.89	2.89	3.58	3.53	3.64
	Anna Spath	Carotene	59.6	61.2	66.3	62.0	62.1	56.4
		Total chlorophyll	276.4	298.7	300.2	291.5	287.4	279.2
		Chlorophyll a/b	2.70	2.98	2.62	2.88	3.01	3.0
	Centenar	Carotene	57.9	63.8	66.1	60.4	66.8	54.8
		Total chlorophyll	274.8	300.1	306.5	295.1	296.2	279.1
		Chlorophyll a/b	3.02	2.81	2.76	3.22	3.33	3.24
Pixy	Stanley	Carotene	59.4	68.5	73.1	60.4	66.3	64.5
		Total chlorophyll	289.3	324.8	330.8	320.6	311.9	306.9
		Chlorophyll a/b	2.97	3.03	2.92	2.74	2.77	2.83
	Tuleu gras	Carotene	57.6	64.5	66.7	63.2	61.5	60.1
		Total chlorophyll	278.1	300.1	309.6	280.0	282.0	278.2
		Chlorophyll a/b	2.98	2.91	3.03	3.47	3.54	3.66
	Anna Spath	Carotene	60.1	62.9	68.2	62.5	61.3	58.2
		Total chlorophyll	278.6	301.4	304.8	292.3	288.8	281.0
		Chlorophyll a/b	2.81	2.83	2.62	2.96	2.92	2.97
	Centenar	Carotene	58.1	65.6	69.1	60.7	58.1	56.2
		Total chlorophyll	278.6	304.3	340.1	295.2	286.9	281.5
		Chlorophyll a/b	2.85	2.84	2.95	3.17	3.30	3.25
Miroval	Stanley	Carotene	60.5	70.2	72.5	70.3	68.6	66.9
		Total chlorophyll	293.4	326.5	337.0	320.1	313.9	308.4
		Chlorophyll a/b	2.87	3.13	2.87	2.82	2.95	3.0
	Tuleu gras	Carotene	57.9	65.8	68.3	62.3	60.8	56.1
		Total chlorophyll	281.0	305.7	310.8	290.4	285.5	276.2
		Chlorophyll a/b	2.97	2.94	2.85	3.39	3.48	3.55
	Anna Spath	Carotene	60.3	62.9	68.7	63.1	62.8	59.3
		Total chlorophyll	278.3	304.1	305.7	296.4	291.3	282.8
		Chlorophyll a/b	2.92	2.91	2.85	2.83	2.92	2.97
	Centenar	Carotene	59.3	65.2	69.5	66.7	58.7	57.1
		Total chlorophyll	284.4	306.8	311.9	301.5	291.6	286.4
		Chlorophyll a/b	2.83	2.82	3.03	3.15	3.19	3.23

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INFLUENCE OF METHANOL TREATMENTS ON CABBAGE SEEDLINGS VIGOR

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Keywords: *Brassica oleracea*, greenhouse, grown, physiological parameters

ABSTRACT

An experiment was conducted to examine the effect of methanol application on cabbage seedlings vigor, by measuring the growth parameters: leaf area, leaf and root fresh and dry weight. Photosynthetic pigments (chlorophylls a, b and carotenoids) content, the rate of CO_2 fixation, transpiration rate, stomata conductance as well as membrane permeability were investigated in response to the different foliar sprays of aqueous methanol (0,10,20,30%). A progressively increase of seedlings vigor, positively correlated with increasing methanol concentration and in the same time the physiological parameters were improved.

INTRODUCTION

Experiments performed by foliar sprays of aqueous 10-50% methanol have shown that the effect was an increased grown and development of C_3 crop plants, while plant with C_4 metabolism showed no increase in productivity by methanol treatment (Nonomura and Benson,1992). The explanation is those that during photosynthetic carboxylation C_3 plants produce ribulose 1,5-diphosphate and from rapid oxidation of methanol can successfully compete with oxygen for RUBISCO, so methanol causes a decline of photorespiration thus enhancing the biomass production (Nonomura and Benson, 1993).

Plants which had been treated with methanol solutions, particularly tomato and sugar beet showed a 50% increase in nitrate reductase activity, significantly enhanced CO_2 assimilation, were less susceptible to water deficit and in some cases their yield equaled that of the irrigated plants (Zbiec and al., 2003).

The present study was realized to evaluate the effect of foliar application of methanol on cabbage seedlings, with the objective to investigate a methodology to improve vigor and the establishment of cabbage transplants.

MATERIAL AND METHODS

This research was performed by two-year greenhouse experiments on cabbage (*Brassica oleracea L. var. capitata f. alba*) seedlings. Seeds of Tucana hybrid were sown in greenhouse on 25 January. Transplanting has been done on 10 February on cubs of 5/5 cm and beginning with this moment, till the transplant moment at 20 March, there were carried out 5 treatments with aqueous solutions of 10, 20 and 30% methanol, also the water was applied for the control variant.

At the transplant moment the following growth parameters have been determined: leaf area (cm^2), leaf and roots weight (g), leaf and roots membrane stability (measured by electrolyte conductivity), and assimilatory pigments content (extracted in acetone 80% and analyzed spectrophotometrically).

Also, there were determined gas exchange parameters (photosynthesis, transpiration rate and stomata conductance) using a portable photosynthesis system (model LCA-4).

RESULTS AND DISCUSSIONS

Data presented in figure 1, showed that methanol treatments positively affected total seedlings leaf area, for instance, in the case of V_3 (30% methanol), leaf area increased by 1,6 times, as compared with the control variant. Also, methanol effect was reflected in the others measured growth criteria: fresh, dry of leaves and roots as compared with plants received water only (figure 2,3). Leaf fresh weight increased progressively from the control, to the V_3 by about 2 times, while leaf dry weight increased by 2,2 times. For roots, these values were higher, an increase by 2,2 times in the case of fresh weight and 3,3 times for roots dry weight.

If we analyze the fresh weight/dry weight ratio (FW/DW) (Table 1), the conclusion is that for roots, the value decrease by 1,5 times at V_3, as compare with the control variant, while for leaves by only 1,2 times, so methanol had a special impact on roots system vigor. Vigorous root system is as essential as vigorous shoots for growth and development of healthy plants and from this view point the figure 4 is relevant. Early seedlings root growth and development determines the optimum root system throughout the entire life of a plant (Nicola, 1988). Cabbage is a short stem type crop, in contrast with tomato for example, but improving shoot and root dry weight, should results in improved suitability for transplanting (Biddington and Dearman, 1985). Moreover, "high seedlings quality" is referred at two more important aspects: vigorous plants able to good use the optimal conditions offered after transplanting at the definitive site and at the same time able to easily adapt and to well resist at the culture condition (Bălaşa, 1973; V. Popescu and N., Atanasiu 2002).

In the same time, there were performed determinations concerning changes on membrane stability and our results presented in Table 2, emphasized an opposite trend as compared with above indicators evolution. As we can observe, despite the low differences in plants electrolyte content status, we could distinguish major differences in membrane permeability expressed as permeability index (IP= electrolyte leakage/total electrolyte content). For instance, in the case of the roots, applying the 20% methanol solution had reduced permeability index by 3 times, as compared with the control (0,2004 against 0,5880).

Methanol impact seems to be directed on plant metabolism too and this influence is noticed by the assimilatory pigment content changes (Figure 4), even if the differences between variants are not remarkable. Increased pigment content is also connected with the intensity of CO_2 assimilation by plants, and data reported in Table 3 confirm this statement. Assimilation increased as follows: 2,08 % at V_1, 11,38 % at V_2 and 23,19% at V_3. Our results demonstrate that methanol enhanced the transpiration rate (an average of 38,88%) and stomata conductance (g_c). According to Karczmarczyk et al. (1999), these processes are closely related, since an enhanced production of organic compounds requires a good supply in mineral taken up by the roots and transported to the plant upper parts. In fact, enhanced leaf stomata conductance allows the carbon dioxide to be better transported and the plant is better supplied with carbon.

Our results are in agreement with those of Loreto et al. (2000) who noticed that methanol sprays on leaves, increase growth and yield of C_3 plants in arid conditions but they related that methanol did not improve gas exchange rates over the entire crop cycle. Moreover, methanol also increased the quantity of harvested fruits with unmarketable characteristics such as lesions and necrosis which were direct consequence of methanol residence over the sprayed surfaces. So, research results are contradictory from some view point, for instance, Zbiec et al., (2003), showed that for tomato, bean, sugar beet, oil seed rape, that the crops when treated with methanol solutions yielded 20-30% higher than the control and the yield increases were comparable to those caused by supplemental irrigation.

The results from this study indicate that methanol is positively involved in seedlings grown and their metabolism. From our experiment, we can conclude that the young plants rapidly react to diluted methanol application and these treatments are efficient especially prior to transplanting in the field, to improve seedlings vigor.

CONCLUSIONS

From the data presented in this study it is concluded that methanol application on cabbage seedling positively influenced their grown pattern (fresh and dry leaves and roots weight as well as leaf area). Such plant growth response was linearly and positively correlated to plant treatment status and the most vigorous plants were that treated with methanol 30%. Methanol impact was also noticed by changes of plants metabolism, the data indicate that net photosynthesis, transpiration and stomata conductance increased with increasing methanol concentration in a similar manner.

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Tables

Table 1. Fresh weight/dry weight ratio (FW/DW)

Variant	FW/DW (leaves)	FW/DW (roots)
Control	16,44	7,13
10%	15,88	7,54
20%	14,57	5,60
30%	13,53	4,75

Table 2. Data concerning membrane permeability

Variant	Total electrolyte content – TE(µS g^{-1})		Electrolyte leakage - EL (µS g^{-1})		Permeability index (PI = EL/TE)	
	Leaves	Roots	Leaves	Roots	Leaves	Roots
Control	34400	34413,96	4707,93	20237,15	0,1368	0,5880
10%	36400	25171,87	6608,78	9040,93	0,1815	0,3591
20%	30400	25720,62	3585,38	5156,30	0,1179	0,2004
30%	37400	23730,07	5505,41	6852,10	0,1472	0,2887

Table 3. Effect of methanol on some physiological processes of cabbage seedlings leaf

Variant	Photosynthesis (µmol m^{-2} s^{-1})	Transpiration (mmol m^{-2} s^{-1})	Stomata conductance (mmol m^{-2} s^{-1})
Control	7,20	0,90	0,19
10%	7,35	1,18	0,28
20%	8,02	1,23	0,31
30%	8,87	1,34	0,38

Figures

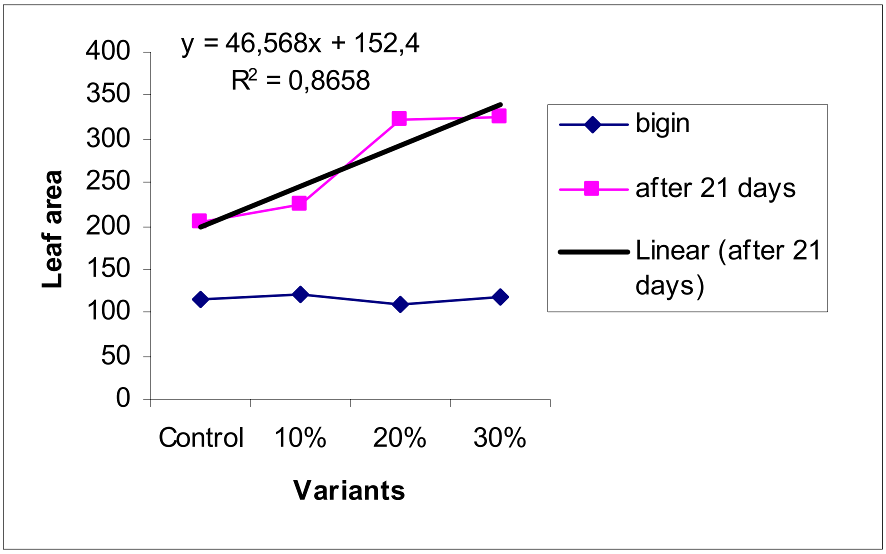

Fig. 1. Methanol influence on cabbage seedling leaf area

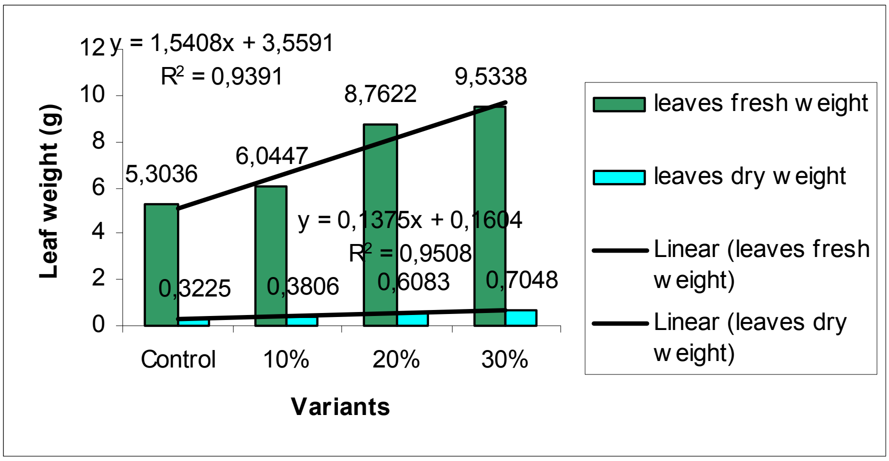

Fig. 2. Methanol influence on cabbage seedlings leaves weight

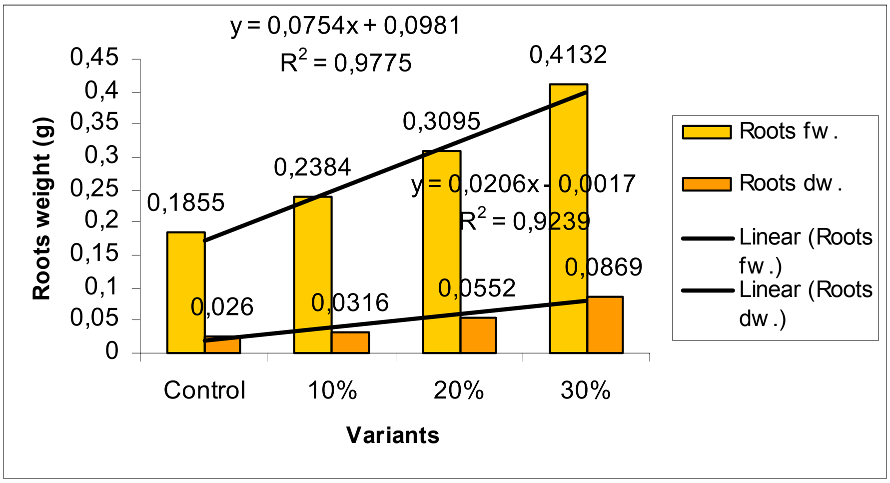

Fig. 3. Methanol influence on cabbage seedling root weight

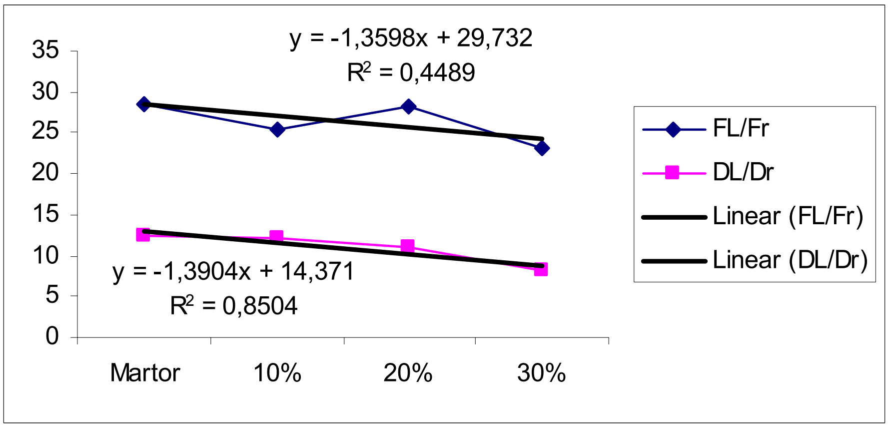

Fig. 4. Leaf/root cabbage seedlings fresh and dry ratio, under methanol impact

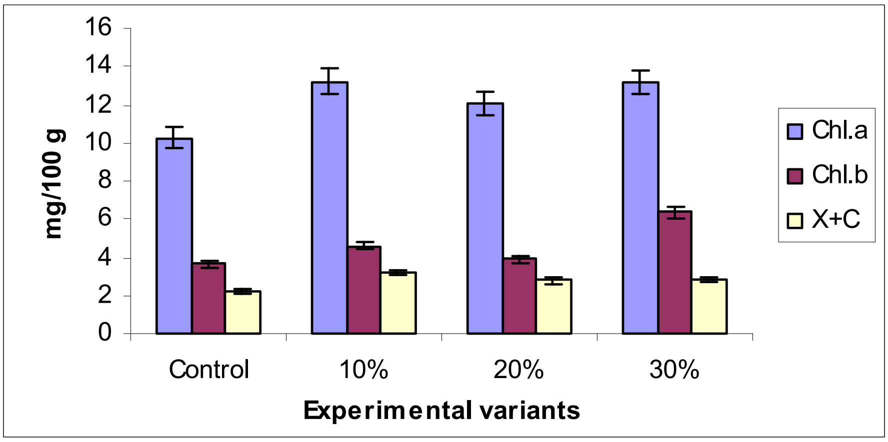

Fig. 5. Methanol influence on cabbage seedlings assimilatory pigments content

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RESEARCHES CONCERNING THE INFLUENCE OF THE IRRIGATION METHOD ON THE PHYSIOLOGICAL AND BIOCHEMICAL PROCESSES IN THE CUCUMBER PLANTS

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Keywords: drip irrigation, photosynthesis, respiration, perspiration, chlorophyll, permeability of cell membranes

ABSTRACT

The aim of the performed researches was to establish the influence of the irrigation method on the intensity of the physiological and biochemical processes, which have role in the metabolism of the cucumber plants cultivated in solarium. There were applied different irrigation methods: irrigation on the furrow, drip irrigation and underground irrigation at Salinas cucumber hybrid.

There were analysed in dynamics the main physiological and biochemical indicators: photosynthesis, respiration and perspiration rate, permeability of the plasmatic membranes, content in assimilatory pigments.

The obtained results emphasized remarkable differences between these indicators at the experimental cultures irrigated using the described methods, revealing the influence of the irrigation method on the metabolism of the plants, determinant for the growth and development of plants.

INTRODUCTION

The irrigation is an extremely important factor for the maintenance of the vegetables crop because it has a direct effect on the precocity of the crop and on the yield and its quality.

The irrigation allows the maintenance of the optimal level of humidity demanded by the processes of growth and development of the vegetables and also allows a suitable fertilization, too.

The cucumbers are a vegetable specie which claims a certain level of soil humidity because their roots are superficial, therefore it is necessary a sufficient water supply. Therefore, the aim of the performed researches was to suggest an irrigation method efficient for the growth and development of the cucumber plants in protected culture (in solarium, protected by thin polyethylene sheets).

This paper presents the results of some researches performed in order to point out the influence of different irrigation methods on the dynamics of the major physiological parameters in the leaf: photosynthesis, respiration and perspiration rate, permeability of the plasmatic membranes, content in assimilatory pigments.

There were applied different irrigation methods: the traditional method (on the furrow), the drip irrigation and the underground irrigation (drip irrigation at the roots level) at Salinas cucumber hybrid.

One appreciate that the drip irrigation is an efficient method because it assures at the same time a contribution of nutritive compounds in controlled doses (Ciofu, 1994). A significant increase of the yield was emphasized at the tomato crops as a result of the application of the drip irrigation (Ciofu, 1994).

The underground irrigation through pipes made of porous ceramics assures the water supply in the depth of the soil, so that reduce the numbers of watering (Ciofu, 1994).

MATERIALS AND METHODS

The experiments were organised with cucumbers plants of Salinas hybrid, which was cultivated in the greenhouses of U.S.A.M.V. Bucharest in the years 2002-2003.

The cucumbers plants were grouped in three experimental variants, depends on the irrigation methods applied: V_M (control variant) – plants watered by the traditional method, on the furrow; V_1 – plants watered by the drip irrigation using the system T-TAPE and V_2 – plants watered by the drip irrigation at the roots level using the system TUPOREX-ECOPORE (the underground irrigation).

In order to apply the traditional method of irrigation, furrows were made between the plant rows at 0,7 m distance and 0,45 m width.

Using a drip tube model TSX 510 (T-TAPE) with 16 mm diameter and 20 cm distance between watering cans made the drip irrigation.

For this purpose it was used a drop irrigation system at the level of the roots. It was applied the technology initiated by the French firm A.E.T., meaning the TUPOREX-ECOPORE.

This irrigation system TUPOREX-ECOPORE represents a watering system composed of pipes made of porous ceramics. This system is buried at 10 cm in the soil and functions at a low level of pressure, so that it provide the distribution of the water, of the nutritive substances and of the oxygen by direct contact with the plant roots.

During the period of vegetation, there were made three determinations at 10 days interval, beginning from the middle of May, in order to follow the physiological activity of the cucumber plants in different phenophases.

There were used the proper methods of researches in order to analyse in dynamics the main physiological and biochemical indicators:

- The intensity of the main physiological processes was determined with a portable analyser LCA 4 directly to the leaves of the plants from greenhouse; the photosynthesis and the respiration were exprimed in μmolls $CO_2/m^2/s$ and the perspiration was exprimed in μmolls $H_2O/m^2/s$.
- The content of the leaves in total chlorophyll was spectrophotometrically determined using a leaves extract in acetone 80%. The results was calculated with Makiney formula and exprimed in mg pigments /100 g fresh material.
- The content in water was gravimetrically determined, after the drying of the leaves at 104°C.
- The permeability of the plasmatic membranes and the total content in free ions were directly determined with a conductometer OK-102; the results are exprimed in microsiemens/g vegetal tissue.

RESULTS AND DISCUSSION

The results of the researches indicated that the intensity of the *process of photosynthesis* (figure 1) increase from the first to the last determination with a rate of 1,18 times at the plants of the control variant and of 1,24 times at the plants of V_2, but the higher increase rate (for 1,3 times) registered at the plants of V_1 variant.

Also, the maxim value of the photosynthesis intensity registered at the plants drip irrigated: 8,59 μmolls $CO_2/m^2/s$ compare to 7,36 μmolls $CO_2/m^2/s$ at the plants underground watered and 6,51 μmolls $CO_2/m^2/s$ at the control plants.

It is known the fact that the water directly interferes in the photosynthesis: the water is considered a primary matter in this process, therefore the difference registered at the experimental variants regarding on the intensity of the photosynthesis showed that the drip irrigation assures a better supply with water to the plants.

The leaves *content in chlorophyll* (table 1) was not directly influenced by the irrigation method, therefore the water not represent a determinant factor in the process of their biosynthesis.

At the control plants was determined 35,58 mg/100 g total chlorophyll in the phenophase of youth, a close value being registered at the plants drip irrigated. Also, the afterward determinations emphasized low differences between the two variants, too.

From the obtained data, it can be observed that it was registered no direct correlation between *the assimilatory pigments content* (table 1) and the intensity of photosynthesis at the cucumber plants: thus, at the plants of variant V_1 the quantity of total chlorophyll was lower (25,08 mg/100 g) compare to the values registered at the control variant (26,84 mg/100 g) and at the variant V_2 (28,34 mg/100 g).

At the plants drip irrigated (V_1), the pigments content (table 1) indicate a biodegradation of the chlorophyll "a" favouring the chlorophyll "b", which is correlated with the maturity degree of the leaves.

Regarding on the development of *the respiration process* (figure 2), there were noticed small oscillations at the control plants (a rate of 1,07-1,09 times from a determination to another) in comparison with the drip irrigated plants (V_1) which registered an increase of the intensity of the respiration for 1,12 times during the whole period of researches.

The intensity or respiration was for 1,48 times higher at the plants drip irrigated (V_1) than at the control plants and for 1,35 times than the plants underground irrigated.

At the plants of each variant*, the process of perspiration* (figure 3) occurred without great fluctuation during the researches. Thus, the intensity of the perspiration varied between 5,10-5,11 μmolls $H_2O/m^2/s$ at the control variant, between 6,00-6,27 μmolls $H_2O/m^2/s$ at the drip irrigated plants and between 5,11-5,34 μmolls $H_2O/m^2/s$ at the underground irrigated plants.

Still, a comparison made between the perspiration values registered at the experimental variants shows a maxim value (6,27 μmolls $H_2O/m^2/s$) at the drip irrigated plants and lower values at the other variants.

The obtained results indicate that the intensity of perspiration registered similar values at the control and underground irrigated variants, these values being correlated with the values of *the water content* in leaves (table 1): in average 82,24% at the control plants, very closed to the value 81,45%, the average registered at the variant V_2.

Moreover, all the metabolic reactions that occur in plants are influenced by the water content determinated in leaves at a certain moment. At the last determination, this indicator registered the value of 87,57% at the drip irrigated plants, so that it was higher than the value reached in the control plants (81,55%).

The permeability of the plasmatic membranes (fig.4) presented at all the studied plants a characteristic dynamics, which was not influenced by the irrigation method.

The permeability of the plasmatic membranes registered at the analysed variants high values during the growth period of the leaves; afterwards it gradually decreases as the cells of the leaves reached the maturity. Thus, the permeability of the plasmatic membranes varied between 12689-8789 μSiemens at the control plants (V_M), between 10473-8098 μSiemens at the drip irrigated plants (V_1) and between 9510-6480 μSiemens at the underground irrigated plants (V_2).

Concerning on *the total content in free ions* of the leaves (table 1), which was conductometrically determined, one notice a accumulation of the ions at both of the studied variants, but pre-eminently at the drip irrigated plants, which indicate a good absorption of the ions concomitant with the water absorption. Thus, the determinations emphasized a content in free ions in the leaves of the drip irrigated plants for 1,16 times higher than in the leaves of the control plants and for 1,09 times higher than in the plants of variant V_2 (underground irrigated).

CONCLUSIONS

1. The drip-irrigated plants achieve the photosynthesis process with intensity higher for 1,32 times than the control plants and for 1,16 times than the underground-irrigated plants.
2. The cucumber represent a vegetable specie on which the leaves content in chlorophyll is not correlated with the intensity of the photosynthesis and is not directly influenced by the irrigation method.
3. The irrigation method influences the development of the respiration process, meaning the drip irrigation stimulates the respiration, which was higher at this variant for 1,48 times compare to the control variant and for 1,35 times compare to the underground irrigated plants.
4. The modification of the permeability of the plasmatic membranes is not caused by the irrigation methods, but by the phase of the development of the plants.
5. The irrigation method influenced the absorption and the accumulation of the ions in the cells of the leaves, respective a better absorption of the ions concomitant with a better absorption of the water occur when the drip irrigation is applied.

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Tables and Figures

Table 1. The dynamics of some biochemical index in cucumbers 'leaves

	CONTENT IN CHLOROPHYLL (mg/100g)			CONTENT IN WATER (%)	TOTAL CONTENT IN FREE IONS (µS/g)
	Chlorophyll a	Chlorophyll b	Total chlorophyll		
V_M (control)	26,84	21,83	48,68	82,30	28000
	22,52	12,88	35,4	81,98	30000
	19	18,42	37,52	81,55	31000
V_1 (drip irrigation)	25,08	19,48	44,56	84,86	30000
	20,43	18,06	38,49	86,54	34000
	21,44	19,91	41,35	87,57	36000
V_2 (underground irrigation)	28,34	17,03	45,37	81,52	30000
	22,93	12,29	35,23	80,37	31000
	20,4	19,99	40,39	82,47	33000

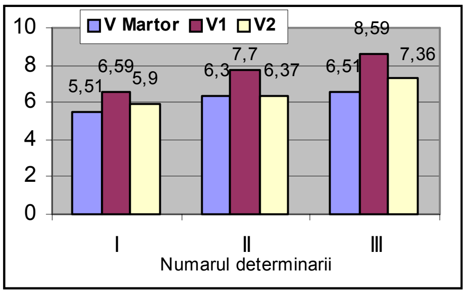

Fig. 1. The dynamics of the intensity of photosynthesis (µmolls $CO_2/m^2/s$)

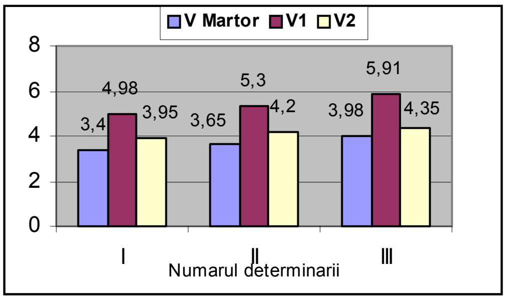

Fig. 2. The dynamics of the intensity of respiration (µmolls $CO_2/m^2/s$)

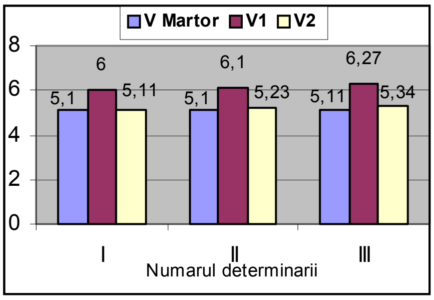

Fig. 3. The dynamics of the intensity of perspiration (µmolls $H_2O/m^2/s$)

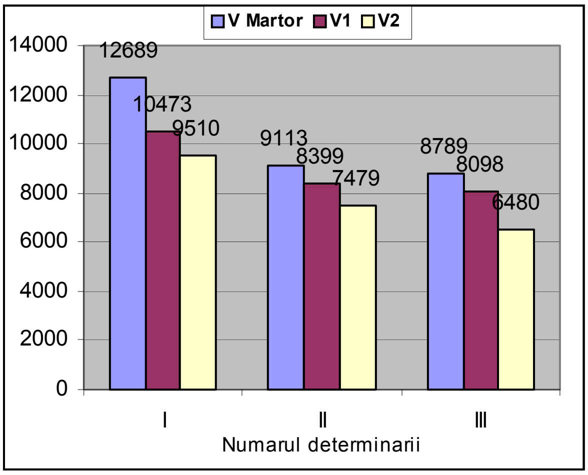

Fig. 4. The dynamics of the electrolyte leakage (µS)

Lucrări ştiinţifice U.Ş.M.A.V.B., Seria B, Vol.XLVII, 2004

THE INFLUENCE OF POSITIVE CORONA DISCHARGE ON PHYSIOLOGICAL PROCESSES IN MUSTARD PLANTLETS

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Keywords: positive corona discharge, mustard plantlets

SUMMARY

In this study it was observed the influence of positive ions upon mustard plantlets. It was remarked a different evolution for the mustard plantlets (5 days old) irradiated with different doses. We analysed the respiration intensity, the length of plants, the surface of leaves and the intensity of photosynthesis. In conclusion, we can say that the positive corona discharge had a negative influence upon the evolution of mustard plantlets.

INTRODUCTION

The environmental is naturally ionizated by cosmically radiations, the radioactivity of the earth and atmospherically radioactivity. Another important factor of ionizing media is the electrical activity. It is known that before the storm, in the atmosphere there are many positive ions, and after the storm the number of negative ions increases.

The atmospherically ions carriers a big quantity of electrostatic energy which has significant biological effects. It was found that about 5×10^{-4} coulomb/sq cm of such ions incident on *Escherichia coli* would reduce them to 1/e. This amounts to 3×10^{8} erg/gm and is about 8 times the amount of ultraviolet energy or 700 times the amount of X-ray energy required to reduce *E. Coli*.

Taking into account the important role of the ions action on living matter, the aim of this paper is to present an experimental study about the action of the positive ions on mustard plantlets.

MATERIALS AND METHODS

Like other electrical discharges in gases, the corona discharge is based on the ionising of gases molecules and on the extract of electrons from metal cathode. Due to the sharp form of electrode, the electrical field is strongly located around these one. For this reason, it is remarked that, at a macroscopically level, the luminescence is only around the sharp electrode. Around the corona discharge will be formed an atmosphere with electrical charge. In this area different objects (plants, for example) could be placed. Depending on the polarity of electrical voltage applied on the electrode, there could be two types of corona electrical discharge: a negative corona discharge (when the sharp electrode is the cathode) and positive corona discharge (when the sharp electrode is the anode. The set-up for experimental study of corona discharge on mustard plantlets is like in fig. 1.

The negative electrode was made from a wolfram wire, with 10^{-2} mm diameter, introduced in quartz capillary. The part of wire, out of capillary is the active electrode, of 1 cm long. The positive electrode was made from cylindrical plate of stainless steel, with 10 cm diameter. The cathode was applied on the vernier on a vertical support, so we can modify the distance between electrodes. The alimentation sources for corona discharge could produce continue voltage to 15 kV. The voltage applied on electrodes was read on an electrostatic voltmeter and the current intensity on a digital microampermeter.

Initially, the biological material used as sample, was wet mustard seed. There were no remarks of significant differences between experimental variants, so we continued the study with mustard plantlets (5 days old). The four experimental variants include a witness lot (nonirradiated by corona discharge). The geometry system was constant; the distance between electrodes was 30 mm. The exposition times and the intensity for discharge current are in table

1t can be remarked that in such experiments it is more important the irradiation dose (product I*t) than each terms (I or t).

The irradiation doses were established by preliminary experiments, when we observed the limit after the effects are significant.

The results obtained after positive corona discharge upon mustard plants are in the following tables. The measurements upon intensity of respiration were performed in the same day with the corona irradiation. From the figure 2 we can see that the higher value for the intensity of respiration is for 10 minutes positive corona irradiation. Another interesting process that we studied was the photosynthesis. Two months after positive corona irradiation the intensity of photosynthesis was strongly diminished in case of mustard plantlets from V3 and V4 lots, comparative with the witness lot (fig. 3).

Comparative with the other experimental variants, the V_2 variant (3 minutes positive corona irradiation) has the higher plantlets. (see table 2)

We have performed measurements upon the foliar area and we observed that the increase of irradiation doses determined a decrease of foliar area, but are not significant differences between the witness lot and V1. (table 3) From table 3 we can see that all the plantlets from V4 (10 minutes positive corona irradiation) were dead about after 3 months irradiation.

CONCLUSIONS

In this paper we observed that the corona discharge effects on mustard culture depend on irradiation doses. So,

1. The plantlets from V2 variants (3 minutes positive corona irradiation) presented a late blossoming as compared with the witness lot,
2. The mustard plantlets in V3 variants are shorter, with a little leaves area.
3. Two months after positive corona irradiation the intensity of photosynthesis was strongly diminished in the case of mustard plantlets from V3 and V4 lots
4. About three months after 10 minutes positive corona irradiation, all the plantlets were dead,

We can conclude that the irradiation of mustard plantlets with positive ions has a negative influence on main physiological process in mustard culture.

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Tables

Table 1 The experimental parameters

Experimental variant	**V_1**	**V_2**	**V_3**	**V_4**
Exposition time (minutes)	0	3	5	10
Current intensity(μA)	0	15	15	15

Table 2 The effect of positive corona discharge upon higher of plantlets (cm)

	First day	**1 month after irradiation**	**2 months after irradiation**	**3 months after irradiation**
Witness	4.10	10.19	13.25	18.76
V1	4.08	11.45	17.62	21.66
V2	4.12	4.61	5.82	6.66
V3	4.09	4.09	4.34	-

Table 3 The effect of positive corona discharge upon foliar surface (dm^2)

	1 month after irradiation	**2 months after irradiation**	**3 months after irradiation**
Witness	0.055	0.077	0.089
V1	0.052	0.075	0.083
V2	0.028	0.030	0.032
V3	0.024	0.016	-

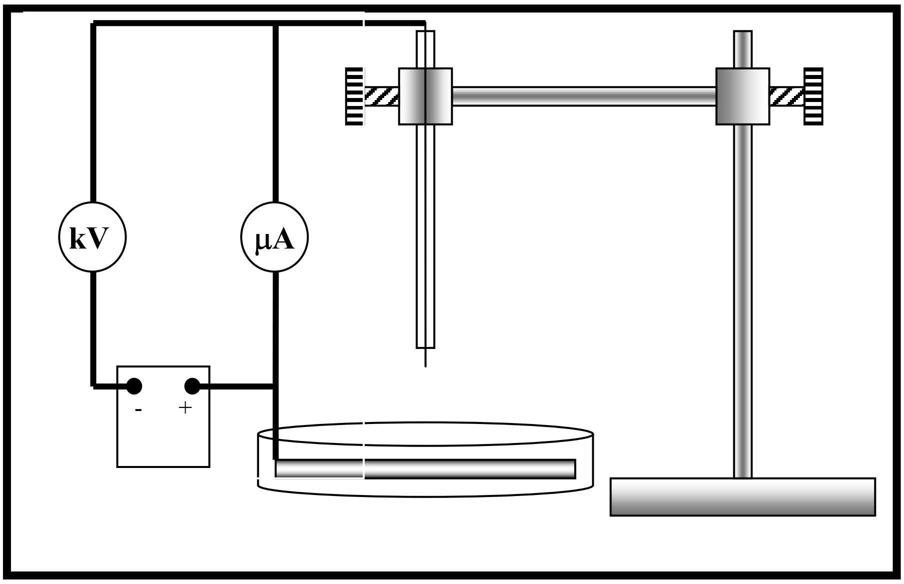

Fig. 1 Experimental set up

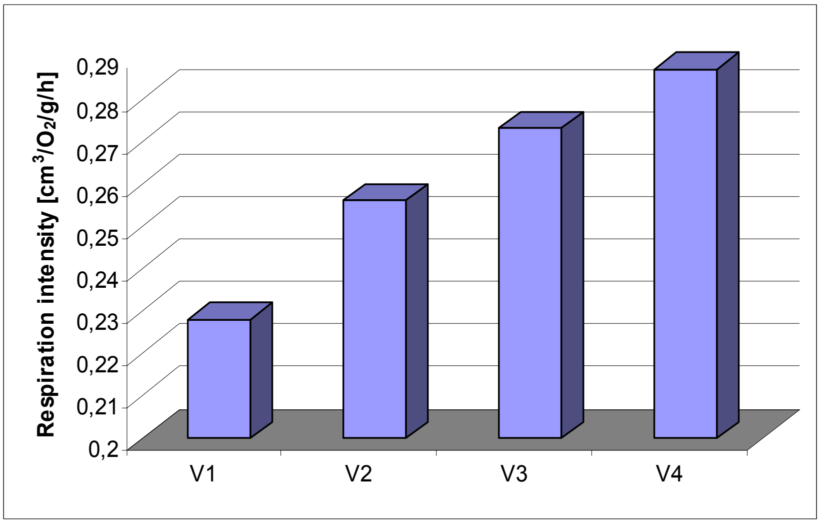

Fig. 2 Dependence of respiration intensity by experimental variants

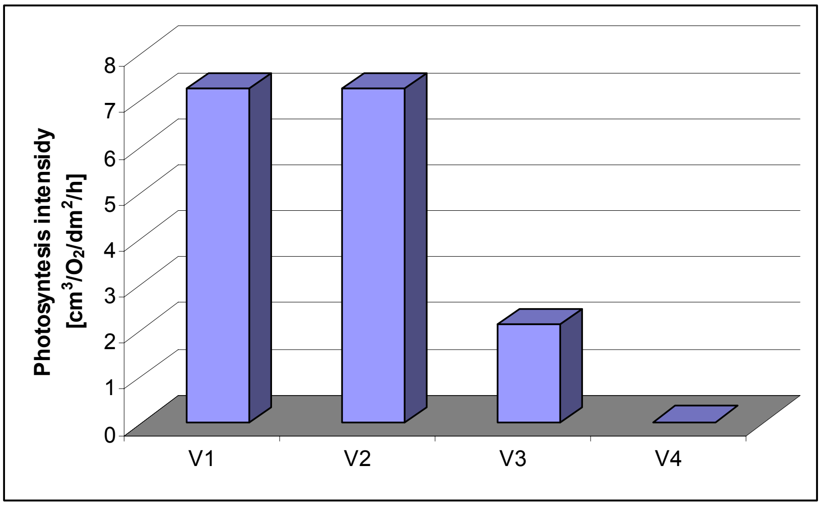

Fig. 3 Dependence of photosynthesis intensity by experimental variants

Fig. 4 Mustard plantlet after two months 5 minutes positive corona irradiation

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THE INFLUENCE OF HIGH DOSE FERTILIZATION WITH WASTE COMPOST UPON THE ACTIVITY OF SOME OXIDASES IN THE TOMATO FRUITS

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Keywords: peroxidase, catalase, enzymatic activity, fertilization.

ABSTRACT

Our researches concerning the dynamics of the enzymatic activity (the activity of peroxidase and catalase) in tomato fruits fertilized with waste compost resulted from purification mud in unique dose of 90 tones/ha. The tomato fruits were harvested in different stages of vegetation (the green maturity, the beginning of ripening and the red ripe maturity).

As the fruits ripened (from the green maturity to the red ripe stage), we noticed the reducing of the activity of peroxidase and the increasing of the catalase activity, both in the unfertilised and in the fertilised variants.

INTRODUCTION

In the tomato fruits, the enzymes control the biochemical reactions associated with the fructifying. The metabolical changes reflect the enzymatic activity changes that occur inside the tissues.

The oxidoreductases are the main component of the bioenergetics systems. These enzymes have an important role in the plant organisms by catalyzing the reactions of oxidations and reductions, which have major effects in achievement of plant maturity.

The catalase and the peroxidase are hem-enzymes functionally related, which are implicated in biodegradation of hydrogen peroxide. This is a strong oxidant, therefore its high accumulation in cells is noxious.

Therefore, at the cell level, the catalase and the peroxidase support a very important biochemical protection mechanism started when injurious changes in the environmental occur.

This paper is a comparative study concerning the effect of the fertilization with waste compost on the dynamics of the catalase and peroxidase activity in tomato fruits during the period of vegetation.

The compost used in order to fertilize the tomato crops is a mixture prepared with the mud resulted from the purification of the town wastewater and vegetal rests (in proportion of 1/5). This mixture represents a rich source of nutritive elements (ratio C:N=10:15), therefore it has positive effects on the soil and on the plants. Added in the soil, the compost contributes to the maintaining and increasing of its fertility potential.

MATERIALS AND METHODS

The biological material consists in tomato hybrid Export II, cultivated in solarium. The hybrid is characterised by undetermined growth, uniform fruits, and middle size and is suitable for consumption in a fresh state.

The experiment consists in 2 variants: unfertilised plants (the control variant) and plants fertilised with compost in unique dose of 90 t/ha. The compost used for this purpose resulted from anaerobic fermentation of the mud proceeded from the purification of the town wastewater mixed up with vegetal rests (cereals straw, maize minced stalk, vegetal waste) in proportion of 1/5.

The harvests were gradually made during the fruits maturation, starting from the beginning of the fruits ripening till final ripening. The determinations were made in three stages of vegetation: series I (the green maturity), series II (the beginning of ripening) and series III (the red ripe maturity).

The enzymatic activity was determined in a vegetal extract obtained by crushing the tomato fruits with quartz sand in distilled water. The supernatant resulted after centrifugation ($4^{o}C$, 15 min, 10000 r/m) was used for the analyses.

The activity of the catalase was determined using a method based on the decomposition of the peroxide of hydrogen under the action of the catalase contained by the vegetal extract. The quantity of oxygen emitted is the measure of the catalase activity, which is expressed in ml O_2 emitted /g vegetal tissue.

The *peroxidase activity* was determined by Mihlin and Bronovitkaia method in an enzymatic extract prepared by pounding the vegetal material with acetate buffer, pH = 4,7. This method is based on the capacity of quinones to oxidize the ascorbic acid. We used pyrocatechine as protons' and electrons' donor in the peroxidase catalysed reaction. The peroxidase activity is expressed in mg H_2O_2 transformed enzymatically/g vegetal tissue.

RESULTS AND DISCUSSIONS

The obtained data show a decrease of the peroxidase activity during the ripening period from 2,413 mg H_2O_2/g in series I to 1,949 mg H_2O_2/g in series III at the unfertilized tomato (fig.1). The fertilised tomato registered also a diminuation of the peroxidasic activity, from 2,008 mg H_2O_2/g in series I to 0,442 mg H_2O_2/g in series III (fig.1). One can observe as a result of the fertilization that the enzymatic activity of peroxidase is lower in all stages of maturity.

Table 1 contain a statistic processing of the data, calculated with the Cohort programme, which show the higher differences registered at the fertilized tomato between series II-III (t = 3,229 ** distinct significant) and between series I-III (t = 4,785 *** very significant).

The catalase activity is showed in figure 2, which indicates that the catalase registered a increased dynamics during the ripening of the tomato fruits from the the green maturity to the red ripe maturity.

The values of the catalase activity varied between 7,80 – 9,904 ml O_2/mg for the unfertilised plants and between 10,266 – 11,108 ml O_2/mg for the fertilised plants, therefore a moderate increase was noticed. The coefficients of variability are lower than those for the peroxidase activity, which reveal a more homogeneous activity of the catalase.

The statistic processing of the data (table 2) shows that the catalase activity increased constantly for the fertilised tomato, with significant differences between series II-III (t = 2,643 *), meaning that the process of maturation is accompanied by a sudden increase of the catalase activity.

CONCLUSIONS

1. The peroxidase activity decreases during the ripening of the tomato fruits, both at the control and at the fertilized plants.
2. The fertilization with 90 t/ha compost determines a severe decrease of the peroxidase activity at the consumption maturity of the tomato fruits.

3. The catalase activity increases moderately during the period of maturation of the tomato fruits.
4. The fertilization with 90 t/ha compost stimulates the catalase activity at the green maturity (series I) of the tomato fruits.
5. The catalase activity at the beginning of ripening (series II) and at the red ripe maturity (series III) is not influenced by the fertilization with 90 t/ha compost.
6. The peroxidase and catalase activities are complementary: when catalase registers a lower activity, increases the peroxidase activity and reciprocally; as a result, the protection mechanism against accumulation of the toxic hydrogen peroxide in the tissues functions permanently in cells, during the ripening of the tomato fruits.

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Tables and Figures

Table 1. The peroxidase activity during the ripening and the meaning of the average values' difference

Specification	*Seria*	$\overline{X} \pm s_{\overline{x}}$	S	CV%	*Pairs*	$\overline{X}_1$	$\overline{X}_2$	"*t*"
Activ. POD mg H_2O_2/g (control)	I	2,413 ± 0,333	1,665	13,84	I – II	2,413	2,139	0,651
	II	2,139 ± 0,257	1,285	12,02	I – III	2,413	1,949	1,175
	III	1,949 ± 0,212	1,060	10,89	II - III	2,139	1,949	0,570
Activ. POD mg H_2O_2/g (90 t / ha)	I	2,008 ± 0,323	1,615	16,08	I – II	2,008	1,302	1,700
	II	1,302 ± 0,261	1,305	15,81	I – III	2,008	0,442	4,785 ***
	III	0,442 ± 0,053	0,265	11,99	II - III	1,302	0,442	3,229 **

Table 2. The catalase activity during the ripening and the meaning of the average values' difference

Specification	*Seria*	$\overline{X} \pm s_{\overline{x}}$	s	CV%	*Pairs*	$\overline{X}_1$	$\overline{X}_2$	"*t*"
Activ. CAT ml O_2 / g (control)	I	7,800 ± 1,002	5,010	12,85	I – II	7,800	9,200	0,878
	II	9,200 ± 1,240	6,200	13,48	I – III	7,800	9,904	1,181
	III	9,904 ± 1,473	7,365	13,48	II - III	9,200	9,904	0,366
Activ. CAT ml O_2 / g (90t / ha)	I	10,266 ± 1,669	8,345	16,26	I - II	10,266	10,904	1,536
	II	10,904 ± 1,547	7,735	14,18	I - III	10,266	11,608	4,100 ***
	III	11,608 ± 1,583	7,915	13,63	II - III	10,904	11,608	2,643 *

The variation of the tomato peroxidase activity with the stage of vegetation

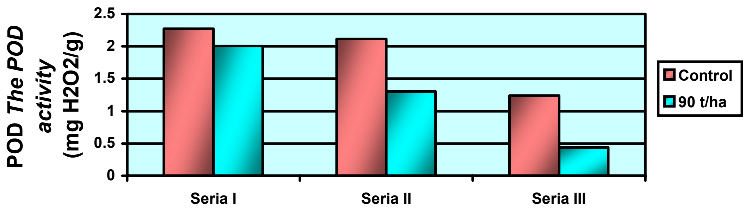

Fig. 1. The dynamics of the peroxidase activity in the tomato fruits during the maturation

The dynamics of the catalase activity

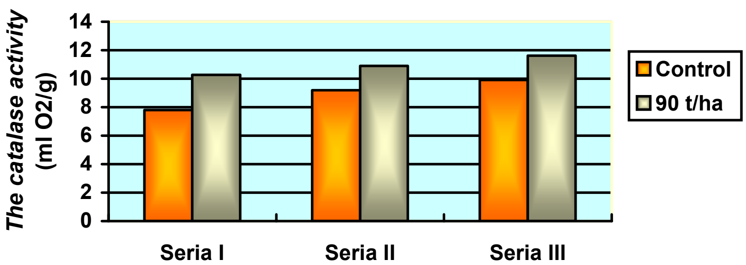

Fig. 2. The dynamics of the catalase activity during the maturation of the tomato fruits

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THE ANTIOXIDANT ACTIVITY OF FLAVONOIDS FROM THE MEDICINAL PLANT, ST.JOHN'S WORT

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Keywords: ferric reducing antioxidant power (FRAP), free radicals, flavonols, reactive oxygen species, high pressure liquid chromatography, mass spectrometry

ABSTRACT

Hypericum perforatum is a herbaceous perennial plant, belonging to Hypericaceae family, distributed in Europe, Asia, Northern Africa and naturalized in USA. The plant is also known as St.John's wort in Anglo-Saxon medicine because it blooms on 24 th June, the birth of St. John. It has been used medicinally since classical Greek times. The most well known actions of the plant are: ulcers, gastritis, burns, depression, treatment against bacteria and fungus, cancer, inflammation.

The active constituents in the plant include hypericin and pseudohypercin, flavo-noids, tannins and procyanidins. In the present study, the focus is on the antioxidant activity of the flavonoids and in the same time the determination of the total phenol content. Flavonoids are a group of naturally occuring plyphenolic compounds found in fruits, plants and vegetables. Flavonoids have shown potential health benefits ari-sing from the antioxidative effects of these phytochemicals, whose properties are attributed to the phenolic hydroxyl groups attached to the flavonoid structure. Scavenging of free radicals is an important property of the flavanoids compounds. In this study is shown that St.John's wort has many compounds with antioxidant activity, which has a pharmacological importance.

INTRODUCTION

There are many studies regarding the biological properties of the medicinal plant, St.John's wort.The most of them are focused on the antidepressive and vasorelaxation effects. The relative potency of the flavonoids to relax isolated vessels is related to the structure of the compound tested with the following order:

Flavonol >flavone = isoflavone > flavonone >catechin.

Flavonoids have antioxidant activities which are more stronger than those of vitamin C and E.

Our body is unable to produce flavonoids so we have to get them from the food we eat and from supplements.

Antioxidants are from two sources:

A. Internal antioxidants: catalase, superoxide dismutase, glutathione;

B. External sources: fruits, vegetables, nuts and grains

Antioxidants are important in combating the free radicals that are constantly formed in our body due to oxidation.

Free radicals are chemical species that possess an unpaired electron in the outer (valence) shell of the molecule. This is the key factor in the structure of this species and is the reason why they are highly reactive.

The fact that they are highly reactive means that they have low chemical specificity; i.e. they can react with most molecules in its vicinity. This includes proteins, lipids, carbohydrates and DNA. It also means that in trying to gain stability by capturing the needed electron they don't survive in their original state for very long and quickly react with their surroundings. Hence, free radicals attack the nearest stable molecule, "stealing" its electron. When the "attacked" molecule loses its electron, it becomes a free radical itself, beginning a chain reaction. Once the process is started, it can cascade, finally resulting in the disruption of a living cell.

The following types of free radicals are involved in oxidative stress:

Hydroxyl radical (HO•), superoxide free radical anion ($O_2^{\bullet -}$), nitric oxide radical(NO•), peroxynitrite ($ONOO^-$) radical.

There are also reactive oxygen species like:

hydrogen peroxide(H_2O_2), hypochlorous acid (HOCl), singlet oxygen ($^1O_2$).

Oxidative stress is defined as the state in which the level of toxic reactive oxygen intermediates (ROI) overcomes the endogenous antioxidant defences of the host. This state results in an excess of free radicals, which can react with cellular lipids, proteins, and nucleic acids, leading to local injury and eventual organ dysfunction. Lipids are probably the most susceptible biomolecules to free radicals.

AIM

The aim of my project is to demonstrate the antioxidant effect of the flavonoids and to determine the total phenol content of the plant.

The antioxidant property of the compounds from St. John's worth is not too much studied.

That is why we have to know the properties of this medicinal plant, which has so many medicinal applications.

MATERIALS AND METHODS

Plant material

It is represented by a dried mixture of leaves, flowers and stems.

The plant extract used in the HPLC chromatograph was prepared as follows:
1g plant was extracted in 25 ml methanol by shaking for 30 minutes and then was centrifuged 20 min; 4500 min-1/g.

The extract was concentrated using the evaporotator.

The dried extract was dissolved in 3 ml methanol.

METHODS

1. Preparative high-pressure liquid chromatography

A preparative HPLC system was used for a large-scale fractionation. This system comprised of a Rheodyne injector model 3725 with a 10 ml injector loop, two LC-10A pumps, a CTO-6A column oven set at 40oC, a Shimadzu SPD 10Avp absorbance detector set at 200-600 nm, linked to a Reeve analytical 2700 data handling system and a Gilson FC 203 fractions collector. Samples were run using a Capital 15 cm x20 mm i.d. optimal column over a 5-50% linear gradient of acetonitrile in 0.1% formic acid over 65 minutes.
The first 6 min of eluent was discarded accounting for the dead volume of the column. Operating at 10 ml/min, 31 fractions were collected from an injection of 10 ml plant extract in methanol. All fractions were stored at –80^{o}C.

Reagents

Methanol, formic acid 0.1%, acetonitrile, plant extract in methanol

2. **High-pressure liquid chromatography-mass spectrometry (HPLC-MS-MS)**
The phenolic profile of the fractions was identified by high pressure liquid chromatography-mass spectrometry (HPLC-MS-MS).A LCQ Instrument MS comprising a series auto sampler and a TSP quaternary pump. Reversed phase separations were carried out at 40^{o}C using a 250 x 4.6 mm i.d. HPLC column. The mobile phase was a 5-50% gradient linear over 60 minutes of acetonitrile in formic acid 0.1%. eluted at a flow rate of 1 ml/min. The column eluent was directed to a UV detector operating at wavelength 200-600 nm.

3. An on line HPLC method employing ABTS. + to detect radical scavenging components (antioxidant activity)
The HPLC system comprised of the following: an HPLC eluent pump, a programmable UV detector, a syringe pump for delivery of ABTS. + solution. The flow rate was 0.5 mL/min. Separations were carried out on a C18 HPLC column
(5µm, 250 x 4 mm i.d.).Samples were injected with a sampling injector equipped with a 10 µl loop. Detection of ABTS.$^+$ quenching was carried out at 734 nm. The UV detection wavelength for the test compounds were chosen according to their absorption maximums:
280 nm - specific for catechins, 365 nm - specific for flavonoids, 520 nm - specific for anthocyanidins.
The volume of the injected extract was 10 µl.
Separation was carried out using the flow rate of 1 ml/min with a linear gradient 5-50 % acetonitrile and 0.1 % formic acid.
Following the separation of the compounds, the eluent was mixed with the ABTS.$^+$ reagent supplied by a Schimadzu liquid pump.
A vacuum degasser was used to remove any oxygen in the reagent prior to mixing.
Reagents
ABTS: (2,2'-azinobis –(3- ethyl bezothyazoline-6-sulfonate)
Solvents:methanol, acetonitrile and 0.1 % formic acid.
Potassium persulfate $K_2S_2O_8$, Potassium phosphate dibasic K_2HPO_4, Potassium phosphate monobasic KH_2PO_4
Preparation of ABTS.$^+$ solutions
ABTS stock (2mM)
55 mg ABTS dissolved in 50 mL distilled water
Add 0.5 ml of $K_2S_2O_8$ solution (19mg/mL)
To obtain a maximum conversion of ABTS to ABTS **.**$^+$ the mixture was stored in the dark at room temperature for 16-17 hours before use. This ABTS stock solution was stable for more than 2 days when kept at room temperature during measurements (protected from light) and at 4^{o}C during the night.
ABTS stock was diluted 1/8 in phosphate buffer, pH=8
Phosphate buffer, pH=8
Mix two phosphate solutions to have 0,1M concentration (K_2HPO_4 17.4 g in 1L and KH_2PO_4 3.4 g in 250 mL). Add the second solution to the first until pH = 8.

4. FRAP method (ferric reducing antioxidant power method)
The antioxidant capacity of the fractions isolated from the medicinal plant was estimated from its ferric reducing ability (FRAP) where development of an intense blue colour resulting from the conversion of a Fe(III)- TPTZ complex to Fe(II)- TPTZ, with a concomitant increase in absorbance at 593 nm, being directly related to the amount of the reductant present in each fraction.

Reagents

Ferrous sulphate ($FeSO_4.7H_2O$) (Fe^{+2}) standard. Make 1mM solution (weigh 0.0278g make up to 100 mL distilled water)

Ferrous chloride ($FeCl_3.6\ H_2O$).Make up 20 mM solution (0.54g make up to 100 mL distilled water).

TPTZ (2,4,6-tripyridyl-s-triazine). Make up 10mM solution (weigh 0.0312g) and dissolve in 10 mL of 40 mM HCl (0.895 mL conc HCl made up to 250mL water).

Acetate buffer: 3.1 g sodium acetate + 16 mL acetic acid in 1L water, adjust to pH 3.6.

FRAP reagent. Mix together previously made up TPTZ and Fe^{+3} (10 mL of each) add this to 100 mL acetate buffer (total volume=120mL). This should be brown in colour (do not use if it turns blue!).

Reaction:

50µl sample + 150µl distilled water + 1.5 mL FRAP reagent $\xrightarrow{\text{4 min}}$ D.O (593 nm)

RESULTS AND DISCUSSIONS

The preparative high-pressure liquid chromatography allowed to separate 31 fractions and then each of them was analysed by HPLC/MS to identify what type of the compounds exist in each fraction. The fractions which had a high phenolic content were the following: fraction no. 13: catechin trimmer, rutin, isoquercitrin, quercetin-3-glucuronid; fraction no. 12: trimmer catechin, rutin, isoquercitrin; fraction no. 9: catechin-monomer, dimmer, trimmer; fraction no. 5: catechin- dimmer, trimmer; fraction no. 8: catechin -monomer, dimmer, trimmer; fraction no. 14: catechin- dimmer, trimmer, rutin, quercitrin; fraction no. 10: catechin-monomer, dimmer, trimmer.

The less phenolic content was determined for the others fractions.

The compounds of each fraction were determined according with their UV spectrum (wavelength: 280 nm - specific for catechins, 365 nm - specific for flavonoids, 520 nm - specific for anthocyanidins) and the specific mass spectrum.

The determination of the antioxidant activity is based on the interaction between the radical scavenger (phenolic compound) with the radical cation: ABTS. + (2,2'-azinobis –(3-ethyl bezothyazoline-6-sulfonate) and the recording in the PDA detector at 734 nm a negative peak, corresponding for the compound which has an antioxidant activity.

The results are shown in the figure 1. There are two types of traces:

- The ones corresponding for the separated chemical compounds;
- The one, which shows the negative peaks corresponding for the compound, eluted by HPLC and which has antioxidant activity.

It was done the calibration curve and then the reading of the absorbance for 31 fractions at 593 nm using the FRAP method. The results are shown in the figure 1. All the 31 fractions from preparative chromatography were analysed and the higher antioxidant activity was determined for the fractions no. 13, 12, 9, 5, 8, 14, 10.

The less antioxidant activity was determined for the others fractions.

CONCLUSIONS

The HPLC method, that uses the radical cation ABTS. + (2,2'-azinobis –(3- ethyl bezothyazoline-6-sulfonate) has a high sensitivity and the method can be applied for quick screening of plant extracts. This method allows the evaluation of radical scavenging properties, providing a picture of the antioxidant activity of the chemical studied compounds.

The antioxidant activity is correlated with the high phenolic content.

It is surprising that the plant extract in alcohol like methanol has different compounds with a strong antioxidant activity.

This study demonstrates that the medicinal plant *Hypericum perforatum* has to be in the attention of the researchers because it can also be used in different medical applications, taking into account that it has a powerful antioxidant activity.

This fact is very important because this plant is very easy to find in the fields and forests or sometimes we can cultivate it in gardens.

The conclusion is that even a plant extract of *Hypericum perforatum* in alcohol like ethanol not only methanol, which is used as a tincture can have a very good effect against the oxidative stress.

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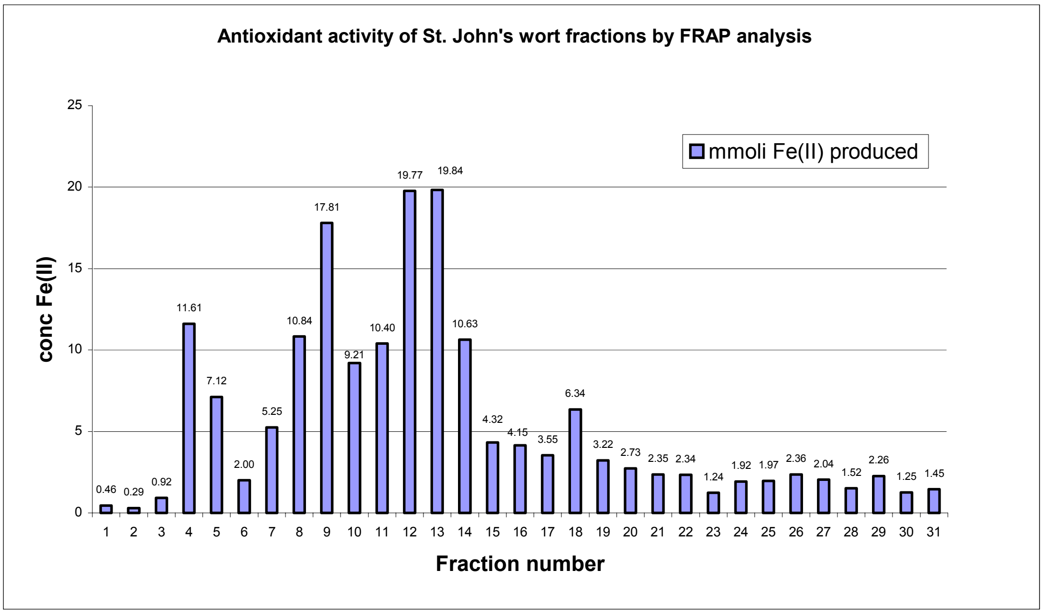


Figure 1. Antioxidant activity of St. John's worth

CARTEA INTELIGENTA

MIJLOC EFICIENT DE PREDARE SI STUDIU

AUTORI:

LECT. DR. CRISTEA BOBOILA
CORNELIA BOBOILA
ING. MARIAN VELCEA

STUD. SIMONA BOBOILA
STUD. GEORGE IORDACHE
ALEXANDRU VELCEA

CARTEA INTELIGENTA

- carte pe suport magnetic
- beneficiaza de avantajele mijloacelor multimedia
- gandita sa interactioneze cu utilizatorul

SCOPUL NOSTRU

Sa atragem atentia asupra **potentialului extraordinar** pe care il ofera domeniul cartilor inteligente in procesul de instruire.

Procesul de instruire – doua aspecte :

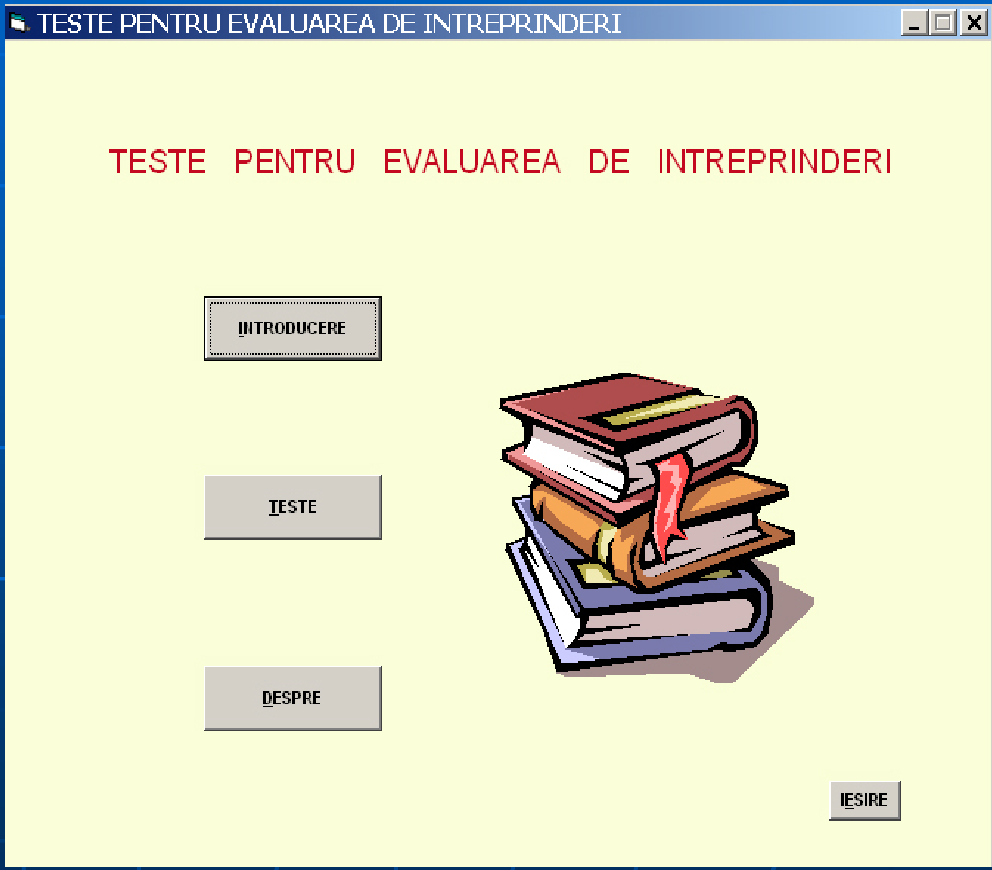
- Predare
- Studiu si evaluare

APLICATIA EVALINFO

- Poate fi folosita cu eficienta in procesul de instruire
- Gandita sa raspunda ambelor laturi ale procesului de instruire

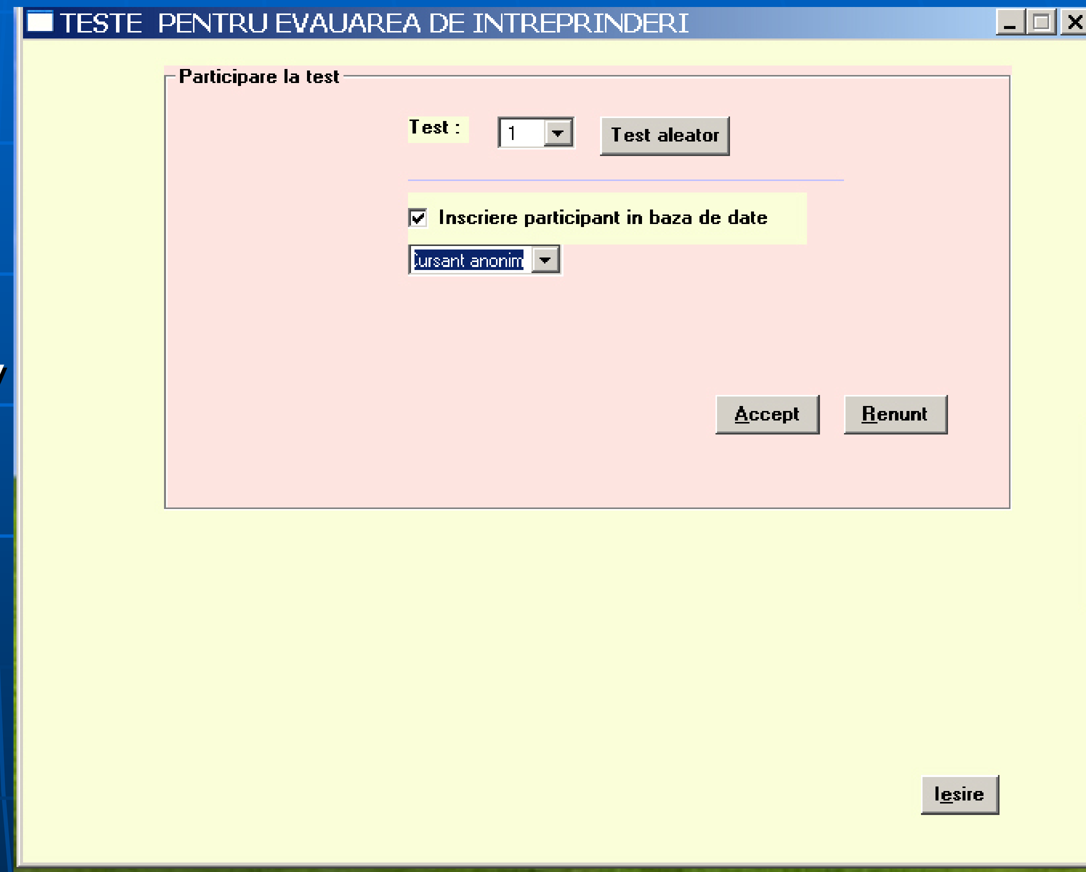
PREZENTARE APLICATIE

- Studentul poate parcurge anumite teste si apoi poate evalua raspunsurile.
- Se face o comparatie intre raspunsurile la testul curent si testul anterior pentru a se vedea evolutia in timp a pregatirii studentului



INSCRIEREA STUDENTULUI LA TEST

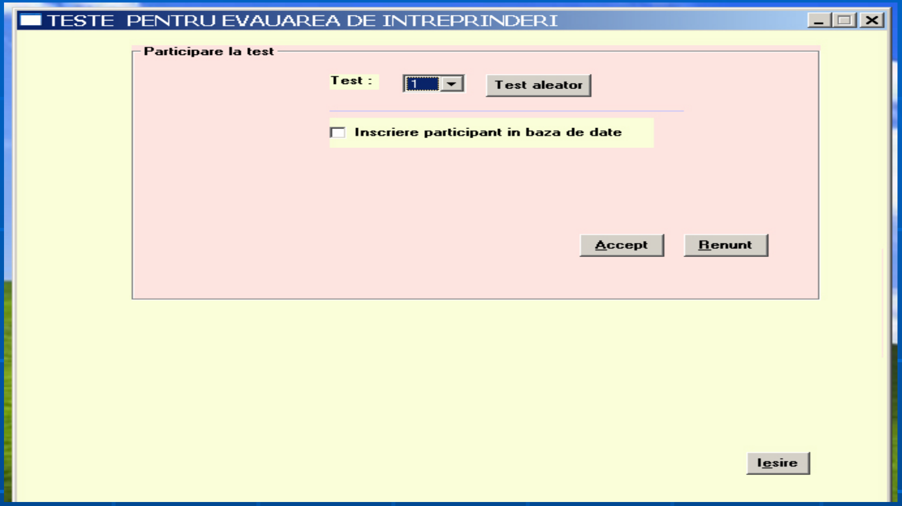
Implicit, studentul parcurge testele cu numele “Cursant anonim”, dar se poate si inscrie cu un anumit nume in baza de date

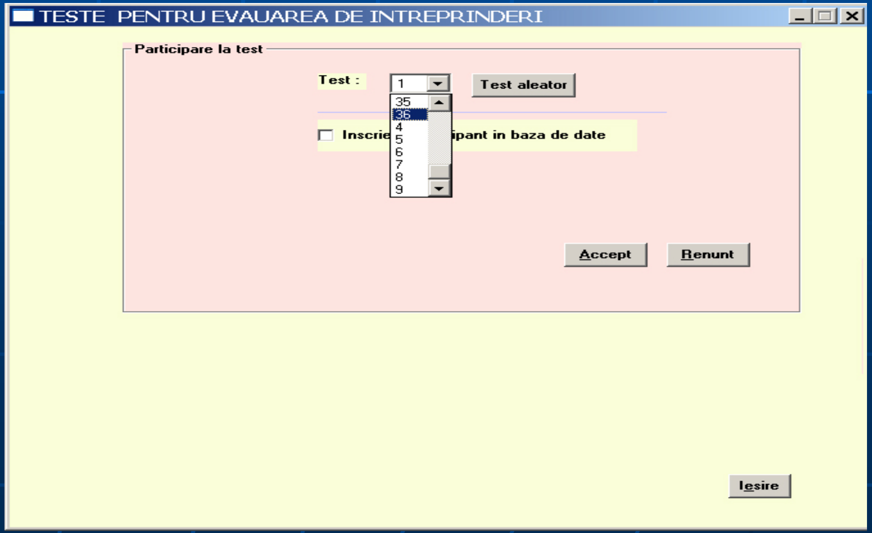


ALEGERE TEST

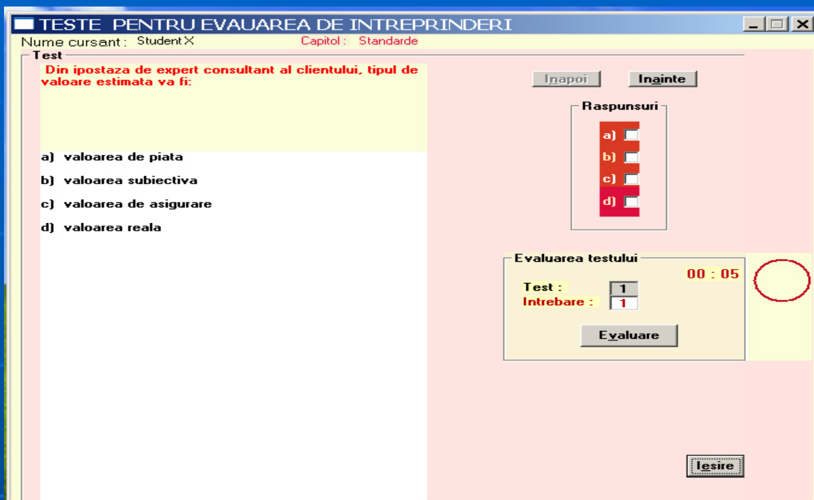
Cartea cuprinde un numar de teste care pot fi alese prin doua metode:

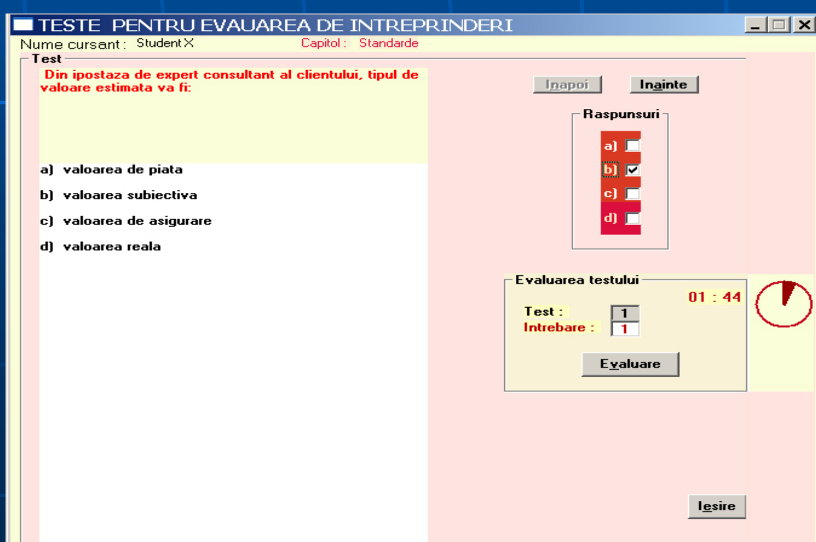
1. aleator conform unui algoritm care apeleaza ceasul sistemului de calcul
2. prin selectie din lista





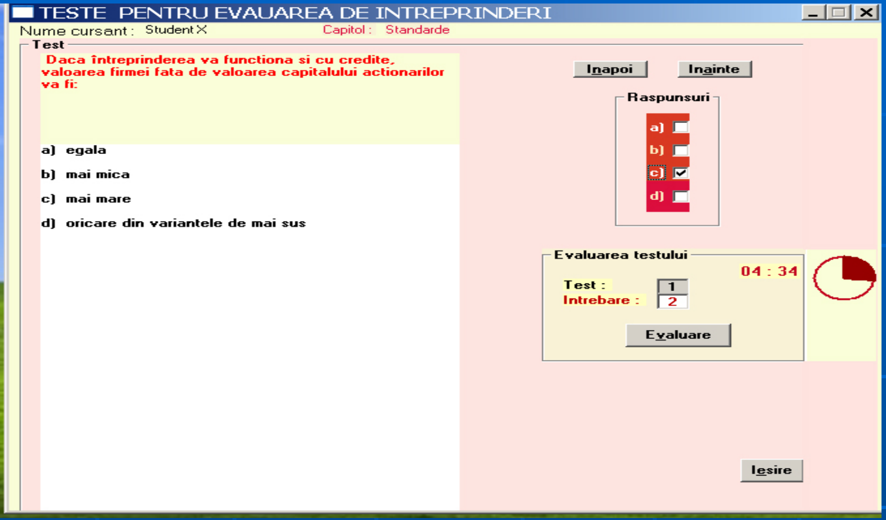
RASPUNSURILE LA TEST

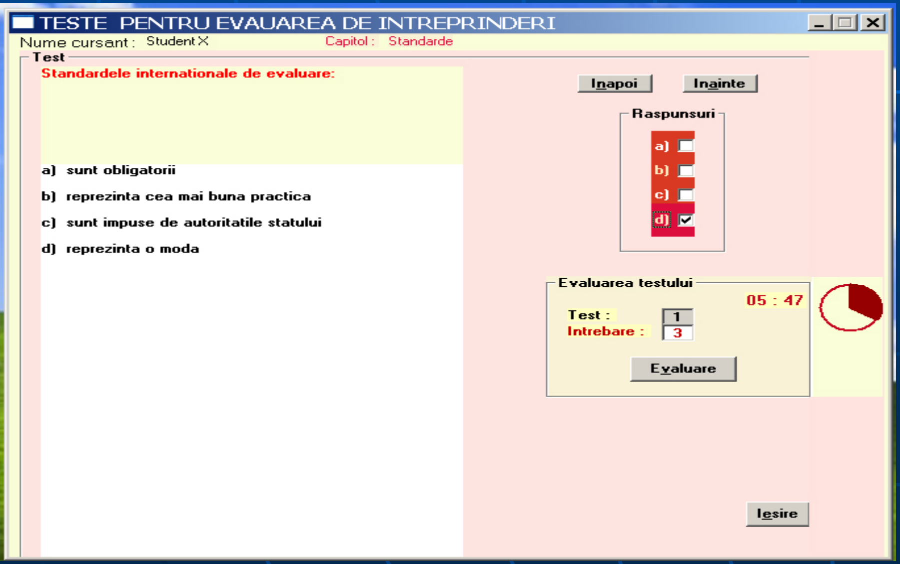




- La fiecare test se afiseaza intrebarile si la fiecare intrebare variantele de raspuns
- Intrebarile se pot parcurge inainte sau inapoi

RASPUNSURILE LA TEST

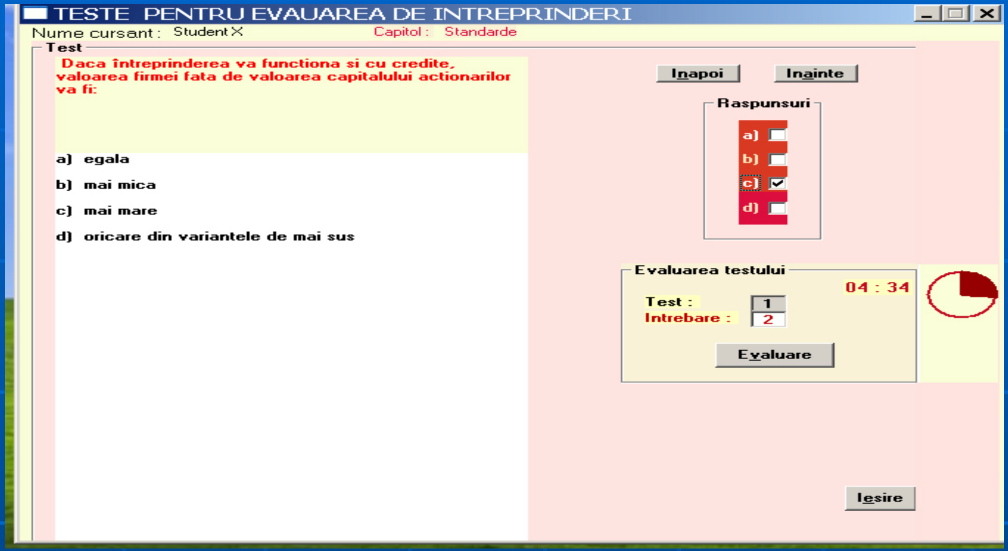


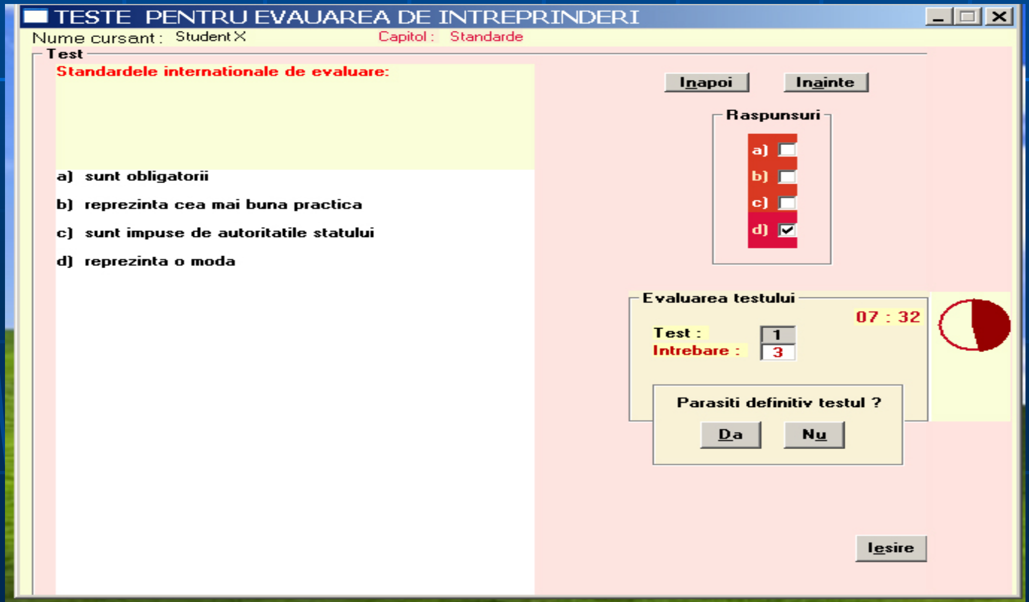


- Raspunsurile se dau prin bifarea in casetele "checkbox"
- Timpul de raspuns se cronometreaza

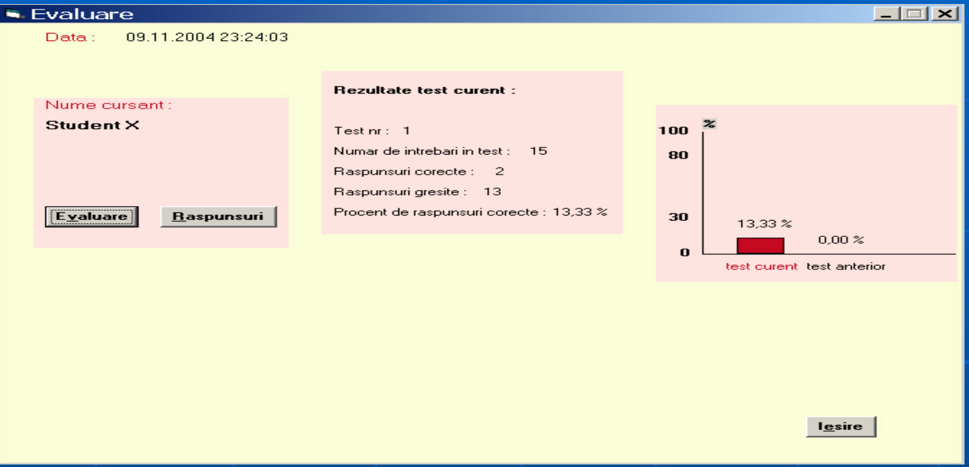
EVALUAREA TESTULUI

Evaluarea se face apeland butonul "EVALUARE"

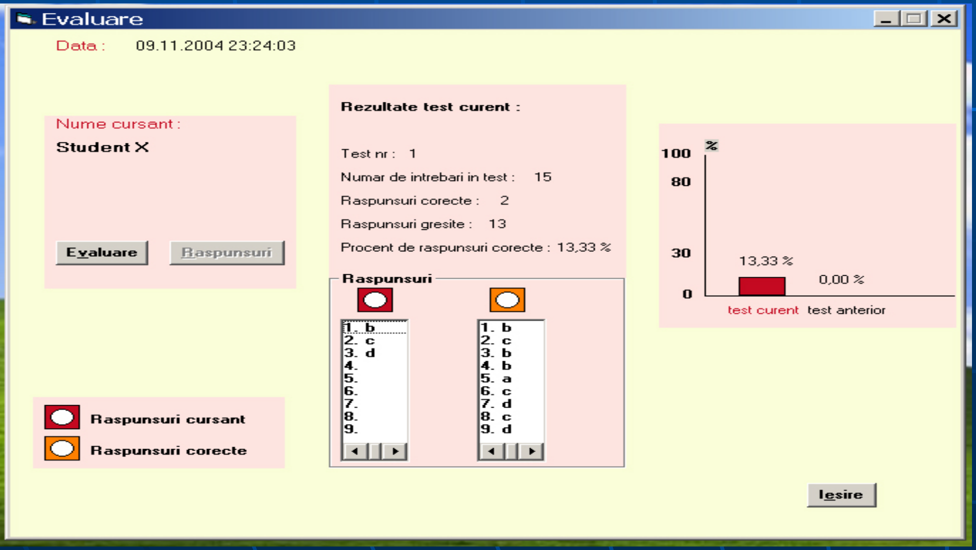




EVALUAREA TESTULUI



- Se afisaza numarul de intrebari din test , numarul de raspunsuri corecte si procentul reprezentat de acestea



- Se face un grafic pentru doua teste consecutive
- Se detaliaza raspunsurile corecte sau gresite pe fiecare intrebare din test

EDITARE DE TESTE

- Posibilitatea de a crea un test selectand anumite intrebari sau selectand aleator intrebarile din diferite capitole
- Posibilitatea de a seta :
  - ponderea fiecarei intrebari la punctajul total
  - timpul de evaluare
- Posibilitatea de a printa testul pe hartie

EDITARE DE TESTE

- Utilitate :
  - Cadrelor didactice
  - Firmelor care doresc sa testeze cunostintele viitorilor angajati
  - Autoevaluare
- Flexibilitatea bazei de date – se pot introduce:
  - Alte tipuri de teste
  - Imagini
  - Grafice

Mărcile – instrument de afaceri

Ing. Ştefan COCOŞ
OSIM, şef serv. mărci

Ing. Marian VELCEA
Consilier Propr. Ind.

Obiectele proprietății intelectuale

- **Dreptul de autor**
- **Proprietatea industrială**
  - **creații cu caracter tehnic**
  - **creații cu caracter estetic**
  - **semne asociate produselor în activitatea comercială**
  - **reprimarea concurenței neloiale**

Proprietatea industrială ; creații cu caracter tehnic

- **Invențiile**
- **Modelele de utilitate**
- **Topografiile de circuite integrate**

Toate aceste creații au o funcție tehnică şi au ca sop rezolvarea unor probleme tehnice!

Proprietatea industrială ; creații cu caracter estetic

- **Desene industriale - aspect exterior al unui produs plan, având o funcție utilitară;**

- **Modelele industriale - aspect exterior al unui produs tridimensional, având o funcție utilitară;**

Proprietatea industrială ; creații cu caracter estetic

- **Caracteristici:**
  - **aspect exterior al unui produs;**
  - **produsul are o funcție utilitară;**
  - **aspectul exterior are rol estetic;**
  - **aspectul exterior nu are rol funcțional;**

Proprietatea industrială ; semne asociate produselor în activitatea comercială

- **Mărci**
- **Indicații geografice**
- **Numele comercial**

Proprietatea industrială ; semne asociate produselor în activitatea comercială

- **Funcții principale:**
  - **indică (direct sau indirect) sursa de proveniență a produselor şi / sau serviciilor;**
  - **permit consumatorului să identifice produsele şi / sau serviciile;**
  - **cele două funcții - de indicare a sursei şi de identificare - au ponderi diferite, după cum vorbim de mărci, indicații geografice sau nume comercial;**

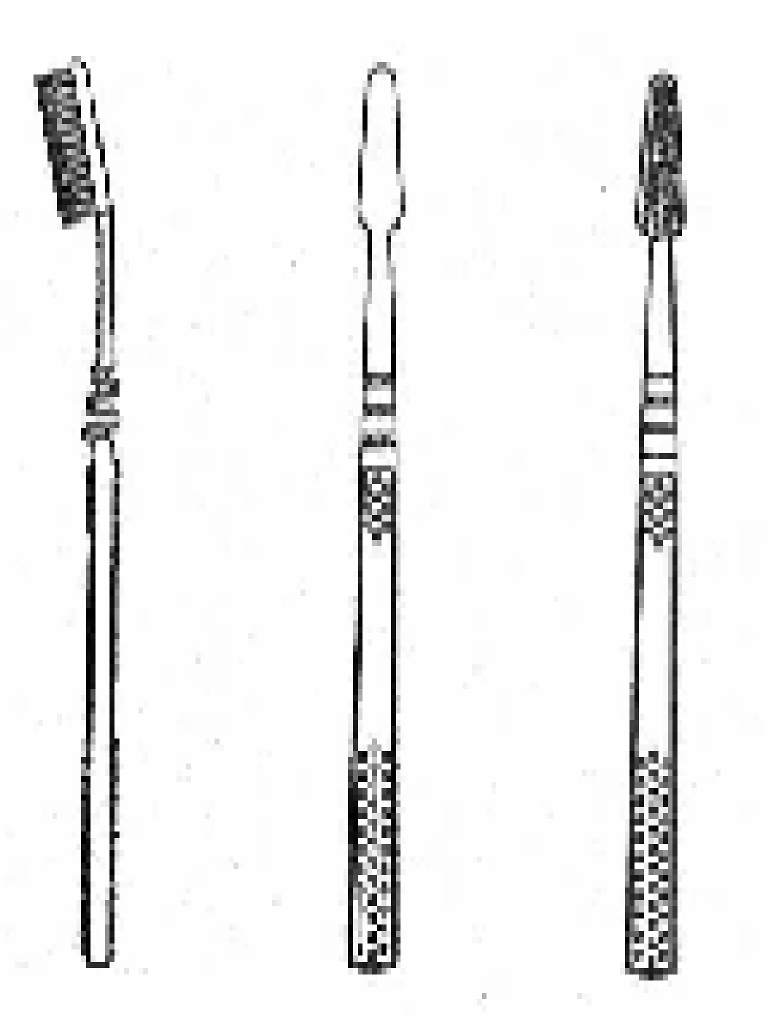
Probleme de interferență între obiectele proprietății industriale

- Periuța de dinți din imagine poate fi analizată ca:

- **invenție?**

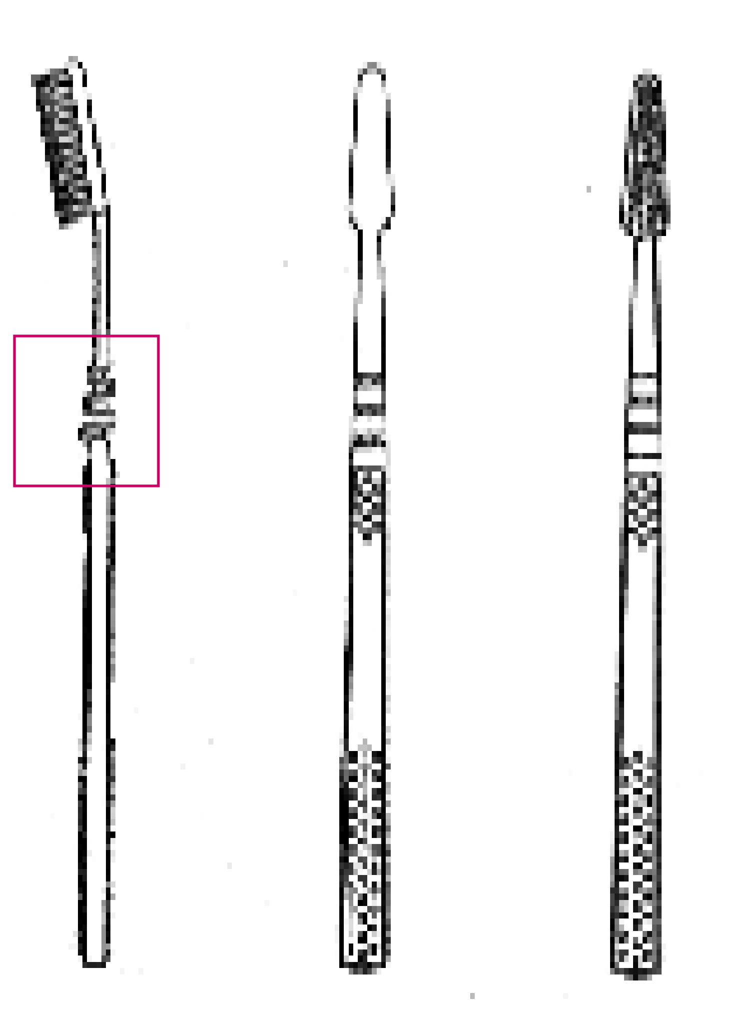
- **model industrial?**

- **marcă?**



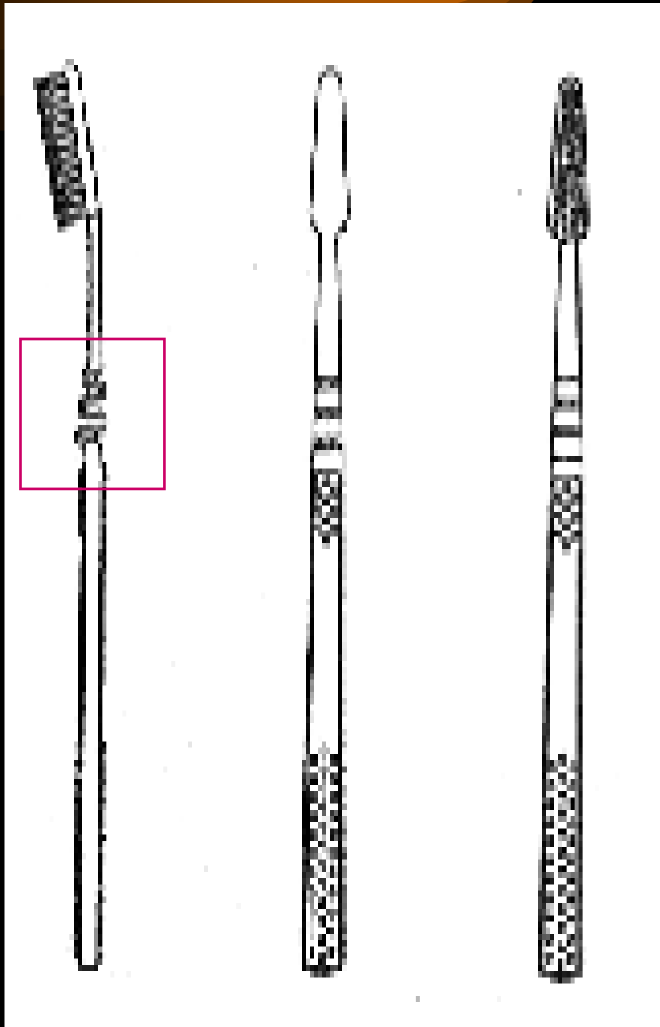
Probleme de interferență între obiectele proprietății industriale

- Onduleurile, de pe mânerul periuței, din chenarul roşu:
- **sunt elastice,**
- **permit flexarea capului periuței,**
- **prin aceasta, limitează presiunea pe dantură când sunt periați dinții;**
- **Funcție tehnică; INVENȚIE!**



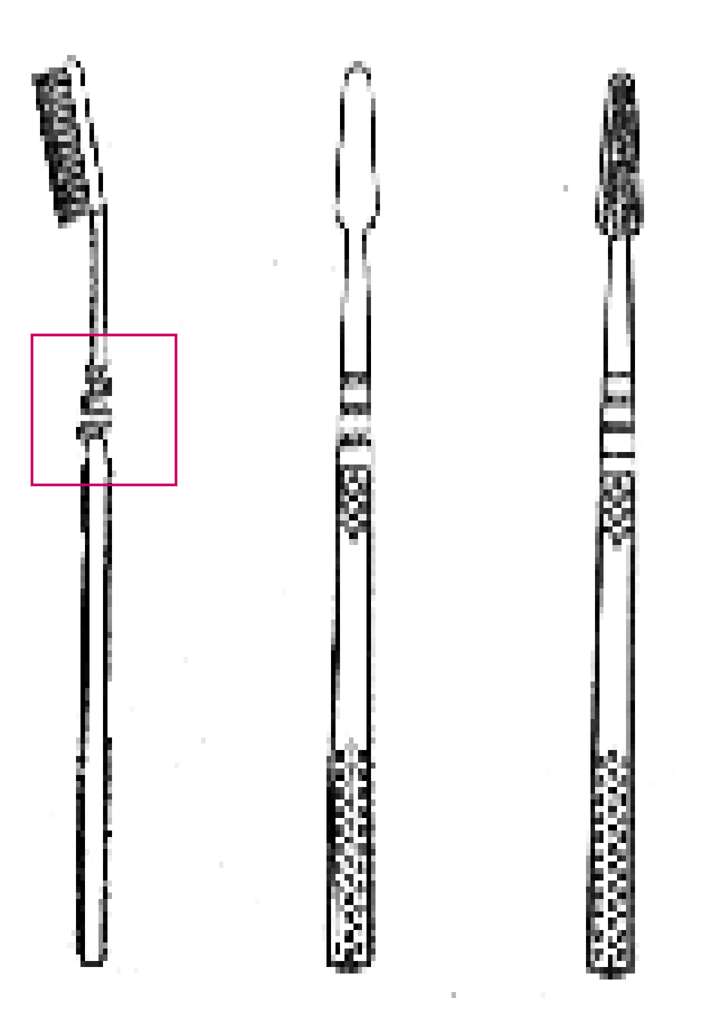
Probleme de interferență între obiectele proprietății industriale

- Onduleurile, de pe mânerul periuței, din chenarul roşu:
- **sunt rigide, periuța are funcția utilitară "clasică"; onduleurile nu aduc o funcție suplimentară,**
- **se apreciază că, prin această formă, periuța e "mai frumoasă";**
- **Funcție estetică; model industrial!**



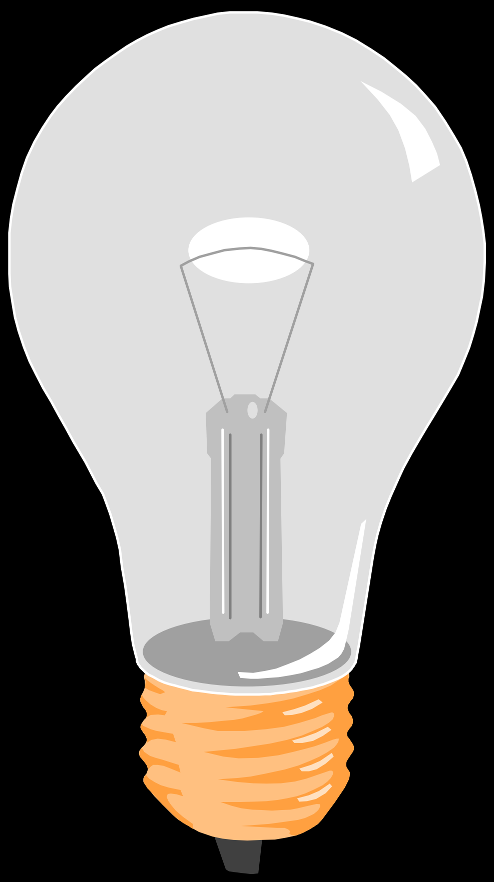
Probleme de interferență între obiectele proprietății industriale

- Onduleurile, de pe mânerul periuței, din chenarul roşu:
- **sunt rigide, periuța are funcția utilitară “clasică”; onduleurile nu aduc o funcție suplimentară,**
- **prin această, formă periuța “poate fi deosebită”de alte periuțe de către cumpărător;**
- **Funcție de identificare; marcă!**



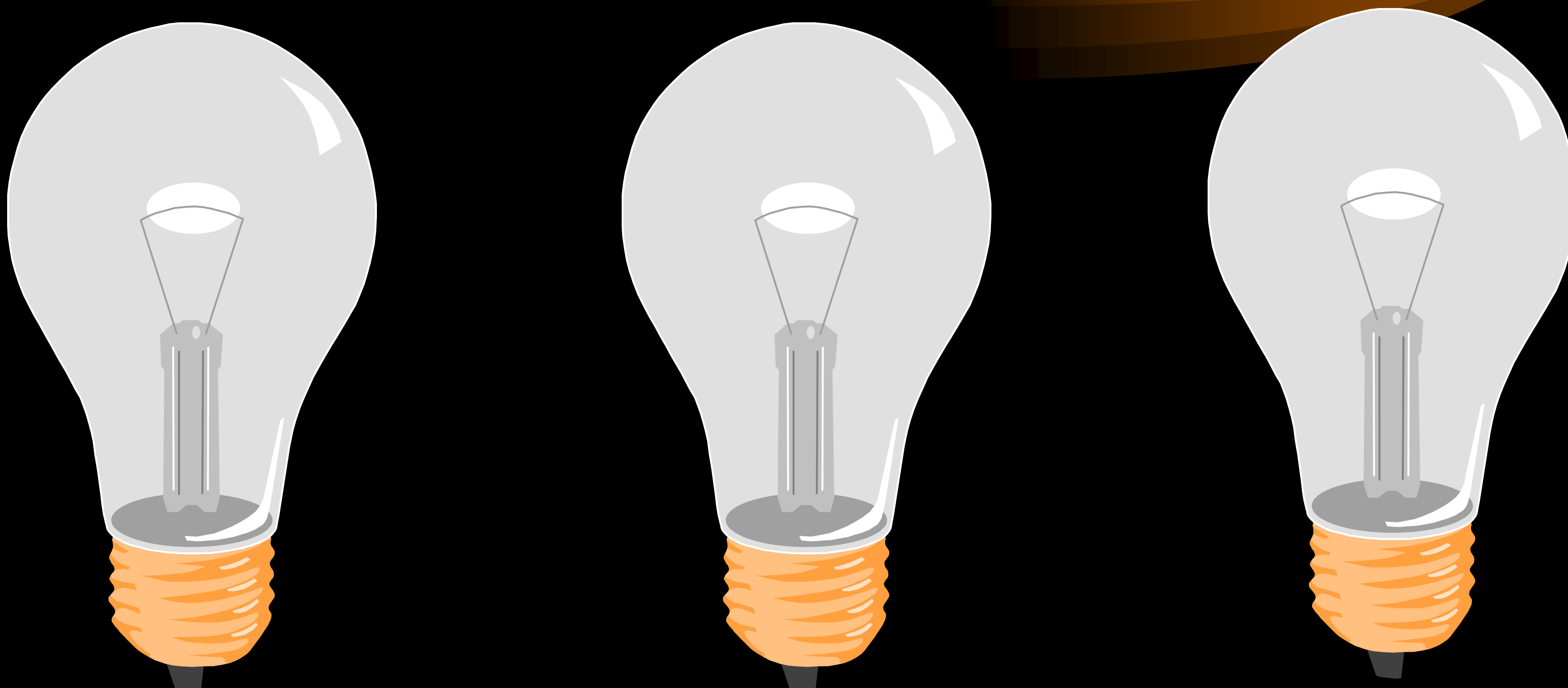
Mărcile şi protecția acestora

Am acumpărat becul din imagine



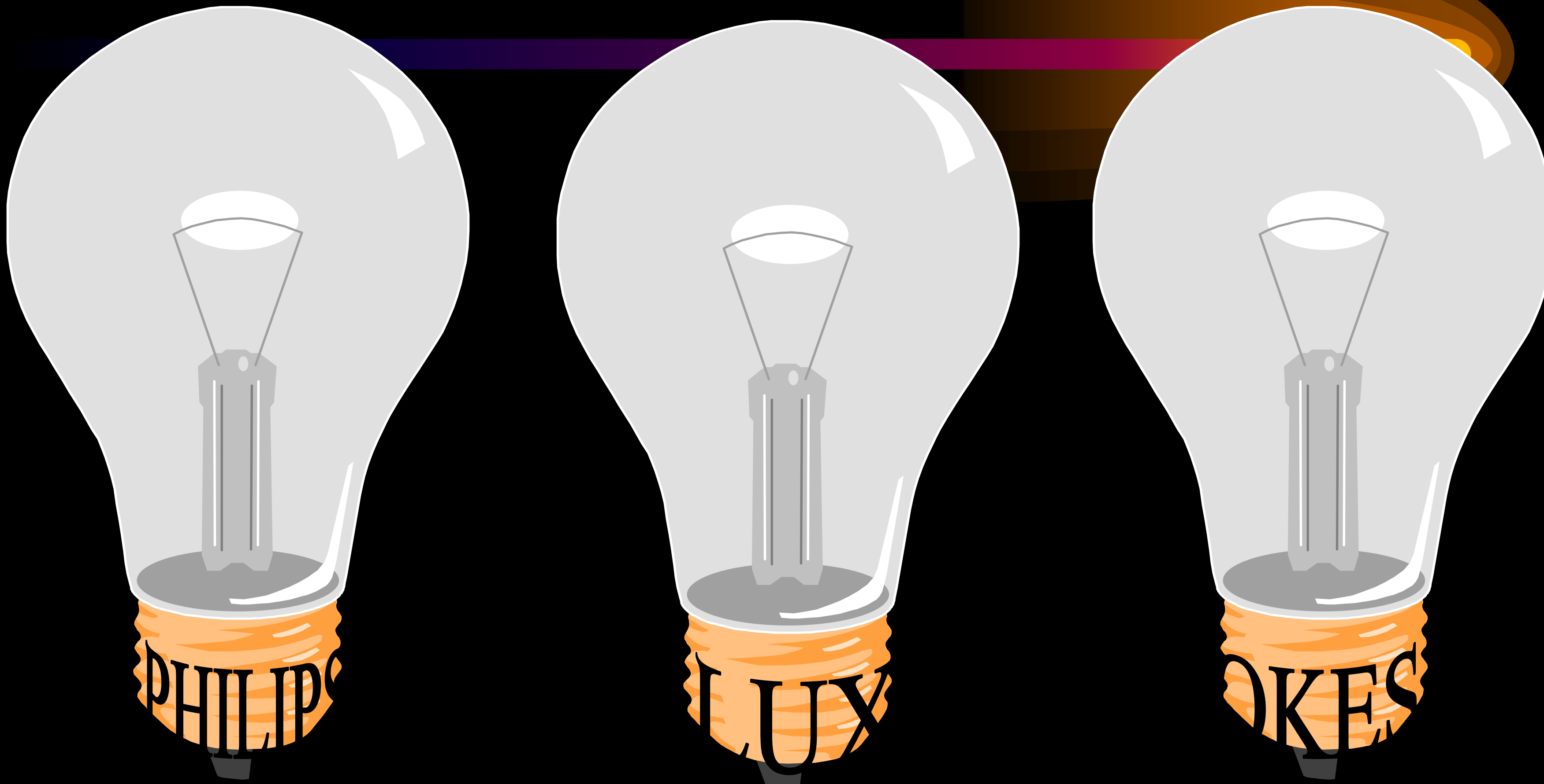
- După 10.000 de ore de funcționare s-a “ars”...
- şi dorind să-l înlocuim cu unul “la fel de bun”…
- mergem în magazin să cumpărăm altul.

În magazin surpriză… găsim 3 tipuri de becuri, identice ca aspect şi performanțe



Pe care îl algem?

Constatăm că fiecare are o … “marcă”: PHILIPS, LUX, OKES;



Şi problema este ca şi rezolvată!

Alegem marca ….

Dar ce este marca MARCA?

- Însemn, caracteristică suplimentară,
- asociat(ă) produselor şi / sau serviciilor,
- care permite consumatorului să deosebească produsele şi / sau serviciile identice sau similare;
- Pe această bază, consumatorul poate să aleagă produsele şi / sau seviciile care îi satisfac exigențele şi care provin dintr-o anumită sursă;

Tipuri (tradiționale) de mărci

- **Vizuale**
- **Sonore**
- **Tactile**
- **Olfactive**
- **Organoleptice**

- În general, însemne perceptibile vizual: etichete, forme, etc.
- Însemne perceptibile auditiv: cuvinte, fragmente muzicale, etc.
- Forme în relief, tridimensionale;
- Mirosuri (de ex. al unei coli de scris);
- Gusturi - de ex. vin spumant cu aromă de căpşuni;

Pentru consumator, MARCA

- Nu este însemnul în sine, ci însemnul asociat produselor sau serviciilor;

- Pentru consumator, marca are două funcții principale:
  - funcția de diferențiere - permite consumatorului să deosebească între ele produsele / serviciile identice sau similare;
  - funcția de indicare a sursei - chiar dacă nu cunoaşte deținătorul mărcii, consumatorul ştie că produsele realizate de acesta îi satisfac exigențele;

Pentru deținător, MARCA

- Este elementul de legătură între produse / servicii şi deținătorul acesteia,
- Permite titularului investiții în publicitate,pentru a-i fi cunoscute produsele şi în calitate, pentru a creşte încrederea consumatorului în acestea;
- pe această bază titularul îşi poate recupera investițiilor făcute în calitate şi publicitate şi îşi poate creşte profiturile.

DE CE PROTECȚIA MĂRCII?

- Pentru a interzice terților utilizarea acesteia fără consimțământul titularului
- Prin aceasta titularul obține:
  - protejarea investițiilor în publicitate,
  - evitarea situației în care alții profită de investițiile făcute de acesta în publicitate,
  - protejarea profiturilor obținute din utilizarea mărcii,
  - reducerea riscului de "degenerare" a mărcii.
  - crearea posibilității de "contabilizare" a valorii acesteia şi de creştere a valorii mărcii în cazul cesionării sau licentierii.

INDEX

Chrysanthemum maximum	phenophases, morphologic characteristics, decorative qualities	**F&D 01**
Cichorium intybus	germination rate, dynamics, F1 hybrids	**VG 07**
Clematis sp.	*Clematis*, uninodal fragments, antibiotics, micropropagation	**F&D 10**
Clematis sp.	Clematis, hybrids, cutting, rooting hormons	**F&D 11**
Coreopsis tinctoria	phenophases, morphologic characteristics, decorative qualities	**F&D 01**
Cucumber sp.	watering by drop, watering on beds, cucumbers crop in solarium	**VG 21**
Cucumis melo	melons, climacteric, postharvest, shelf ripening	**B&P 04**
Cucumis melo	melon, respiration, carotene, soluble solids	**B&P 05**
Cucumis sativus	drip irrigation, photosynthesis, respiration, perspiration, chlorophyll, permeability of cell membranes	**B&P 09**
Cucurbita maschata	*Cucurbita maschata*, ecolagical crop, productivity	**VG 10**
Cyclamen persicum	cyclamen, foliar fertilizer	**F&D 07**
Diospyros lotus	grafting, scion, rootstock, budding, shoots	**FG&T 21**
Equinacaea purpurea	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Equinacaea purpurea	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**
Ficus elastica	zeolite, ficus, hibiscus, substrate, fertilizer	**F&D 06**
Forsythia sp	*Forsythia* sp., species, cultivars, vegetative propagation, cuttings	**F&D 08**
Fuchsia hybrida	growth regulators, organogenesis, adventitious shoots	**F&D 02**
Gaillardia hybrida	phenophases, morphologic characteristics, decorative qualities	**F&D 01**
Gentiana triflora	*in vitro*, ornamental, axillary branching	**F&D 09**
Geum coccineum	phenophases, morphologic characteristics, decorative qualities	**F&D 01**
Helianthus annuus	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Helianthus annuus	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**
Hemerocalis fulva	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Hemerocalis fulva	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**
Hibiscus	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Hibiscus	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**
Hibiscus sp.	zeolite, ficus, hibiscus, substrate, fertilizer	**F&D 06**
Hippophäe rhamnoides	seabuckthorn, berries, flavonoids, carotene, dry weight, ripening	**B&P 02**

Hippophäe rhamnoides	seabuckthorn, leaves, photosynthesis, transpiration, chlorophyll pigments, permeability indices	**B&P 03**
Hydrangea macrophylla	*Hydrangea macrophylla* Ser. plants, container culture, substrates, leaves compost	**F&D 16**
Hydrangea macrophylla	*Hydrangea*, cuttings, containers, blueing	**F&D 17**
Hypericum perforatum	ferric reducing antioxidant power (FRAP), free radicals, flavonols, reactive oxygen species, high pressure liquid chromatography, mass spectrometry	**B&P 12**
Hypericum perforatum	Hypericum perforatum	**B&P 13**
Juglans sp.	pruning, walnut	**FG&T 18**
Lactuca sativa	rooting, *Lactuca sativa*	**VG 12**
Lactuca sativa	lettuce transplants, Fitpol C product, chemical analyzed	**VG 13**
Lactuca sativa	lettuce	**VG 18**
Lactuca sativa	pyramids, active water, salad, germination, production,	**VG 20**
Lavandula angustifolia	*Lavandula angustifolia*, *in vivo* rooting, microcutts, rooting stimulators, micropropagation	**F&D 21**
Lupinus polyphyllus	phenophases, morphologic characteristics, decorative qualities	**F&D 01**
Lycopersicon aesculentum	tomatoe	**B&P 01**
Lycopersicon aesculentum	peroxidase, catalase, enzymatic activity, fertilization	**B&P 11**
Lycopersicon aesculentum	*light incidence, tomato*	**B&P 14**
Lycopersicon aesculentum	protein level dynamics	**B&P 15**
Lycopersicon aesculentum	the productive potential, *Agrobacterium rhizogenes*, the ecological culture, bonitat	**VG 08**
Lycopersicon aesculentum	consumption, mineral, organic, cultivar, production	**VG 11**
Lycopersicon aesculentum	*Lycopersicon esculentum*, quality	**VG 14**
Lycopersicon aesculentum	*Lycopersicon esculentum*, variety, residue, quality	**VG 16**
Lycopersicon aesculentum	zeolite, tomatoes, pepper	**VG 17**
Lycopersicon aesculentum	watering by drop, watering on bed, hybrid tomatoes in solarium, economic indixes	**VG 22**
Lycopersicon aesculentum	firmness, quality, respiration rate, soluble solids, calcium treatment	**FG&T 07**
Lycopersicon aesculentum	tomato	**FG&T 16**
Malus domestica	foliar, fertilizers, apple, yield, unpolluting	**FG&T 12**
Malus sp.	apples, cherries, infusion, syrup, equipment	**FG&T 17**
Miscanthus sinensis	*in vitro*, ornamental, axillary branching	**F&D 09**
Monarda didyma	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Monarda didyma	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**

Pelargonium peltatum	growth regulators, organogenesis, adventitious shoots	**F&D 02**
Penstemon barbatus	phenophases, morphologic characteristics, decorative qualities	**F&D 01**
Persica sp.	breeding, rootstocks	**FG&T 14**
Phlox paniculata	phenophases, morphologic characteristics, decorative qualities	**F&D 01**
Physostegia virginiana	phenophases, morphologic characteristics, decorative qualities	**F&D 01**
Pisum sativum	*Pisum sativum* L., cultivars “mangetout” pea, trellis culture	**VG 01**
Pisum sativum	mangetout pea, cultivars, crop technology, biological peculiarity	**VG 02**
Pisum sativum	providing flow, grain purity, smashing degree of grains	**VG 15**
Polyanthes Tuberosa	bulbs, *in vitro* cultures, multiplication coefficient	**F&D 23**
Primula auricula	phenophases, morphologic characteristics, decorative qualities	**F&D 01**
Prunus armeniaca	inoculated, *Botrytis cinerea*, fruit quality	**FG&T 09**
Prunus armeniaca	*Prunus armeniaca*, thinning, fruit, quality	**FG&T 13**
Prunus cerasifera	peach dwarf, nectarine dwarf, cross breading, auto pollination, hybrid fruits	**FG&T 04**
Prunus cerasifera	seedling, resistance diseases, peach dwarf, nectarine dwarf, hybrids	**FG&T 05**
Prunus domestica	plum, cultivars, rootstocks, physiology	**B&P 06**
Prunus domestica	quality, profitable, the times am period of growth, resistens, productivity	**FG&T 03**
Prunus domestica	fertilizers, soil, leaves, macroelements, microelements, yield, fruit	**FG&T 24**
Prunus sp	*Prunus* sp. hybrids, protein, glucide accumulation, peroxides activity	**FG&T 01**
Prunus sp	rootstocks, *Prunus* sp. hybrids, comparative, biometry	**FG&T 02**
Prunus spinosa	peach dwarf, nectarine dwarf, cross breading, auto pollination, hybrid fruits	**FG&T 04**
Prunus tomentosa	peach dwarf, nectarine dwarf, cross breading, auto pollination, hybrid fruits	**FG&T 04**
Prunus tomentosa	seedling, resistance diseases, peach dwarf, nectarine dwarf, hybrids	**FG&T 05**
Pyrus communis	*Pyrus communis*, community structure, abundance, faunistic study	**FG&T 10**
Rosa	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Rosa hybrida	growth regulators, organogenesis, adventitious shoots	**F&D 02**
Rubus idaeus	raspberry, *in vitro*	**FG&T 15**
Rudbeckia bicolor	phenophases, morphologic characteristics, decorative qualities	**F&D 01**

Salvia officinalis	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Salvia officinalis	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**
Sinapis sp.	positive corona discharge, mustard plantlets	**B&P 10**
Solanum tuberosum	*Solanum tuberosum*, solarium, field, density, Ostara, Agata, Kondor, Impala	**VG 19**
Symphoricarpos x doorenbossii	substrate, pH, salinity, ornamental plants	**F&D 15**
Syringa vulgaris	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Syringa vulgaris	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**
Tamarix tetrandra	substrate, pH, salinity, ornamental plants	**F&D 15**
Taraxacum officinalis	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Taraxacum officinalis	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**
Tropaeolum majus	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Tropaeolum majus	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**
Viola tricolor	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Viola tricolor	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**
Vitis vinifera	viticulture, winemaking, small producers, wine contests	**V&O 01**
Vitis vinifera	wine storage containers, metal content, heavy metals, chromium, nickel	**V&O 02**
Vitis vinifera	pruning type	**V&O 03**
Vitis vinifera	sandy soils, vine planting, Dabuleni	**V&O 04**
Vitis vinifera	grape marc, wine distillation residue, minim tillage, green fertilizers	**V&O 05**
Vitis vinifera	rainfall, intensity, soil, viticultural, terraces, grassing bands	**V&O 07**
Vitis vinifera	vine varieties, phitosanitary status, main diseases attacks	**V&O 08**
Vitis vinifera	vitis, rootstock, cultivars, micropropagation, explants, shoot	**V&O 09**
Vitis vinifera	vitis, rootstock, cultivars, micropropagation, explants	**V&O 10**
Vitis vinifera	yeasts, strain selection, wine production, must fermentation, liquid and solid growth media	**V&O 12**
Vitis vinifera	illumination, foliar covering, caloric power	**V&O 13**
Vitis vinifera	fructification load, cutting type	**V&O 18**

Vitis vinifera	super absorption, Fitpol-C, aerohidric regime, root system, copse and leafs of grape-vine plants	**V&O 19**
Vitis vinifera	volatile compounds	**V&O 20**
Vitis vinifera	micro propagation, *in vitro*, viticulture, vine varieties, micro grafting	**V&O 22**
Vitis vinifera	micro propagation, *in vitro*, viticulture, vine varieties, rootstocks, vine	**V&O 23**
Vitis vinifera	lead, content, soil, wine.	**V&O 24**
Vitis vinifera, Cabernet Sauvignon, Fetească Neagră, Afuz Ali, Cardinal	*Vitis*, stem, anatomy, grapevine cultivars, Cabernet Sauvignon, Fetească Neagră, Afuz Ali, Cardinal, taxonomic characters	**V&O 17**
Vitis vinifera, Fetească neagră	polyphenols, assimilating pigments, glucides, dDAS-ELISA, GLRaV-3	**V&O 11**
Vitis vinifera, Fetească neagră	Fetească Neagră, winter-eyes charge, production, quality	**V&O 16**
Vitis vinifera, Fetească regală	*Vitis vinifera*, Fetească regală, cultivar, pruning, bud load, biomass, leaf area.	**V&O 06**
Vitis vinifera, Merlot	phytoalexin, phenolic componds, cis and trans-isomer forms, pathologenic attach, system HPLC	**V&O 15**
Vitis vinifera, Merlot, Cabernet Sauvignon	Merlot, bud load, production, quality	**V&O 14**
Vitis vinifera, Pinot noir	viticulture, winemaking, phenols, grapevine clones, quality wines	**V&O 21**
Yucca	free radicals, antioxidants, anthocyans, polyphnols, catechins, eatable flowers	**F&D 13**
Yucca	optic density, colour intensity, pigments, chromo-therapy	**F&D 14**
xxx	tissue culture	**FG&T 11**
xxx	motovehicle, motohoe, the usage of the fuel, the usage of working people, organized work capacity.	**VG 03**
xxx	iron, deficiencies, symptoms, photos, favorizing conditions, human health, diseases	**VG 04**
xxx	manganese, deficiencies, toxicities, symptoms, photos, favorizing factors and conditions, human health, diseases	**VG 05**
xxx	soil, calcium, ammonium oxalate, precipitation, plants, deficiency	**VG 06**
xxx	substrate, pH variation, acid reaction, ammonium chloride acidifying substance	**F&D 03**
xxx	green urban space, analysis, integration, revitalization, reorganization, modernization and maintenance	**F&D 04**
xxx	negotiation, landscape, ecology, recycling	**F&D 05**

xxx	production categories, technology, surface estimation, efficiency	**F&D 12**
xxx	French baroque style, romantic style, planning, discreet interventions, geophysical survey	**F&D 18**
xxx	Romantic, historical monument, art monument, main alley, axis, law	**F&D 19**
xxx	Countryside, authentic, slope, lakeside, stream, surroundings	**F&D 20**
xxx	characteristic indicators, rating system, landscape categories, functional landscape value, general valuation of the landscape	**F&D 22**
xxx	food safety, traceability, risk	**FG&T 08**
xxx	nuts	**FG&T 20**
xxx	trademarks, OSIM	**OF 01**
xxx	teaching soft, assesment	**OF 02**