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PLENARY SESSION

Kiwifruit, the fruit of XX-th Century

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Keywords: *Actinidia arguta, Actinidia chinensis*, *Actinidia deliciosa*, 'Hayward', 'Hort16A', history, Production, plant description, varieties

ABSTRACT

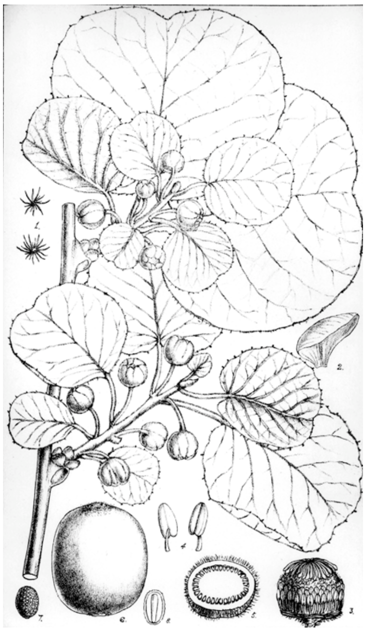
Kiwifruit is a recent edible fruit diffused on the international market after 1950's. Being first time described more than 150 years before (1847), it was promoted by New Zealand that was for many years the most important producer. Nowadays Italy has the biggest kiwifruit production, but recently China enlarged the cultivated area. The most important kiwifruit species, here described: *Actinidia deliciosa, Actinidia chinensis*, *Actinidia arguta* have conquered step by step the market thru varieties as Hayward, Zespri Gold, Jintao, etc. Having a rich diversity of species and taxa Actinidia genus, offers to breeders good prospective for the future.

INTRODUCTION AND BRIEF KIWIFRUIT HISTORY

Kiwifruit is a recent edible fruit diffused on the international market only after 1950's.

The plant was first time described in 1847 by Planchon using the material collected from China in 1845 by Robert Fortune.

The first design of *Actinidia chinensis* was published in 1887.



***Hooker's Icones Plantarum* 16 (1887): Tab. 1593**

Other species from *Actinidia* genus were successively introduced in Europe and USA in many Botanical Gardens, but have not been taken in consideration as fruit species.

The first cultivation of *Actinidia* plant was possible after obtaining plant from seeds but fruits were produced later in time due to the diocity and unknown plant biology. The first trials were made in USA, Britain and New Zealand at the beginning of the XXth Century, but only New Zealand succeeded (Ferguson, 2009).

E.H. Wilson had an important role in kiwifruit introduction and propagation.

E.H. Wilson

Kiwifruits in China 1908 (photo E.H. Wilson)

In 1904, Isabel Fraser, a New Zealander young girl, after a visit in Eastern China at her sister, brought home few seeds and gave them to a local nursery man: Hayward Wright.

Isabel Fraser

Hayward Wright

First fruits were obtained in 1910 and in 1917 nurserymen from the Bay of Plenty started to sell kiwifruit plants. By chance, Bay of Plenty offered to the new fruit specie, excellent conditions for growth and fruiting. In that period, many varieties were selected from a limited number of seedlings: Hayward, Allison, Bruno, etc.

Hayward was the best variety and since now it represents more than 90% of the total world production.

Hayward Wright with his large-fruited kiwifruit selection

Only in the 1930's first fruits were sold in New Zealand from commercial orchards.

Based on a wise trading policy, New Zealand launched in the 50's a new fruit on the market and named it "kiwifruit" in 1959.

After a number of fails in the 60's, only at the beginning of the 70's, the kiwifruit production has been started in Europe, mainly in Italy.

The main Italian production zones are Latina, Piemonte, Emilia Romagna and Veneto. In about 20 years of cultivation, Italy became the number one kiwifruit producer in the world, followed by New Zealand (Tab. 1).

Nowadays, China is increasing rapidly the cultivated area and production and other countries as Chile, Iran. Greece started to have a role on the kiwifruit market.

Most of the kiwifruit production is exported (tab. 2), from Southern Hemisphere being used mostly the shipping.

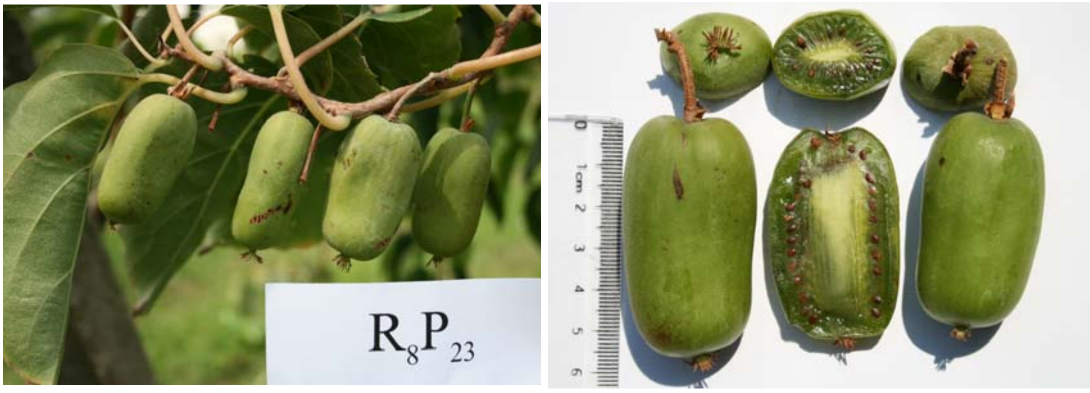
Kiwifruit shipping from New Zealand

For many years the only cultivated specie was *Actinidia deliciosa* and the variety Hayward represented more than 99% of the market. After 1996 New Zealand launched on the market a yellow fleshed cultivar named Hort 16A - ZespriGold from *Actinidia chinensis* and a new era was opened for kiwifruit. Italy and China have also yellow flesh cultivars and the cultivated are increase every year.

Hort 16A – ZespriGold **Hayward**

There are some other breeding programs focused on hair less or frost resistant species as *Actinidia arguta, A. kolomikta* and *A. rufa* (Stanica, 2006, 2009, Kim 2006, etc.)

***Actinidia arguta* plantation in New Zealand (orig.)**



R8P23 *Actinidia arguta* hybrid selection (orig.)

KIWIFRUIT SPECIES AND VARIETIES

Actinidia deliciosa is a hexaploid specie (2n=6x=174) characterised by plants with hairy leaves, shoots and fruits. The name was established in 1984 by Liang and Ferguson.

The root system is formed by skeleton roots (than can overpass 5 cm in diameter, secondary roots and active roots.

The roots explore the soil till 1 meter deep and 2-3 meters around the trunk, with a density of 1.4-1.6 cm/cm^3 of soil (apple has 1.0-1.7 and grapevine 1.0-1.5).

Actinidia deliciosa is a climbing plant, the trunk having no sustaining tissues.

The solitary buds, placed under the bark at nodes are vegetative or mixt. The vegetative buds form sterile shoots, most of them being with continuous growing. The mixt buds form fertile shoots with flower at leaf axils.

Percentage of sterile shoots is variable (20-81%) and only about 60% of the buds produce shoots.

Bud breaking in *Actinidia deliciosa* (orig.)

Leaves have variable shapes and dimensions from heart form till round. They are hairless on the upper page but pubescent on the inferior side. The colour is intense dark green. *Actinidia* is a dioic specie having female and male plants.

The flowers, are big (2-3 cm in diameter) and are formed at the fertile shoots base (nodes 2-8) at leaves axils

Female flowers are normally solitaires, white-yellowish, with 5-8 petals. Male flowers are grouped in bunches and have a high number of stamina (120-150 buc.).

Female flowers (orig.)

Fruit are berries of variable shape and size (80-140 g) depending on variety. Fruit skin is brown covered with strong brown hairs. Fruit flesh is shiny green, sweet-sour, with typical flavour.

Every fruit has 1200-1500 small, black seeds, their number influencing the fruit shape and size.

***Actinidia deliciosa* cv. Hayward**

Actinidia chinensis is a diploid specie (2n=2x=58). Before the classification of Liang and Ferguson (1984) the name was used for all the hairy fruit species.

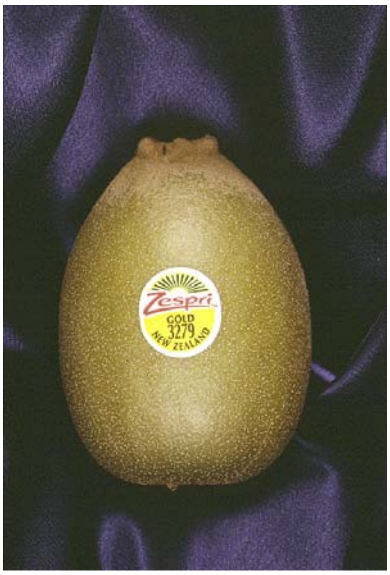
The main difference in comparison with A. deliciosa is regarding the fruit smooth skin with fine hairs. Fruits are usually smaller (60-80 g). Fruit flesh is mainly yellow and sweeter that of the *A. deliciosa's* one.

***Actinidia chinensis* (orig.)**

The vegetation period of *Actinidia chinensis* is shorter but the plants freezing resistance is lower.

In 1995, the New Zealand Zespri Company launched the first commercial variety of *Actinidia chinensis*: Hort 16A registered as ZespriGold. After some marketing tests in 2000 was organized the first export.

In 2009, Zespri® Gold is produced under Zespri control also in Italy and Chile.



Hort 16A registered as Zespri ® Gold

Packaging of Zespri® Gold

Around the world there are different new *Actinidia chinensis* varieties most of them protected and cultivated under licence.

In Italy was formed Consorzio Kiwigold®, that registered the first Italian yellow flesh variety Jintao marketed under the name jingold™.

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Jintao variety and jingold™ trade mark

In 2008 was launched in Italy a new yellow kiwi variety obtained at the University of Udine, by Prof. Raffaele Telstolin and named Soreli. Soreli is not a club variety and it is multiplied by a group of authorized nurseries.

***Actinidia chinensis* cv. Soreli (orig.)**

Even the majority of Actinidia chinensis variety has yellow flesh fruits; there is few selection or varieties that have green flesh. The most known is the Chinese variety Wuzhi No. 3.

'Wuzhi No. 3' - a Chinese green-fleshed cultivar of *Actinidia chinensis*

The newest type of *Actinidia chinensis* fruits are the red flesh ones. There is a competition around the world between the breeders to obtain a valuable red flesh variety.

A redflesh *Actinidia chinensis*

Actinidia arguta is a tetraploid (2n=4x=116) or octoploid (2n=8x=232, var. purpurea) specie.

Arguta is less vigorous that the previous two species, but it is the most frost resistant (-20 -25 degrees C).

The plant and the fruits are hairless. Leaves are smaller, elliptic. Flowers are smaller too, the male ones having black stamina.

Female flowers (orig.)

Male flowers (orig.)

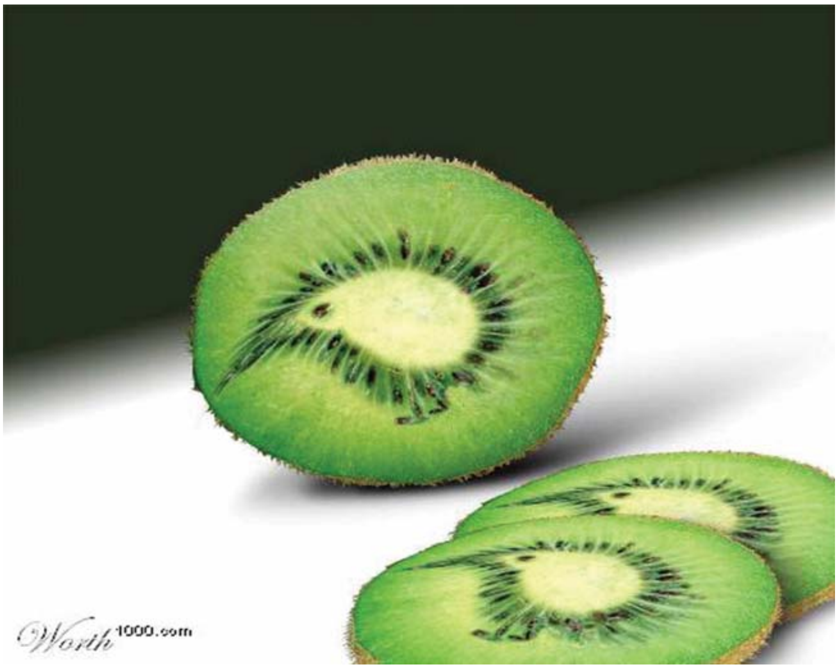
Arguta fruits are smaller (9-18 g), hairless, coloured from green (most of the varieties) to red (Francesca, Rosana, etc.). Flesh colour goes from green to light yellow, orange and red. The flavour is more intense and the test is sweeter that at the *A. deliciosa* fruits.

Fruits content in soluble solids and Vitamin C are also higher (table 3).

Other *Actinidia* species

Actinidia genus has 74 known species and 120 taxa. Until now, only 4-5 species are used for their edible fruits. In the future are open many possibilities of breeding and extending the variability and the commercial value of kiwifruit.

Actinidia species



Kiwifruit, was definitively the new fruit of XXth Century and has all the chances to became the fruit of the future.

ACKNOWLEDGEMENTS

Special thanks to Ross Ferguson for the pictures and bibliographical materials provided.

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TABLES

Table 1. Estimated commercial kiwifruit production 2008/2009 (t)

Producers	Production (t)
Northern Hemisphere:	1,260,000
China	450,000
France	70,000
Greece	60,000
Iran	130,000
Italy	460,000
Japan	30,000
Others	60,000
Southern Hemisphere:	580,000
Chile	160,000
New Zealand	380,000
Others	40,000
World total	1,840,000

Table 2. Exports of kiwifruit as % of the total production

Producers	Exports %
Chile	88
China	1-2?
Italy	75
New Zealand	94

Table 3. Fruit biochemical composition of few *Actinidia arguta* selections

Selection	Soluble solids %	Ascorbic acid (mg/100 g)
R_8P_1	13.71	70.15
R_8P_2	13.77	26.88
R_8P_3	13.73	64.11
R_8P_6	12.80	55.76
R_8P_7	12.40	45.50
R_8P_{15}	15.60	41.20
R_8P_{23}	14.20	67.32
R_9P_7	16.65	76.70
$R_{10}P_{10}$	18.20	49.89
$R_{10}P_{25}$	15.80	67.34
Average	**15.10**	**54.67**

VEGETABLE GROWING

"In vitro" culture – research tools always current

Cornelia Atanasiu, Nicolae Atanasiu

Keywords: phytotron, meristems culture

ABSTRACT

The use of meristems „in vitro" knew a great spread in practice for obtaining planting material without viruses and other pathogen agents. Through „in vitro" multiplication were obtained information regarding some lines, varieties, species value in a very short time.

INTRODUCTION

As authors of this article we can value the hurry with which we remained without an important material basis, after 1989, in many domains and in agriculture.

Having (Atanasiu Nicolae) more than 20 years responsibilities on a vast material basis: mechanization polygons at Ţigăneşti and Vidra (at I.C.L.F. – and scientific manager, authorized by ASAS, 1975), Băneasa teaching farm of SDE-Belciugatele – 210 ha and (Atanasiu Cornelia) phytotron Vidra, subunits that have obtained also good results in those times, we only can look with regret the lost of these performances after 1989.

So in present we have heard at one pest symposium about those tests "in vitro" and we remembered also with that occasion the documentation from Japan phytotron (Atanasiu Nicolae) and the papers that fallowed in phytotron at (Atanasiu Cornelia).

The researches in meristems culture began already from XIX century. Mendel friend, Czech botanist Tomaschek published at Brno in 1871, 1873, his results in polynic tubes culture ("virtual bionts" that can regenerate the entire organism).

At the beginning of the XX century G. Haberlandt (1902) tells that theoretically, regardless of cell, every nucleus has all the hereditary information and that a cell or a group of cells can regenerate the entire organism, as a result of totipotency.

Only at the middle of the XX century spread such laboratories in which are studied more and more aspects regarding cell and tissues cultures.

In pharmaceutical industry and in food industry were made competitive technologies for high quality biomass production.

Starting from wild flora and from varieties with high potential was made cells in suspension cultures, in bioreactors, with continuously flux, for alkaloids, enzymes and other substances production.

MATERIALS AND METHODS

It was used mainly Murashige-Skoog (1962) mediums with the mentioned specifications for controlled medium.

RESULTS AND DISCUSSIONS

The photos (10) from here show some done aspects in the phytotron from Vidra.

The use of meristems „in vitro" knew a great spread in practice for obtaining planting material without viruses and other pathogen agents.

Through „in vitro" multiplication were obtained information regarding some lines, varieties, species value in a very short time.

In this century biotechnologies will replace many conventional technologies (that need space, time, are pollutant and in one word are unprofitable). But geneticians observed that meristems propagation conduct through time to clones genome poorness, to “genetic erosion”. Was needed of a contrary – through “genes banks” constitution – that has permitted genome enrich, passing the continents frontiers, and also genetic barriers, and in this domain E.C. Cocking (1977) has mentioned the hybridization through protoplast fusion “in vitro”.

CONCLUSIONS

Following up high productions, diseases resistance, stress resistance (ionic radiations, chemical agents etc.) the researchers have obtained good results in passing geographical frontiers.

For passing the genetic frontiers are looking for information introduction in genome through viruses etc. genetic information carrying agents.

It is still tested stress resistance (also to new factors, to pollutants, to pesticides, insecticides, herbicides).

There were obtained haploids “in vitro” for more than 50 species that were afterwards reused.

There were obtained “in vitro” mutant organisms.

There are coming up new aspects regarding multiple resistances also for these organisms, in interaction.

If in the 8th decennium of the XIX century the Czech botanist A. Tomaschek was astonishing the whole world with “virtual bionts”, in the first decennium of the XXI century the japanese doctor Masaru Emoto is writing 10 books regarding the water vibrant force and about the resonance produced by the water content (human –70%, some fruits – almost 90%, some jellyfish – over 90%), in the organisms interaction appearing a huge force, without money.

With these were explained better the energetic meridians, chakras, was enriched the traditional medicine of the Far East.

And then we are putting the question if the physiology that we have studied delimits correctly “normal” and “optimum”, the second resuming the necessary vitality for surviving in a possible “psi” weapons century.

ACKNOWLEDGEMENTS

We thank to Botanical Department from Horticulture Faculty Bucharest, to Mr. Prof. dr. docent Gheorghe Anghel and to Mrs. Prof. Dr. Irina Morlova for our training in organogenesis domain.

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(Translated by drd. Alexandra Costea)

FIGURES

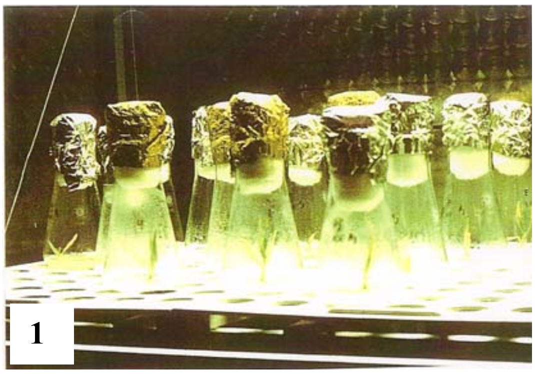

Fig. 1 – “In vitro” multiplication - Lily

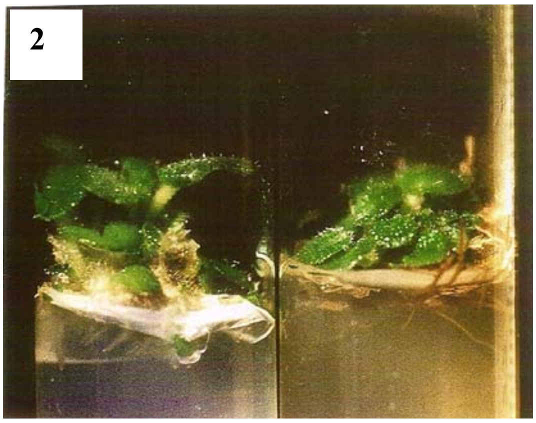

Fig. 2 – “In vitro” multiplication - Saintpaulia

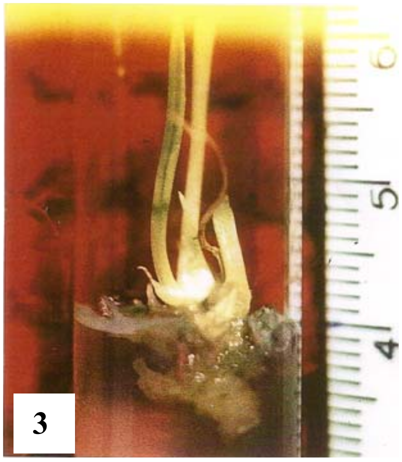

Fig. 3 – Anthers culture - Lily

Fig. 4 – Anthers culture - eggplants

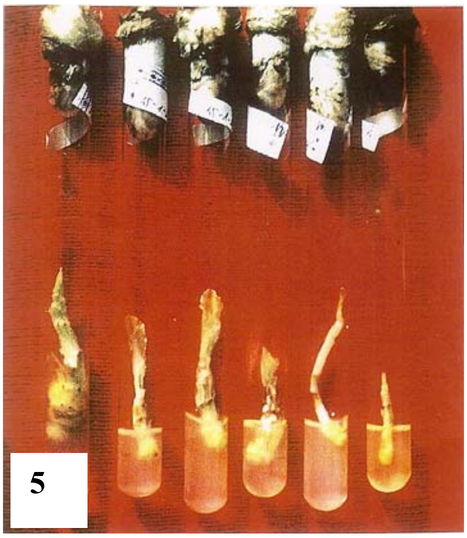

Fig. 5 – Chinese cabbage – insecticides resistance

Fig. 6 – “In vitro” fecundation - tomatoes

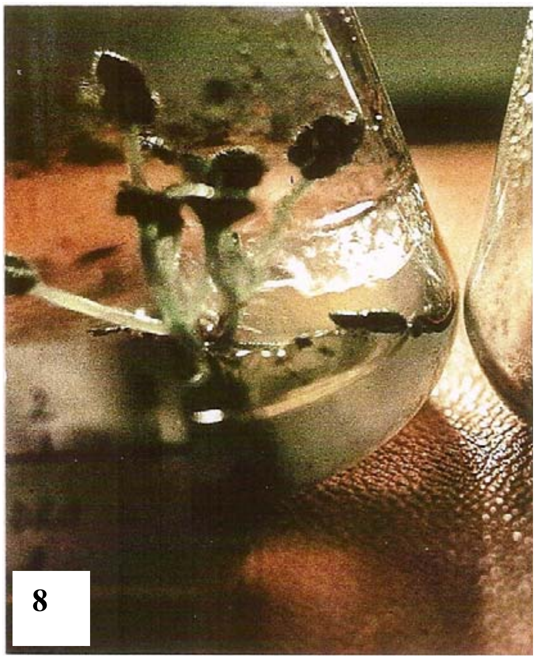

Fig. 7, 8 – Hidric stress resistance – Saintpaulia

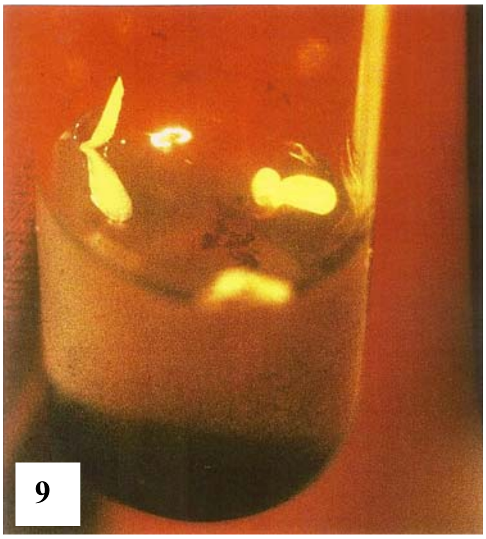

Fig. 9. – Salad – pesticides resistance

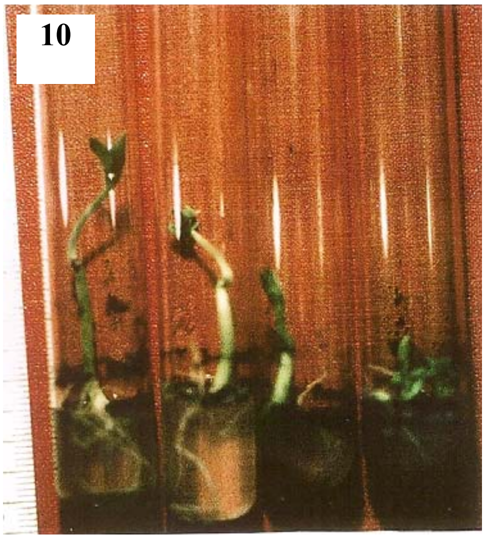

Fig. 10. – Leguminous – diseases resistance in different stages of new plants

Water source management for cultivated tomatoes on different substrates in glasshouse - solarium

N. Atanasiu, D. Ghiţescu, Mileva Chirică Barbu, Gh. Câmpeanu
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Keywords: tomatoes, water/nutritive solution consumptions, unconventional substrates

ABSTRACT

In Romanian specialty literature, the water consumptions are measured in mc/ha, without being established a precise rapport between those and productions. In the actual context, when the water for irrigation becomes a very hard to be assured and more expensive source, the economical use of it is a imperative request. A more efficient irrigating water use is realized in unconventional cultures, for which the water consumptions necessary for one tomatoes kilo are smaller than the specific one for cultivars on soil. This work paper presents water consumptions experimental determined for tomatoes cultures realized on unconventional substrates, in glasshouse/solarium.

INTRODUCTION

In previous years, were done researchers regarding water consumptions for tomatoes cultures, using a way of work that in present is exceeded because of technical progress registered also in vegetable growing from Romania.

The main objective of the paper is the establishment of water/nutritive solution consumptions administrated through fertirrigation on cultivated tomatoes in unheated glasshouses, on organic and anorganic substrates, in comparison with the specific one for the same culture on soil.

MATERIALS AND METHODS

For experience realization that is the basis for this paper was studied the variants presented in Table 1.

Through the combination of 2 experimental factors – a – substrate with 4 graduations and b – cultivar with 2 graduations – was realized a bifactorial experience with 8 variants that were placed in 3 repetitions without randomization.

As specific materials were used:

- Peat – with commercial name Terracult had coarse granulation (0-20 mm), being composted with fertilizers. Was imported in Romania by S.C. Holland Farming;
- Coir substrate – prepared in South of Asia from fibers and peel of coconuts, dehydrated and pressed is from Hungarian company Neopeat;
- Perlite – with coarse granulation was from sponsorship of a Hungarian society Pannon Perlit;
- The bags for the substrate are made from thick polyethylene folium UV aditivated;
- The complex fertilizers – Blue Universol and Violet Universol – used together with calcium azotate for experimental culture fertirrigation.

For air and soil temperature and humidity, for nutritive solution concentration and debit monitoring was used performant equipments.

The watering fertilisating installation was equipped with programmers of functioning, electro-valves for fertirrigation program automation.

Were done observations and determinations, paying special attention those regarding production and nutritive solution consumptions.

RESULTS AND DISCUSSIONS

Data regarding total production underline very good results, if it is compared the data from Table 2 with common productions realized in solarium in Bucharest area.

There are underlined the production performances for the cultivar Electra F_1 – 182,2 t/ha and 230,8 g/fruit for culture on peat, that significantly overcome the similar results obtained for RZ – 73-490 F_1.

The differences are due to not only the number of harvested fruits from a plant but also their average weight.

The total production for cultures on substrates is much bigger for both hybrids than the variants cultivated on soil.

The results regarding the water/nutritive solution consumptions, measured in l/kg of tomatoes fruits (Table 3) underline the followings:

- Electra F_1 realizes comparing with RZ – 73-490 F_1 the more economical consumptions for each of 4 substrates with which was worked.
- The most economical water/nutritive solution consumptions are registered at Electra F_1, in ascending order for the variants cultivated on peat, coir and soil; the consumptions for the culture on perlite are not so evident due to some technical problems satisfying unsolved for watering program and for nutritive solution preparation.

The statistical interpretation of specific consumptions underlines the fact that comparing with the witness, for some variants realized with Electra F_1 (peat) appear negative significant differences.

The results presented in a concise manner underline the fact that at the best variants, water/nutritive solutions consumptions are similar with those published in the literature of specialty from West Europe.

CONCLUSIONS

- The average production for the 4 substrates at Electra F_1 (15,8 kg/m^2) overcome with 7,7 kg/m^2 the similar performance of the hybrid RZ – 73-490 F_1;
- The remarkable level of the hybrid Electra F_1 production is due first of all to the average weight very high of its fruits (203,7 g);
- The most economical water/nutritive solution consumptions registered for Electra F_1 on peat substrate (33,57 l/kg fruits) and on coir substrate (38,52 l/kg fruits);

RECOMMENDATIONS

In the medium technical endowment conditions specific for tomatoes cultures in solarium from Romania, we recommend the use of organic substrates with high retaining capacity, fertirrigated with nutritive solutions in open system.

ACKNOWLEDGEMENTS

We address through this way thanks to the societies Holland Farming and Adri Prodcom Romania and to the societies Pannon Perlit and Neopeat – Hungary that sponsored with materials the experimental program presented in this paper.

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TABLES

Table 1 – Experimental variants.
Tomatoes in unheated glasshouses, USAMV Bucharest, 2009

Var. no.	Substrate (a)	Cultivar (b)	Observations
V_1 (mt)	Soil (a_1)	Electra F_1 (b_1)	80/40 cm; 3,12 pl/m^2
V_2		RZ – 73-490 F_1 (b_2)	80/40 cm; 3,12 pl/m^2
V_3	Peat (a_2)	Electra F_1 (b_1)	160/40 cm; 2 pl/1 bag with 10 l substrate;3,12 pl/m^2
V_4		RZ – 73-490 F_1 (b_2)	
V_5	Coir (a_3)	Electra F_1 (b_1)	160/40 cm; 2 pl/1 bag with 10 l substrate;3,12 pl/m^2
V_6		RZ – 73-490 F_1 (b_2)	
V_7	Perlite (a_4)	Electra F_1 (b_1)	80/80 cm; 2 pl/1 bag with 10 l substrate;3,12 pl/m^2
V_8		RZ – 73-490 F_1 (b_2)	

Table 2 – Total production.
Tomatoes on substrates in glasshouse-solarium, USAMVB, 2009

Var. no.	Substrate	Cultivar	No. fruits/plant	g/fruit	Production		
					Kg/plant	Kg/m^2	t/ha
V_1 (mt)	Soil	Electra F_1	23,0	194,3	4,47	13,94	139,4
V_2		RZ – 73-490 F_1	17,7	132,3	2,35	7,33	73,3
V_3	Peat	Electra F_1	25,3	230,8	5,84	18,22	182,2
V_4		RZ – 73-490 F_1	19,1	150,4	2,87	8,95	89,5
V_5	Coir	Electra F_1	23,6	215,6	5,09	15,88	158,8
V_6		RZ – 73-490 F_1	18,0	145,7	2,62	8,17	81,7
V_7	Perlite	Electra F_1	27,8	174,2	4,85	15,13	151,3
V_8		RZ – 73-490 F_1	18,1	141,5	2,56	7,98	79,8

Table 3 – Nutritive solution consumptions.
Tomatoes on substrates in glasshouse-solarium, USAMVB, 2009

Var. no.	Substrate	Cultivar	Prod. Kg/plant	Nutritive solution consumptions			
				m^3/ha	l/m^2	l/plant	l/kg tomatoes fruits
V_1 (mt)	Soil	Electra F_1	4,47	5918	591,8	189,7	42,44
V_2		RZ – 73-490 F_1	2,35	5918	591,8	189,7	80,74
V_3	Peat	Electra F_1	5,84	6118	611,8	196,1	33,57
V_4		RZ – 73-490 F_1	2,87	6118	611,8	196,1	68,32
V_5	Coir	Electra F_1	5,09	6118	611,8	196,1	38,52
V_6		RZ – 73-490 F_1	2,62	6118	611,8	196,1	74,84
V_7	Perlite	Electra F_1	4,85	10857	1085,7	348,0	71,75
V_8		RZ – 73-490 F_1	2,56	10857	1085,7	348,0	135,9

Research and preliminary results on coconut substrate (coir) use to the tomatoes planted in cool greenhouses

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Keywords: tomato, cold greenhouses, peat, coconut substrate.

ABSTRACT

This paper presents the results of production recorded in tomatoes grown in cold greenhouses on organic substrates (such as peat and coconut) and ground. By water and mineral nutrition of these crops was provided by fertirrigation, applying nutrients in open system solutions to variants grown on two organic substrates. Production results demonstrated qualities of coconut substrate which is a renewable material, whose production does not negative influence environment.

INTRODUCTION

Unconventional vegetable crops (tomatoes) on organic substrates are approved by the growers and ecologists because debris resulting from the conclusion of the cycle of use of biodegradable substrates. Among the organic substrates in recent years, have noted the preparation of fibers and fibers resulted from eating coconut flesh.

Vicinity secondary material, which acts as ballast is just a source of environmental pollution, waste of coconuts are processed to meet substrate is actually renewable. From this point of view is superior because peat production by exploiting peat is a form of aggression on the environment. Research undertaken in Bucharest UASVM-discipline "horticultural crops without soil" is the first of its kind made in Romania.

MATERIALS AND METHODS

To achieve that bifactorial experience was the basis of this work were the studied variants are presented in table number 1. Experience was staged intro greenhouse individualized, unheated, in three repetitions, with compliance requirements experimental techniques. Hybrids use is presented explicitly in Table 1. Peat used as substrate (Terracult) comes from the producers of the Batiks and the substrate of coconut in southern Asia.

Experimental culture of plant density to 3.12 square meters was made as follows:

- The variant grown on soil: 80 cm between rows and 40 cm between plants per row.
- The variants grown on peat and coir substrate: 160 cm between rows by 40 cm at a time between bags, capacity 10 l bags of substrate, 2 plants in the bag. Fertilization was achieved through the use of nutrient solutions prepared with chemical fertilizer complex: Universol Blue, Purple Universol, Calcined (calcium nitrate). Works of care applied were specific experimental culture tomatoes grown in greenhouses and cold greenhouses.

Plants vertically palis were total child and meat to 7 inflorescences. Works to stimulate fruiting not applied. The experience was harvested by hand, gradually, separate choice and rehearsing. Determinations were made on average weight and size of fruit.

RESULTS AND DISCUSSION

Primary experimental data were centralized and interpreted. Summary of main experimental results is presented in Tables 2, 3 and 4.

CONCLUSIONS

In terms of production per square meter plant and shows performance Abellus F1 hybrids and F1 Electra on substrates of peat - 17.81 kg/sq.m respectively 18.10 kg/sq.m, which slightly exceeded the similar productions of coconut substrate obtained 16.19 kg/sq.m and 16.38 kg/sq.m. Average weight of fruit in variants grown on peat is higher by 15-20 g compared to that obtained for F1 and Abellus Electra F1 hybrids, the variants grown on peat. Similar differences over the substrate of coconut culture are much lower being in the range of values of 10-12 g. Total production of coconut substrate at Electra F1 is higher than the same substrate F1 hybrid Abellus only 1.17%. This difference is not important (Table 4).

Culture tomatoes in unheated greenhouses substrate of coconut in production is possible with good results very close to similar ones made on the substrate of peat (14.86 kg/sq.m of peat substrate on the substrate versus 13.47 kg/sq.m of coconut).

Average fruit weight is influenced by the culture substrate, the average weight of fruit Electra F1 variants obtained from peat and coconut is 15-20 g higher than the cultivated version on the soil. Similar differences between peat and coconut yields are much lower (10-12 g).

*

*　　*

We recommend further research and promotion of coconuts substrate in conventional crops with fertirrigation in open system, tomato crops in cold greenhouses made F1 hybrids and Abellus Electra F1.

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TABLES

Experimental variants

Table 1 – Tomatoes grown on soil and organic substrates in the unheated greenhouse – USAMV Bucharest, 2009

Variants	Substrates (a)	Cultivars	Origin
1	Soil (a1)	Abellus F1	Rijk Zwaan-Netherlands
2	Soil (a1)	Electra F1	Rijk Zwaan-Netherlands
3	Soil (a1)	RZ 73-490 F1	Hazera-Israel
4	Peat (a2)	Abellus F1	Rijk Zwaan-Netherlands
5	Peat (a2)	Electra F1	Rijk Zwaan-Netherlands
6	Peat (a2)	RZ 73-490 F1	Hazera-Israel
7	Coconut (a3)	Abellus F1	Rijk Zwaan-Netherlands
8	Coconut (a3)	Electra F1	Rijk Zwaan-Netherlands
9	Coconut (a3)	RZ 73-490 F1	Hazera-Israel

Table 2 – Number of fruit, their average weight and total production. Tomatoes under glass substrates by cold – USAMV Bucharest, 2009

Cultivars	Substrate	No. of fruit harvested	Average weight of fruit (g)	Production kg/pl	Density Pl/sq.m	Production kg/sq.m
Abellus F1	Soil	28.1	164.0	4.61	3.12	14.38
Abellus F1	Peat	30.8	185.3	5.71	3.12	17.81
Abellus F1	Coconut	29.6	175.3	5.19	3.12	16.19
Electra F1	Soil	21.7	211.0	4.58	3.12	14.28
Electra F1	Peat	25.8	225.9	5.83	3.12	18.10
Electra F1	Coconut	24.3	217.6	5.29	3.12	16.38
RZ 73-490 F1	Soil	17.2	128.4	2.21	3.12	6.89
RZ 73-490 F1	Peat	18.8	149.4	2.81	3.12	8.76
RZ 73-490 F1	Coconut	18.2	138.4	2.52	3.12	7.86

Table 3 – Average total production of hybrids on the three variants of substrate

Var.	Substrate	Total production average kg/sq.m	Output gap kg/sq.m	Production	Output gap%	Meaning
1	Soil	11.85	-	100.00	-	-
2	Peat	14.86	+3.01	125.40	+25.40	***
3	Coconut	13.47	+1.89	113.17	+13.70	**

DL-5%=0.76 Kg/sq.m **DL-1%=1.39** Kg/sq.m **DL-0.1%=2.88** Kg/sq.m,

Table 4 – Influence of varieties on the production on coconut substrate.

Var.	Hybrid	Average production of coconut substrate kg/sq.m	Output gap kg/sq.m	Production%	Output gap%
1	Abellus F1	16.19	-	100.00	-
2	Electra F1	16.38	+0.19	101.17	+1.17
3	RZ 73-490 F1	7.86	-8.24	48.54	-51.45

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Study on lipid composition and energy potential of cardon and artichokes seeds

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Keywords*: Cynara cardunculus, Cynara scolimus,* artichoke and cardon seeds, lipid content

INTRODUCTION

Lately, the worldwide and European research aimed to use the cardon as energy plant, especially the seeds, but also the biomass serving as feedstock for obtaining biodiesel. The thermogenic power of wild artichokes oscillates between 14.53 MJ/kg dry weights and 24.73 MJ/kg dry weights of seed.

The seeds contain oil in quantities large enough (25%). Of the total biomass, approximately 10% is represented by the seeds. In Greece and Spain is expected in the future the use of seeds for extraction of bio-oil in order to obtain biodiesel. This will be used in the production of thermic and electric power (*** Rev. Agricon Ellas, Gebhardt, R., 2001).

This paper presents the results of a study on lipid composition and energy potential of the seeds of cardon and artichokes, as an indicator of their energy potential.

THE ORGANISATION OF EXPERIMENTS

In 2008 it was performed in plant physiology laboratory of the USAMV Bucharest, an experience having as main objective the determination of seed oil from cardon and artichokes.

The experimental variants consisted of:

- Seeds of cardon
- Seeds of green artichokes
- Seeds of red artichoke
- Seeds of 3 new lines of artichokes from Italy (L-02, L-03, L-3).

OBSERVATIONS AND DETERMINATIONS

To determine the energy potential of the cardon and artichoke seeds there were used the following **working methods**:

- Seed lipids were extracted with a Soxhlet apparatus;
- The lipids saponification and the resulting fatty acids derivatization was done by heating them with a solution of potassium hydroxide in methyl alcohol;
- The separation of constituents of the derivatised samples was performed using a gas chromatography AGILENT, equipped with a masspectometric detector with quadrupol (Figure 1).
- The capillary column was type DB 5 having a length of 25 m and diameter 0.25 mm, using helium as carrier gas and the initial temperature of oven was 50^{o} C, and increased isotherm with 4^{o}C/minute until 280^{o}C.
- To confirm the exact position of the peaks on the chromatogram there were used Kovats retention indices and a series of n-alkanes as references.

RESULTS

Results of the analysis carried out showed that the seeds of studied cultivars of the genus *Cynara* contain oil in quantities large enough (Table 1).

Considering the average values of the two species and varieties analysed we observed that the new lines of artichokes have the highest fat content (23.7%), the first being L-02

(25%). The second is cardon with approximately 23% fat and the two varieties of artichokes with the average of 21.7% of which the red artichoke 22.4% (Table 1 and Figure 2).

During the undertaken experiences, between cultivars were noted also important qualitative differences in the oils contained in seeds (Table 2 and Figures 3-8). It may be observed that specific compounds are contained only by certain species or varieties; some other compounds are common to several varieties. Thus:

- **cardon** contains 14 specific substances (methyl-Inden, Trimethyldecan, Pentadecenol, 6-Pentadecenol, Trimethyltetradecan, Methylpalmitate, Methyllinoleate, Metiloleat, Metilizostearat, Octadecadien-1-ol, Octadecadienolacetate, Octadecadienil ethanol, Nonadecadien diol, Nonadecatrien-diol). These substances belong to the category of those which are most suitable to conversion to biodiesel and therefore the cardon seeds are currently used for this purpose;
- **green artichokes** is also high in fat, 10 compunds are typical of this cultivar (*Linalool, Tridecan, Geranylacetate, Pentadecan, Hexadecan, Heptadecan, Octadecan, Pentacosane, Hexacosane, Octacosane*);
- **red artichokes**, by comparison, is poor in fat but still contains 4 specific compounds (*Ethyl-etilbutyltetradecan, Tetraethylheptadecan, Methyleicosane, Ethyl-ethylbuthyloctadecan*);
- Only the seeds of artichoke cultivar **L-3** contain *Methylheptan Trimethylcyclohexan, Ethyl-3-methylcyclohexan Terpinolene*;
- some lipids are common to the 2 varieties of artichokes and many of them are common to all artichoke lines studied;
- there are lipids like *Undecan* and *Bromonaftalen*, which are common to all cultivars except green artichokes, or *Limonene* and *Dodecan* missing only from cardon.

CONCLUSIONS

The new lines of artichokes have the highest fat content (23.7%), the first being L-02 (25%). The second is cardon with approximately 23% fat and the two varieties of artichokes with the average of 21.7% of which the red artichoke 22.4%.

It was noted that specific compounds are contained only by certain species or varieties; some lipids are common to more varieties.

Cardon contains 14 compounds; these ones belong to the class of lipids that is most suitable for the conversion to biodiesel.

Green artichokes are rich in fat, 10 lipids are typical of this cultivar. Red artichoke is poor in fat but contains 4 specific compounds.

Some compounds are common to the 2 varieties of artichokes and many of them are common to all artichokes lines studied. There are lipids that are common to all cultivars except green artichokes, or just missing from cardon.

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TABLES

Table 1 – The cultivated variety influence on oil content of artichokes and cardon seeds

Variety					
Green artichokes	Red artichokes	Cardon	L - 02	L - 03	L - 3
Lipid content (%)					
21.037	22.388	22.870	24.950	22.750	23.510
Average (%)					
21.712		22.870	23.737		

Table 2 – The oil composition of artichoke and cardon seeds

Nr. crt.	Identified compound	Variety					
		Green artichokes	Red artichokes	Cardon	L - 02	L - 03	L-3
1.	**Metil-inden**			0.84			
2.	**Trimetildecan**			1.15			
3.	**Pentadecenol**			2.83			
4.	**6-Pentadecenol**			1.47			
5.	**Trimetiltetradecan**			0.75			
6.	**Metilpalmitat**			4.41			
7.	**Metillinoleat**			11.93			
8.	**Metiloleat**			12.27			
9.	**Metilizostearat**			1.33			
10.	**Octadecadien-1-ol**			10.77			
11.	**Octadecadienolacetat**			2.84			
12.	**Octadecadienil etanol**			7.10			
13.	**Nonadecadien diol**			1.88			
14.	**Nonadecatrien-diol**			3.43			
15.	**Linalol**	8.93					
16.	**Tridecan**	0.93					
17.	**Geranilacetat**	1.05					
18.	**Pentadecan**	1.30					
19.	**Hexadecan**	0.91					
20.	**Heptadecan**	0.73					
21.	**Octadecan**	0.60					
22.	**Pentacozan**	10.07					
23.	**Hexacozan**	8.81					
24.	**Octacozan**	5.05					
25.	**Etil-etilbutiltetradecan**		5.12				
26.	**Etil-etilbutiloctadecan**		9.21				
27.	**Tetraetilheptadecan**		2.00				
28.	**Metileicozan**		1.60				
29.	**Metilheptan**						2.88
30.	**Trimetilciclohexan**						5.43
31.	**Etil-3-metilciclohexan**						3.63
32.	**Terpinolen**						0.23
33.	**Eicozan**	0.65	1.78				
34.	**Heneicozan**	1.77	13.72				
35.	**Docozan**	4.16	1.43				
36.	**Tricozan**	7.79	1.23				
37.	**Tetracozan**	10.19	1.36				
38.	**Heptacozan**	7.01	6.01				
39.	**Etil hexan**				0.46	1.17	1.51
40.	**cis-Dimetilciclohexan**				2.49	2.11	2.54
41.	**Octan**				7.56	6.53	7.78
42.	**trans-Dimetilciclohexan**				1.87	1.49	1.93

43.	**Dimetilheptan**				2.13	1.99	2.28
44.	**Etilciclohexan**				5.02	4.80	5.19
45.	**Dimetilheptan**				5.91	6.14	1.83
46.	**β-Pinen**				1.38	1.28	0.56
47.	**Mircen**				0.57	0.60	0.46
48.	**Camfen**				0.34	0.43	0.51
49.	**Ciclogeranialan**				5.27	6.14	
50.	**Metiloctan**				1.54	1.56	
51.	**Metiloctan**				1.54		6.43
52.	**o-Xilen**				3.65		3.63
53.	**Etiltoluen**					1.28	1.36
54.	**Tetrtadecan**	1.24	3.30	1.67			
55.	**Bromonaftalen**		3.47	2.77	1.34	1.03	0.55
56.	**Undecan**		10.00	21.63	3.85	2.61	1.85
57.	**Toluen**		1.75		3.21	3.01	
58.	**p-Xilen**		2.77		14.03	14.03	13.65
59.	**Nonan**		2.03		8.61	8.28	8.43
60.	**Decan**		3.31		1.11	0.69	0.74
61.	**α-Pinen**	2.93			8.76	8.71	8.56
62.	**β-Cimen**	1.83			1.56	1.85	1.95
63.	**γ-Terpinen**	8.79			5.34	6.66	4.70
64.	**Limonen**	1.75	5.10		1.14	2.09	1.45
65.	**Dodecan**	0.60	2.78		0.52	0.44	0.22

FIGURES

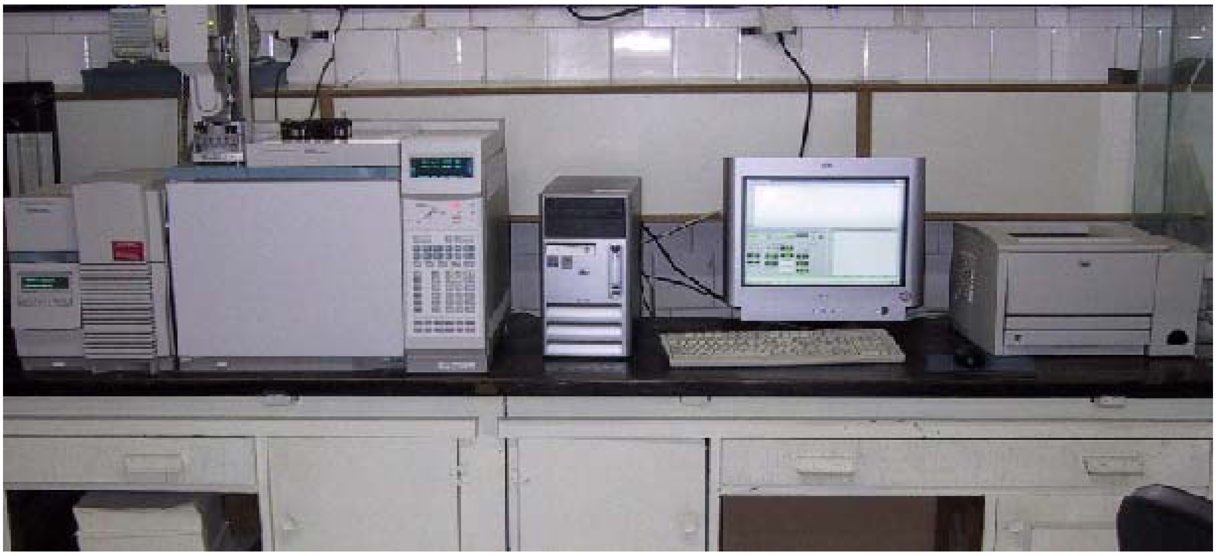

Fig. 1. Agilent Gaschromatograph with masspectrometric detector and autosampler

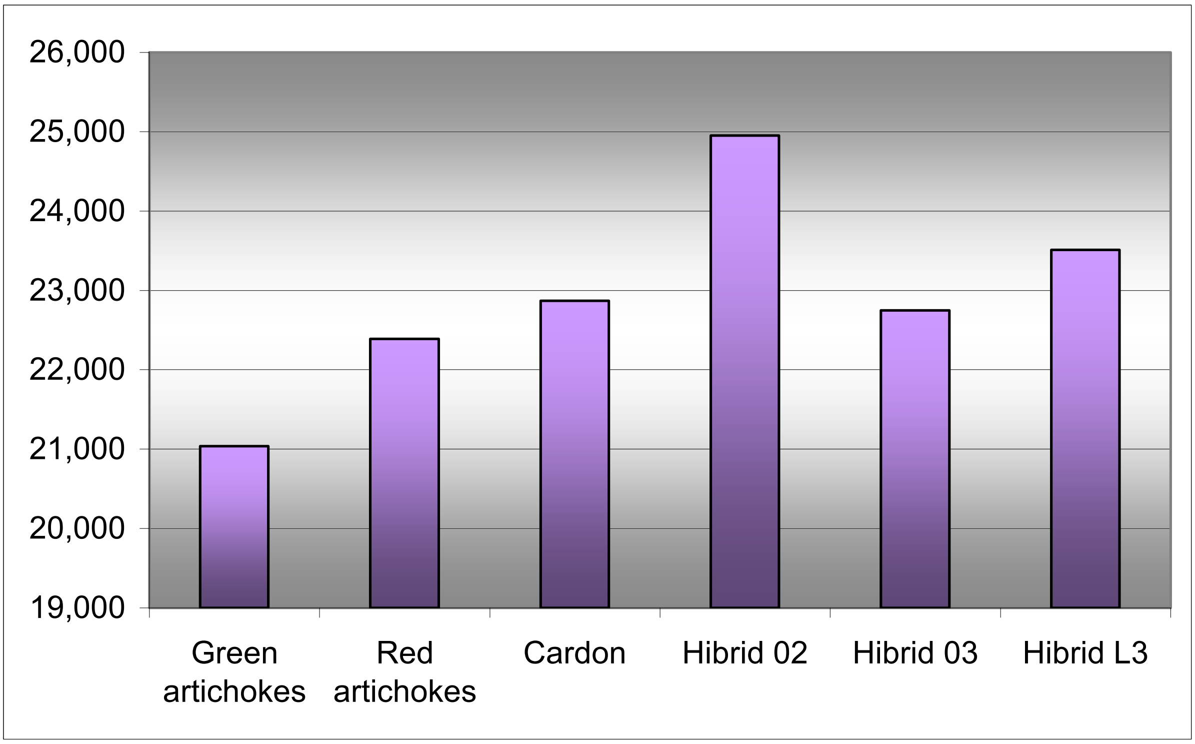

Fig. 2. Lipid content of artichoke and cardon seeds

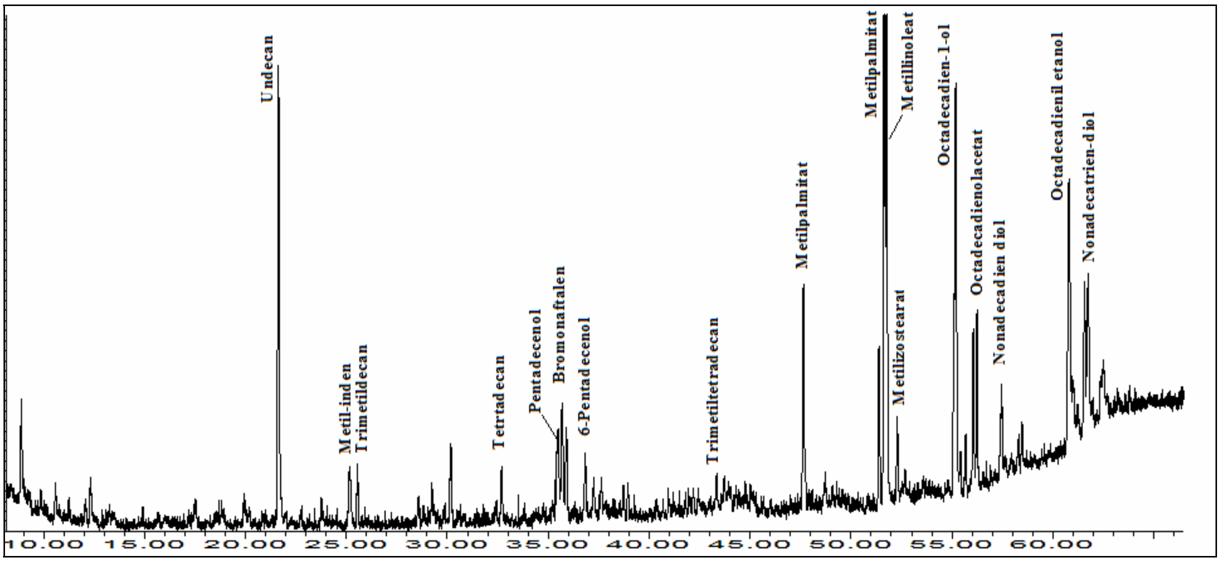

Fig. 3. Gas-chromatogram of the cardon seeds oil

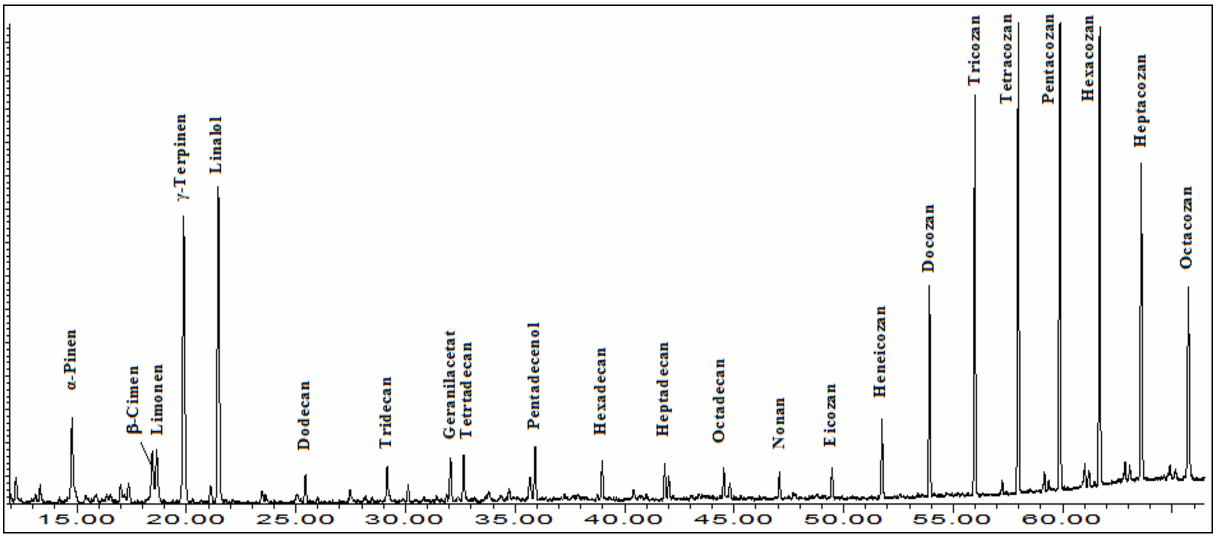

Fig. 4. Gas-chromatogram of the green artichoke seeds oil

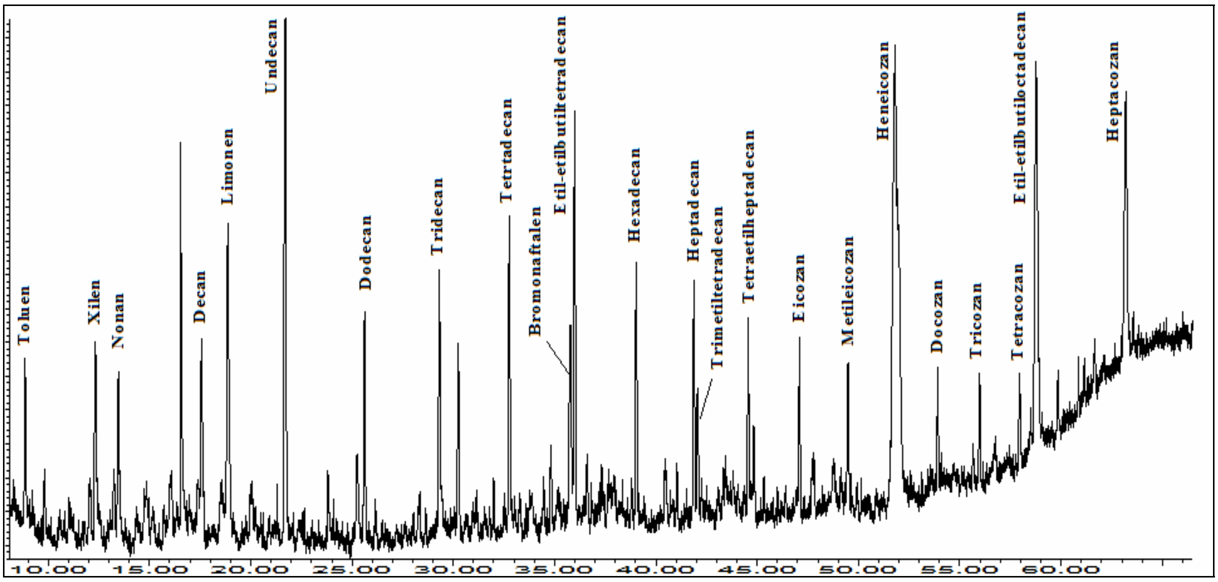

Fig. 5. Gas-chromatogram of the red artichoke seeds oil

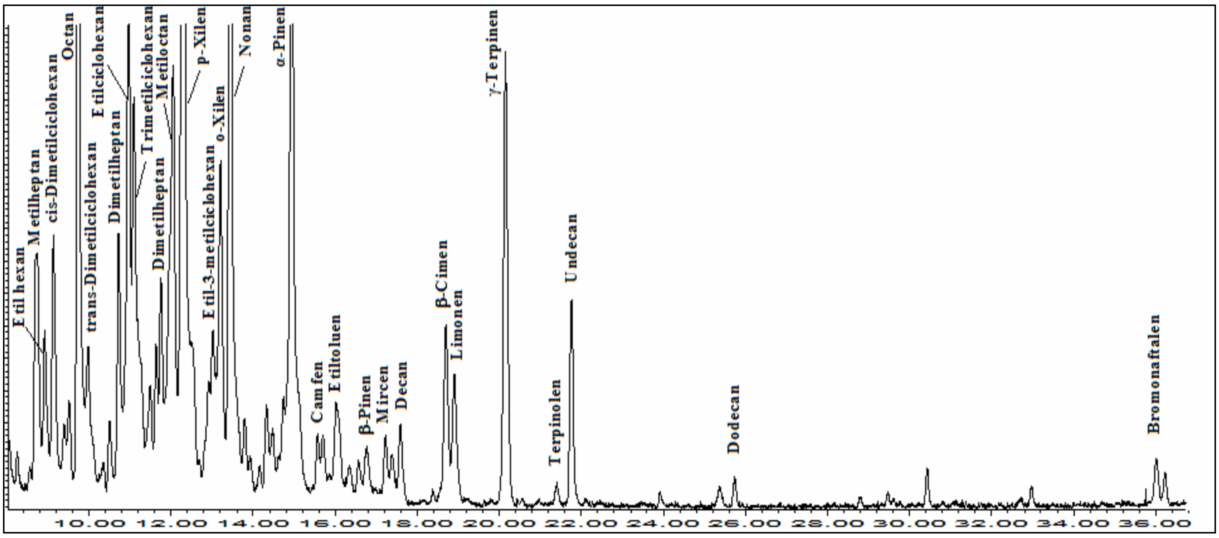

Fig. 6. Gas-chromatogram of the artichoke L-01 seeds oil

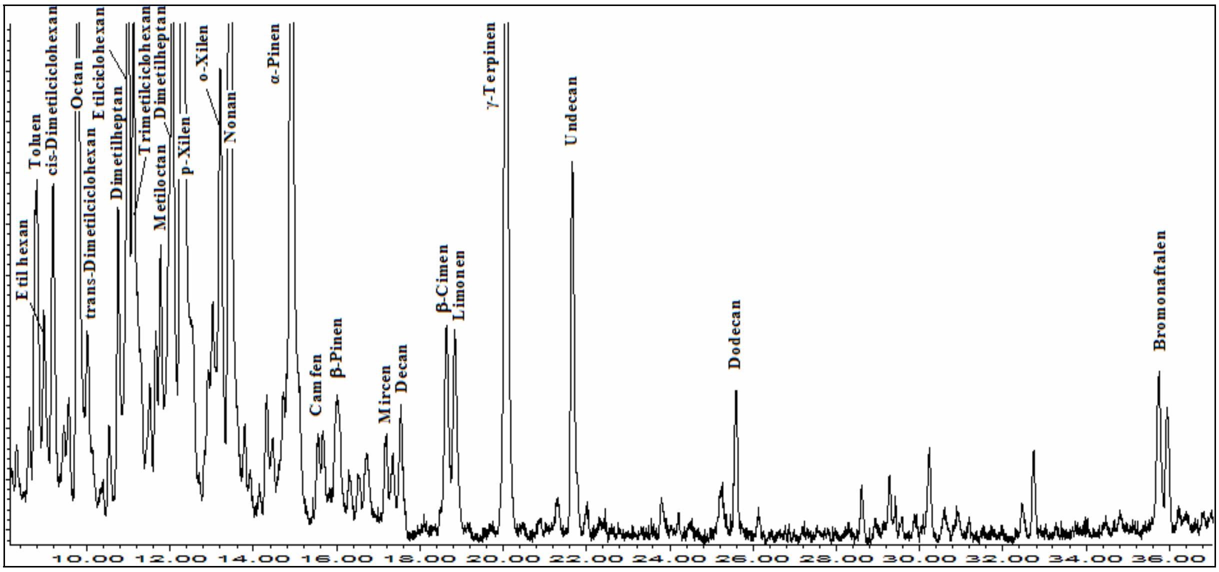

Fig. 7. Gas-chromatogram of the artichoke L-02 seed oil

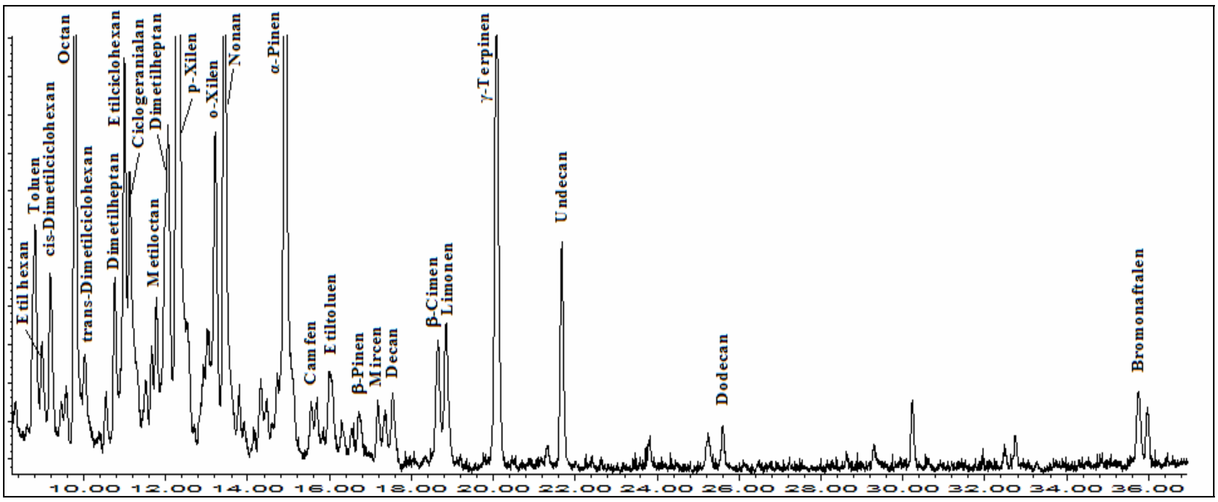

Fig. 8. Gas-chromatogram of the artichoke L-03 seeds oil

Economic efficiency of onion crop as effect of the application of various protection complexes for disease and pest control

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Keywords: onion yield, treatments, economic efficiency, cost

ABSTRACT

The analysis of crop efficiency studies, besides several factors with direct influence on profit (the quantitative and qualitative yield level, the mean sale price and consequently the incomes obtained, etc.), the structure of expenses, in order to establish which of these elements determines decisively the profit dimension, in terms of dimension, but especially with its influence on the application or not of some technological works or operations. In this situation, one of the structural elements of expenses is represented by the cost of the treatments applied in the onion crop. The influence exerted by these treatments on yield, in terms of quantity, per variants of the protection complexes applied, shows their efficiency, which will be retrieved in the profit achieved and in the differentiated profitableness rate.

INTRODUCTION

Under a modern intensive agriculture, the calculation of economic indices for onion yield represents an important element.

This work shows that the attacks caused by pathogens and pests, under climatic conditions favouring the development of them, may contribute significantly to the reduction of onion yield.

According to Simeria Gh. (1995), among the total economy elements of plant protection, we may distinguish two basic notions, namely:
- evaluation of the damage caused by diseases and pests;
- economic efficiency of the means and measures of control.

The economic efficiency of the treatments applied in the integrated control of the main diseases and pests represents the index that determines the value of the protected yield, compared with the cost of control activities or with damage value, the reference being made with the cost of the phyto-sanitary treatments.

MATERIAL AND METHODS

The arrangement of this experiment took place in Albina, Timiş County. The experiment studied the effects exerted by the treatments applied on yield and economic efficiency, with direct implication on onion crop capitalization.

The experiment was performed along 3 years (2003-2005), the onion crop arrangement took place during 23-25 February through scallion planting, and the harvesting was performed in the third decade of July.

During the three years of experience, there were optimal conditions for the development of the pathogen agents (onion downy mildew - Peronospora destructor (Berk.) Casp and onion rot - Botrytis allii Munn.) and of the pest (onion fly – Delia antiqua Meig.). In order to calculate the attack degree, we made monthly observations on attack frequency and intensity.

The treatments were performed at warning, namely four treatments, in 8 variants, and we applied the following protection complexes: V_1 – Trichodex 25 WP 0.2% (Trichoderma harzianum (T-39)/l g dry product) + Victenon 50 WP 0.05% (Bensultap 50%);- V_2 – Bravo 500 SC 0.15% (Chlorothalonil 500 g/l) + Actara 25 WG 0.01% (Thiametoxam 25%); - V_3 – Previcur 607 SL 0.15% (Propamocarb 607 g/l) + Confidor 70WG 0.02% (Imidacloprid 700 g/kg); - V_4 – Folpan 80 WDG 0.15% (Folpet 80%) + Karate Zeon 0.02% (Lambda-cyhalothrin 50 g/l); - V_5 – Ridomil Gold MZ 68 0.25% (Mefenoxam 4% + Mancozeb 64%) + Victenon 50 WP 0.075% (Bensultap 50%); - V_6 – Ridomil Gold Plus 42.5 WP 0.3%

(Mefenoxam 2.5% + metallic copper 40%) + Mospilan 20 SP 0.025% (Acetamiprid 20%); - V_7 – Dithane M45 0.2% (Mancozeb 80%) + Fastac 10EC 0.02% (Alpha-cypermethrin 100 g/l); - V_8 – Untreated control variant.

RESULTS AND DISCUSSION

Analysing the synthesis of economic efficiency and profitableness rate for the period 2003-2005 (table 1 and figure 1), we may observe the following:

- there is a direct proportionality between the mean yield level obtained during the experimental period and the size of the profit obtained, namely that the biggest profit value corresponds to the biggest yield; the decrease of yield level generates the decrease of profit:

  V_5 - Ridomil Gold MZ 68 WP 0.25% + Victenon 50 WP 0.075%: 26.8 t/ha → 10625.55 lei/ha profit;

  V_6 - Ridomil Gold Plus 42.5 WP 0.3% + Mospilan 20 SP 0.025%: 25.7 t/ha → 9530.26 lei/ha profit;

  V_8 – Untreated control variant: 9.0 t/ha → -5007.65 lei/ha profit (loss).

The yield saved or the yield growth compared with the variant V_8 – untreated control variant ranges in six of the experimented protection complexes, in the variants V_1 – V_6, with percentages between 134.44%-197.78% compared with the total yield achieved (V_6 - Ridomil Gold Plus 42.5 WP 0.3% + Mospilan 20 SP 0.025%: 197.78%, V_5 - Ridomil Gold MZ 68 WP 0.25% + Victenon 50 WP: 185.50% and V_4 - Folpan 80 WDG 0.15% + Karate Zeon 0.02%: 134.44%, proving the extremely positive effect of the treatments applied on the yield itself and implicitly on incomes, and finally on profit; in variant V_7 - Dithane M 45 0.2% + Fastac 10 EC 0.02%, the yield growth is approximately equal with the one obtained in variant V_8 – untreated control variant, however with a minimal profit.

The treatment cost ranges with the purchase price of the pesticides, this one being between 140.71 lei/ha and 828.93 lei/ha; the percentage of the treatments costs in the total production expenses, according to the protection complex applied, is extremely small; expressed as percentages, they are between 1.06% in variant V_7 - Dithane M 45 0.2% + Fastac 10 EC 0.02% and 5.91% in variant V_3 - Previcur 607 SL 0.15% + Confidor 70 WG 0.02%.

But the influence exerted by treatments is extremely positive, because the yield saved (the yield growth) represents up to 66.41% of the mean yield obtained (in variant V_5 - Ridomil Gold MZ 68 WP 0.25% + Victenon 50 WP 0.075%); the variation of them, according to the protection complexes applied, is between 49.72% and 66.41%, and in five of the other experimental variants the yield saved represented more than 60% of the mean yield.

The cost of treatments expressed through yield per unit of surface (t/ha), necessary for their amortization, is insignificant compared with the yield saved (the yield growth), namely between 0.15-0.91 t/ha, below 1 t/ha.

CONCLUSIONS

1. The profit obtained, compared with the expenses made, represents more than 50% of them in the case of six experimental variants out of eight; the biggest profit may be observed in variant V_5 - Ridomil Gold MZ 68 WP 0.25% + Victenon 50 WP 0.075% -10625.55 lei/ha, followed at small distance by V_6 - Ridomil Gold Plus 42.5 WP 0.3% + Mospilan 20 SP 0.025% - 9630.26 lei/ha, and the smallest profit in variant V_7 - Dithane M 45 0.2% + Fastac 10 EC 0.02% - 2941.74 lei/ha; in variant V_8 – untreated control variant, we recorded a loss of 5007.65 lei/ha;

2. The level of the profit obtained in the six treatment variants assures the repetition of the process of production in the next year;

3. The profitableness rate, as level of percentage expression, follows the same route of numeric ordination like the profit; its biggest value was recorded in variant V_5 - Ridomil Gold MZ 68 WP 0.25% + Victenon 50 WP 0.075% - 43.62%, followed by V_6 - Ridomil Gold Plus 42.5 WP 0.3% + Mospilan 20 SP 0.025% - 40.80%, and the smallest value in variant V_8 – untreated control variant, 61.21%.

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FIGURE AND TABLE

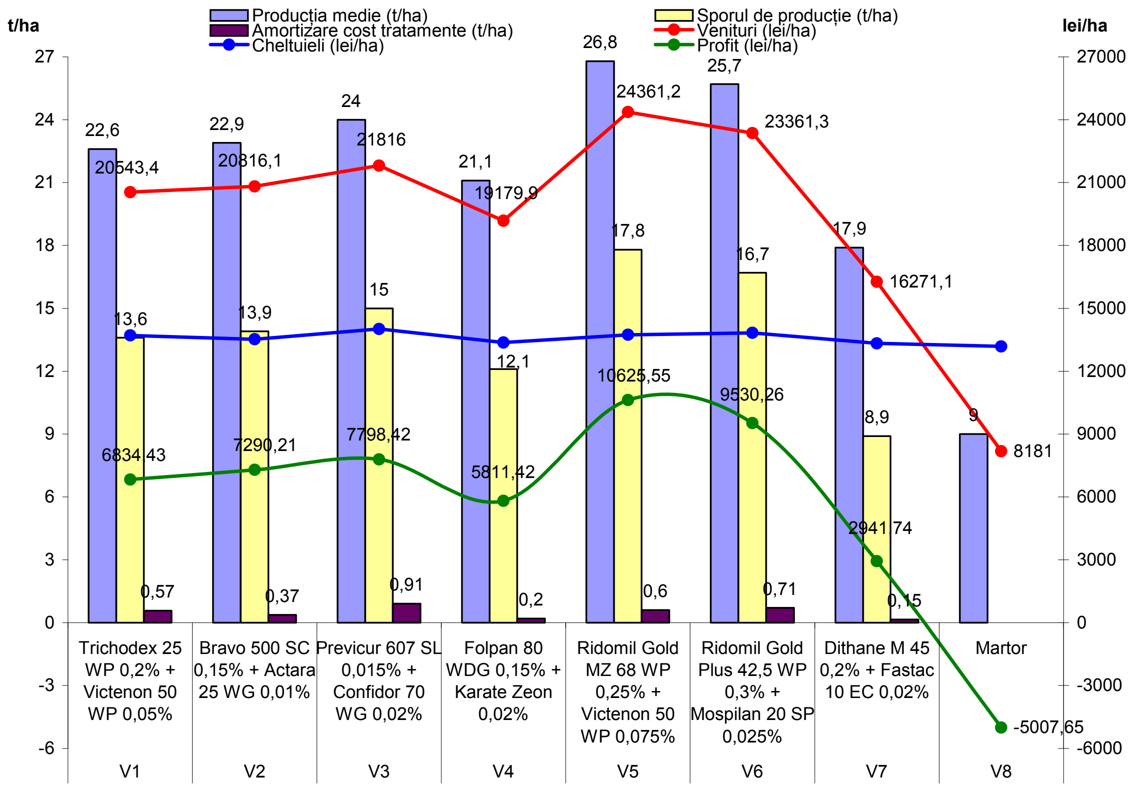

Fig. 1. Economic efficiency and profitableness rate

Table 1 - Economic efficiency and profitableness rate

Var.	Treatments	Conc. (%)	Ratio (l,kg/ha)	Crop average (t/ha)	Gain production			Average price of delivery (lei/t)	Earnings (lei/ha)	Cost			Depreciation cost of treatments (t/ha)	Account (lei/ha)	Profitableness rate (%)
					(t/ha)	% over Mt	% over crop average			lei/ha	Of which cost of treatment lei/ha	%			
V_1	Trichodex 25 WP + Victenon 50 WP	0,20 0,05	1,20 0,30	22,6	13,6	151,11	60,18	909,00	20543,40	13708,97	520,32	3,80	0,57	6834,43	33,27
V_2	Bravo 500 SC + Actara 25 WG	0,15 0,01	0,90 0,06	22,9	13,9	154,44	60,70	909,00	20816,10	13525,89	337,24	2,49	0,37	7290,21	35,02
V_3	Previcur 607 SL + Confidor 70 WG	0,015 0,02	0,90 0,12	24,0	15,0	166,67	62,50	909,00	21816,00	14017,58	828,93	5,91	0,91	7798,42	35,75
V_4	Folpan 80 WDG + Karate Zeon	0,15 0,02	0,90 0,12	21,1	12,1	134,44	57,35	909,00	19179,90	13368,48	179,83	1,35	0,20	5811,42	30,30
V_5	Ridomil Gold MZ 68 WP + Victenon 50 WP	0,25 0,075	1,5 0,45	26,8	17,8	197,78	66,42	909,00	24361,20	13735,65	547,00	3,98	0,60	10625,55	43,62
V_6	Ridomil Gold Plus 42,5 WP + Mospilan 20 SP	0,30 0,025	1,8 0,15	25,7	16,7	185,56	64,98	909,00	23361,30	13831,04	642,39	4,64	0,71	9530,26	40,80
V_7	Dithane M 45 + Fastac 10 EC	0,20 0,02	1,2 0,12	17,9	8,9	98,89	49,72	909,00	16271,10	13329,36	140,71	1,06	0,15	2941,74	18,08
V_8	Approval test	-	-	9,0	-	-	-	909,00	8181,00	13188,65	-		-	-5007,65	-61,21

The accumulation of pigments in the tomatoes fruits

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Keywords: carotene, lycopene, phenophase, culture cycle

ABSTRACT

The tomatoes fruits are consumed fresh or canned and are very famous for their flavour, and for their rich content in ascorbic acid. The analyzed physiologic indices were selected due to the importance that they have in the appreciation of their commercial quality. These indices are also vital for the evaluation of the fruit's maturity degree, their colour being important for the consumer's preferences.

INTRODUCTION

The present researches concentrates over the comparative analysis of fie tomatoes genotips, of different origin, cultivated in the greenhouse in two cycle of culture, for the determination of their ability for culture in the pedo-climatic conditions that are specific for Romania. The biosynthesis of carotene and lycopene was analysed in two cycle of culture, in different phenophases, concomitant with the biodegradation of chlorophyll pigments from the tomatoes fruits.

MATERIALS AND METHODS

The biological material was represented through fruits from five hybrids of tomatoes, with different origin, cultivated in the greenhouse, after the same technology of culture. The experimental variants are represented by four hybrids with Holland origin, newly introduced in the cultivation system (KATERINA, BIRDIE, YACALLO and BELLAVISA) and one genotip from Romania (Euroser).

The researches were accomplished at the greenhouses RAPPS Pipera, Bucureşti. The experience was placed in randomised blocks, with five variants and four repetitions. The period of time allocated for these experiments can be tracked down in table 1.

The average temperatures during the entire duration of cycle II of culture were higher than the cycle I (19,6^{o}C, respectively 19,1^{o}C), as it is underlined in table 2.

The content in carotene and lycopene was determined in the maturated fruits and in the fruits that are during the maturation process. The carotene pigments from the tomatoes fruits was extracted with petroleum ether, after the following procedure: 1 g of vegetal material was majored in the presence of quartz sand, and than was quantitatively washed few times with petroleum ether. The ether extract was filtered in vide and quantitatively passed in a 50 ml measuring bottle.

The quantitative determination was accomplished at a spectrophotometer Cecil, at a wave length of 452 nm for carotene, respectively 472 nm for lycopene.

The results were calculated using the following formula:

$$\text{Carotene} = DO_{452} \text{ x } 19,96$$
$$\text{Lycopene} = DO_{472} \text{ x } 14,495$$

The results were expressed as mg 100g^{-1} vegetal material.

RESULTS AND DISCUSSION

From the dates presented in table 3 results that the fruits harvested during the maturation phase had a low content in **carotene**, in average 1,50 mg/100 gin the case of the fruits from the first cycle of culture and 0,90 mg/100 g, for the one from the second cycle (cycle II). In the maturity phase, the average content of carotene from the fruits from the five genotips were: 11,62 mg/100 g in case of cycle I of culture and 4,99 mg/100 g from the one of cycle II. This situation represented an accumulation of carotene, that is 2,32 lower at tomatoes from the cycle II, comparing with the cycle I.

The accumulation rhythm of carotene in the period between the mellowness phase and the maturation phase was more intense for the tomatoes from the cycle I of culture – where we tackled an average increase of 5,54 times, comparing with the one from cycle II.

The higher content in carotene from the tomatoes fruits from the first cycle of culture was due mainly to the temperature that was higher during the maturation period. The average monthly temperatures from the fruit's growth and maturation period vary between 20 and 21,5^{o}C in cycle I (May – June) and between 19 and 17^{o}C, in cycle II of culture (November – December). On remark that the average monthly temperatures from the tomatoes maturation period are very close to the optimum value for the synthesis of this pigment, that vary between 25 and 29^{o}C (Burzo et al., 2005).

In the mellowness period, the higher content in carotene was determined in the fruits of BELLAVISA hybrid: 2,44 mg/100 g in cycle I of culture and 1,10 mg/100 g in cycle II.

In the period of full maturation, the following hybrids were remarked through their fruit content in carotene: KATERINA (19,64 mg/100 g in cycle I and 5,17 mg/100 g in cycle II of culture) and BIRDIE (15,43 mg/100 g and respectively 4,81 mg/100 g). The weakest pigmentation was determined at the fruits of YACALLO hybrid (4,69 mg/100 g in cycle I and 7,05 mg/100 g in cycle II of culture).

The increase in the carotene content, during the period of passing from the mellowness phase and the maturity, had a maximum value at the hybrid KATERINA. At this hybrid we registered an increase of 20,24 times in cycle I and of 6,46 times in cycle II of culture.

The **lycopene** analyse of tomatoes fruits revealed a lower accumulation comparing with the content in carotene. The dynamic of lycopene accumulation is similar with the one of carotene (Table 4.).

In the mellowness phase, the fruits that belongs to the five experimental variants had a low content in lycopene; in average 1,36 mg/100 g at the one from cycle I of culture and 0,64 mg/100 g, at the one from cycle II of culture. In this phase, the higher content in lycopene was registered at BELLAVISA hybrid (2,35 mg/100 g in cycle I and 1,15 mg/100 g in cycle II of culture), and the lowest content in lycopene was observed at BIRDIE hybrid (0,71 mg and respectively 0, 55 mg/100 g).

In the transition period from mellowness to the maturity, we observed a process of lycopene synthesis and accumulation, but at a lower intensity comparing with the carotene. The average content in lycopene, increased in this period with 4.31 times at tomatoes from the cycle I of culture and with 4.86 times, at the one from cycle II. As a result the average content of lycopene from the fruits in cycle I of culture increased 5,86 mg/100 g, and at the one from cycle II, at 3,13 mg/100 g. we can conclude that there is an accumulation of lycopene, 1.87 times more intense in the tomatoes fruits cultivated in cycle I, comparing with the ones in cycle II.

As in the case of carotene, the process of lycopene synthesis, at tomatoes from I cycle of culture, was stimulated by the higher temperatures during the tomatoes growth and maturation period (May - June), that were closer to the optimum value for the synthesis of this pigment that usually vary between16 and 22^{o}C (Burzo et al., 2005).

In the maturity phase, the highest quantities of lycopene were determined in the fruits of KATERINA genotip (9.83 mg/kg) and BIRDIE genotip (7.67 mg/kg), in the cycle I of culture. In cycle II of culture, the highest content in lycopene was registered at BELLAVISA genotip (4,57 mg/100 g) and YACALLO genotip (4,31 mg/100 g).

CONCLUSIONS

1. From the analytical dates that refer to the content in **carotene and lycopene**, resulted that the most intense coloured fruits are the one that belonged to the **KATERINA and BIRDIE** genotips, obtained in the first cycle of culture.
2. The carotene content from the tomatoes fruits, increased during the transition period from mellowness to maturity, in average, in cycle I with 7.74 and with 5.54 times at hybrids cultivated in cycle II.
3. In the maturity phase, the average content of carotene from the fruits of the five genotips was of 11,62 mg/100 g in cycle I of culture and 4,99 mg/100 g at the hybrids from cycle II.
4. The average monthly temperatures during the maturation period of tomatoes from cycle I of culture (23 – 24,5^{o}C), is very close to the optimum period for the accumulation of this pigment (25 and 29 ^{o}C), situation that determined a more intense accumulation of the carotene, in the fruits of tomatoes from the cycle I of culture.
5. The average content in lycopene increased during the mellowness – maturity phase with 4,31 times at tomatoes from cycle I of culture and with 4,86 times, at the ones from cycle II.
6. As in the case of carotene, the process of synthesis of lycopene was stimulated by the higher temperatures from the maturation period of tomatoes from cycle I, that were more close to the optimum value for the synthesis of this pigment (16 and 22^{o}C).
7. In the maturity phase, the highest content in carotene and lycopene was determined in the fruits of genotips EUROSER and BIRDIE, from the cycle I of culture.

ACKNOWLEDGEMENT

The author is grateful to Prof. Ioan Burzo for allowing the use of elemental analyzer.

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TABLES

Table 1 - The dates of realisation of the two cycle of culture

Specification	CYCLE I	CYCLE II
SOWING	20 NOV	10 JUN
PLANTING	10 JAN	10 JUL
CLEARING	20 JUN	15 DEC
THE SEEDLING AGE	50 DAYS	30 DAYS

Table 2 - The variation of temperature in greenhouse, on the two cycles of cultures

CYCLE I	TEMPERATURE ^oC			Difference day/night
	DAY	NIGHT	AVERAGE	
JANUARY	19	13	16	6
FEBRUARY	20	15	17,5	5
MARCH	22	16	19	6
APRIL	23	17	20	6
MAI	23	17	20	6
JUNE	24,5	18,5	21,5	6
Average	**21,9**	**16,1**	**19,0**	
CYCLE II				
JULY	26	19	22,5	7
AUGUST	25	17,5	21,25	7,5
SEPTEMBER	20	16	18	4
OCTOBER	23	16,5	19,75	6,5
NOVEMBER	22	16	19	6
DECEMBER	19	15	17	4
Average	**22,5**	**16,7**	**19,6**	

Table 3 - The carotene content of tomatoes fruits

Hybrid	MELLOWNESS		MATURITY	
	Cycle I	Cycle II	Cycle I	Cycle II
	mg/100 g fruit			
BELLAVISA	2.44	1.10	7.62	4.41
YACALLO	1.22	1.10	4.69	7.05
BIRDIE	0.90	1.04	15.43	4.81
KATERINA	0.98	0.80	19.64	5.17
EUROSER	1.96	0.46	10.74	3.51
AVERAGE	**1.50**	**0.90**	**11.62**	**4.99**

Table 4 - The lycopene content of tomatoes fruits

Hybrid	MELLOWNESS		MATURITY	
	Cycle I	Cycle II	Cycle I	Cycle II
	mg/100 g fruit			
BELLAVISA	2.35	1.15	3.97	4.57
YACALLO	1.03	0.52	2.45	4.31
BIRDIE	0.71	0.55	7.67	1.94
KATERINA	0.77	0.54	9.83	3.23
EUROSER	1.96	0.43	5.39	1.58
AVERAGE	**1.36**	**0.64**	**5.86**	**3.13**

The study of analog variants for mating disruption pest, cabbage moth

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Keywords: Brassica, pheromone, noctuidae

ABSTRACT

The experimentations were accomplished at Vegetable Research and Development Station Bacău, during 2008-2009. In 2008, the hard infestation of eggs with *Trichograma evanescens* Westw from generations 1 and 2 determined a low attack degree (GA%) of 11,3% in generation 1 (over the economic damage threat attack (EDTA) and 2,1% in generation II (under EDTA). In 2009 the dispensers with analogue pheromones, for mating disruption, variant C4 were experimented in the autumn cabbage crop, in the second generation of cabbage moth. In conditions of a low population of *Mamestra brassicae* L., in the un-treated control a higher number of eggs (with 30.7% more, comparing with the variant Analog C4) were laid down. The percentage of larva apparition of cabbage moth was higher at the control variant - 67%, comparatively with 14,5% in variant Analog C4. As a result, the frequency of attack (AF%) surpassed the economic damage threat attack (EDTA) in control variant, its value being 11,9%. In variant Analog C4 the frequency of attack AF% was below the economic damage threat attack (EDTA), respectively 2,4%.

INTRODUCTION

Mating disruption of cabbage moth is a pest management technique for control of pest infestations (Stephen and colab. 2009; Carter and Fraser, 2003).

Mating disruption involves the utilization of synthesized sex pheromone to disrupt the reproductive cycle of this pest. This method exploits the male insects' natural response to female by introducing a synthetic pheromone into the insects' habitat. The synthetic pheromone is a volatile organic chemical for to mimic the species-specific sex pheromone produced by the female insect (Stephen and colab. 2009).

The general effect of mating disruption is to confuse the male insects by masking the natural pheromone of female, causing the males to follow "false pheromone trails" at the expense of finding mates, and affecting the males' ability to respond to "calling" females. Consequently, the male population experiences a reduced probability of successfully locating and mating with females, which leads to the eventual cessation of breeding and collapse of the insect infestation. Many farmers consider mating disruption to be among the most environmentally friendly treatments used control of pest infestations (Stephen and colab. 2009; Carter and Fraser, 2003).

Different countries use pheromone programs for controlling low to moderate pest population density (Kakizaki, 2002).

SCDL Bacau and I.C.C. Cluj Napoca has accomplished synthesis of variants with analog of pheromones for experiments in the field during 2008-2009. In the present paper we present the preliminary results of this semichemicals tip.

MATERIAL AND METHODS

The dispensers with analogue pheromones for mating disruption were installed on the cabbage plants in the following variants:

2008

Analog C4 – MD vegetables – early and summer cabbage experiment - 2200 mp.
Analog C5 – MD vegetables – autumn cabbage experiment - 2000 mp.

2009

Analog C4 – MD vegetables – autumn cabbage experiment 1,1 ha.

The decadal observations were accomplished over the number of eggs and clusters deposed, the frequency (F%) and intensity of attack (I%), attack degree (GA%).

RESULTS AND DISCUSSIONS

In the conditions of existence of some noctuidae lepidopters that were in phase of gradation regression, the number of clusters and eggs deposed by them on 100 plants (the analyzed sample) was low (tab. 1). The hard infestation of eggs with *Trichograma evanescens* Westw from generations 1 and 2 determined a low attack degree (GA%) of 11,3% in generation 1 (over the economic damage threat attack (EDTA) and 2,1% in generation II (under EDTA).

2009

The utilization of variant Analog C4 allowed the obtaining of the following results (table 2).

We can observe that the first clusters and apparition of larva were observed in the 1st decade of September. As a result the attack of noctuidae lepidopters started in September (fig. 1).

Analyzing the obtained dates, we observed that in the control, un-treated variant, a higher number of eggs (with 30.7% more, comparatively with the variant Analog C4) were deposed.

The percentage of eggs emersion was higher at the control variant – 67%, comparatively with 14,5% in variant Analog C4. As a result, at the un-treated control, the attack frequency (AF%) overcome the economic damage threat attack (EDTA), with a value of 11,9%.

In variant Analog C4, AF% was under EDTA, respectively 2,4%.

CONCLUSIONS

2008 - In the conditions of existence of some noctuidae lepidopters that were in phase of gradation regression, the number of clusters and eggs deposed by them on 100 plants (the analysed sample) was low. The hard infestation of eggs with *Trichograma evanescens* Westw from generations 1 and 2 determined a low attack degree (GA%) of 11,3% in generation 1 (over the economic damage threat attack (EDTA) and 2,1% in generation II (under EDTA).

2009 - The dispensers with analogue pheromones, for mating disruption, variant C4 were experimented in the autumn cabbage crop, in the second generation of cabbage moth. In conditions of a low population of *Mamestra brassicae* L., in the un-treated control a higher number of eggs (with 30.7% more, comparing with the variant Analog C4) were laid down.

The percentage of larva apparition of cabbage moth was higher at the control variant – 67%, comparatively with 14,5% in variant Analog C4. As a result, the frequency of attack (AF%) surpassed the economic damage threat attack (EDTA) in control variant, its value being 11,9%. In variant Analog C4 the frequency of attack AF% was below the economic damage threat attack (EDTA), respectively 2,4%.

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TABLES

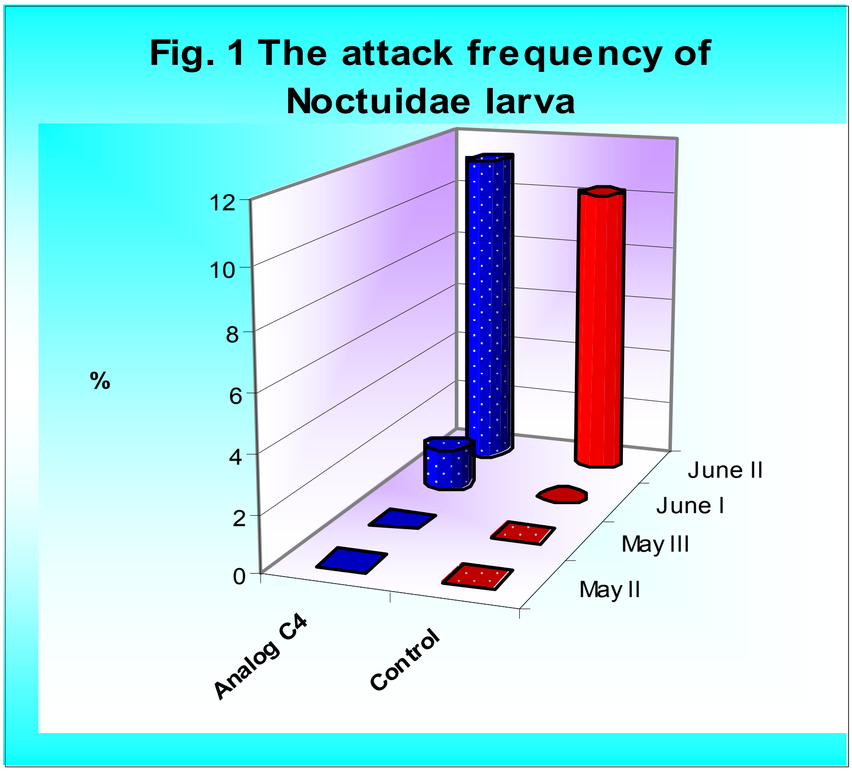
Table 1 - Testing of mating disruption

Nr. crt.	Specification	No. clusters on 100 plants	No. eggs, from which:				Obs.
			Total	No. of parasitized eggs	No. of emerged eggs	%	
Analog C4 – MD vegetables – early and summer cabbage experiment - 2200 mp.							
1	**Analog C4**	9	115	46	69	60	GA 11,3%
2	**Control un-treated**	7	120	52	68	56,7	GA 10,3%
Analog C5 – MD vegetables – autumn cabbage experiment - 2000 mp.							
1	**Analog C5**	3	68	60	8	11,8	GA 2,5%
2	**Control untreated**	2	66	61	6	9,0	GA 2,1%

Table 2 - Testing mating disruption Analog C4 – autumn cabbage experiment

Nr. crt.	Specification	No. clusters on 100 plants	No. eggs, from which:			Observations
			Total	No. emerged eggs	%	
September 1st decade						
1	**Analog C4**	2	124	18	14,5	F% 2,4%
2	**Control untreated**	7	179	120	67,0	F% 11,9

FIGURES



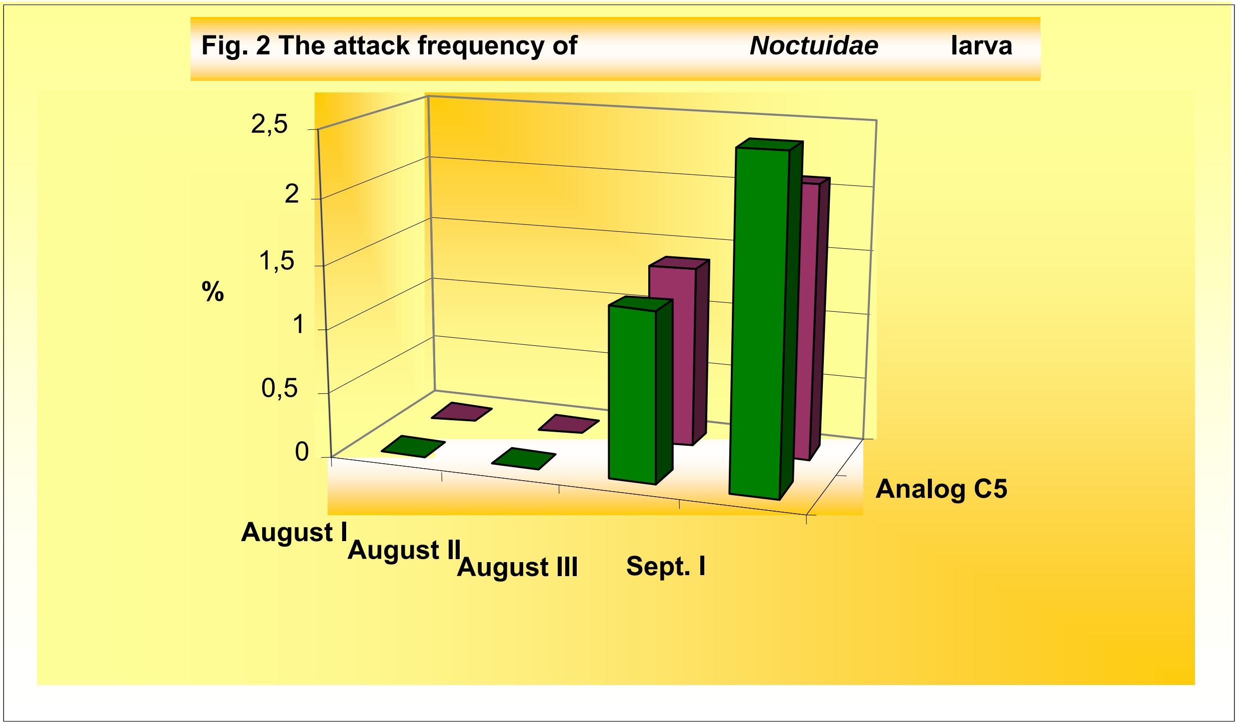


Fig. 2 The attack frequency of Noctuidae larva
%
2,5
2
1,5
1
0,5
0
August I
August II
August III
Sept. I
Analog C5

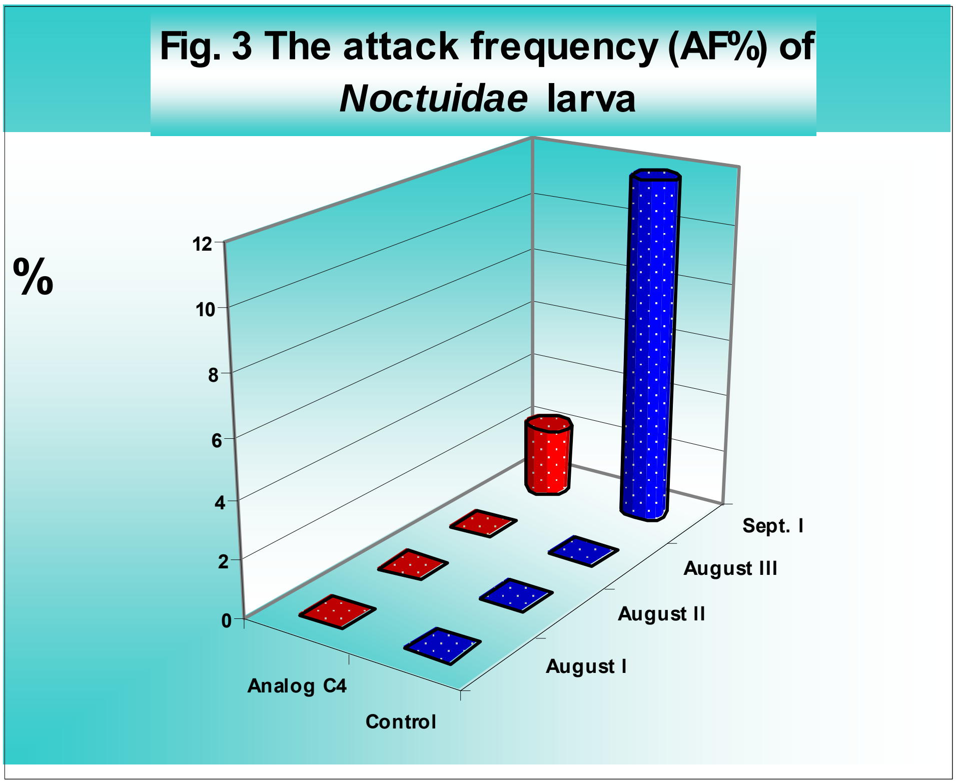


Fig. 3 The attack frequency (AF%) of Noctuidae larva
%
12
10
8
6
4
2
0
Analog C4
Control
August I
August II
August III
Sept. I

Ecological products obtained from plants used as pesticides used in vegetables culture (*Solanaceae Family*)

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Keywords: ecological agriculture, bio food, durable agriculture

ABSTRACT

The paper presents the problems regarding the bioaccumulation of chemical products in food and environment, maintaining the genetically diversity of agroecosystems, obtaining vegetables with good gustative and nutritive qualities. Because of the applying of plants mixtures it could be observed a vigorously development of the cultivated vegetables. Also, the preventive use of these mixtures determined a superior resistance of the plants comparatively with control and an increase of the crop with 18%.

INTRODUCTION

To prevent the looses problems from vegetable culture because of the pests in the same time with the vegetables perisability there were take some measurements for pests control using synthetically chemical products. The accumulation of chemical products in vegetables and fruits leads at the bioaccumulation of pests in human body, at the decrease of life quality, respectively at the increase of deceases. These problems may be avoid with the use/consume of bio products, following the harmonization of dynamic interactions between soil-plant-animal-human, between ecological offer, social and economical one of the agroecosystems and with the need of human food.

Small farmers which cultivate vegetables: tomatoes, cabbage and onion use a lot of types of pesticides to control the parasites and pests which attacks this culture. Ngowi et al., in 2007 realized a study in which investigated the farmers practices, the perceptions and conexes costs, and also the health problems because of the pesticides use.

Types of pesticides used by the farmers were insecticides (59%), fungicides (29%), and herbicides (10%) and 2%rodendicides (Ngowi et al., 2007). Health symptoms associated with the use of pesticides are skin problems and neurological problems (dizziness, had troubles).

The farmers used pesticides without understanding the impact of these on human health and environment. Although the common exposes parts were the skin and oral inhalation, pesticides residues are present also in food and water.

MATERIAL AND METHODS

The experiments were realized on a private property of 0.40 ha from which 0.10 ha have ecological certificate, the location is in Muntenia.

The cultures used were tomatoes (*Lycopersicum esculentum*), eggplants (*Solanum melongena L.*) and peppers (*Capsicum annum L.*). These vegetables were cultivated in ecological system without using the chemical fertilizers and syntactical pesticides. To prevent pests there were used many plants mixtures in infusion or extract.

Plants used for preparations (infusion, extract) were: *Matricaria chamomilla*, *Equisetum arvense*, *Urtica dioica*, *Artemisia absinthium*, Allium sativum, *Allium cepa*, *Taraxacum officinale*, *Lycopersicum esculentum*, *Brassica oleracea*, *Armoracia rusticana*, *Achileea milifolium*, *Tropeolum majus*, *Tagetes patula*, *Salvia officinalis*, *Ocimum basilicum*, *Satureea hortensis*, *Heliantus anus*, *Datura stramonium*.

The preparations used are presented in tables 1, 2, 3.

RESULTS AND DISCUSSION

The great diversity of vegetables species attracted also many pests. The possibility to prepare the vegetables for the aggressions is the main objective of using of these plants with fortifications, fungus, repellent and insecticides. Plants used for infusions and extracts had a significant roll in the prevention process of pests.

Urtica dioica had a double roll, a fungicide effect and insecticide one at vegetables from the *Solanaceae* family and is also used at fermentation process.

Applied as prevention the infusion of *Equisetum arvense* determine to obtain of well-developed plants without disappearances comparison with control at which the plants registered a 40% disappearance.

As a prevention action of these infusions, the tested vegetables were free of diseases and pests, and the results were the increase of crops until 18% comparatively with control.

The maximum efficiency of infusions were at next cultures: tomatoes and potatoes, comparatively with eggplants and peppers where the disease were under control but red spider was present at the cultures in the proportion of three adults per plant, the climacteric conditions were favorable for that pest.

Because of the easy preparation of that, products determine the possibility of prevention of the disease and pest with minimum costs.

CONCLUSIONS

The use of products: infusions or solutions or in direct culture to prevent the pests and disease at *Solanaceae* plant determined:

1. *Urtica dioica* had a double roll as fungicide and insecticide at plants from *Solanaceae* Family;
2. Applied as prevention the infusion of *Equisetum arvense* determine to obtain of well developed plants without disappearances;
3. An increase of the production with 18% comparatively with control;
4. The maximum efficiency of the infusions manifested at tomatoes and potatoes cultures comparatively with eggplants and peppers.

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TABLES

Table 1. Types of products made to prevent and treated the diseases

Product	Plants used	Preparation	The roll of product	
Product I	*Matricaria chamomilla*	50g plant, 200ml water; undiluted	Germinate the seeds	To short the period of germination
Product II	*Equisetum arvense*	1kg fresh plant or 150 g dry plant 10 l water boiled 30 min, dilution 1/10	Fungicide, fortifying, insecticide	Healthy plants, high crop
Product III	*Urtica dioica*	1 kg fresh plant or 300g dry plant, 10 l water, 4-5 days at sun	Fungicide, fortifying, insecticide	Healthy plants, high crop
Product IV	*Artemisia absinthium*	300 g flower stems in 10 l water for 2-3 weeks time	Insecticide	Healthy plants, high crop
Product V	*Allium sativum*	75 g bulbs in 10 l water, undiluted	Fungicide	Healthy plants, high crop
Product VI	*Allium cepa*	500 g leaves in 10 l water, infusion	Fungicide	Healthy plants, high crop

Table 2. Plants products which determines the resistance to the disease and pests

Product	Plants used	Preparation	The roll of product
Product I	*Taraxacum officinale*	1 kg fresh plant or 200g dry matter in 10 l water, infusion 10-15 days	Foliar treatment 1/5 dil. Root fertilization 1/10 dil.
Product II	*Lycopersicon esculentum*	1kg leaves fresh plant 10 l water, infusion 7-10 days	At the root of plants, undiluted
Product III	*Armoracia rusticana*	1 kg root in 10 l water, infusion 12-14 hours	Seeds treatment
Product IV	*Allium sativum*	100g bulbs in 10 l water, extract 12-14 hours	Prevent the bacterium and mycosis attack
Product V	*Allium cepa*	500 g bulbs in 10 l water, infusion 12 hours	Prevent the cryptogrammic diseases

Table 3. Products from plants with insecticide effect

Product	Plants used	Preparation	The roll of product
Product I	*Tropeolum majus*	1 kg fresh plant or 200g dry mater in 10 l water, infusion 10-15 days	Insecticide
Product II	*Lycopersicum esculentum*	1kg leaves-fresh plant 10 l water, infusion 10-12 days	Treatment for white butterfly
Product III	*Salvia officinalis*	1 kg fresh plant in 10 l water, infusion 12-14 hours	Insecticide
Product IV	*Ocimum basilicum*	1 kg fresh plant in 10 l water, extract 12-14 ore	Insecticide
Product V	*Ranunculus*	In culture	Reducing the pests from soil
Product VI	*Heliantus anus*	In culture	Reducing the pests from soil
Product VII	*Ricinus communis*	In culture	Reducing the pests from plants
Product VIII	*Datura stramonium*	In culture	Plant from worms

PHOTOS


Matricaria chamomilla


Alternaria porri


Fusarium oxysporum


Pythium debariyanum


The effect of use of *Equisetum ravense* infusion


Phytophtora sp.


Halicoverpa armingera


Liriomyza trifolii


Urtica dioica


Trialeurodes vaporariorum


Phitotphthora infestans


Verticillium sp.


Artemisia absinthium


Leptinotarsa decemlineata


Aphis sp.


The effect of peppers infusion


Allium sativum


Phytophtora infestans


Allium cepa


Septoria licopersici


Phytophtora infestans


Taraxacum officinale


Lycopersicon esculentum


Armoracia rusticana

Assessment of accumulation potential of nitrates in leafy vegetables, grown in protected environments

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Keywords: spinach, lettuce, fertilization, nitrates

ABSTRACT

In this paper are presented the results of performed researches for to determine the accumulation potential of nitrates in lettuce and spinach, grown within protected environments, depending on the applied fertilization level. In the culture technology of lettuce and spinach, they were applied the following fertilization variants (fertilizer being ammonium nitrate with 33% nitrogen): V1 = 0 kg nitrogen/ha; V2 = 25 kg nitrogen/ha; V3 = 50 kg nitrogen/ha; V4 = 75 kg nitrogen/ha; V5 = 100 kg nitrogen/ha. For each fertilization variant, they were realised 4 repetitions. For determination of accumulation potential of nitrates in lettuce and spinach cultivated within protected environments, it was used an enzymatic method. Lettuce, *Graţia* variety, has a high accumulation potential of nitrates, in the range 1931.46 mg NO_3^-/kg – 3159.03 mg NO_3^-/kg, and spinach, *Românesc* variety, also has a high accumulation potential of nitrates, in the range: 1636.76 mg NO_3^-/kg – 2575.86 mg NO_3^-/kg.

INTRODUCTION

For growing and development of horticulture-wine-growing plants, improving of soil fertilization state and achievement of high and constant crops, within soil they are applied organic or mineral fertilizers (Luchian, 2007).

Excessive fertilization, with organic and mineral fertilizers with nitrogen, means a frequent method of production improvement at hectare. This method, although increases production, it alters the crop quality, through concentration of nitrates and nitrites within vegetable products. Nitrates accumulation in plants and their consumption by human or animal, determine disorders and intoxications of the body, which can have severe consequences (Rădulescu, 1999).

Nitrogen content of vegetables and fruits is in the range 0.04 and 0.2%, the highest values being determined at soy and almonds (Gherghi, 2001).

Vegetables and fruits can accumulate also nitrogen, as nitrate and nitrite forms. The mineral nitrogen amount in tissues of vegetable and fruit is much more in the case of species of which the nitrates reduction happens in leaves and when light intensity and temperature are lowers (Gherghi, 2001).

High concentration of nitrates in plants (especially in vegetables) means a hazard for human and animal body, for two reasons: possibility of methemoglobin appearance at children and nitrates conversion to nitrites in saliva and formation of cancerigen nitrozamines in intestinal tract (Bibicu, 1994).

In a normal diet, 54% of nitrates content comes through vegetables consumption. In the daily ingestion of vegetable-based products, especially in the case of vegans, the percentage can be much more, 75 – 80% (Bibicu, 1994).

Taking into consideration the cancerigen potential of nitrosamines, the high content of nitrates in vegetable-based products, presents a potential hazard.

MATERIAL AND METHODS

Within the achieved study for to determine the accumulation potential of nitrates in leafy vegetables, grown within protected environments, lettuce samples (*Graţia* variety) and spinach samples (*Românesc* variety) were supplied by the Vegetable Research and Development Plant for Horticulture Buzău. In the culture technology of lettuce and spinach, they were applied the following fertilization variants (fertilizer being ammonium nitrate with 33% nitrogen):

V1 = 0 kg nitrogen/ha; V2 = 25 kg nitrogen/ha; V3 = 50 kg nitrogen/ha;
V4 = 75 kg nitrogen/ha; V5 = 100 kg nitrogen/ha.

For each fertilization variant, they were realised 4 repetitions.

For determination of accumulation potential of nitrates in lettuce and spinach cultivated within protected environments, it was used an enzymatic method. Within this method, nitrate is reduced by the reduced nicotinamide adenine dinucleotide phosphate (NADPH), to nitrite, in presence of nitrate – reductase (NR):

$$NO_3^- + NADPH + H^+ \xrightarrow{NR} NO_2^- + NADP^+ + H_2O$$

Amount of oxidized NADPH is stoechiometrically equal with nitrate amount. Decreasing of NADPH amount is measured through absorbance at λ = 340 nm.

For determination of the accumulation potential of nitrates in lettuce and spinach cultivated within protected environments, it was proceeded to:

- ✓ For each fertilization variant, within each repetition, they were analyzed three average samples of lettuce and spinach, respectively, being determined nitrates content in mg/kg
- ✓ It was determined arithmetic average of nitrates content for those three samples, within a repetition, thus obtaining the accumulation potential of nitrates in lettuce and spinach within respective repetition
- ✓ It was determined arithmetical average of nitrates content for 4 repetitions within a fertilization variant, thus obtaining accumulation potential of nitrates in lettuce and spinach within respective fertilization variant

RESULTS AND DISCUSSION

Within experimental variant V1 (without fertilizer adding), nitrates content of lettuce is in the range 1879.35-1987.45 mg/kg. Average value of the accumulation potential of nitrates in this case is 1931.46 mg/kg. This value is explained in fact that, genetically, lettuce is a species with high potential of nitrates accumulation, using in this case only nitrogen existing in the soil.

When is applied fertilizer, nitrates content of lettuce increases once with increasing of fertilizer dose (ammonium nitrate with 33% nitrogen). Thus, in the case of fertilization variant V2 (25 kg nitrogen/ha) lettuce has a nitrates content in the range 2225.24-2299.43 mg/kg, and the average potential of nitrates accumulation is 2252.99 mg/kg, with 16.65% much more than in case of none fertilizer applied.

Within fertilization variant V3 (50 kg nitrogen/ha) lettuce has a nitrates content in the range 2500.20 – 2570.36 mg/kg, and the average potential of nitrates accumulation is 2528.5 mg/kg, with 30.91% much more than in case of none fertilizer applied.

Application of a fertilizer dose of 75 kg nitrogen/ha (fertilization variant V4), it determines increasing with 47.04% of the average potential of nitrates accumulation in lettuce cultivated within these conditions, comparative with those non-fertilized. In the case of this fertilization variant lettuce has nitrates content in the range 2798.52-2883.27 mg/kg, and the average potential of nitrates accumulation is 2840.11 mg/kg.

Use in the culture technology of a fertilizer dose of 100 kg nitrogen/ha, it determines increasing with 63.56% of the average potential of nitrates accumulation in lettuce cultivated within these conditions, comparative with non-fertilized lettuce. In the case of this fertilization variant, lettuce has nitrates content in the range 3108.64-3198.23 mg/kg, and the average potential of nitrates accumulation is 3159.03 mg/kg.

Between fertilization level with nitrogen of the lettuce culture, within protected environments and accumulation potential of nitrates in lettuce, it was established a liniar correlation, decribed by equation $y = 12.169x + 1934$, linearity coefficient (R^2) being 0.9994.

In case of the experimental variant V1 (without fertilizer adding), nitrates content of spinach is in the range 1616.25 – 1657.37 mg/kg. Average value of the accumulation potential of nitrates in this case is 1636.76 mg/kg. This value is explained in fact that, genetically, spinach is a species with high potential of nitrates accumulation, using in this case only nitrogen existing in the soil.

When are applied fertilizers nitrates content of spinach increases once with increasing of fertilizer dose (ammonium nitrate with 33% nitrogen). Thus, in the case of variant fertilization V2 (25 kg nitrogen/ha) spinach has a nitrates content in the range of 1838.90 – 1889.75 mg/kg, and the average potential of nitrates accumulation is 1865.66 mg/kg, with 13.98% much more than in case of none fertilizer applied.

In case of fertilization variant V3 (50 kg nitrogen/ha) spinach has a nitrates content in the range of 2062.87 – 2129.20 mg/kg, and the average potential of nitrates accumulation is 2097.61 mg/kg, with 28.16% much more than in case of none fertilizer applied.

Application of a fertilizer dose of 75 kg nitrogen/ha (fertilization variant V4), it determines increasing with 42.88% of the average potential of nitrates accumulation in spinach cultivated in these conditions, comparative with those non-fertilized. In case of this fertilization variant spinach has nitrates content in the range 2318.65 – 2358.49 mg/kg, and the average potential of nitrates is 2338.6 mg/kg.

Use in the culture technology of fertilizer dose of 100 kg nitrogen/ha (fertilization variant V5), determines increasing with 57.38% of the average potential of nitrates accumulation in cultivated spinach in these conditions, comparative with non-fertilized spinach. In case of this fertilization variant spinach has nitrates content in the range 2554.83 – 2597.77 mg/kg, and the average potential of nitrates accumulation is 2575.86 mg/kg.

Between fertilization level with nitrogen of spinach culture within protected environments and accumulation potential of nitrates in spinach, it was established a liniar correlation, described by equation $y = 9.4046x + 1632.7$, linearity coefficient (R^2) being 0.9999.

According to the obtained results it can be concluded that lettuce and spinach are vegetable species with high accumulation potential of nitrates. This can be explained through existence in these plants of a low amount of nitrate-reductase.

European legislation, through Commission Regulation No. 1.881/2006/EC and Commission Regulation No. 401/2006/EC, anticipates maximum limits of nitrate only for spinach and lettuce species, but it specify limitation of agrochemical products to the other vegetable species, through observance of Good Agricultural Practice and monitoring of their use. Regulations were whole assumed by our country, through Order 530/2007, concerning approval of sanitary veterinary norm and for food safety concerning some contaminants in animal- and non-animal-based products.

Nitrates content of lettuce samples, *Graţia* variety, analyzed, is under the maximum limit specified by the Order 530/2007 (4500 mg NO_3^-/kg).

Nitrates content of spinach samples, *Românesc* variety, analyzed, are under the maximum limit admitted, specified by the Order 530/2007 (3000 mg NO_3^-/kg).

CONCLUSIONS

1. Lettuce samples, *Graţia* variety, obtained in culture within protected environments, through application of 5 fertilization variants, have a high potential of nitrates

accumulation in the range: 1931.46 mg NO_3^-/kg – 3159.03 mg NO_3^-/kg. The minimum value of nitrates content is for non-fertilized lettuce, and the maximum value is for fertilized lettuce with 100 kg nitrogen/ha.

2. Between fertilization level with nitrogen of lettuce culture, within protected environments, and accumulation potential of nitrates in lettuce it was established a liniar correlation, described by equation y = 12.169x + 1934, linearity coefficient (R^2) being 0.9994.
3. Spinach samples, *Românesc* variety*,* obtained in culture within protected environments, through application of 5 fertilization variants, have a high acumulation potential of nitrates in the range: 1636.76 mg NO_3^-/kg – 2575.86 mg NO_3^-/kg. The minimum value of nitrates content is for non-fertilized spinach, and the maximum value is for fertilized spinach with 100 kg nitrogen/ha.
4. Between fertilization level with nitrogen of spinach culture, within protected environments and accumulation potential of nitrates in spinach, it was established a liniar correlation, described by equation y = 9.4046x + 1632.7, linearity coefficient (R^2) being 0.9999.
5. Nitrates content of the lettuce samples, *Graţia* variety, and spinach, *Românesc* variety*,* analyzed, is under the maximum limits admitted, specified by the Order 530/2007 (4500 mg NO_3^-/kg for lettuce and 3000 mg NO_3^-/kg for spinach, respectively).

ACKNOWLEDGEMENTS

The experiments were performed within the contract no. 51-050/18.09.2007, financed through Programme 4 "Partnerships in priority S&T Domains" 2007-2013 – National Centre for Projects Management.

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FIGURES

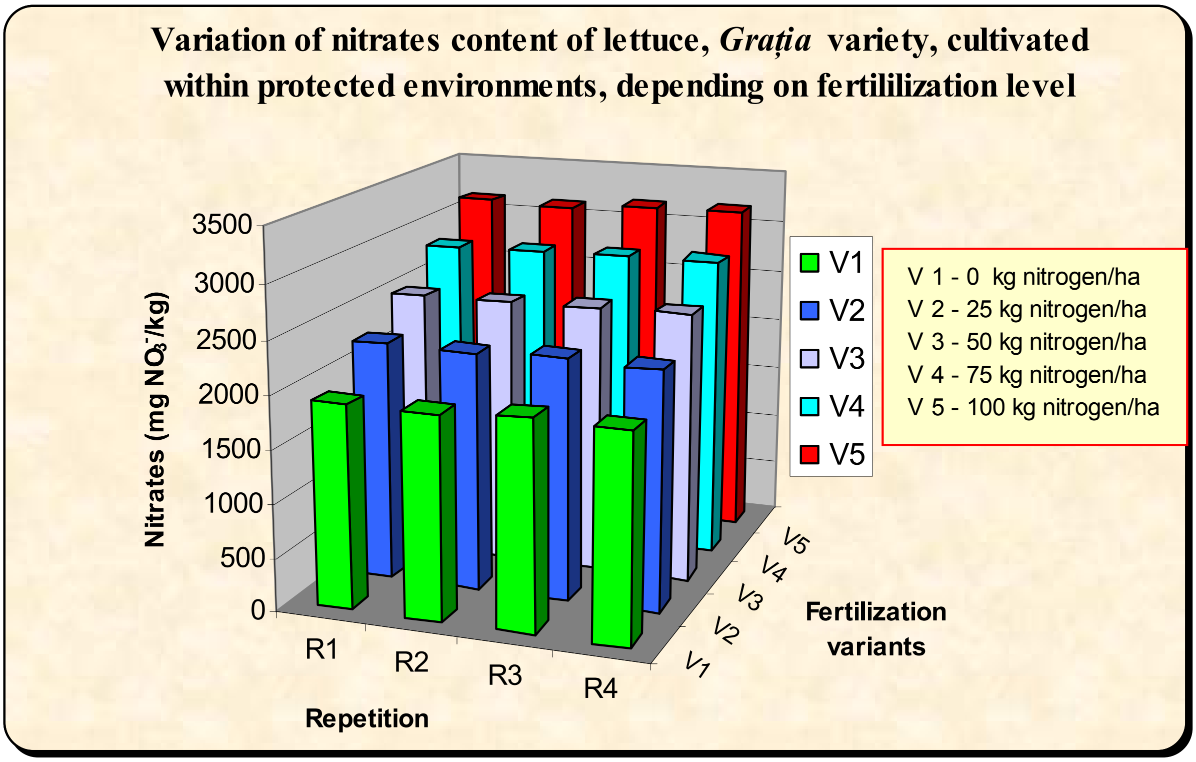

Fig. 1. Variation of nitrates content of lettuce, *Graţia* variety, cultivated within protected environments, depending on fertilization level

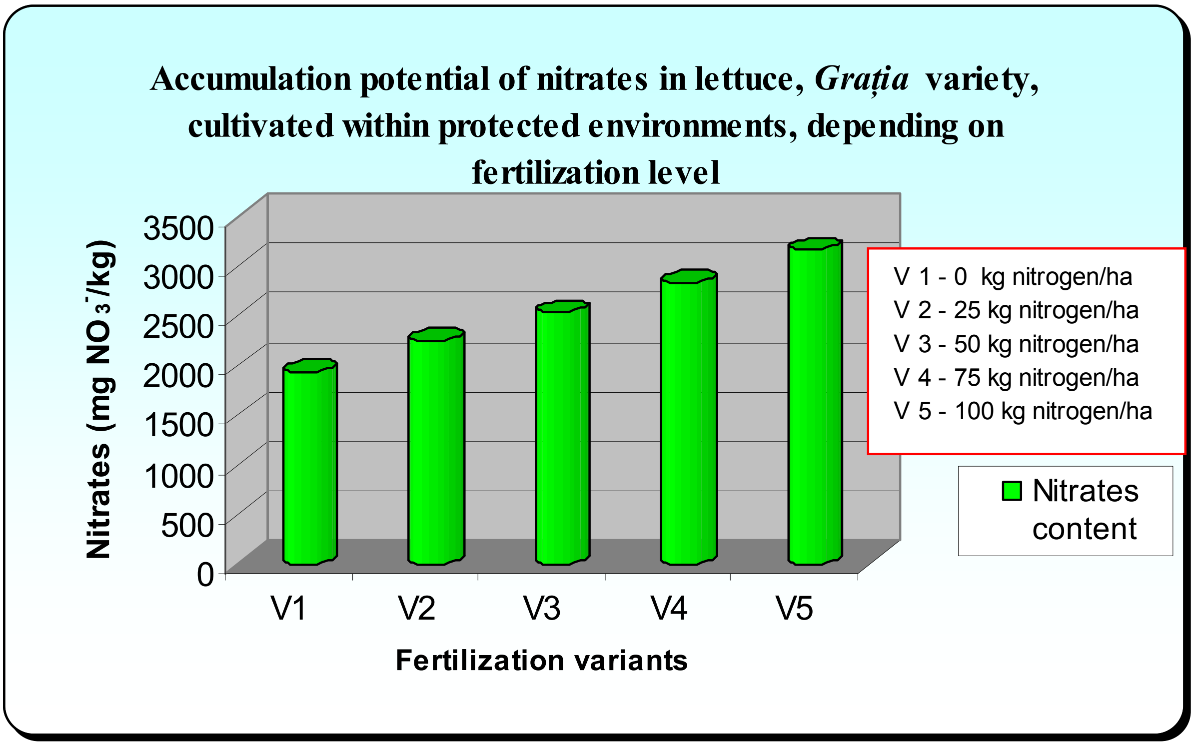

Fig. 2. Accumulation potential of nitrates in lettuce cultivated within protected environments, depending on fertilization level

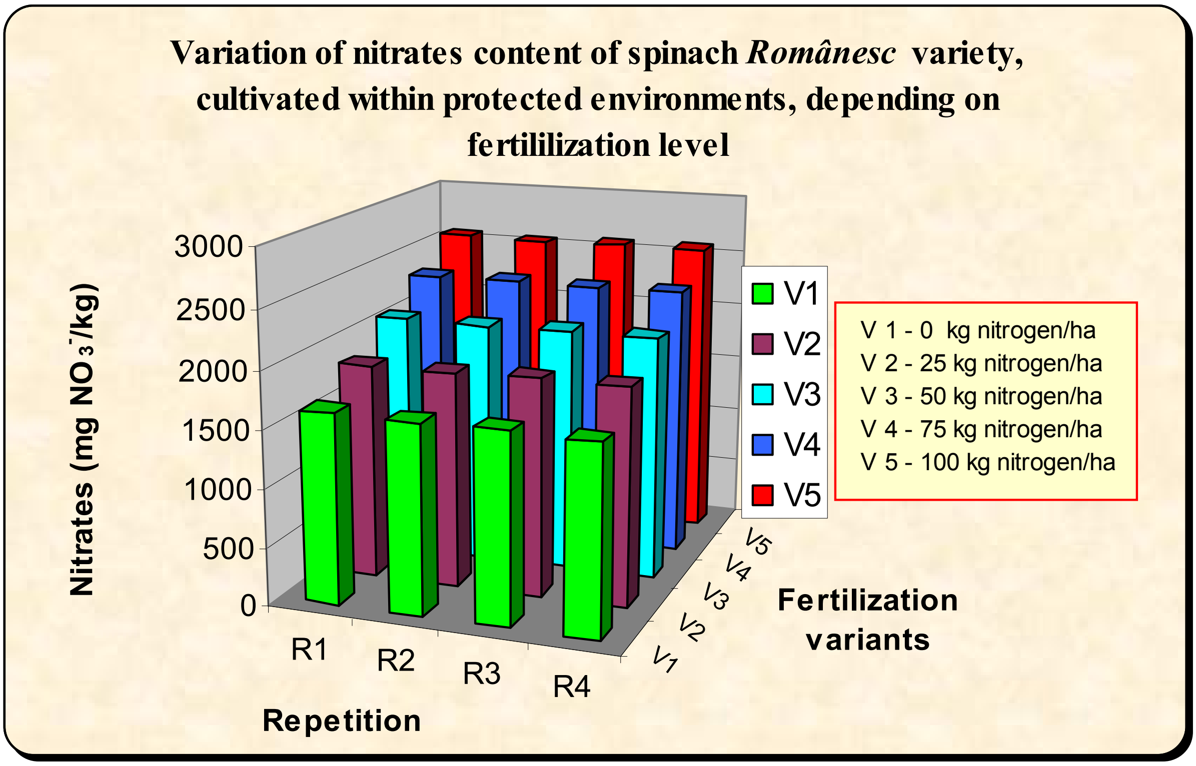

Fig. 3. Variation of nitrates content of spinach, *Românesc* variety, cultivated within protected environments, depending on fertilization level

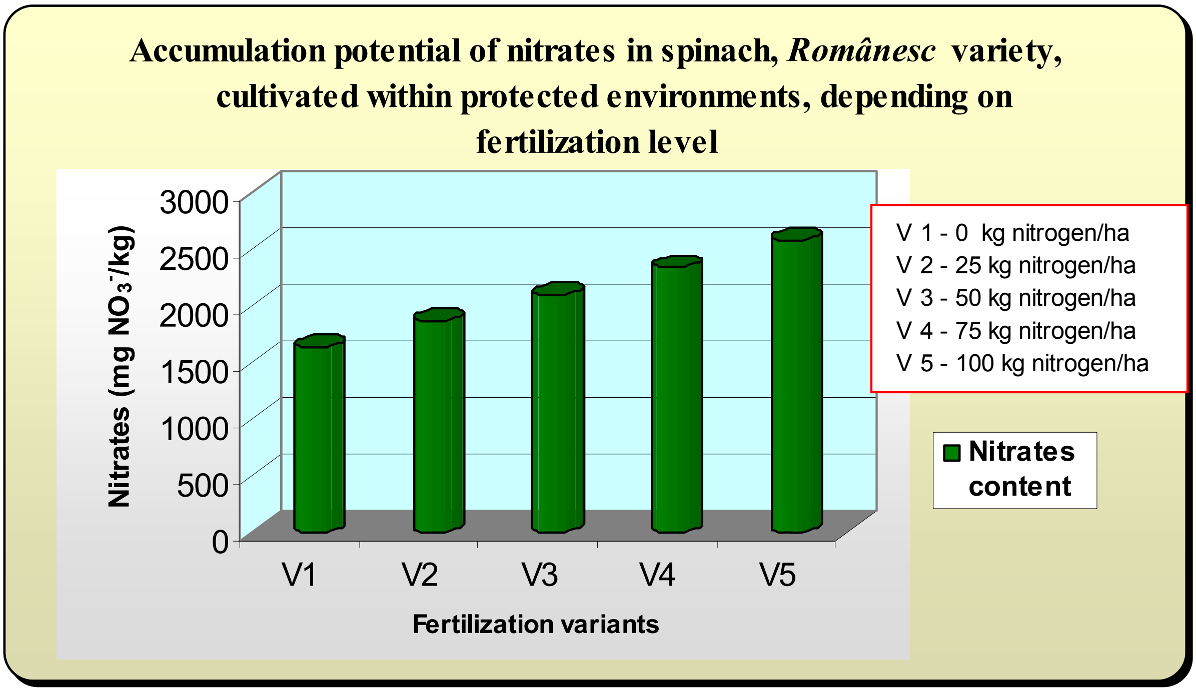

Fig. 4. Accumulation potential of nitrates in spinach, *Românesc* variety, cultivated within protected environments, depending on fertilization level

Lucrări ştiinţifice USAMVB, Seria B, vol. LIII, 2009

Influence of fertilization treatments on nitrates content of some vegetable species cultivated in greehouses and solars

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Keywords: tomatoes, cucumbers, fertilization, nitrates

ABSTRACT

In this paper are presented the results of performed researches, for to establish the influence of fertilization treatments on nitrates content of cucumbers cultivated within greenhouses and of tomatoes cultivated within solar. In the culture technology of cucumbers and tomatoes, they were applied the following fertilization variants (fertilizer being ammonium nitrate with 33% nitrogen): V1 = 0 kg nitrogen/ha; V2 = 100 kg nitrogen/ha; V3 = 200 kg nitrogen/ha; V4 = 300 kg nitrogen/ha; V5 = 400 kg nitrogen/ha. For to establish the accumulation potential of nitrates in cucumbers and tomatoes cultivated within protected environments, it was used an enzymatic method. Cucumbers, *Triumf F1* hybrid, obtained in culture within protected environments, through application of 5 fertilization variants, have an average accumulation potential of nitrates in the range: 53.35 mg NO_3^-/kg – 222.44 mg NO_3^-/kg. Nitrates content of tomatoes cherry type, *Capriciu* variety, and *Siriana F1* hybrid, cultivated within solar (through application of 5 fertilization variants), is very low, being in the range 3.54 – 12.33 mg/kg.

INTRODUCTION

Achieving a sustainable soil fertility reintegration involves the mineral, plant and animal in its natural flow. In natural conditions, soil organic matter is maintained in terms of intake of animal and vegetable, devoid of life, which falls on the surface of the land mass of dead roots, soil microorganisms that die, all incorporated by biological cycles characteristic of biocenoses (Luchian, 2007).

Fertilizer application is made on the basis of careful analysis for each crop separately and for each type of soil, taking into account that they use in uncontrolled quantities, can pollute soil, groundwater and end products. In determining the dose of fertilizer should be taken of nutrients in the soil, the degree of assurance of water plants, pre-plant, the planned production on cultivated plot (Borlan, 1999).

Naturally, between nitrates and nitrites in soil, water and plants it established an equilibrium, which can be disrupt by intensive use in agriculture of natural organic fertilizers (rother) and of those synthetic nitrate, especially. Their degradation products enrich the soil and they can accumulate in cultivated plants until deleterious levels for consumers.

Also vegetables and fruits can accumulate nitrogen as nitrates and nitrites form. Mineral nitrogen amount in tissues of vegetable and fruit is higher in case of species at which nitrates reduction is made in leaves and when light intensity and temperature are lowers (Gherghi et al., 2001).

Factors which determine nitrates accumulation in cultivated horticultural products within protected environments (greenhouses, solar) or in open field are (Bibicu, 1994):

- genetically potential of species
- high doses of mineral fertilizers with nitric nitrogen, applied to cultures
- low temperature
- reduced light intensity
- maintenance system of soil

MATERIAL AND METHODS

Within the achieved study for to determine the influence of fertilization treatments on nitrates content of some vegetable species, they were used cucumbers (*Triumf F1* hybrid) cultivated within greenhouse and tomatoes (*Capriciu* variety, and *Siriana F1* hybrid) cultivated in solar. Samples were supplied by the Vegetable Research Development Plant for Horticulture Buzău. In the culture technology of cucumbers and tomatoes, they were applied the following fertilization variants (fertilizer being ammonium nitrate with 33% nitrogen):

V1 = 0 kg nitrogen/ha; V2 = 100 kg nitrogen/ha; V3 = 200 kg nitrogen/ha;
V4 = 300 kg nitrogen/ha; V5 = 400 kg nitrogen/ha.

In the culture technology of cucumbers, for each fertilization variant, they were achieved 4 repetitions, and in the case of tomatoes they were achieved 2 repetitions.

For determination of the accumulation potential of nitrates in cucumbers and tomatoes cultivated within protected environments, it was used an enzymatic method. In this method, nitrate is reduced by the reduced nicotinamide adenine dinucleotide phosphate (NADPH), to nitrite, in presence of nitrate-reductase (NR):

$$NO_3^- + NADPH + H^+ \xrightarrow{NR} NO_2^- + NADP^+ + H_2O$$

Amount of oxidized NADPH is stoechiometrically equal with nitrate amount. Decreasing of NADPH amount is measured through absorbance at λ = 340 nm.

For determination of the accumulation potential of nitrates in cucumbers and tomatoes cultivated within protected environments (greenhouse, solar), it was proceeded to:

- ✓ For each fertilization variant, within each repetition, they were analyzed three average samples of cucumber and tomato, respectively, being determined nitrates content in mg/kg
- ✓ It was determined arithmetic average of nitrates content for those three samples, within a repetition, obtaining thus the accumulation potential of nitrates in cucumbers and tomatoes within respective repetition
- ✓ It was determined arithmetical average of nitrates content for the repetitions within a fertilization variant, obtaining thus accumulation potential of nitrates in cucumbers and tomatoes within respective fertilization variant

RESULTS AND DISCUSSION

Within experimental variant V1 (without fertilizer adding), nitrates content of cucumbers is in the range 52.35 – 54.27 mg/kg. The average value of the accumulation potential of nitrates in this case is 53.35 mg/kg. Cucumbers are a vegetable species with a low accumulation potential of nitrates.

When is applied fertilizer, nitrates content of cucumbers increases once with increasing of fertilizer dose (ammonium nitrate with 33% nitrogen). Thus, in the case of fertilization variant V2 (100 kg nitrogen/ha) cucumbers have a nitrates content in the range 81.50 – 84.92 mg/kg, and the average potential of nitrates accumulation is 82.93 mg/kg, with 55.44% much more than in case of none fertilizer applied.

Within fertilization variant V3 (200 kg nitrogen/ha) cucumbers have a nitrates content in the range 120.23 – 123.85 mg/kg, and the average potential of nitrates accumulation is 122.16 mg/kg, of 2.3 times higher, than in case of none fertilizer applied.

Application of a fertilizer dose of 300 kg nitrogen/ha (fertilization variant V4), it determines increasing of 3.23 times of the average potential of nitrates accumulation in cucumbers cultivated within these conditions, comparative with those non-fertilized. In the case of this fertilization variant cucumbers have nitrates content in the range 170.21 – 174.15 mg/kg, and the average potential of nitrates accumulation is 172.32 mg/kg.

Use in the culture technology of a fertilizer dose of 400 kg nitrogen/ha (fertilization variant V5), it determines increasing of 4.17 times of the average potential of nitrates accumulation in cucumbers cultivated within these conditions, comparative with non-fertilized cucumbers. In the case of this fertilization variant, cucumbers have a nitrates content in the range 220.95 – 224.08 mg/kg, and the average potential of nitrates accumulation is 222.44 mg/kg.

Between fertilization level with nitrogen of the cucumbers culture, within protected environments and accumulation potential of nitrates in cucumbers, it was established a liniar correlation, described by equation $y = 0.4276x + 45.126$, linearity coefficient (R^2) being 0.9889.

According to the obtained results, cucumbers are vegetable species with an average potential of nitrates accumulation.

According to the obtained results, nitrates content of tomatoes cherry type, *Capriciu* variety, cultivated within solar (through application of 5 fertilization variants), is very low, being in the range 3.54 – 10.02 mg/kg. Application of different doses of fertilizer (ammonium nitrate with 33% nitrogen) in the range 0 – 400 kg nitrogen/ha it does not determine meaningful differences, for the accumulation potential of nitrates, in this tomatoes variety. In the case of those 5 fertilization doses, tomatoes cherry types, *Capriciu* variety, have a very low accumulation potential of nitrates.

Between fertilization level with nitrogen of tomatoes cherry type, *Capriciu* variety, culture within solar and accumulation potential of nitrates in tomatoes, it was established a liniar correlation, described by equation $y = 0.0162x + 3.738$, linearity coefficient (R^2) being 0.9923.

According to the obtained results it can be concluded that nitrates content of tomatoes, *Siriana F1* hybrid, cultivated within solar (through application of 5 fertilization variants), is very low, being in the range 3.57 – 12.33 mg/kg.

Application of different doses of fertilizer (ammonium nitrate with 33% nitrogen) in the range 0-400 kg nitrogen/ha it does not determine meaningful differences, for the accumulation potential of nitrates, in this tomatoes hybrid. In the case of those 5 fertilization doses, tomatoes, *Siriana F1* hybrid, have a very low accumulation potential of nitrates.

Between fertilization level with nitrogen of tomatoes, *Siriana F1* hybrid, culture within solar and accumulation potential of nitrates in tomatoes, it was established a liniar correlation, described by equation $y = 0.0216x + 3.58$, linearity coefficient (R^2) being 0.9969.

CONCLUSIONS

1. Cucumber samples, *Triumf F1* hybrid, obtained in culture within greenhouse, through application of 5 fertilization variants, have an average potential of nitrates accumulation in the range 53.35 mg NO_3^-/kg – 222.44 mg NO_3^-/kg. The minimum value of nitrates content is for non-fertilized cucumbers, and the maximum value is for fertilized cucumbers with 400 kg nitrogen/ha.
2. Between fertilization level with nitrogen of cucumbers culture, within greenhouse, and accumulation potential of nitrates in cucumbers, it was established a liniar correlation, described by equation $y = 0.4276x + 45.126$, linearity coefficient (R^2) being 0.9889.
3. Nitrates content of the tomatoes cherry type, *Capriciu* variety and *Siriana F1* hybrid, cultivated within solar (through application of 5 fertilization variants), is very low, being in the range 3.54 – 12.33 mg/kg.

ACKNOWLEDGEMENTS

The experiments were performed within the contract no. 51-050/18.09.2007, financed through Programme 4 "Partnerships in priority S&T Domains" 2007 – 2013 – National Centre for Projects Management.

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FIGURES

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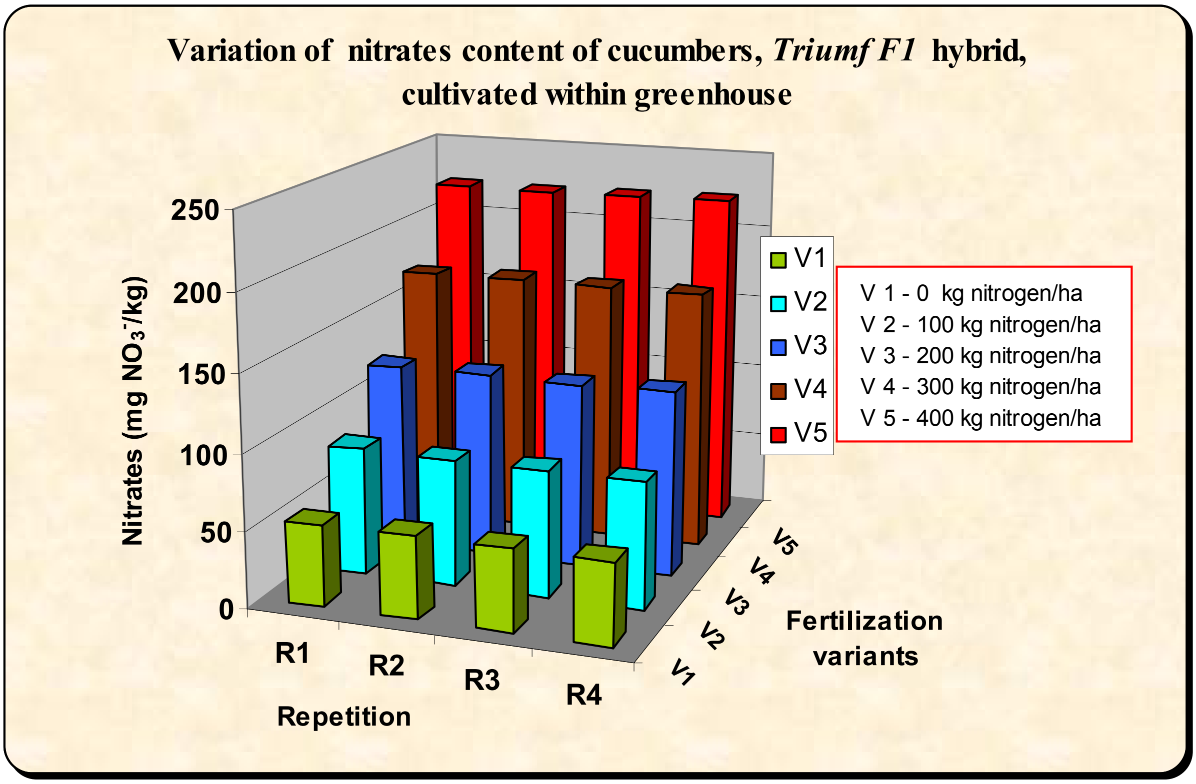

Fig. 1. Variation of nitrates content of cucumbers, *Triumf F1* hybrid, cultivated within greenhouse

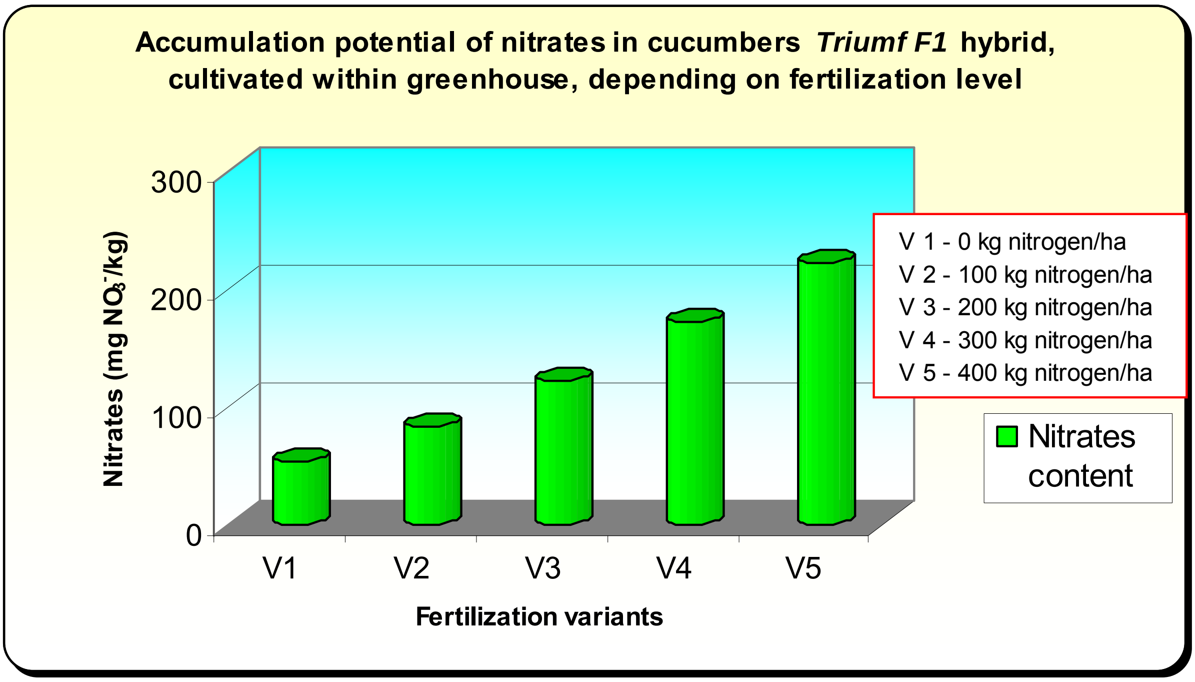

Fig. 2. Accumulation potential of nitrates in cucumbers, *Triumf F1* hybrid, cultivated within greenhouse, depending on fertilization level

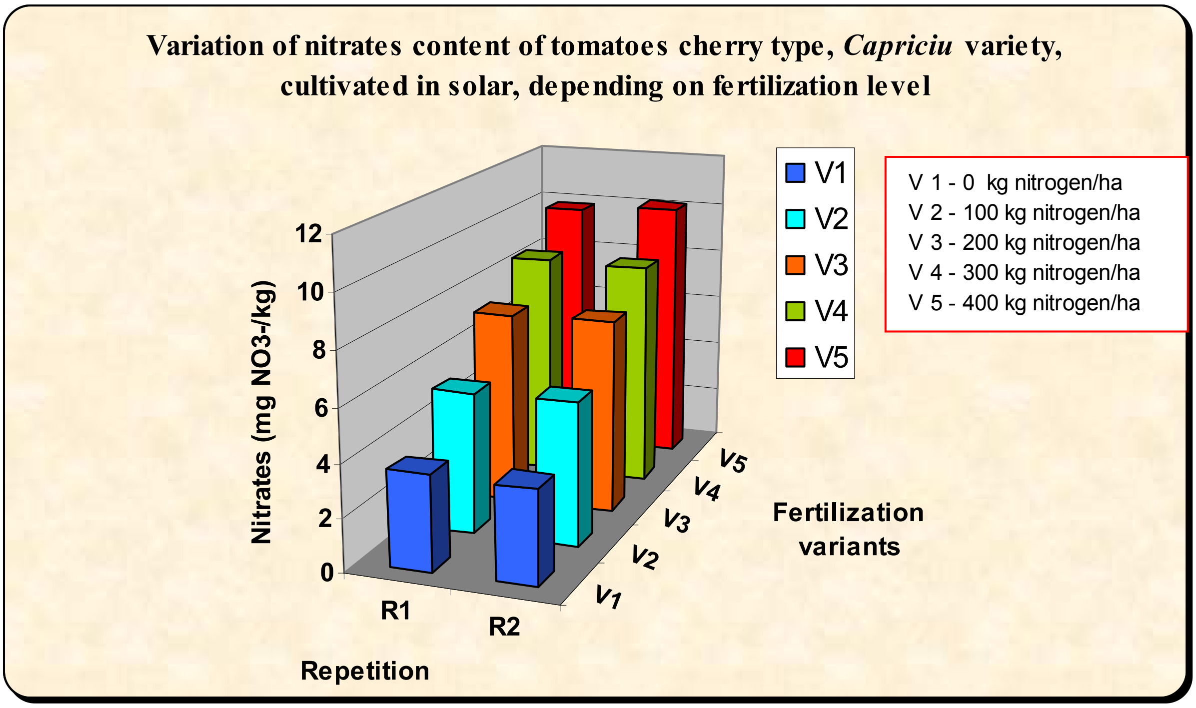

Fig. 3. Variation of nitrates content of tomatoes cherry type, *Capriciu* variety, cultivated in solar, depending on fertilization level

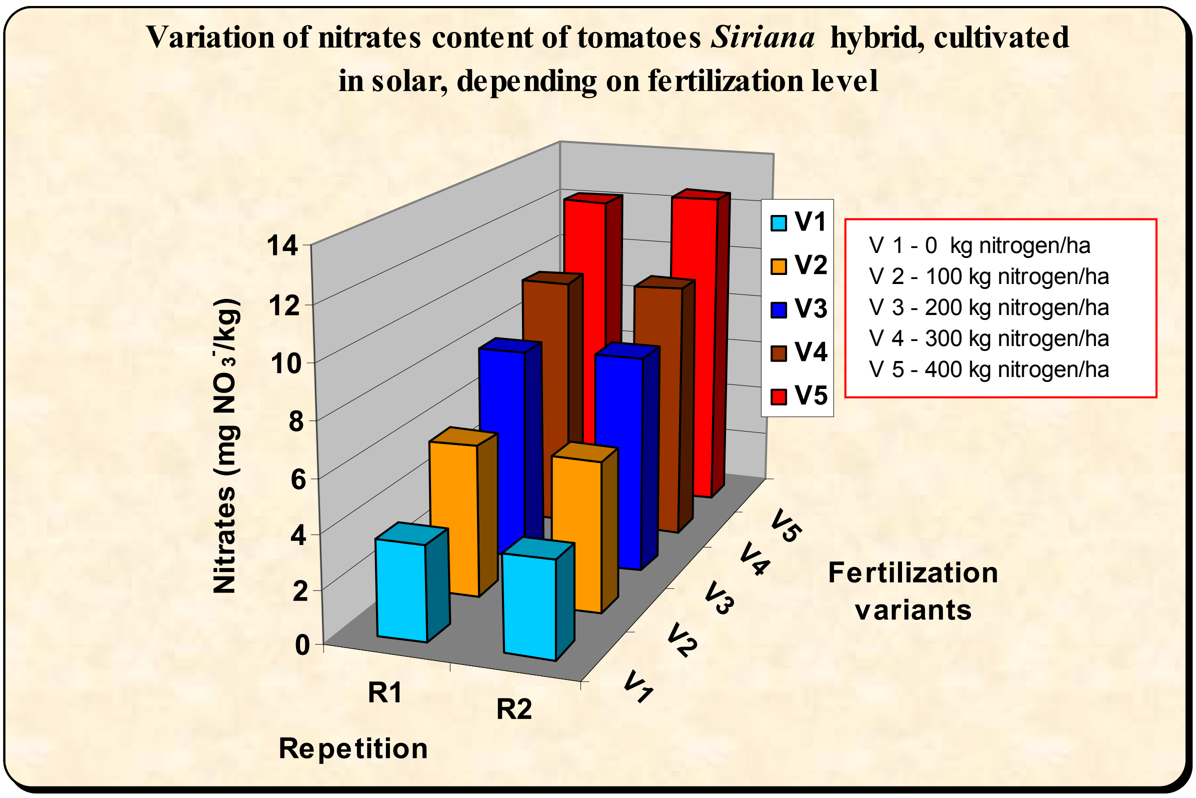

Fig. 4. Variation of nitrates content of tomatoes, *Siriana F1* hybrid, cultivated in solar, depending on fertilization level

Liriomyza trifolii (Diptera: Agromyzidae) - some morphological characters for pest identification

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Keywords: Agromyzidae, American serpentine leafminer, quarantine pest, identification

ABSTRACT

The American serpentine leafminer *Liriomyza trifolii* Burgess 1880 is known as one of the most economically pest of ornamental and vegetable crops in many regions of the world. Also, this pest was recorded on weeds (Minkenberg, 1986). The larvae feed in leaf mesophyl tissue producing long and serpentine tunnels inside of leaflets which may cause reductions in crop values or yield (Spencer, 1973). In Romania this polyphagous pest is regulated as quarantine pests as well as other leafminers species: *Liriomyza sativae* and *Liriomyza huidobrensis*. According to data providing by Romanian Faunistic Checklist (2007) in Romania there are 12 species of Liriomyza. Due to the differences in phytosanitary measures applied to the leafminers detected on imported plant material or in the fields it is important to have precise species identification.

INTRODUCTION

In Romania the leaf miner *Liriomyza trifolii* was detected for the first time in 1981 (Deheleanu and Macedon) and has subsequently spread in the greenhouses. Despite of its presence in Romania the studies on American serpentine leafminer are limited and also the bibliography.

In order to apply the adequate measures and develop an effective control of leafminer is important to understand the systematic of agricultural pests. The Liriomyza species known as quarantine pest for Romania, including *Liriomyza trifolii* are difficult to identify at immature stages (eggs, larvae and pupae). Female adults, pupae and larvae can only be identified at the level of groups of species (*bryoniae* group- *Liriomyza bryoniae*, *Liriomyza huidobrensis* and *Liriomyza strigata*, *trifoli*i group-*Liriomyza trifolii* and *Liriomyza sativae*. Leafminers of *Liriomyza* genus can be identified using classical morphological methods at the adult stage, especially male genitalia (Spencer, 1973).

MATERIAL AND METHODS

The main object of this work is to present some morphological characters used for identification of *Liriomyza trifolii* population.

The *Liriomyza* specimens used for this study were obtained from a tomatoes greenhouse originated from Romania. In order to get adults we collected the mined leaves with living larvae, transported them in the laboratory in a sealed plastic bag in order to retain the turgidity of the host plant or collected puparia, directly, found adhering to the leaf surface using a soft brush. The pupae were placed, individual, in Petri dishes at room temperatures (20-25° C) in the laboratory on a small strip of filter paper to prevent the desiccation, until adult emergence. When the fly emerges it must be allowed to harden for 24 hours before killing for identification purpose. After killing, in the refrigerator, specimens were collected in safe recipes with 75% ethanol and kept in dark, until the dissection process. To check the external characters, mainly the coloration, and the adults were observed in water or glycerin. For an accurate identification the male genitalia should be examined. In this way, males were placed in 10% KOH solution and leave for 24 h for tissue maceration. After that the specimens were washed in distilled water and the abdomens were dissected under a Leica MZ 12_5 stereomicroscope. For microscopic examination the genitalia were mounted in Hoyer solution and observed at Zeiss Axio Imager. A1. microscope.

RESULTS AND DISCUSSION

The main external characters used for *Liriomyza trifolii* identification were: frons and front orbits entire yellow or orange, both vertical setae on yellow ground; all antennal segments bright yellow, third small, round and finely pubescent (figure 1); mesonotum matt black with gray undertone, distinctly mat, acrostichal bristles occur irregularly in three or four rows at the front, reducing to two rows behind; scutellum yellow; anepisternum yellow with small blackish grey mark at front lower margin. Legs: coxae yellow, femora with variable brownish variation striation, but lighter than tibiae and tarsi; tibiae and tarsi darker, brown (figure 2). Discal cell small, vein Cu 1 A with a three times length of b (figure.3); distiphallus (terminal part of aedeagus) with one distal bulb with marked constriction between lower and upper halves (figure 4), aedegeal hood conspicuously narrowing distally (fig. no.5) (Spencer, 1973, Dempewolf, 2004).

CONCLUSIONS

The leaf miners are small flies which produce tunnels through the leaf feeding on the tissue. Action is taken to exclude or eradicate those species of Liriomyza named in the Plant Health Directive of European Community, as follow: *Liriomyza trifolii*, *L. huidobrensis* and *L. sativae*. These species must be separated from other pest and non-pest species which may be also found in the cultures or in the imported products. Identification of species using classical morphological methods is restricted to the adult stage and because the characters used are minute or internal, this is not practicable in the field.

The male genitalia have extreme significance both for the identification of individual species and also for the clarification of generic relationships. They represent a large complex of taxonomic characters which show remarkable constancy. The most significant and stable structure in the male genitalia is the distal part of the aedeagus, called distiphallus.

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FIGURES

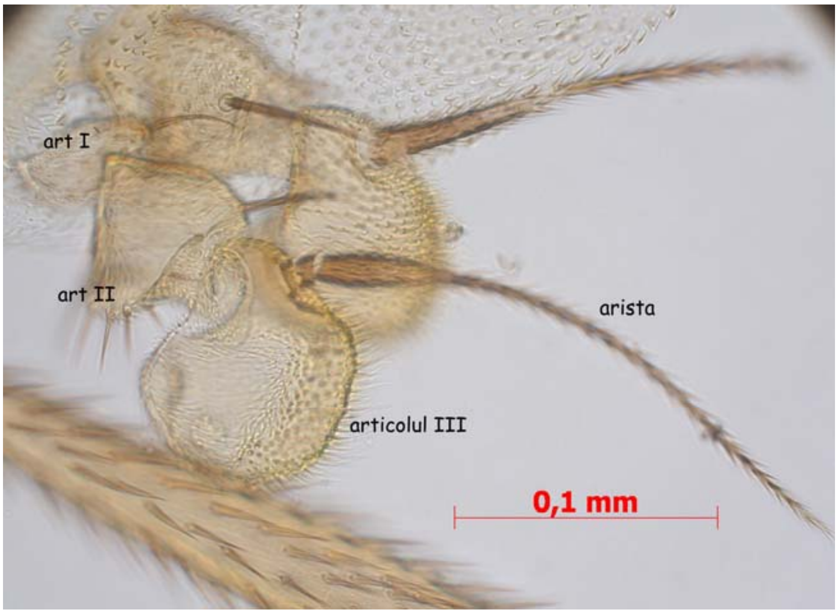

Fig. 1 Antennal segments

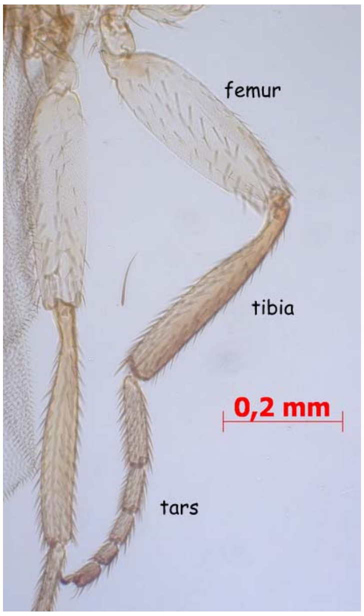

Fig. 2 Legs

Fig. 3 Aedeagus with one bulb

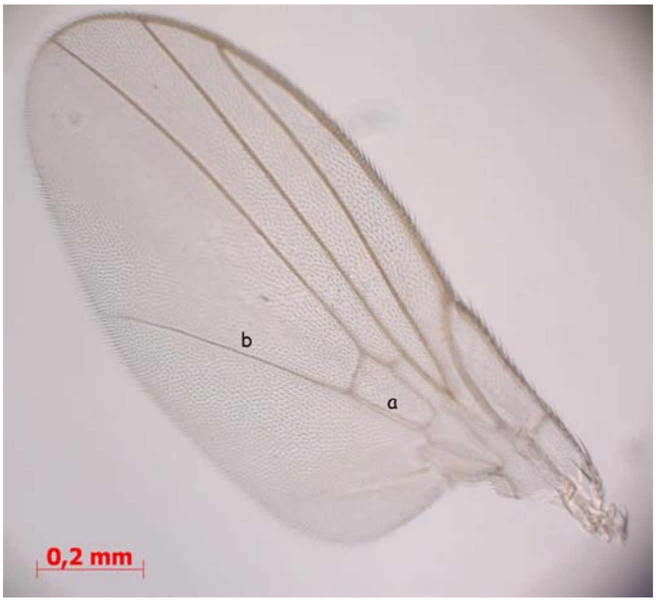

Fig. 4 Wing with “b” greater then “a” (3-4 times)

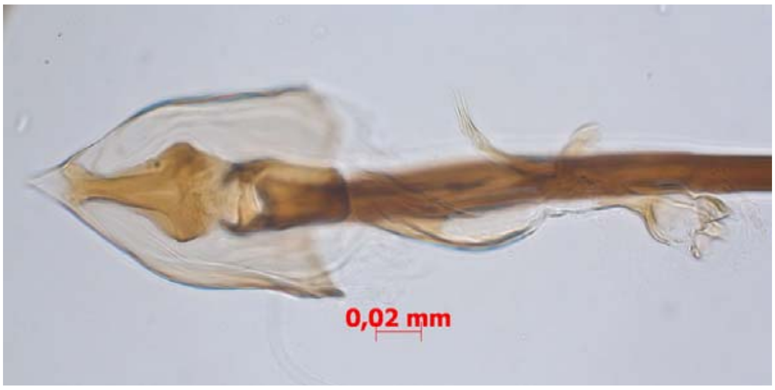

Fig. 5 Aedegeal hood with sharp end

Variability of the main characteristics in a Romanian-French bean variety *Alena* during the process of conservative selection

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Keywords: dwarf variety, midearly range, green pod, broad-elliptical section, neither threads

ABSTRACT

The research works were carried out to R.I.D.V.F.G. Vidra, during the 2002-2004 period, on the field of prebase seed to the French green bean culture. Biological material was represented by a new Romanian variety: *Alena.* The object of this study was obtaing of the prebase seed stock. For determing the variability of principal caracters of biological material were made the following biological measurements: number of pods per plant, pod length, pod width, the number of grains in the pod, weight of one thousand grains during the dry stage. There were calculated the arithmetic mean, standard deviation, variability coefficient for integrating them in the variability limits of principal characters studied. *Alena* belongs to the middle early group French bean (57 days from the sprouting date to the technological maturity of the pods), with green pods, middle length (13,3cm) and broad-elliptical section. The flowers are white. The dry grain is of medium to small in size, having a white colour.

INTRODUCTION

In order to assure a permanent distribution of the seed stock belonging to the valuable varieties which are able to maintain initial traits and characteristics, it is necessary after the variety certification, to carry out a series of measures and proceedings aiming to reach this end. These techniques are based on scientifically bases according to biological specificity of the species and variety in a well established frame called formerly seed and vegetal plant production by selection. As a result, the process of plant breeding doesn't finish by creation and releasing of a new variety, but it goes on aiming to maintain it at the same high biological value during the whole period under multiplication for the production requirements.

Taking into account the present stage of the research works carried out both in our country and abroad, the research team who worked at this project aimed to attain the following objectives:

a. supply with seed stocks of high biological links (PB II) which are necessary for introduction in the culture of the assortment of Romanian cultivars registered in the official list for the year 2000 for the French green bean ALENA, in suitable amounts for the national requests;
b. maintaining of the genetic structure of the new Romanian French green bean varieties certified for the growing in the year 2000 at the values of the parameters established by the state standards for every biological category;
c. assurance of a high biological, cultural and phytosanitary level of the seeds according to the compulsory standards of the legislation in force (Low 266/2002) by the application of some technical methods in a differentiated way for each variety and cultural stage;
d. drawing up of some new strategies in order to limit the presence of the pathogens, pests and weeds populations under the economical threshold for damage in French bean seed crop grown in open field;
e. promotion, dissemination and practical demonstration of the research works in the vegetable growing domain.

MATERIALS AND METHODS

The French greean bean variety *Alena* was created at the R.I.D.V.F.G. Vidra by the research worker Constantin Ionescu. It is a dwarf variety belonging to the midearly range (57 days to maturity), having a green pod. In transversal section pods are in a broad-elliptical shape. It presents neither threads nor parchment like layer. Dry grains are white in colour and medium to small size. This variety is susceptible to the attack of *Xanthomonas phaseoli* and common Mosaic virus but it shows a high tollerance to yellow Mosaic virus as well as *Pseudomonas phaseolicola*. It is characterized by a high yielding potential of about 11.7 t/ha green pods.

The following experimental fields for French green bean were set up: - Selection field (CA), Field for the study of descendants (CSD) and Prebase field (CSPB).

The experimental plots were placed respecting the crop rotation regulations.

The sowing plots were get ready in spring when the humidity of the soil permitted mechanical works by two passings of the combinator.

For the French green bean crop sowing was achieved mecanically with the aid of a tractor L 445 + MELO for the prebase field (using a sowing scheme consisting in two rows at a distance of 70 cm apart and assuring a plant density of 350,000 plants per ha.), and manually for the plot for the study of descendants with two rows per a furrow, when soil temperature was 10-12 ^{0} C at a depth of 5 cm.

For the weed control the herbicide Treflan 48 EC-2,5 l/ha. was applied preemergenty and four manual hoeings were achieved by association with two another mechanical hoeings with the aid of the tractor L 445+CL. Simultaneously at the first manual hoeing complex chemical fertilizers NPK (15-15-15) were applied at a dose of 100 kg/ha.

To control pest and disease development chemical treatments were applied associated with application of the foliar fertilizers.

Biological sorting out was carried out and a selection method was applied according to the principle single plant descendence. Mass selection was applied taking into account the principle of negative characters by removing the plants and lines which showed deviations from the variability interval computed for the main characters.

As a research method for the obtaining of the phenological phases “phenotipical observations” were used and for the morphological and productive traits necessary in order to compute the interval of variability “determinations” and “biometrics measurements” were carried out.

In order to establish the variability of the main characteristics of this biological material and for the computing of the variability interval of each trait, under the soil and weather conditions specific to the R.I.D.V.F.G. Vidra, the arithmetic mean (x), the standard deviation (s) and the coefficient of variability (s%) were computed.

The research works carried out under the soil, weather and phytocenoses conditions from the R.I.D.V.F.G. Vidra regarding integrated control of the pathogens, pests and weeds in French green bean for the seed crop included:

- establish of the frequency and intensity of the attack during the vegetative period as well an investigation on the ecological requirements for their development;
- identification of the host plants belonging to wild and cultivated flora as well as their contribution for the increase of the contamination potential;
- identification of some efficient control products;
- establish of a plan containing preventive and curative methods in order to limit pathogens and pests attack.

RESULTS AND DISCUSSIONS

2,500 representative plants for the highest level of authenticity of the variety were selected out. They were remarkable by high productivity, good phytosanitary state and other morphological characteristics such as pod size and shape, leaf and leaflet colour. From these elite plants, seeds were harvested separately in order to assure the seed stock according to each biological category planned.

During the vegetative period phenological observations upon the main morphological traits regarding specificity elements of the variety were carried out on the shape and the color of the leaf and color of the flowers as well as pod shape and color.

Observations on the following phenological stages were carried out: sowing-date, mass sprouting of the plantlets, date of the flowering beginning, pod setting, grain development in the pods, and date of the technological and physiological maturation.

Concerning to the vegetative period, this index was expressed by the number of days elapsed from the sprouting to the technological maturity and per phenological stages (Table 1).

Considerring the variability term for the traits number of pods per plant, pod length, number of grains in the pod and weight of 1,000 seeds in dry stage one can be found that the above mentioned French green bean presented a medium coefficient of variability (Table 2).

Table 3 showed that was realized a higher biological purity of the French green bean of over 98%; the value of sprouting capacity increased by 10%, while the seed harvest increased in average by 10%.

Insecticides mentioned in the project showed a effectiveness of over 90% against the French green bean crop pests.

On a natural scale, a large number of predator species belonging to the genus *Coccinella* have a direct intervention in control of the level of aphid populations.

An important link of the term of durable agriculture is the integrated management of the weeds, pathogens and pests. It includes a system of integrated measurements to maintain the weed population density under the damage threshold. The system aims to achieve a minimum impact against both the environment and economical and social activities.

Firstly, this system is based on some agricultural, technical and biological measures. There is not excluded the use of herbicides but they are used moderately, only in some extreme cases and only with substances having a minimum impact against the environment. Its main objective is decreasing or changing the weed influence to a tolerant level. It takes into consideration development of the weed population as well as their influence. The system assures keeping up of the biodiversity as a requirement for a durable agriculture.

In this new conception, control have to be integrated in the frame of management because this term does not exclude control measures but puts an important stress on them in the frame of an integrated control to a tolerant level for the growing plants (Table 4).

CONCLUSIONS

One can assure the seed material which is necessary for the development of the process of conservative selection, in order to promote and extend the new vegetable creations obtained at the R.I.D.V.F.G. Vidra for growing on a large scale because they are certified in the year 2000 and on the other hand, they are listed in the Official List, where R.I.D.V.F.G. Vidra is responsible for the maintaing of the French green bean *Alena*.

Because the following links, such as selection field, sorting out field, prebase seed stock field and base seed stock field need some special selection works, these links are developed only in the frame of the R.I.D.V.F.G. Vidra.

By introduction in the culture of this new French green bean cultivar there is assured the possibility to get some stabile, high yields, superior from the quantitative and qualitative point of view by comparison with the old assortment. Having a different period of vegetation, one can provide in a ritmic and sufficient manner both the market and canfactories with row material. As a consequence, there is a positive impact on the health of the consumers by providing a large amount of fresh vegetables for a longer period during the year.

This variety can be grown all over the growing areas suitable for French green bean in our country.

The scheme of integrated control of pathogens, pests and weeds is based on the use of an adequate crop rotation associated with preventive and curative measures, namely agrotechnical, biological and chemical methods.

Distinction between the preventive and curative methods is relative, because most of agrotechnical methods as well the chemical ones have in paralel a preventive characteristic ploughing, hoeing, herbicide application are methods able to destroy the existing weeds in the field much earlier before seed apparition and dissemination and that leads to a decrease of the weed populations for the next years.

By drowing up of the new strategies for integrated control of the pests, pathogens and weeds from the French green bean seed crop and by decreasing of their population level under the economical threshold of damage will be render possible the decrease of the number of chemical treatments during the period of vegetation. So, this will lead to a significant diminuishing of the environment pollution as well achievement of yields having a minimum level of chemical residues which means favourable implications on the life quality.

Beneficiaries of these results can be the state societies having a major share of the capital, economical agencies authorized to multiply and trade vegetable seeds which belong own farms, agricultural societies for trade, processing units for cans which have own or hired acreage, both point or individual producers under licence which work on the Romanian territory.

These research results can be useful for the educational units where such new creations are taught and popularized for the future specialists.

ACKNOWLEDGEMENTS

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TABLES

Table 1. The main phenological phases expressed by the number of days for the French green bean varieties *Alena*, R.I.D.V.F.G. Vidra, 2002-2004

Sowing-sproutingphase	Sprouting-flowering phase	Sprouting-pod setting phase	Sprouting– grain development phase	Sprouting– technological maturity phase	Sprouting– physiological maturity phase
13	32	45	51	57	89

Table 2. Variability of the main characters of the French green bean variety *Alena*, R.I.D.V.F.G. Vidra, 2002-2004

Character	Arithmetic mean	Standard deviation	Variability coefficient.	Variability value
Number of pods per plant	16,6	4,7	24,0	middle
Pod length (cm)	13,3	1,5	11,3	middle
Pod width (cm)	0,95	0,08	7,9	low
Grain number per pod	4,3	0,8	19,0	middle
Weight of 1000 dried grains (gr)	241,8	35,8	14,8	middle

Table 3. Some physiological indices characterizing the seed quality in the French green bean variety *Alena*, R.I.D.V.F.G. Vidra, 2002-2004.

Purity (%)		**Germination (%)**				**Humidity (%)**
Seed purity	**Inert matter**	**Total germination**	**Normal embryos**	**Anormal embryos**	**Dead seed**	
99,9	0,10	92,5	92,5	6,5	1,0	10,9

Table 4. Scheme of integrated control of the pathogens, pests and weeds from the French green bean crops, R.I.D.V.F.G. Vidra, 2002-2004.

Crop rotation	Preventive measures	Curative measures		
		Agrotechnical method	Biological method	Chemical method
Performing of a suitable vegetable crop rotation for 3-4 years: straw cereals, roots+bulbous, solanaceous-fruit, leguminous+ cabbages	Use of varieties having tollerance/ resistence against pathogens	Placement of the crops under maize curtains, in long plots situated perpendicular against the dominant wind	Coccinella	Treatment of the seeds before sowing date
Field choosing	Removing of vegetal parts after harvesting	Destroying of the host plant species from wild flora		Foliar treatment application under warning conditions
	Deep ploughing	Assure of an optimum technology for the French green bean seed crops		Alternative use of the fungicides and different active substances which are selective for the useful entomofauna species
	Irrigation of the French green crop by furrows	Hoeing		Application of the chemical weed control measures differentiatedly on each plot
	Preventive and curative chemical treatments of the cultivated host plant.			Control of the sagittated weeds on the while unit
	Avoidance of the weeds dissemination in the frame of the unit			

Napomyza (Phytomyza) gymnostoma – a new pest of *Allium* plants in Romania

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Keywords: Agromyzidae, morphology, damages, spread, control

ABSTRACT

In spring 2007, an allium leafminer was recorded for the first time in non-commercial onion crops (Mirela Cean, 2007). Typical feeding symptoms were observed, caused by the mining behavior of larvae, producing the formation of descending galleries. The pest was identifying as *Napomyza* (*Phytomyza*) *gymnostoma Loew.* based on morphological characters of the adults. This leafminer is a pest of *Allium* spp., particularly leek, onion (bulb and spring), garlic, and chive and also a potential pest of ornamental *Allium* plants.

INTRODUCTION

Napomyza gymnostoma Loew, 1858 is a leaf miner from Diptera: Agromyzidae which was first described in 1858, in Poland (the region of Poznan) and named *Phytomyza*. In 1976, it was transferred to the genus *Napomyza* by Spencer and back to *Phytomyza* in 1994 by Zlobin.

This pest was reported in 1976 in Denmark, Sweden, and Poland and in the Mediterranean Basin. Today, the pest is widespread in Europe, as follow: Austria (damage reported in 1994), Croatia (1990, now reported as the most important and most frequent pest of onions), Czech, Denmark, France (2003), Germany (1994), Hungary (1986), Italy (Friuli-Venetia Giulia in 1999 and Veneto in 2001), Poland (1997), Serbia and Montenegro (1992), Slovakia (1990), Slovenia (1994), Spain, Sweden, Switzerland, Turkey, United Kingdom (2003) (EPPO Reporting Service 2005/064).

MATERIAL AND METHODS

The main goal of this work is to present some morphological characters useful for *Phytomyza gymnostoma* identification, to show damages and to evaluate the spread of the pest in some regions of the country. An accurate identification could help us to avoid the certain confusions of this pest with other *Allium* pest, especially with *Delia antiqua* and *Ditylenchus dipsaci*.

In 2008, some growers who produce onion and garlic crops on small surfaces observed that the plants were damaged by an unknown pest.

Plants with symptoms were transported in the laboratory placed in good condition in order to obtain adults. To check the external characters, mainly the coloration, the obtained adults were observed in water or glycerin. For an accurate identification the male genitalia should be examined. In this way, males were placed in 10% KOH solution and leave for 24 h for tissue maceration. After that the specimens were washed in distilled water and the abdomens were dissected under a Leica MZ 12_5 stereomicroscope. For microscopic examination the genitalia were mounted in Hoyer solution and observed at Zeiss Axio Imager. A1. microscope.

RESULTS AND DISCUSSION

First data obtained show the presence of the pest on a large area in the south part of the country in the following counties: Bucuresti, Dambovita, Calarasi, Ilfov, Arges. An increasing significance has to be expected. The distribution of the pest at the national level it is not known because of its new occurance and also due to possible confusion with other *Allium* pest, especially *Delia antiqua*.

The damaged plants were analyzed in the field and also in the laboratory in order to find the specific symptoms. On the leaves had been seen a large numbers of feeding and oviposition punctures made by females with their ovipositor (fig.1). These punctures are the first sign that the flies are active. The onion fly (*Delia antiqua*) laid the eggs in a different manner, directly in the soil. The *Phytomyza* larvae mine the leaves, moving downward into the stalk, and to the bulb, and pupate at the end of their galleries. This behavior is different from *Delia antiqua* larvae which pupate in the soil. We observed also severe plant deformations: split leaves and stalks, distortions (fig. 2).

Adults of *Phytomyza (Napomyza) gymnostoma* could be identified based on the following characters: small grayish, mat flies of 3 mm long, with a head largely yellow (fig.3); the abdomen is also yellow on the ventral side, halteres white; wing length varied from 2.9 in males to 4.0 mm in females; legs are dark with yellowish knees.

The larvae are headless, white yellowish colored and rich 6-7 mm when fully grown (Fig. 4).

Puparia is dark brown, around 3,5 mm in length, have a pair of posterior spiracle each with 18-20 bulbs(fig. 5).

The eggs are ovoid and translucent, whitish (fig. 6).

CONCLUSIONS

In several countries of mainland Europe this pest has become the major pest of Allium crops. It can infest a high proportion (80-100%) of a susceptible crop (Darvas et al., 1988). Plants can be completely destroyed or reduced in market value. *Napomyza gymnostoma* can cause significant economical damages in *Allium* crops, so further studies should be put in practice in order to investigate the level of infestation at a national level, the pest biology, and host range and also to evaluate possible cultural, chemical, biological control measures.

It can be concluded that more attention should be paid to this potentially damaging pest of leek, onion and other *Allium* crops.

ACKNOWLEDGEMENTS

The authors would like to thank Mr. Martinez for confirmation of the pest.

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FIGURES

Fig. 1 Feeding and oviposition punctures

Fig. 2 Stalk deformation

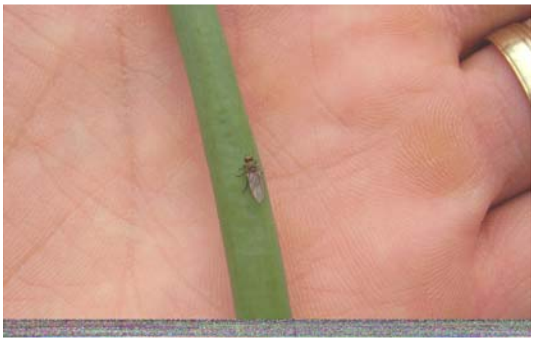

Fig. 3 The adult

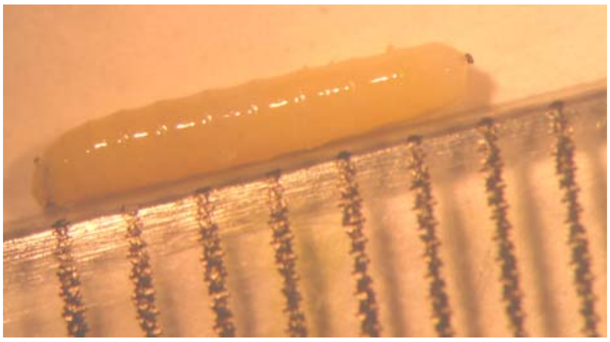

Fig. 4 Full developed larva

Fig. 5 Puparia

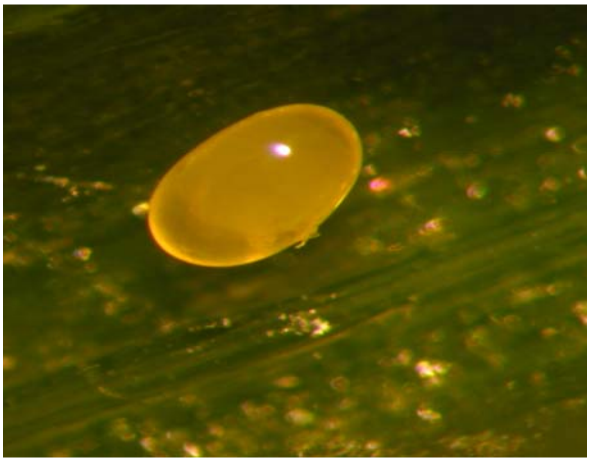

Fig. 6 Egg

Induction of "in vitro" regeneration of tomato plants (*Lycopersicon Esculentum* Mill.) through hypocotyl and tip explants culture

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ABSTRACT

Tomato (*Lycopersicon esculentum* Mill.) is a major vegetable crop that has a tremendous popularity, being cultivated in almost every country of the world either for fresh market or processing. Due to its economic worldwide and due to the present and future potential of improving the crop through molecular techniques, improvement in the efficiency of regeneration is expected to have a positive impact on transformation results. Also, extending the technology to a wider range of commercial cultivars will speed up the introgression of new economic characters into the tomato germplasm. The present article describes high-frequency shoot induction and regeneration from a number of tomato cultivars that led to the production of normal phenotype fertile plants. Many concentrations and combinations of growth regulators were used to define an efficient regeneration medium. The best reaction - direct bud formation was observed on explants cultured on MS medium added with KIN and IAA. The combination of zeatin with IAA also increased the percentage of organogenesis and the development of the explants.

INTRODUCTION

Tomato (Lycopersicon esculentum Mill.; 2n = 2x = 24), due to its unmatched culinary uses, is the most produced vegetable crop around the world (Nonecke 1989). Tomato is rich in vitamins A and C and fibre, and is also cholesterol free (Hobson and Davies, 1971). An average sized tomato (148 g) boasts only 35 calories. Tomato contains approximately 20-50 mg of lycopene/100 g of fruit weight (Kalloo, 1991). Lycopene is part of the family of pigments known as carotenoids which are natural compounds that create colours of fruits and vegetables. Lycopene is the most powerful antioxidant in the carotenoid family and it protects humans from free radicals that degrade many parts of the body; lycopene is also known to prevent cancer (Block et al., 1992; Gerster, 1997; Rao and Agarwal, 2000). At present, tomatoes are consumed at a higher rate in the developed countries than in the developing countries and hence it may be referred to as a luxury crop.

Development of protocols for *in vitro* selection can provide new advances for the production of improved cultivars. Techniques have been optimised for the production of haploids and somatic hybrids. Attempts have also been made to transfer the higher regenerative ability of wild varieties to cultivated tomatoes. Although, some information is available on the morphogenesis of tomato, the techniques have not been developed to a level at which they can be utilised in large-scale multiplication of commercially important cultivars. The morphogenesis response seems to be highly dependent PGRs used in the media, which is again cultivar and genotypic specific. Somatic embryogenesis in tomato is still at its infancy, and efficient procedures for large-scale production via somatic embryogenesis are yet to be developed. Genetic stability of the tissue culture raised tomato plants also needs to be addressed.

Success of regeneration depends not only on the type of the explant chosen, but also the way explants are placed on the culture media (Duzyaman et al., 1994). Explants can be inoculated on the culture media in polar (straight up, with the physiological base in the medium) or apolar (upside down, physiological base out of the medium) position for the hypocotyls and shoots, and abaxial (lower surface facing down) or adaxial (upper surface facing down) orientation for the cotyledons and leaves (George, 1993).

Micropropagation in *Lycopersicon* could be a useful option when a large number of rare genotypes (such as interspecific hybrids) are required. As in other crops (Baroncelli *et al.*, 1973; Bayliss and Dunn, 1979; Pence *et al.*, 1979; Jarret *et al.*, 1980), different responses (callus production, regeneration of whole plants, roots and pseudo-fruit differentiation) have been reported in tomato, depending on the genotypes, explants, culture media and incubation conditions (Kartha *et al.*, 1976; Tal *et al.*, 1977; Kut and Evans, 1982; Kurtz and Lieneberger, 1983; Locky, 1983; Zorzoli *et al.*, 1993a, b).

Plant tissue culture has progressed immensely from its inception in the 1930s, when the scientists used this technique to grow cells in culture. Currently, it is used for many different purposes such as callus induction, anther culture, protoplast culture and somatic embryogenesis amongst the others. Plant tissue/cell culture is a key facilitator component in genetic transformations using *Agrobacterium tumefaciens*, electroporation and particle bombardment.

In order to achieve these important goals, a primordial condition is the establishment of a viable and rapid multiplication technology, specific for each species, which should allow the regeneration of a sufficient number of plants in the shortest period of time.

MATERIALS AND METHODS

Mature, dry seeds of a high purity variety (TM) were used in our experiments. Vegetable Research and Development Station Bacau supplied the seed samples used in our tests.

Tips and hypocotyl of tomatoes (*Lycopersicon esculentum* Mill.) excised from aseptically germinated seven-day-old seedlings were used as explants for multiple shoot formation. Freshly mature and dried seeds were washed thoroughly under running tap water to eliminate the dust and surface contaminants. The seeds were then washed with distilled water for 3 - 4 min followed by a wash in 70% ethanol for 1 min. Then they were transferred to sterile conical flask and surface sterilized with a 0.1% $HgCl_2$ for 7 min under laminar flow. These were washed with sterile distilled water for three times. Finally they were cultured in germinating medium (MS medium with 0.09M sucrose and 8 g/l agar).

Tips and hypocotyls were separated from seedlings and cultured on MS containing different concentrations of hormones. The media contained 0.09M sucrose, 8 g/l agar and the pH was adjusted to 5.8 prior to autoclaving at 121^0C for 20 minutes.

All the cultures were maintained under a 16 h photoperiod (3000 lux.) regime at 26 ± 2^0C. Subcultures were maintained at a regular interval of four weeks. Data on different parameters were recorded after four weeks of culture.

The morphogenetic response of tomato explants to hormones types and concentrations in nutritive mediums was expressed as a number of explants which formed adventitious buds and where shoots differentiated.

RESULTS AND DISCUSSIONS

Hypocotyl and tip explants excised from aseptically grown seven-day-old seedlings of tomatoes were cultured on MS supplemented with various hormonal concentrations for production and development of multiple shoots. BA, KIN and Zeatin at different concentrations and in combination with IAA were added to MS to determine their effect for shoot development and multiplication.

Shoot development and shoot multiplication were achieved at all media composition containing tips explants (Table 1). The morphogenic potential of explants differed between the two types of explants. The tips proved to be the most potential for multiple shoot regeneration directly compared to hypocotyls.

The data were taken every three weeks after the inoculation of the explants on the cultivation medium. At this time the explants already started the growing and development processes.

The tips grew in height, and already developed six true leaves. Gradually new embryo and shoots appeared at the basis of the initial explants (fig. 1), shortly after, the entire base of the explant being covered with new organogenic structures (fig. 2). After transferring to new media the shoots developed both by increasing in heath and developing new shoots at its base.

The hypocotyls grow in diameter and the terminal edges become globular. The green color of the explants became more intense and none of the explants presented at this time callus. After a while the epidermal tissue of some explants split and new embryos and small shoots started to appear covering the entire explant (fig. 3). Other explants, developed shoots preponderant at one side of the hypocotyl and other at the other side developed adventitious roots (fig. 4).

A distinctive response to "in vitro" conditions, observed at the Lycopersicon species is the appearance starting from early stages of development of adventitious roots, developed both in the medium and outside it (fig.5).

The highest number of shoots (12) per explant was also recorded in media with KIN, from tips (table 2). On the other hand, hypocotyl produced maximum number (6) of shoots at the same medium (table 2). The highest length of shoots derived from tips in the same medium was 5.9 cm. With repeated subcultures at an interval of four weeks the number of regenerated shoots per culture gradually increased.

Meanwhile, MS supplemented with BAP showed comparatively less response toward shoot multiplication from both hypocotyl and tips (Table 2). A considerable improvement of multiple shoot induction from tips and their subsequent growth were also observed on MS supplemented with 4.0 mg/L Zeatine and 0.5 mg/L IAA. However, hypocotyls produced comparatively lower number of shoot/culture at all concentrations of hormones. Interestingly, the answers of the explants were better in case of combination between cytokinin with auxins, comparing with cytokinins alone.

The cultivation of the explants and then of the shoots on the T_0, variants allowed the regeneration of strong, well-developed roots (fig. 6). These variants, characterized through the absence of any growth regulators, were used as witness variants, but the obtained results recommend this medium for its utilization as rooting medium. The absence of any exogenous hormones doesn't allow the differentiation of new shoots, but this variant can be successfully utilized for inducing root formation at the newly formed shoots. We observed that even not well elongated shoots rooted on this medium.

Regenerated plants with six or eight leaves were transferred on hydroponics medium (fig.7) and kept about four days covered with a plastic foil, in the culture room. Subsequently, they were day by day acclimatized to room atmosphere.

Surviving plants, nearly 100% (fig. 8) were transferred to the greenhouse and grown to maturation.

CONCLUSIONS

The researches finalize through the obtaining of viable plants through direct organogenesis and embryogenesis. The capacity of regeneration is strongly depending on the type and quantity of exogenous hormones. The best morphogenetic reaction was obtained on the variants that contained as growth regulators the kinetine and IAA. These hormones allowed both in tips and hypocotils the development of meristematic centres that rapidly evolved in shoots.

Optimum values for shoot induction, were obtained on MS medium, supplemented with KIN - 4 mg/l and 0.5 mg/l IAA. The highest number of shoots (12) per explant was also recorded on these media, from tips. On the other hand, hypocotyl produced maximum number (6) of shoots at the same medium. The highest length of shoots derived from tips in the same medium was 5.9 cm.

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Hypocotyls produced comparatively lower number of shoot/culture at all concentrations of hormones.

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TABLES

Table 1. Variants of nutritive medium with different hormonal factors utilized for "in vitro" regeneration

Variant	BAP (mg/L)	Kinetin (mg/L)	Zeatin (mg/L)	IAA (mg/L)
T_0	-	-	-	-
T_1	4.0	-	-	0.5
T_2	2.0	-	-	0.2
T_3	1.0	-	-	0.1
T_4	5.0	-	-	-
T_5	-	4.0	-	0.5
T_6	-	2.0	-	0.2
T_7	-	1.0	-	0.1
T_8	-	5.0	-	-
T_9	-	-	4.0	0.5
T_{10}	-	-	2.0	0.2
T_{11}	-	-	1.0	0.1
T_{12}	-	-	5.0	-

Table 2. Production of multiple shoots on MS medium containing various concentrations of cytokinins from hypocotyl and tips explants of *Lycopersicon esculentum* Mill.

Variant	Tips			Hypocotyl		
	% responsive explants	No. of shoots/explant (± SE)	Mean length of shoots	% responsive explants	No. of shoots/explant (± SE)	Mean length of shoots
T_0	30	3±0.85	4.4	24	2±0.32	4.6
T_1	48	2±0.15	4.6	40	2±0.18	4.8
T_2	52	4±0.48	5.3	45	3±0.52	4.8
T_3	50	3±0.72	4.6	40	3±0.48	4.5
T_4	38	4±0.38	4.9	35	4±0.58	5.4
T_5	73	12±1.25	5.9	66	6±0.57	5.6
T_6	65	8±1.12	5.4	62	5±0.62	5.5
T_7	60	5±0.88	5.3	48	3±0.35	5.2
T_8	46	5±0.65	5.2	38	4±0.62	5.3
T_9	62	5±0.68	5.1	58	4±0.42	5.5
T_{10}	58	3±0.35	4.6	42	3±0.37	4.8
T_{11}	52	3±0.28	4.4	38	3±0.34	4.4
T_{12}	62	7±0.82	4.8	-	-	-

FIGURES

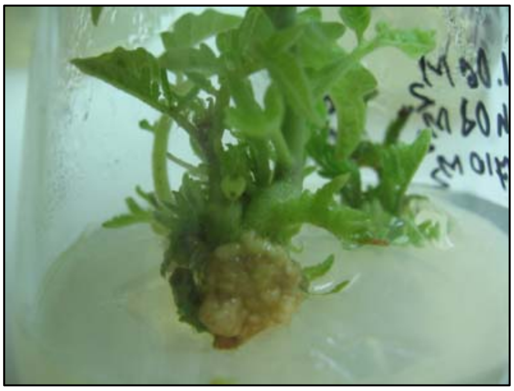

Fig. 1 – The reaction of tips

Fig. 2 – New shoots that appeared at the explants basis

Fig. 3 – New shoots in hypocotyls

Fig. 4 – New shoots at one side of hypocotyls

Fig. 5 – Development of roots on the explants

Fig. 6 – Plants with normally roots

Fig. 7 – Acclimatization of plants

Fig. 8 – Plants in nutritive pots

Manufactured textile cover meant for plant protection in the cold season

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Keywords: plant development, textile composite, polyethylene, parameter, salad

ABSTRACT

INCDTP accomplished a new textile composite material for applications in horticulture, for plant protection (as manufactured cover) against cold and weathering, in the cold season. The CERTEX-C textile composite was entirely made of UV resistant polyethylene, as reinforced woven fabric and special formulated top and bottom laminated films. The functionality of the composite material and that of the manufactured cover, for plant protection against cold and weathering, was established at USAMV Bucharest, through experiments achieved under real utilization conditions, in field, in the cold season of 2008-2009, on two lettuce varieties (Withe Boston; Embrace). The positive evolution of the weekly measured agro-technological parameters (air and soil temperature, air humidity, light intensity, soil pH) and plant development parameters (average height, average leaf number, average plant mass) confirmed the functionality of the textile composite material, by comparison with the uncovered crops. The periodical direct observations of the manufactured cover during experimenting also confirmed their functionality, as material, structure, dimensions, in correlation with the plant dimensions, airing openings, zip closing system and revealed the necessary modification of the cover (side access openings) and of the sustaining system (fixing straps).

MATERIAL AND METHODS

INCDTP accomplished a new textile composite material for applications in horticulture, for plant protection (as manufactured cover) against cold and weathering, in the cold season. The CERTEX-C textile composite was entirely made of UV resistant polyethylene, as reinforced woven fabric and special formulated top and bottom laminated films. The UV radiation transmissions (with average values of 8 determinations per wave length, on a Varian C-50 apparatus) through the individual and assembled films are presented in the figure.1 and confirm the obtaining of the polymer UV stabilization, as well as the composite durability assurance.

The transmission of the visible solar radiation from the 400-700 nm range is an important condition for the development of the plant and therefore of the crop; the values determined on a LAMBDA 350 UV VIS NIR type spectrophotometer and illustrated in the figure 2, confirmed the potential for obtaining a solar light level good for the plant development. The physical mechanical characteristics of the CERTEX C material are presented in the table 1; being flexible and resistant (breaking resistance within the range 155 – 163 N and breaking elongations within the range 5.7-6.9%), the textile composite was transformed into a crop protection cover for the cold season, by usual textile manufacturing technologies.

The manufactured textile cover for the plant protection in the cold season is sustained on attached/incorporated metalic arches and includes peripherical furbelows covered with soil, for the enclosed separation from the exterior environment. The frontal airing and access openings, from both covering extremities, are bordered with classical zippers and easy to open/close; the airing openings are doubled with a low density woven fabric (CERTEX 35), to prevent insects penetration, if the cover is continuously used in the intermediate seasons (figure 3).

The functionality of the textile composite material and of the manufactured covering for plant protection against cold and weathering was established at USAMV Bucharest through experiments achieved under real utilization conditions, in field, in the cold season of

2008-2009, on two adequate lettuce varieties (Withe Boston and Embrace, at 20x20 cm distances between plants). Weekly measurements were achieved for the determination of agro-technological parameters (air and soil temperature, air humidity, light intensity, soil pH) and the plant development parameters (average height, average leaf number, average plant mass) inside and outside the cover and periodical observations were effectuated on the composite material and the manufactured cover's behavior on the field, during the experimenting.

RESULTS AND DISCUSSION

The functionality of the manufactured textile cover for the plant protection in the cold season was experimentally confirmed, under real utilization conditions, by the following observations:

- The good correlation of the cover dimensions with the salad plant dimensions, cultivated on two rows; the cover height allows easness in airing enclosure, due to the special airing openings with zippers;
- The perypherical furbellows and the classical zippers were effective for the enclosure of the environment and therefore protective against cold and weathering in winter;
- The sufficient depth in soil of the arches correlated with the furbellow dimensions that mentained the textile cover integrity, functionality and initial position, over the plants, for the entire winter of 2008-2009, with the exception of the terminal arches inclining to the cover middle, under powerfull winds and rainfall accumulation on the apical zone of the cover;
- The condensation water drops seeped on the interior side of the composite material, allowing the light penetration to the crop.

For functionality increase of the manufactured cover, there were proposed: a) additional lateral zippered access openings; b) an apical/lateral fixing straps between arches, to maintain better verticality of the terminal arches under powerfull wind.

The functionality of the textile composite material CERTEX C for plant protection in the cold season was experimentally confirmed, under real utilization conditions, on the field, as compared to the uncovered crops, by the following data:

- The higher air temperature inside the cover, mentioning that the biggest differences were obtained in the coldest days (table 2);
- The higher soil temperature inside the cover, mentioning that the biggest differences were obtained in the coldest days (table 3);
- The sufficient light intensity for the plant development inside the cover, under winter conditions (table 4);
- More constant and higher air humidity inside the cover (table 5);
- pH was constant during the experimenting, presenting the same value (7), and both inside and outside the cover.

The salad plants development were weekly evaluated, in height (fig.4) and average leaves number (fig.5), using the following codes:

V1 – Withe Boston salad uncovered;
V2 – Withe Boston salad covered CERTEX C;

Every data illustrated in the figures 4-5 represents the average value of the two repetitions (R1 and R2) and each of the repetition included three measured plants.

The diagrams 4-5 totally confirmed the more favourable plant evolution under the manufactured cover made of CERTEX C, as compared with the uncovered crops (especially the White Boston salad), equally as the figure 6, that simultaneously presents the aspect of the salad plants inside and outside the cover, through the access opening.

CONCLUSIONS

The experimenting of the manufactured cover made of CERTEX C textile composite effectuated by the specialists of the USAMV Bucharest confirmed their functionality, as material, dimensions, in correlation with the plant dimensions, airing openings, enclosed protection against cold and weathering due to the zip and furbelow cover closing systems, arches depth in soil, etc; the necessary modifications of the cover regarding the side access openings and the fixing straps were also revealed.

The air and soil temperature increasing inside the cover (till 5°C) and the sufficient solar light incidence to the crop (min.1000 lux) enabled the better plant development and the attainment of higher winter yields, without thermal energy consumption.

These positive results constitued the bases of a new European project in the agro-textile field for our institute to prepare, in partnership with USAMV Bucharest.

ACKNOWLEDGEMENTS

INCDTP expressed a deep gratitude and consideration to the institutions and persons that contributed to the attainment of these results: ANCS–The Nucleus Program, USAMV Bucharest, SC NATROM PROD-IMPEX SRL and to its own involved specialists.

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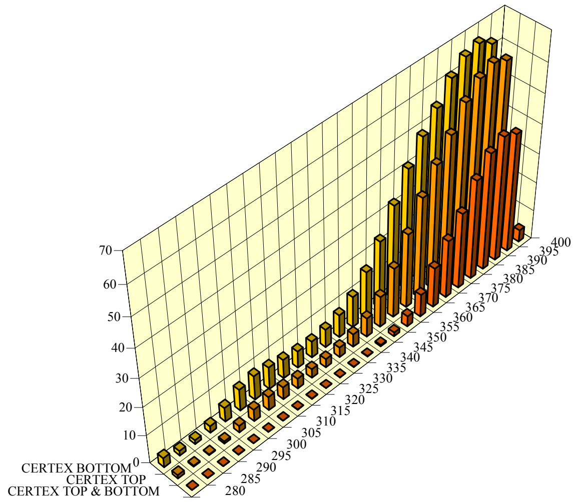
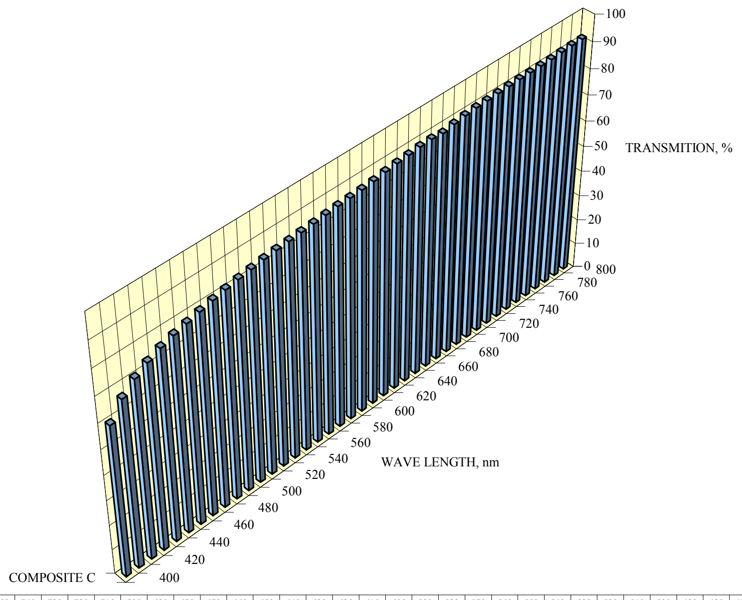
FIGURES

FIG.1 - THE TRANSMITION OF THE UV RADIATIONS WITH THE WAVE LENGTHS BETWEEN 280 - 400 nm, THROUGH THE CERTEX UV STABILIZED POLYETHYLENE SIMPLE FILMS, SEPARATED AND ASSEMBLED, AS A RESULT OF THE FILM THICKNESS INCREASE, %



	400	395	390	385	380	375	370	365	360	355	350	345	340	335	330	325	320	315	310	305	300	295	290	285	280
CERTEX BOTTOM	1.33	64.15	66.99	65.67	61.8	55.18	49.1	41.67	32.63	23.55	16.22	10.9	7.96	6.37	5.76	5.96	6.66	7.76	8.53	7.61	4.96	2.41	1.38	1.66	3.28
CERTEX TOP	32.07	61.63	63.57	61.52	56.88	49.46	42.79	35.07	25.89	17.39	10.81	6.68	4.56	3.44	3.04	3.15	3.63	4.37	4.83	4.23	2.35	0.84	0.28	0.39	1.25
CERTEX TOP & BOTTOM	4.15	40.85	42.93	40.46	34.46	26.29	20.13	13.88	7.86	3.69	1.42	0.52	0.2	0.1	0.1	0.1	0.1	0.11	0.11	0.1	0.1	0.1	0.1	0.1	0.1

FIG.2 - THE TRANSMITION OF THE VISIBLE RADIATION WITH THE WAVE LENGTHS BETWEEN 400-700 nm THROUGH THE COMPOSITE CERTEX C, %

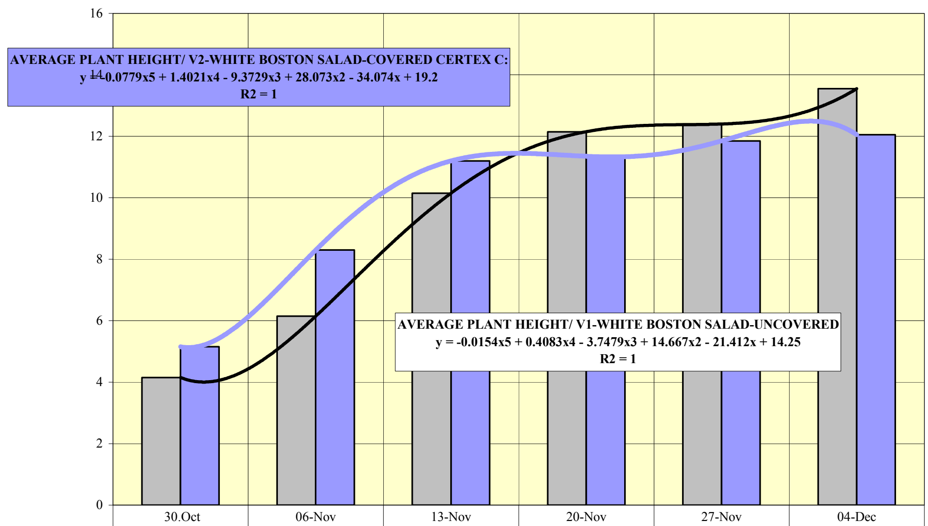


	800	790	780	770	760	750	740	730	720	710	700	690	680	670	660	650	640	630	620	610
COMPOSITE C	91.75	91.75	91.62	91.33	91.27	91.17	91.19	91.06	90.90	90.71	90.60	90.22	89.65	88.83	89.32	89.09	88.68	88.33	87.82	87.17

	600	590	580	570	560	550	540	530	520	510	500	490	480	470	460	450	440	430	420	410	400
COMPOSITE C	86.72	86.49	86.23	85.84	85.43	85.11	84.73	84.34	83.84	83.20	82.54	81.76	80.80	79.74	78.59	77.35	75.84	73.75	70.99	66.86	60.39

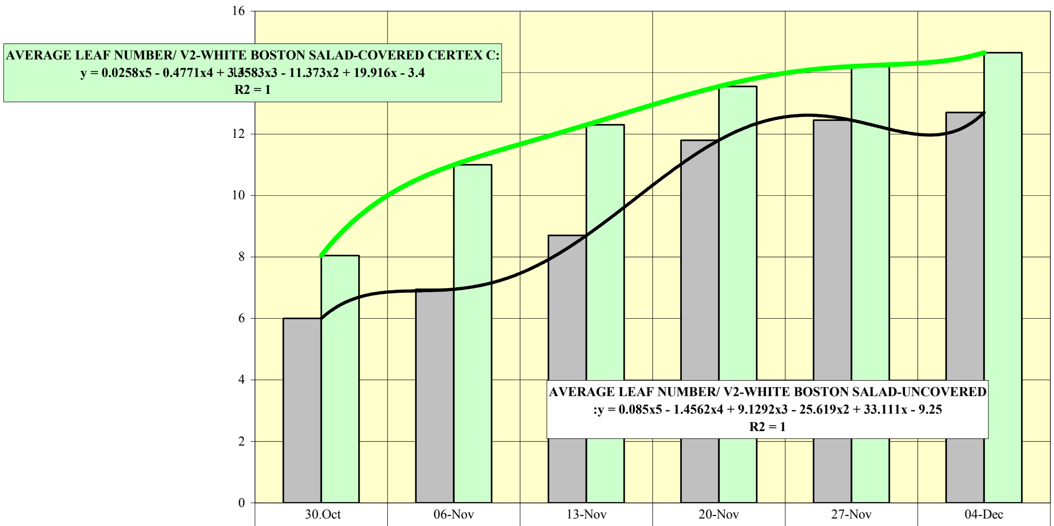
Fig. 3 – Aspects from the manufactured textile cover mounting in the field, at USAMV Bucharest, transversally over the salad rows; Left: The peripheral furbelows aren't yet covered with soil; Right: Both extremities of the manufactured covering includes insect proof airing openings, easy to open/close by zippers. The initial plant aspect is the same, inside and outside the cover.

FIG.4 - THE EVOLUTION OF THE AVERAGE PLANT HEIGHT OF THE WHITE BOSTON SALAD INSIDE AND OUTSIDE THE COVER MADE OF CERTEX C COMPOSITE; INSIDE THE COVER, THE PLANT HEIGHT GREW SLOWLY AFTER 13.11.08, BUT THE AVERAGE LEAF NUMBER INCREASED.



	30.Oct	06-Nov	13-Nov	20-Nov	27-Nov	04-Dec
AVERAGE PLANT HEIGHT/ V1-WHITE BOSTON SALAD-UNCOVERED	4.15	6.15	10.15	12.15	12.4	13.55
AVERAGE PLANT HEIGHT/ V2-WHITE BOSTON SALAD-COVERED CERTEX C	5.15	8.3	11.2	11.35	11.85	12.05

FIG.5 - THE EVOLUTION OF THE AVERAGE LEAF NUMBER OF THE WHITE BOSTON SALAD INSIDE AND OUTSIDE THE COVER MADE OF CERTEX C COMPOSITE; INSIDE THE COVER, THE AVERAGE LEAF NUMBER IS HIGHER AND IT IS CONTINUOUSLY GROWING.



	30.Oct	06-Nov	13-Nov	20-Nov	27-Nov	04-Dec
AVERAGE LEAVES NUMBER/ V1-WHITE BOSTON SALAD-UNCOVERED	6	6.95	8.7	11.8	12.45	12.7
AVERAGE LEAVES NUMBER/ V2-WHITE BOSTON SALAD-COVERED CERTEX C	8.05	11	12.3	13.55	14.2	14.65

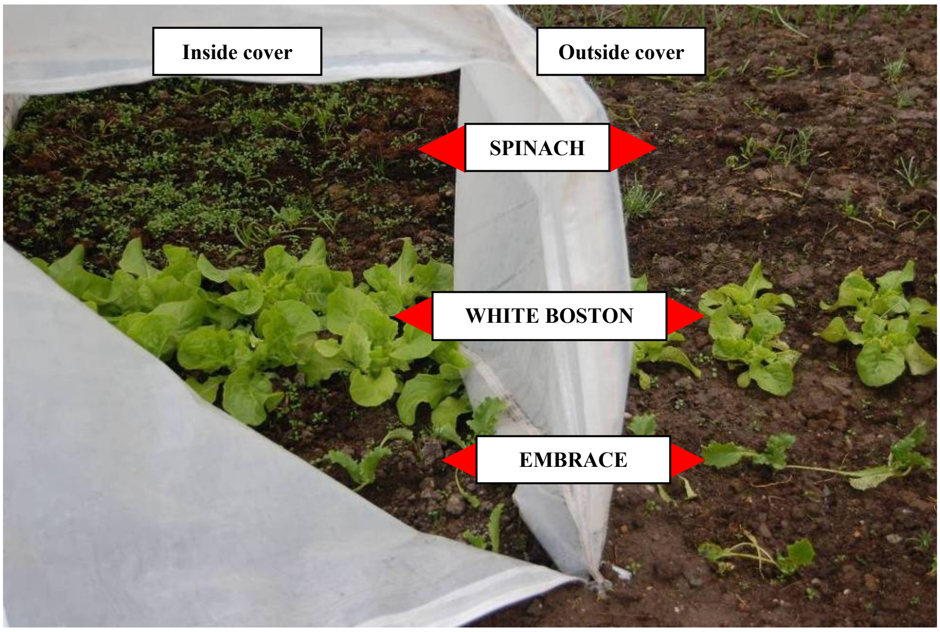


Fig. 6 – The crop comparative aspect after 42 days from the cover mounting, inside and outside cover

TABLES

Table 1 - The physical mechanical characteristics of the composite CERTEX-C

Characteristics	Values
Mass, g/m^2	234
Thickness, mm	0.288
Breaking resistance-warp, N	155
Breaking resistance-weft, N	163
Breaking elongation-warp,%	5.7
Breaking elongation-weft,%	6.9

Table 2 – The air temperature inside and outside the cover made of CERTEX C, °C

	23 Oct	30 Oct	6 Nov	13 Nov	20 Nov	27 Nov	4 Dec
V1– uncovered	21	14	13	12.5	12.5	5	7
V2 – covered CERTEX C	21	15	14.5	16	16	10	10

Table 3 – The soil temperature inside and outside the cover made of CERTEX C, °C

	23 Oct	30 Oct	6 Nov	13 Nov	20 Nov	27 Nov	4 Dec
V1– uncovered	12	8	9	10	2.5	2.5	3
V2 – covered CERTEX C	12	10.5	10.5	12.5	6	6	6

Table 4 – The light intensity inside and outside the cover made of CERTEX C, lux

	23 Oct	30 Oct	6 Nov	13 Nov	20 Nov	27 Nov	4 Dec
V1– uncovered	4200	2000	2500	2800	3000	2500	2500
V2 – covered CERTEX C	3100	1000	1200	1500	2000	1500	1000

Table 5 – The air relative humidity inside and outside the cover made of CERTEX C,%

	23 Oct	30 Oct	6 Nov	13 Nov	20 Nov	27 Nov	4 Dec
V1– uncovered	55	80	70	75	85	80	85
V2 – covered CERTEX C	55	95	80	85	90	85	90

The Cropmax ecological biofertilizer influence on the production of solarium grown cucumbers

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Keywords: biofertilizer, cucumbers, sun, productions

ABSTRACT

Obtaining vegetables in biological system allows for several aspects including: the use of some solariums with a very high biological potential the use of and ecological biostimulators for a better protection of the environment and for the achievement of good quality productions with high sensorial properties. The biological material used in this study consisted of three hybrids of cucumbers: Mathilde F1, Bianca F1 and Motiva F1 which following the Cropmax treatment, recorded early production increases between 11,1-12,9% in the treated version and between 6,6-10,4% in the entire production.

MATERIAL AND METHODS

The research was conducted during 2007-2008 and aimed at the establishment of morphological and productivity changes by using the ecologic product Cropmax on several vegetable species: solarium grown cucumber, tomato and pepper.

The present work concerns only the solarium grown cucumbers. After the plantation, inside the vegetation a single Cropmax fertilization was made at a concentration of 0.15% using 500 l of water at a ha of culture, that is an amount of commercial product of 750-1000 ml/ha.

The Sprays were applied throughout the plant, emphasis placed on the underside of leaves where the absorption is more intense.

The vegetation phase when the fertilization was performed was during his formation of the first fruit.

Three hybrids were taken in for study, hybrids which can be well cultivated in the solarium, in greenhouses but also in the field.

The hybrids used were: Mathilde F1, Bianca F1 and Motiva F1.

For a proper comparison of results within each hybrid two versions were analyzed: the unfertilized one (considered a testifies-V1) and the one fertilized with Cropmax 0.15% (V2).

RESULTS AND DISCUSSIONS

The obtained productions were recorded during the May-June harvesting and were interpreted in terms of early ripeness and as a part of the total amount.

In order to establish the behavior of the three hybrids, the unfertilized versions results were compared, which in terms of early ripeness were of 28.8 t/ha in Motiva F1, 30.0 t/ha to Mathilde F1 and 31.8 t/ha in Bianca F1, with highest values at Bianca F1 and the lowest in Motiva F1, still acknowledged as good considering the given growing conditions (Figure 1).

In terms of total production the average values of the unfertilized versions (V1) were of 64.9 t/ha for Motiva F1 being practically equal to those obtained in Mathilde F1 - 65.0 t/ha, but much higher than in Bianca F1-67,4 t/ha (Table 1).

These issues are very important in order to choose one or the other hybrids in the culture; under the same conditions it can be noticed that their behavior was different, caused mainly by the natural productive potential, as a characteristic of the hybrid, but it can also be influenced by the growing conditions, considering the fact that each individual behaves in the same conditions.

In determining the influence of applied treatments, by using the ecological product Cropmax (version 2 of each hybrid) it was established that in all cases the production has increased, which in this case is not only justified but also determined by the favorable influence of product used. In terms of absolute values, in the treated versions, the early productions were of 32, 0-35, 9 t/ha and for each hybrid were of 28.8 t/ha in Motiva F1, 33.8 t/ha in Mathilde F1 and 35.9 t/ha in Bianca F1, that is the hybrids responded differently.

The actual establishment of the treatment influence can only result from a comparison between the second and the first version of the same hybrid.

By comparing the percentage values recorded it can be noted that the three hybrids reacted similarly and responded well to treatment, thus resulting increases of production in the fertilized versions as compared to the unfertilized ones by 11,1-12,9%. The differences between the treated versions are insignificant, but impressive as compared with untreated ones (Table1).

In terms of total production, the differences between the variants, generally, are similar, but within other values.

In order to distinguish the total production obtained in the three hybrids, the average values of the two years being between 64,9-67,4 t/ha with the highest value in Bianca (for the unfertilized version 1) the hybrids studied behaved differently also in terms of total production, but the justification has been previously presented. The total average productions of hybrids are considered best for the specific conditions of culture.

The applied treatments influenced favorably the productive potential of plants for the three hybrids resulting production increases in relation to the above mentioned testifiers. The total productions were of 68, 8 - 72, 6 t/ha and the percentage were increased of 6, 0-10, 4%, values were recorded in F1 and Mathilde F1 and Bianca F1 being very close.

CONCLUSIONS

The hybrids investigated in relation to their productive (early ripeness and total production) are situated at he level of the requirements for protected cultivation conditions;

In terms of production values Bianca F1 MathildeF1 and Motiva F1 are situated in the order of preference for culture;

Early production increases have ranged between 11, 1-12, 9% and those of total production between 6, 6-10, 4%, considered to be very good considering that a single treatment was applied.

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FIGURE

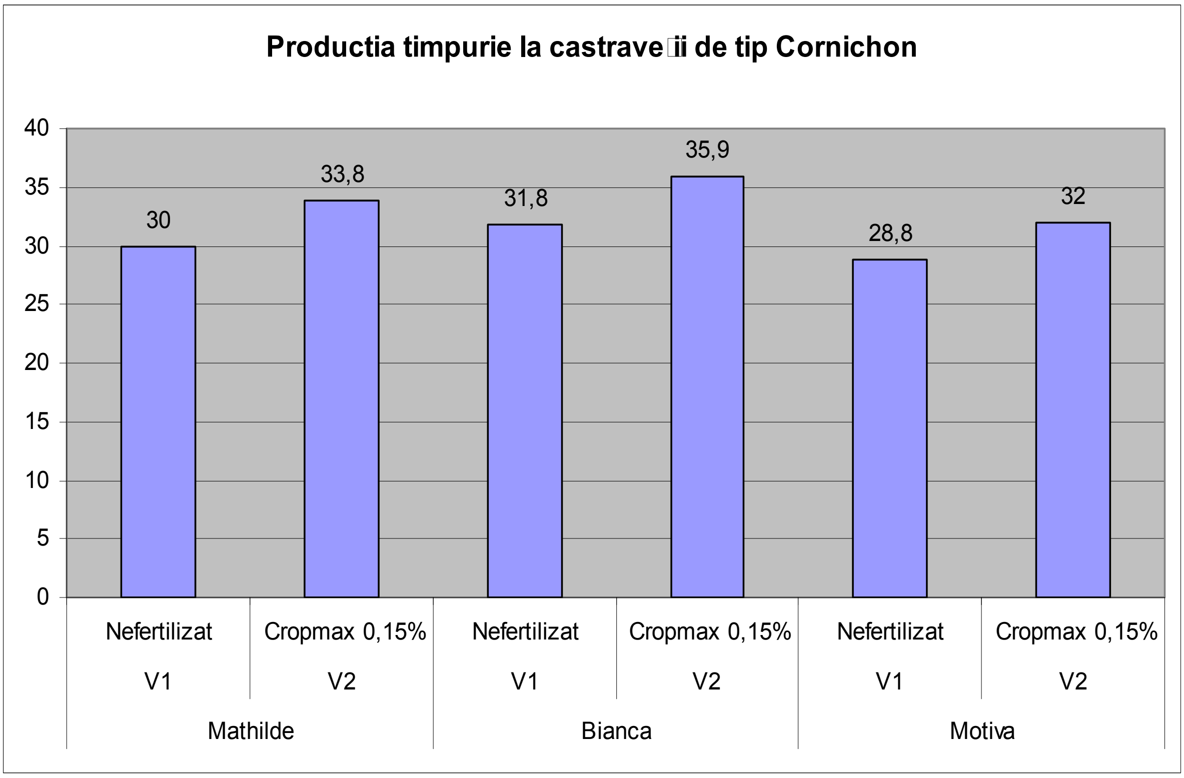

Fig. 1. The production values of the early solarium grown cornichon cucumber

TABLE

Table 1.The influence of the ecological Cropmax product on the early and total production of solarium grown Cornichon cucumbers

Hybrid	Version	Version type	Early production			Total production		
			t/ha	%	± dif.as to Mt.	t/ha	%	± dif.as to Mt.
Mathilde	V1	Unfertilized	30,0	110,0	Mt.	65,0	100,0	Mt.
	V2	Cropmax 0,15%	33,8	112,7	3,8	71,4	109,8	6,4
Bianca	V1	Unfertilized	31,8	100,0	Mt.	67,4	100,0	Mt.
	V2	Cropmax 0,15%	35,9	112,9	4,1	72,6	110,4	6,6
Motiva	V1	Unfertilized	28,8	100,0	Mt.	64,9	100,0	Mt.
	V2	Cropmax 0,15%	32,0	111,1	3,2	68,8	106,6	3,9

Study regarding the influence of soil multch at brocolli culture grown in unwarm greenhouse during september-october period

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Keywords: broccoli, mulch, fertilized

ABSTRACT

The study was realised as part of the didactic field of vegetable greenhouses at Faculty of Horticulture, Bucharest. The Calabrese Precocious type was cultivated in unwarm greenhouse. The study contained 9 experimental variants, 4 unmulched variants and 4 variants mulched with black biodegradable leaf. Both Unmulched and mulched variants were fertilised at planting with Agroblen in doses of 15g (V2 şi V6), 20 g (V3 şi V7), 25 g (V4 şi V8) şi 30 g (V5 şi V9). The obtained results showed that there were differences between the mulched experimental variants and those Unmulched, the total productions being bigger in case of the mulched and fertilised variants.

INTRODUCTION

Brocolli is a much appreciated species in Romania, the culture being extended more and more both in spring and in autumn. The realised experiments proved that this species could be cultivated from spring to autumn, but bigger productions are obtained at spring and autumn cultures. The study was realised at Faculty of Vegetable, in the didactic and research field of Faculty of Horticulture from Bucharest.

The purpose of the study was to test the Calabrese Precocious type in culture having fertilising conditions with different fertiliser doses but also having multching conditions and, in this sense, we can recommend our cultivators better productions during the cold period of the year, too.

MATERIALS AND METHODS

The study was realised as part of the didactic field of unwarmed greenhouses at Faculty of Vegetable, Bucharest. The biologic material was the type of Calabrese Precoce.

Experimental variants are presented in table 1.

The sowing regarding the nurseling production was realised on 14th of July 2008 and at planting the nurseling had 45 days. The culture was set up in September-December. The fertilising was realised before planting, with Agroblen using the mentioned doses in experimental variants. The soil multching was realised using degradable polietilen of black colour before planting. The scheme of planting had 70/40 cm, thus resulting 35720 plants/ha.

There have been made determinations regarding the nurseling growing in height. At planting there have been made biometrical determinations regarding the height, the number of leaves,the thickness,the total mass, the radicular volume and the foliar surface. During the vegetation period, there have registered the temperature in air, in soil and under multches in the morning at 8 o'clock and in the afternoon at 2 p.m. There have been made observations regarding the dynamics of brocolli plants growing in height, there have determined the average rhythm of growing in height, the dynamics of leaves formation at brocolli plants.

There have been registered the main, the secondary and the total production for every experimental variants.

To distinguish the results there have interpreted the obtained dates from statistically point of view.

RESULTS AND DISCUSSION

In table 2 there have presented the temperatures registered in unwarm greenhouse in air, Unmulched soil and under multches along the whole period of culture.The autumn of 2008 year was long and mild regarding the temperatures during the day and the night.We can remark that the temperatures registered under multches were higher at mulched variants compared to those Unmulched.

At planting the nurseling had the height of 21 cm with an average rhythm of growing of 0.467 cm/day, the stem diameter of 3.66 mm, 6.5 average leaves, a total mass of 12.7 g, a radicular volume of 5.33 cm 3 and a foliar surface of 61.33 cm^2 (tab.3 and 4).

Regarding the plants growing in height we can remark that at 40 days after planting (85 days after the spring) the biggest height was obtained at V 9, mulched and fertilised with 30 g/m2 Agroblen compared to control variant which presented the lowest growth in height of 56.50 cm (table 5). From statistically point of view there have registered significant differences at V5, V7 and V9 (table 6).

The average mass of the main inflorescence was included between 208 g/plant at V_1- Control, of 355g at V_5 and 406 g at V_9 -variants at which the doses of fertilisation were maximum. The total mass of the inflorescence from the secondary production was bigger at the mulched variants and fertilised compared to the mulched and fertilised variants.The total production obtained on plant was bigger at the mulched variants compared to those unmulched.At the mulched variants the suplimenting of the fertiliser dose conducted to getting a bigger total production on plant (table 11).

CONCLUSIONS

The average mass of the main inflorescence was obviously bigger at all the mulched and fertilised variants.

The biggest total production was registered at V_9.

Variant 5 presented the biggest percent of the main production towards the total production.

The mulched variants presented a bigger percent at the secondary production compared to the mulched variants.

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TABLES

Table 1 - Experimental variants

Variants	Fertiliser quantity
V1	Martor
V2 Unmulched	15 g/m^2
V3 Unmulched	20 g/m^2
V4 Unmulched	25 g/m^2
V5 Unmulched	30 g/m^2
V6 Mulched	15 g/m^2
V7 Mulched	20 g/m^2
V8 Mulched	25/m^2
V9 Mulched	30 g/m^2

Table 2 - The sum of the degrees of maximum and minimum temperatures and the daily average temperatures registered between September-November period

Month	Determinations	The minimum sum of temperature degrees (at 8 o'clock)	The maximum sum of temperature degrees (at 2 p.m)	The average values of the sum of temperature degrees	Daily average temperatures o C	The difference between the temperature under multches and soil
September	Air	132	437	284.0	9.76	
	Soil	111	334	222.5	7.41	
	Under multch	167	338	252.5	8.41	+ 1
October	Air	117	359	238.0	7.93	
	Soil	98	312	205.0	6.83	
	Under multch	116	342	229.0	7.63	+ 0,8
November	Air	92	347	219.5	7.32	
	Soil	90	322	206.0	6.89	
	Under multch	127	329	228.0	7.61	+ 0,72

Table 3 - Morphological characteristics of brocolli nurseling at the moment of planting

Soil	The nurseling height cm	The rhythm of growing cm/day	The age of nurseling at planting	The thickness oh nurseling mm	The number of leaves pieces
Calabrese Precoce	21	0.467	47 days	3.66	6-7

Table 4 - The total mass, the radicular volume and the foliar surface at brocolli nurseling

Soil	Total mass g	Radicular volume cm^3	Foliar surface cm^2
Calabrese Precoce	12.7	5.33	61.33

Table 5 - The dynamics of growing in height of broccoli plants

Variant		Number of days from planting					The rhythm of growing cm/day
		15 days	20 days	25 days	30 days	40 days	
V1	Martor	23.50	28.0	31.33	41.12	56.50	1.413
V2	Unmulched	23.73	31.17	36.25	41.33	61.55	1.539
V3	Unmulched	23.75	32.11	38.67	41.87	62.76	1.569
V4	Unmulched	24.00	32.67	39.19	42.66	62.87	1.572
V5	Unmulched	24.11	33.14	41.25	43.00	63.00	1.575
V6	Mulched	24.66	36.00	41.00	48.22	63.33	1.583
V7	Mulched	25.33	37.25	42.11	50.18	64.33	1.608
V8	Mulched	26.33	37.66	42.55	51.66	64.55	1.614
V9	Mulched	26.66	37.67	46.17	52.33	65.00	1.625

Table 6 - The analysis of variant for the average rhythm of growth

Variant	Rhythm of growth (cm/day)	Difference (cm/day)	Difference (%)	Sign.
V(0) MEDIA	1.56	0.14	110.25	N
V(1)	1.41	0.00	100.00	Mt
V(2)	1.54	0.13	108.92	N
V(3)	1.57	0.16	111.04	N
V(4)	1.57	0.16	111.25	N
V(5)	1.58	0.17	112.03	*
V(6)	1.50	0.09	106.02	N
V(7)	1.61	0.20	113.80	*
V(8)	1.61	0.20	114.23	*
V(9)	1.63	0.21	115.00	*

DL5% = 0.160 DL5% in% = 11.3234
DL1% = 0.230 DL1% in% = 16.2774
DL01% = 0.350 DL01% in%= 24.7700

Table 7 - The dynamics of leaves growing at brocolli plants

Variant		Number of days from planting				
		15 days	20 days	25 days	30 days	40 days
V1	Martor	6	7	8.22	9.00	9.11
V2	Unmulched	7	7	8.33	9.05	10.25
V3	Unmulched	7	8	8.67	9.11	10.67
V4	Unmulched	8	8	9.00	9.33	10.65
V5	Unmulched	8	9	9.14	9.67	11.33
V6	Mulched	9	9	11.33	12.27	13.18
V7	Mulched	8	10	12.27	13.11	14.22
V8	Mulched	8	10	12.86	14.0	14.25
V9	Mulched	8	11	13.67	16.0	16.17

Table 8 - The synthesis of results for the total number of leaves formed on plants

Variant	Nr. of leaves (pcs.)	Difference (pcs.)	Difference (%)	SEMF
V(0) MEDIA	12.19	3.08	133.80	***
V(1)	9.11	0.00	100.00	Mt
V(2)	10.13	1.02	111.14	***
V(3)	10.67	1.56	117.12	***
V(4)	10.65	1.54	116.90	***
V(5)	11.33	2.22	124.37	***
V(6)	13.18	4.07	144.68	***
V(7)	14.22	5.11	156.09	***
V(8)	14.25	5.14	156.42	***
V(9)	16.17	7.06	177.50	***

DL5% = 0.130 DL5% in% = 1.4270
DL1% = 0.190 DL1% in% = 2.0856
DL01% = 0.290 DL01% in%= 3.1833

Table 9 - Main production of brocolli

Variant		Main production	Difference at the main production		Significance
		Kg/m^2	Kg/m^2	%	
V1	Martor	0.74	0.00	100.00	Mt
V2	Unmulched	0.81	0.07	109.46	***
V3	Unmulched	0.83	0.09	112.16	***
V4	Unmulched	0.95	0.21	127.86	***
V5	Unmulched	1.27	0.53	170.66	***
V6	Mulched	1.08	0.33	144.68	***
V7	Mulched	1.15	0.41	154.78	***
V8	Mulched	1.39	0.64	187.84	***
V9	Mulched	1.450	0.71	195.95	***

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

Table 10 - The secondary production of brocolli

Variant	The secondary production	Difference		SEMF
	kg/m2	kg/m2	(%)	
V1	0.98	0.00	100.00	Mt
V2	0.99	0.01	100.56	**
V3	1.02	0.03	103.49	***
V4	1.17	0.18	118.28	***
V5	0.67	-0.32	67.65	OOO
V6	0.36	-0.63	36.15	OOO
V7	0.75	-0.23	76.35	OOO
V8	0.80	-0.18	81.42	OOO
V9	0,918	-0.07	92.96	OOO

DL5% = 0.000 DL5% in% = 0.0000
DL1% = 0.000 DL1% in% = 0.0000
DL01% = 0.010 DL01% in%= 1.0127

Table 11 - The average mass of the main inflorescence.
The total mass of the secondary inflorescence and the total production obtained on plant

Variant		The scheme of planting	Number of plants at $1m^2$	The aveage mass of the main inflorescence	The total mass of the inflorescence obtained in the secondary culture	The total production obtained on plant
		cm		Kg	Kg	Kg
V1	Martor	70/40	3.5720	0.208	0.275	0.483
V2	Unmulched	70/40	3.5720	0.227	0.278	0.505
V3	Unmulched	70/40	3.5720	0.233	0.286	0.519
V4	Unmulched	70/40	3.5720	0.266	0.327	0.593
V5	Unmulched	70/40	3.5720	0.355	0.187	0.542
V6	Mulched	70/40	3.5720	0.301	0.100	0.401
V7	Mulched	70/40	3.5720	0.322	0.211	0.533
V8	Mulched	70/40	3.5720	0.388	0.225	0.613
V9	Mulched	70/40	3.5720	0.406	0.257	0.663

FIGURE

a. **b.**

Fig. 1a. and b. - The main and secundary inflorescence at the experimental variants

Preliminary study regarding the effect of fertilization with organic fertilizer B5A on early and total crop of tomatoes

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Keywords: organic fertilization, ecological product, tomato

ABSTRACT

Preliminary study was made at the Vegetables Department from the Horticultural Faculty at University of Agronomical Sciences and Veterinary Medicine Bucharest in the period June-September 2009. We test the ecological product, B5A, applied on the soil with three days till planted and in the vegetation period after 15 days from transplanting. We had remark differences regarding the vegetative growth in all variants were applied the ecological product. Also, the number of fruit formed on the plant was biggest comparatively with Control.

INTRODUCTION

On present days, the tomato culture necessits large quantities of fertilization on the context of obtaining high crops. The chemical fertilizers used are different from the point of view of the sort of elements incorporated and also from the quantities of these elements. From time to time appears different fertilizers which have also a high solubility used in the new technologies.

One of those fertilizers is B5A which is an organical one, totally ecologic and of plant origin, only vegetative and organic substances are used in the production of that fertilizer. Its role is to increase the organismic and microorganismic life in the soil and allows the soil be processed by organismic and microorganismic living beings.

To use any fertilizer is necessary to test it on different culture and in our case the culture test was tomato culture.

MATERIALS AND METHODS

Preliminary study was made at the Vegetables Department from the Horticultural Faculty at University of Agronomical Sciences and Veterinary Medicine Bucharest in the period June-September 2009. It was test the ecological product, B5A, applied on the soil with three days till planted and in the vegetation period after 15 days from transplanting.

B5A is a liquid organic fertilizer, tested by many farmers (...). Its activation in soil is very fast and it has a rehabilitating effect on the soil. It is a product which allows the beneficial bacteria and other microorganisms which can normally be found in the soil in low numbers to reproduce rapidly by means of microplasmic replication and has no equivalent or alternative on the world.

The experimental variants were V1 as Control, V2 and V3 treatment on soil with 5ml ecological product B5A in 1 liter water applied below and after planted on soil, V4 and V5 treatment on soil with 10ml ecological product B5A in 1l water below and after planted on soil. The experimental variants are presented in table 1.

The tomato cultivar used was Tamaris F1. The tomato nursering had 55 days of vegetation. The technology of planted was at 80cm between the rows and 40cm between plants on the row that means 31250 plants on one hectare.

During vegetation time, there were made observations regarding the plant growing and the crop was registered.

There were made soil analyses at two periods before planting and at harvest time and at tomatoes there were made agrochemical and biochemical analyses.

RESULTS AND DISCUSSION

The analyses of biometrical measurements regarding the transplants (Table 2) results that at the height vary between 19.20cm at V4 to 21.10cm at V3. The best results from that point of view are at variant 3 with a height of 21.10cm and variant 5 with a 20.50cm height.

The numbers of leaves are in low at all variant comparatively with control and are equal value at variant V2. The diameters of transplants were in low values at all variants comparatively with control.

The biometrics measurement regarding the tomato plants (table 3) shows that the plant height was influenced by the fertilization system. So variant 3 fertilized with 10ml of B5A used in two times, variant 4 fertilized with 10 ml used at the beginning to fertilized the soil and variant 5 fertilized with 20 ml of B5A had the heights over the control with differences between 13.01 at variant 3 to 19.77 at variant 5.

From the analyses of the fructification process, the percent of fruit formed is higher at all fertilized variants. The best results were obtained variant 5 with 91.8% of fructification, variant 2 with 90.8% of fructification and variant 4 with 90.4% of fructification.

During harvest period there were made agrochemical analyses of fruits. Nitrates varied between116.5 ppm at control to maximum value of 139.0 ppm at variant 2 fertilized with 5ml of B5A. These values are under the maximum admitted limit of 150 ppm mentioned by the low from our country as dangerous value to consume. Phosphorus values were under 400ppm, values that determined a good quality of tomatoes for human consume. Potassium contents are between 2008 ppm at control and 2340 ppm at variant 4 fertilized with 10 ml of B5A.These values determined the good quality of tomatoes for transportation time and for preservation one.

The biochemical composition of tomatoes shows that the quantity of glucides increase from the variant 1 unfertilized to variants fertilized with different doses of B5A. Biochemical characteristics as glucides, vitamin C and acidity are characteristics for the tomato cultivar used and there are slightly influenced by the fertilization. The maximum value for the glucides is registered at variant 4 fertilized with 10ml of B5A and the value obtained was of 5.60%.

The values for vitamin C varied between 19.00mg/100g fresh matter at control to 19.56 mg/100g fresh matter at variant 5 fertilized with 20ml of B5A the variability of that characteristic is low and could not be influenced by the fertilization system. The acidity characteristics vary between 0.11 and 0.13% and the differences between the control and fertilized variants are small.

CONCLUSIONS

The plants have recorded a biggest growth in height in all variants treated with product B5A. We remarked distinct significant increases at the variants 3, 4 and 5 from statistically point of view.

The percentage of fruits formed per plant was higher for all treated comparatively with V1-control.

Regarding the chemical composition of tomato fruit was observed in all experimental variants a higher content in carbohydrates and vitamin C.

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TABLES

Table 1. The experimental variants and mode of application

Variants	B5A fertilizer		
	Concentration, ml/l	Administration on the soil before planted	Administration in vegetation
V1-Ct	-	-	-
V2	5ml/l	Incorporation in the soil	
V3	5ml/l	Incorporation in the soil	Spraying on the soil
V4	10ml/l	Incorporation in the soil	
V5	10ml/l	Incorporation in the soil	Spraying on the soil

Table 2. Analyses of the tomato transplants

Variants	Height, cm	Average number of leaves	Φ, mm
V1-Ct	20.18	5.66	2.55
V2	19.60	5.66	2.23
V3	21.10	5.33	2.27
V4	19.20	5.33	2.35
V5	20.50	5.27	2.33

Table 3. Biometric measurements regarding the tomato plants

Variants	Plant height,	Differences		Sign.	No. of inflorescences on a plant	At 6 inflorescences		
						Flowers	Fruits	Percent of fruit formed
	cm	cm	(%)		No.	No.	No.	%
V1-Ct	108.11	0.00	100.00	Ct	6	35.66	29.4	82.3
V2	106.80	-1.31	98.79	OOO	6	37.33	33.9	90.8
V3	121.12	13.01	112.03	***	6	36.33	31.9	87.8
V4	127.33	19.22	117.78	***	6	37.15	33.6	90.4
V5	127.88	19.77	118.29	***	6	36.21	33.2	91.8

DL5% = 0.070 DL5% in% = 0.0647
DL1% = 0.120 DL1% in% = 0.1110
DL01% = 0.240 DL01% in%= 0.2220

Table 4. Assessment of total and early crop (t/ha)

Variants	Total crop, t/ha	Differences (%)	Sign.	Early crop, t/ha	Differences (%)	Sign.	% from total crop	Early crop, distribution by the class,%		
								Extra	The first class	Under Stas
V1-Ct	9.72	100.00	Mt	2.4	100.00	Mt	24.7	13.0	82.4	4.6
V2	10.22	105.20	***	2.7	112.50	***	26.8	18.0	79.3	2.7
V3	10.91	112.30	***	3.0	125.00	***	**27.6**	14.0	82.5	3.5
V4	12.34	127.02	***	4.1	170.83	***	**33.4**	14.8	83.7	1.5
V5	13.53	139.27	***	4.6	191.67	***	**33.8**	11.0	86.7	2.3

DL5% = 0.010 DL5% = 0.000
DL5% in% = 0.1029 DL5% in% = 0.0000
DL1% = 0.030 DL1% = 0.010
DL1% in% = 0.3088 DL1% in% = 0.4167
DL01% = 0.050 DL01% = 0.020
DL01% in%= 0.5147 DL01% in%=0.8333

Table 5. Agrochemical composition of tomato fruits

Variants	**Concentration, ppm**		
	$N\text{-}NO_3^-$	**$P\text{-}PO_4^{3-}$**	**K^+**
V1-Ct	116.5	234	2008
V2	139.0	245	2140
V3	122.3	258	2200
V4	135.0	353	2340
V5	133.4	365	2314

Table 6. Biochemical composition of the tomato fruits

Variants	**Total glucides %**	**Vitamin C mg/100g fresh matter**	**Acidity %**
V1-Ct	5.045	19.00	0.12
V2	**5.23**	**19.12**	0.12
V3	**5.12**	**19.05**	0.11
V4	**5.60**	**19.23**	0.13
V5	**5.23**	**19.56**	0.13

The partial studies regarding the production of the carrot mother plants with different development stage

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Keywords: variety, periods, weight, mother plants

ABSTRACT

The studies were part from a bifactorial experiment (A – varieties and B – period), in the process of carrot mother plants production with different development level. The bifactorial experiment was a 6x4x4 type, meaning: 6 varieties (Uriaş de Berlicum, Nantes, Nantes Bantop, Chantenay Red Core, Chantenay, Danvers 126), 4 sowing crops (10, 20, 30 July and 9August) and 4 repetition stage (table 1). The influence of every factor (A, B) and as well as the influence of interaction between those two factors are distinctly significant regarding the weight of mother plants.

MATERIAL AND METHODS

The researches were accomplished to SCDL Buzău.

As biological material was used the pre based seed from those 6 varieties.

The placement of the experience was accomplished after the type of bi factorial experiences with subdivided lots of the four rehearsals:

The A factor (varieties), with 6 graduation: A_1 – Uriaş de Berlicum, A_2 – Nantes, A_3 – Nantes Bantop, A_4 – Chantenay Red Core, A_5 – Chantenay, A_6 – Danvers 126.

The B factor (sowing crop), with 4 graduation: B_1 – 10 July, B_2 – 20 July, B_3 – 30 July and B_4 – 9 August.

Excepting the factors from our study, which were takes under consideration, the other technologic elements were suitable to the in force technology al ICDLF Vidra..

The results have been interpreted by analysis of the variant.

RESULTS AND DISCUSSIONS

a) The table number 2-6 reveals the signification of the differences between variants, the influence of every factor as well as the interaction of studied factors on the weight of mother plant.

The table 3 reveals the influence of A factor regarding the weight of root, where s_d = 1, 93 and GL = 15.

It is noticed that the weight of root – the mother plants has demonstrated:

- Very significant differences between **A_1** (Uriaş de Berlicum) and the rest of varieties;
- Between **A6** (Danvers 126) and A_2, A_3, A_5 factors, very significant differences; and A_4 – significant difference;
- Very significant differences between A_4 (Chantehay Red Core) and A_3, A_2; and between A_4 and A_3 are not significant differences;
- A_5 (Chantehay) demonstrates significant distinctly differences than A_3 and very significant than A_2;
- **A_3** (Nantes 3 Bantop) demonstrates significant difference than A_2.

It results that A factor (cultivated) present a strong influence upon the “weight root” feature.

b) For comparing two B average for example :(b_2-b_1), were established by statistic gravel the multiples comparisons of the B factor (table 4), where: s_d = 2,99; GL = 54.

From the multiples comparisons of the B factor – sowing crop- was revealed that all the differences were very significant. Result also that this factor has a strong influence upon some feature of “the weight root”.

c) For comparing two B average at the same graduation of A, for example: (a_1b_2-a_1b_1) were been made multiple comparisons of B factor as the same graduation of A, where: s_d = 7,3 şi GL = 54

From the multiple comparisons to the same A graduation (table 5) can be revealed:

To **A_1** (*Uriaş de Berlicum*)

- B_1 reveals a very significant difference than B_4, significant distinctively than and significant than B_2;
- B_2 and B_3 present a significant difference than B_4;

To **A_2** (*Nantes*)

- It is a significant difference only between B_1 and B_4;

To **A_3** (*Nantes 3 Bantop*)

- The same as A_2 there is only a significant difference between B_1 and B_4;

To **A_4** (*Chantehay Red Core*)

- The same as A_1, B1 demonstrates a very significant difference than B_4, significant distinctively than B_3 and significant than B_2;

To **A_5** (Chantehay)

- It was recorded a significant distinctively difference between B_1 and B_4 and also significant between B_1 and B_3

To **A_6** (Danvers 126)

- B_1 has recorded a very significant difference than B_4 and B_3 and between B_2 and B_4 was recorded a significant distinctively difference.

The influence of B factor at the same graduation of A is different. The biggest intensity of the B factor influence was demonstrated to B_1.

d) For comparing two A average at the same graduation of B (a_2b_1-a_1b_1) or at different B graduation (a_2b_2-a_1b_1), was establish after the statistic gravel the significance of the differences and was made the table 5.6, being revealed that:

- The **A_1B_1** variant recorded differences
- Very significant than the variants: A_2B_4, A_6B_4, A_3B_4, A_5B_4, A_2B_3, A_3B_3, A_5B_3, A_6B_3, A_4B_3, A_1B_4,A_2B_2, A_3B_2, A_4B_2, A_5B_2, A_2B_1 şi A_3B_1,
- Significant distinctively that the variants: A_1B_3, A_5B_1, A_1B_2,
- Significant than the A_4B_1 variant,
- Is not significant the difference from A_6B_1.
- The **A_6B_1** records differences
- Very significant that the variants: A_2B_4, A_6B_4, A_3B_4, A_5B_4, A_2B_3, A_3B_3, A_5B_3, A_6B_3, A_4B_3, A_1B_4,A_2B_2, A_3B_2, A_4B_2, A_5B_2,
- Significant distinctively than the variants: A_2B_1 and A_3B_1,
- are not significant the differences from the variants: A_1B_3, A_5B_1, A_1B_2, A_4B_1,
- The A_4B_1 recorded differences
- Very significant than the variant: A_2B_4, A_6B_4, A_3B_4, A_5B_4, A_2B_3, A_3B_3, A_5B_3,
- Significant distinctively from the variant: A_6B_3, A_4B_3, A_1B_4,A_2B_2, A_3B_2, A_4B_2,
- Significant that the variant: A_5B_2, A_2B_1
- Is not significant the difference from the variant: A_3B_1,A_1B_3, A_5B_1, A_1B_2,
- The **A_1B_2** variant recorded differences
- Very significant than the variant: A_2B_4, A_6B_4, A_3B_4, A_5B_4,
- Significant distinctively than the variant: A_2B_3, A_3B_3, A_5B_3, A_6B_3, A_4B_3,
- Significant than the variant: A_1B_4,A_2B_2, A_3B_2, A_4B_2, A_5B_2,
- Is not significant the difference from the variants: A_2B_1 şi A_3B_1,A_1B_3, A_5B_1,
- The **A_5B_1** variant recorded differences
- Very significant than the variants: A_2B_4, A_6B_4, A_3B_4, A_5B_4,
- Significant distinctively than the variants: A_2B_3, A_3B_3, A_5B_3, A_6B_3, A_4B_3,

- Significant than the variants: A_1B_4,A_2B_2, A_3B_2, A_4B_2,
- Is not significant the difference towards the variants: A_5B_2, A_5B_2, A_2B_1 A_3B_1,
- The**A_1B_3** variant recorded differences
- Very significant than the variants: A_2B_4, A_6B_4, A_3B_4, A_5B_4,
- Significant distinctively than the variants: A_2B_3, A_3B_3, A_5B_3
- Significant than the variants: A_6B_3, A_4B_3, A_1B_4,A_2B_2, A_3B_2,
- Is not significant the difference from the variants: A_4B_2, A_5B_2, A_5B_2, A_2B_1
- The **A_3B_1** variant recorded differences
- Very significant than the variants: A_2B_4,
- Significant distinctively than the variants: A_6B_4, A_3B_4,
- Significant than the variants: A_5B_4, A_2B_3, A_3B_3,
- Is not significant the difference from the variants: A_5B_3, A_6B_3, A_4B_3, A_1B_4,A_2B_2, A_3B_2, A_4B_2, A_5B_2, A_2B_1
- The **A_2B_1** variant recorded differences
- Significant distinctively than the variants: A_2B_4, A_6B_4, A_3B_4,
- Is not significant the differences from the variants: A_5B_4, A_2B_3, A_3B_3, A_5B_3, A_6B_3, A_4B_3, A_1B_4,A_2B_2, A_3B_2, A_4B_2, A_5B_2,
- The **A_5B_2** variant recorded differences
- Significant distinctively than the variants: $A_2B_{4,}$
- Significant than the variant: A_6B_4,
- Is not significant the differences from the variants: A_3B_4, A_5B_4, A_2B_3, A_3B_3, A_5B_3, A_6B_3, A_4B_3, A_1B_4,A_2B_2, A_3B_2, A_4B_2,
- The **A_4B_2** variant recorded differences
- Significant than the variants: A_2B_4, A_6B_4,
- Is not significant from the variants: A_3B_4, A_5B_4, A_2B_3, A_3B_3, A_5B_3, A_6B_3, A_4B_3, A_1B_4,A_2B_2, A_3B_2,
- The **A_3B_2** variant recorded differences
- Significant than the variants: A_2B_4, A_6B_4,
- Is not significant the differences from the variants: A_3B_4, A_5B_4, A_2B_3, A_3B_3, A_5B_3, A_6B_3, A_4B_3, A_1B_4,A_2B_2,
- The **A_2B_2** variant recorded differences
- Significant than the variant: A_2B_4
- Is not significant the differences from the variants: A_6B_4, A_3B_4, A_5B_4, A_2B_3, A_3B_3, A_5B_3, A_6B_3, A_4B_3 A_1B_4
- The **A_1B_4** variant recorded differences
- Significant than the variant: A_2B_4
- Is not significant the differences from the variants: A_6B_4, A_3B_4, A_5B_4, A_2B_3, A_3B_3, $A_5B_{3,}$ A_6B_3, A_4B_3.

CONCLUSIONS

From the studies results that the weight of mother plant is strongly influenced by the A factor (range) and also by the B factor (sowing crop). The interaction between those two factors demonstrates significant influence regarding the weight from the variants of the mother plant.

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TABLES

Table 1 - The weight of mother plants resulted from the variants of the bi factorial carrot experience (the average on 2 years)

	A (variety)	B (period)	Repetition				Σ V_M	Xmed.
			R_1	R_2	R_3	R_4		
1	**A_1** (Uriaş de Berlicum)	V_1	198	210	212	175	795	199
2		V_2	175	143	181	165	664	141
3		V_3	172	134	125	112	543	136
4		V_4	108	98	87	75	368	92
	Total		**653**	**585**	**605**	**527**	**2370**	
5	**A_2** (Nantes)	V_1	110	92	115	112	429	107
6		V_2	90	95	93	98	376	94
7		V_3	85	62	81	79	307	77
8		V_4	52	50	55	49	206	51
	Total		**337**	**299**	**344**	**338**	**1318**	
9	**A_3** (Nantes 3 Bantop	V_1	105	125	120	123	473	118
10		V_2	98	102	102	95	397	99
11		V_3	73	82	82	69	306	77
12		V_4	69	72	58	61	260	65
	Total		**345**	**381**	**362**	**348**	**1436**	
13	**A_4** (Chantehay Red Core	V_1	165	148	150	143	606	151
14		V_2	105	98	102	95	400	100
15		V_3	96	89	82	85	352	88
16		V_4	75	58	68	70	271	68
	Total		**441**	**393**	**402**	**393**	**1629**	
17	**A_5** (Chantehay	V_1	140	152	135	132	559	139
18		V_2	105	98	110	95	408	102
19		V_3	92	78	85	82	337	84
20		V_4	65	72	68	70	275	69
	Total		**402**	**400**	**398**	**379**	**1579**	
21	**A6** (Danvers 126	V_1	166	172	170	168	676	169
22		V_2	125	132	128	120	505	126
23		V_3	85	87	92	88	352	88
24		V_4	45	62	57	59	223	56
	Total		**421**	**453**	**447**	**435**	**1756**	
	Σ.R		2599	2511	2558	2420	10088	

Table 2 - Variant analysis

Variability cause	**SP**	**GL**	**s^2**	**F sample**
Large lots	44016,4	23		
Repetitions	739,65	3		
Variety (A)	42828	5	8565,6	286,47(3,29;5,42)
Error (a)	448,75	15	29,9	
Little lots	143459,4	95		
Periods (B)	84767,8	3	28255,9	263,2(2,79;3,72)
Interaction (AxB)	8878,6	15	591,9	5,5(1,85;2,39)
Error (b)	5796,6	54	107,34	

Table 3 - The factor influence on the root weight

The factor	**Absolute weight of root (g)**	**A_6**	**A_4**	**A_5**	**A_3**	**A_2**
A_1 (Uriaş de Berlicum)	147,5	37,25***	45,69***	48,81***	57,75***	65,13***
A_6 (Danvers 126)	109,75	-	7,94*	11,06***	20,0***	27,38***
A_4 A_4 (Chantehay Red Core	101,81	-	-	3,12	12,06***	19,44***
A_5 (Chantehay)	98,69	-	-	-	8,94**	16,32***
A_3 (Nantes 3 Bantop	89,75	-	-	-	-	7,28*
A_2 (Nantes)	82,37					

$DL_{5\%} = 1{,}93x2{,}13 = 4{,}11$ $DL_{1\%} = 1{,}93x2{,}95 = 5{,}69$ $DL_{0{,}1\%} = 1{,}93x4{,}07 = 7{,}85$

Table 4 - Multiple comparisons of the B factor

Clasification	**The weight root (g)**	**The diference from the variant on**			
		IV	**III**	**II**	**I**
I-B_1	147,17	80,37***	55,47***	36,87***	-
II-B_2	110,3	43,5***	18,6***	-	-
III-B_3	91,7	24,9***	-	-	-
IV-B_4	66,8	-	-	-	-

$DL_{5\%} = 2{,}99x2{,}01 = 6{,}01$ $DL_{1\%} = 2{,}99x2{,}68 = 8{,}01$ $DL_{0{,}1\%} = 2{,}99x3{,}49 = 10{,}43$

Table 5 - Multiple comparisons of the B factor at the same graduation of the A factor

Clasification		**The weight root (g)**	**The difference from the variant on**			
			IV	**III**	**II**	**I**
A_1 (Uriaş de Berlicum)	B_1	199	107***	63**	58*	-
	B_2	141	49*	5	-	-
	B_3	136	44*	-	-	-
	B_4	92	-	-	-	-
A_2 (Nantes)	B_1	107	56*	30	13	-
	B_2	94	43	17	-	-
	B_3	77	26	-	-	-
	B_4	51	-	-	-	-
A_3 (Nantes 3 Bantop	B_1	118	53*	41	19	-
	B_2	99	34	22	-	-
	B_3	77	12	-	-	-
	B_4	65	-	-	-	-
A_4 (Chantehay Red Core)	B_1	151	83***	63**	51*	-
	B_2	100	32	12	-	-
	B_3	88	20	-	-	-
	B_4	68	-	-	-	-
A_5 (Chantehay)	B_1	139	70**	55*	37	-
	B_2	102	33	18	-	-
	B_3	84	15	-	-	-
	B_4	69	-	-	-	-
A6 (Danvers 126)	B_1	169	113***	81***	43	-
	B_2	126	70**	38	-	-
	B_3	88	32	-	-	-
	B_4	56	-	-	-	-

$DL_{5\%} = 7{,}3x6{,}01 = 43{,}87$ $DL_{1\%} = 7{,}3x8{,}01 = 58{,}47$ $DL_{0{,}1\%} = 7{,}3x10{,}43 = 76{,}14$

Table 6 - Comparing two A environments at the same B graduation or at different B graduation

The factor		The weight root (g)	The difference from the variant on																				
			XXII	XXI	XX	XIX	XVIII	XVII	XVI	XV	XIV	XIII	XII	XI	X	IX	VIII	VII	VI	V	IV	III	II
I	A1B1	199	148***	143***	134***	130***	122***	122***	115***	111***	111***	107***	105***	100***	99***	97***	92***	81***	63**	60**	58**	48*	30
II	A_6B_1	169	118***	113***	104***	100***	92***	92***	85***	81***	81***	77***	75***	70***	69***	67***	62**	51**	33	30	28	18	0
III	A_4B_1	151	100***	96***	86***	82***	74***	74***	67***	63**	63**	59**	57**	52**	51**	49*	44*	33	15	12	10		
IV	A_1B_2	141	90***	86***	76***	72***	64**	64**	57**	53**	53**	49*	47*	42*	41*	39*	34	23	5	2			
V	A_5B_1	139	87***	83***	74***	70***	62**	62**	55**	51**	51**	47*	45*	49*	39*	37	32	21	3				
VI	A_1B_3	136	84***	80***	71***	67***	59**	59**	52**	49*	49*	44*	42*	46*	36	34	29	18					
VII	A_3B_1	118	67***	62**	53**	49*	41*	41*	34	30	30	26	24	19	18	16	11						
VIII	A_2B_1	107	56**	51**	42**	38	30	30	23	19	19	15	13	8	7	5							
IX	A_5B_2	102	51**	46*	37	33	25	25	18	14	14	10	8	3	2								
X	A_4B_2	100	49*	44*	35	31	23	23	16	12	12	8	6	1									
XI	A_3B_2	99	48*	43*	34	30	22	22	15	11	11	7	5										
XII	A_2B_2	94	43*	38	29	25	17	17	10	6	6	2											
XIII	A_1B_4	92	41*	36	27	23	15	15	8	4	4												
XIV	A_4B_3	88	37	32	23	19	11	11	4														
XV	A_6B_3	88	37	32	23	19	11	11															
XVI	A_5B_3	84	33	28	19	15	7	7															
XVII	A_3B_3	77	26	21	12	8																	
XVIII	A_2B_3	77	26	21	12	8																	
XIX	A_5B_4	69	18	13	4																		
XX	A_3B_4	65	14	9																			
XXI	A_6B_4	56	5																				
XXII	A_2B_4	51																					

$DL_{5\%} = 6{,}5x5{,}86 = 38{,}09$
$DL_{1\%} = 6{,}5x7{,}81 = 50{,}76$
$DL_{0{,}1\%} = 6{,}5x10{,}21 = 66{,}35$

The phenophase study of one carrot range for obtaining production seed in the environmental condition at SCDL Buzău

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Keywords: mother plant, seed plants, vegetation period, biological phase

ABSTRACT

The studies established to every range phenological observations and determination regarding the period (days) and the average of the temperature degrees for every phenophase and also for vegetation period. The researches lasts two biological cycle "from seed to seed" specific for 6 different varieties, as shape, color, size and precociousness.

MATERIAL AND METHOD

The researches were accomplished in an experimental field, to SCDL Buzău (2002-2005).

The pre-base seed was used as biological material for the beginning of the production seed and for establishing the seed plant experiences was used as material biological the mother plants from the previous year.

The varieties which were used as base for this study were: Urias de Berlicum, Nantes, Nantes 3 Bantop, Chantenay Red Core, Chantenay and Danvers 126.

The placement of the experience was accomplished in storeyed lots of four rehearsals.

In the mother plant phase were made phenological observations regarding: sowing, rise and technological maturity, keeping in mind the duration of the Phenophase and of vegetation period, as well as the average of the accumulated temperature degrees specific to every Phenophase and vegetation period to those 6 varieties.

In the seed phase were made phenological observations regarding the date: planting, rising, flowering, physiological maturity.

RESULTS AND DISCUSSIONS

In the table 1 and 2 and also in the figures1-6 are revealed the Phenophase and vegetation periods as well as the average of the accumulated temperatures degrees of this periods.

The date's analysis revealed that the studied varieties have different needs than the temperatures degrees which were accumulated on Phenophase. This determined the differences of the Phenophase duration and of vegetation period.

CONCLUSIONS

All those 6 varieties have environmental conditions for multiplication.

The placement of the carrot experiences was determined by the dates regarding Phenophase and vegetation periods as duration and requests from the temperatures, for assuring the best condition of rising, growth and development, fructifying, etc.

TABLES

Table 1 - Duration of vegetation's phenophase to the mother plants and the amount of accumulated temperature degrees regarding carrot varieties mid average on 2 years

Variety	**Sowing-East**		**East- thickening root**		**Thickening root-technological maturity**		**Total period of vegetation**	
	Days no.	**Σ °C**	**Days no.**	**Σ °C**	**Days no.**	**Σ °C**	**Days no.**	**Σ °C**
Nantes	10	215	38	645	67	1162	110	1962
Nantes Bantop	10	217	42	684	66	1194	112	1980
Uriaş de Berlicum	12	289	52	830	83	1580	135	2552
Chantenay Red Core	14	295	36	770	64	1335	111	2246
Chantenay	14	220	32	235	63	1995	106	2338
Danvers126	18	320	40	530	53	1355	98	1835

Table 2 - Duration of vegetation phenophase to seed plants and the average of temperature degrees on phenophase specific to carrot varietes, mid average on 2 years to SCDL Buzău

Variety	Planted-resumed vegetation		Resume vegetation-flourished		Flourised-physiological maturity		Entire period of vegetation	
	Days no.	Σ °C	Days no.	Σ °C	Days no.	Σ °C	Days no.	Σ °C
Nantes	16	148	68	845,1	52	909,8	120	1754,9
Nantes Bantop	15	140	67	830	48	869,8	115	1699,8
Uriaş de Berlicum	16	146,5	68	1091,8	68		136	2516
Chantenay Red Core	12	142	70	990	45	890	115	2022
Chantenay	15	105	44	619	66	1484	110	2002

FIGURES

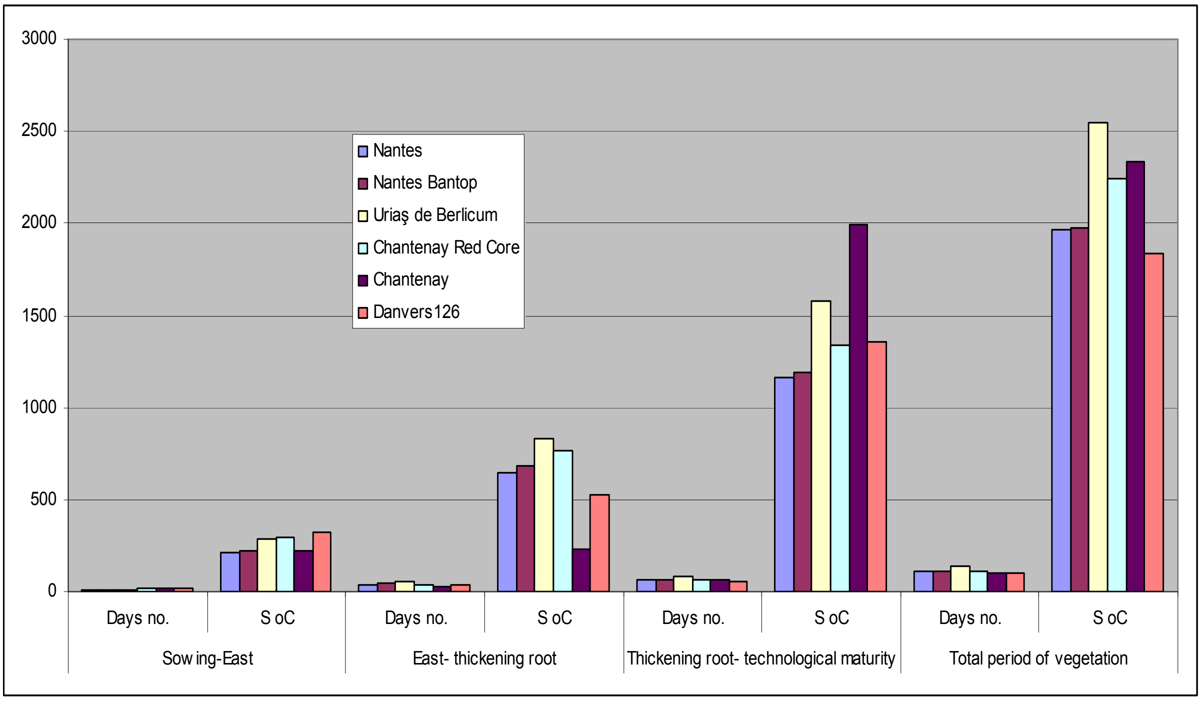

Fig. 1. Duration of phenophase and of vegetation period to the mother plants, on varieties in days and the amount of temperature degrees

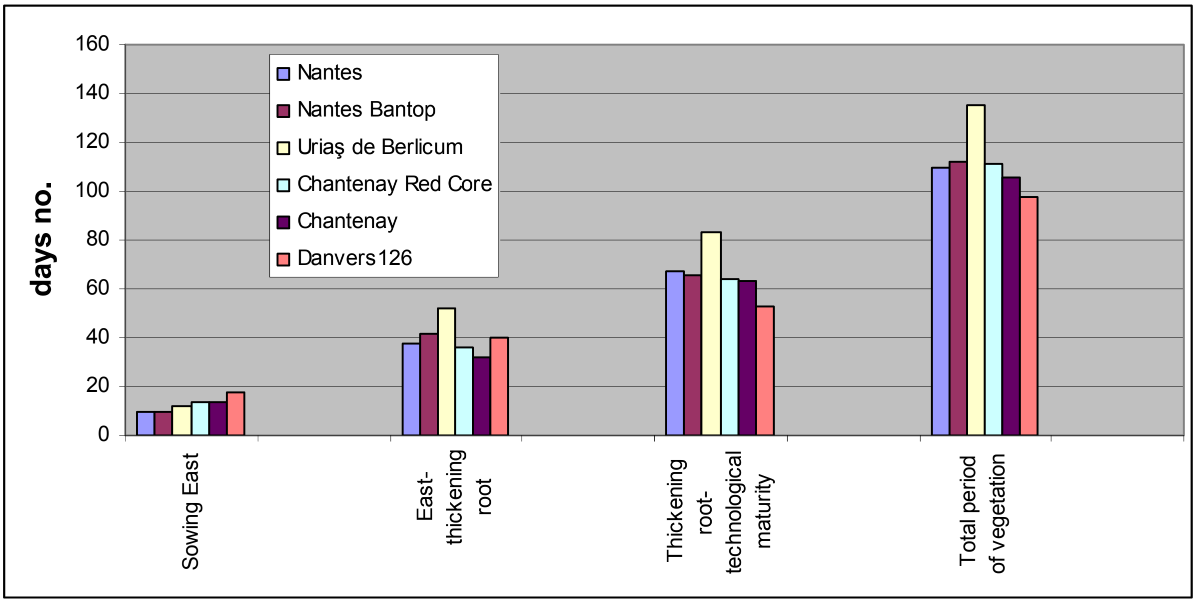

Fig. 2 The medium duration of phenophase and of vegetation period to the mother plants, on varieties

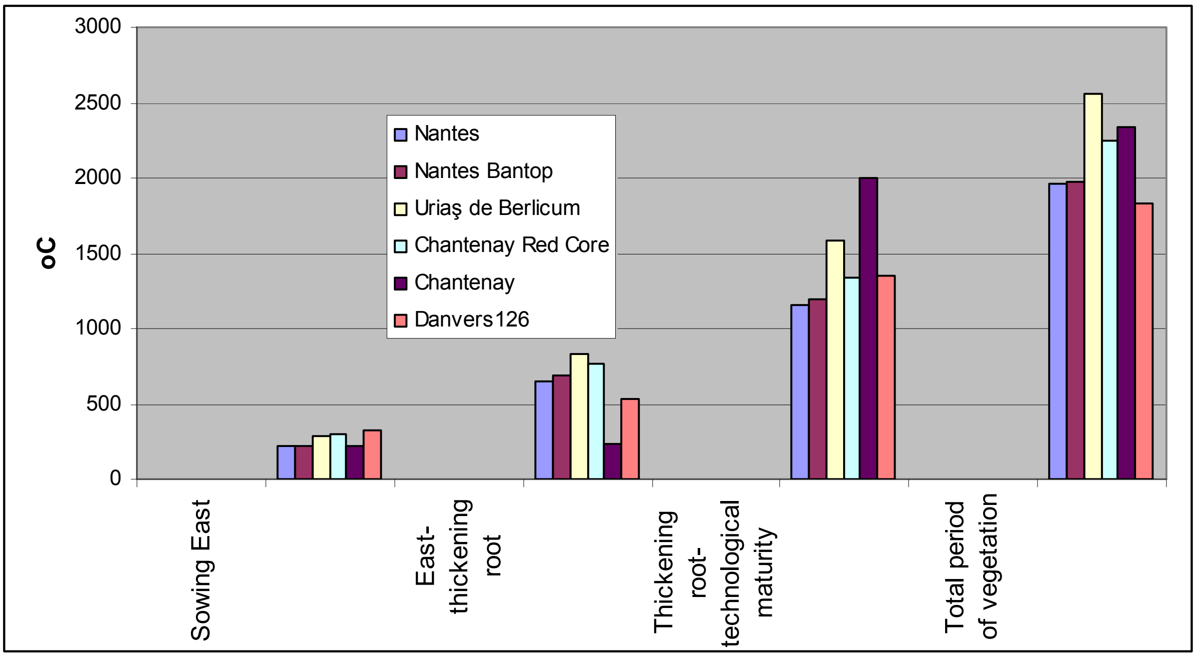

Fig. 3. The average amount of accumulated temperature degrees on phenophase and on total period of carrot/first year

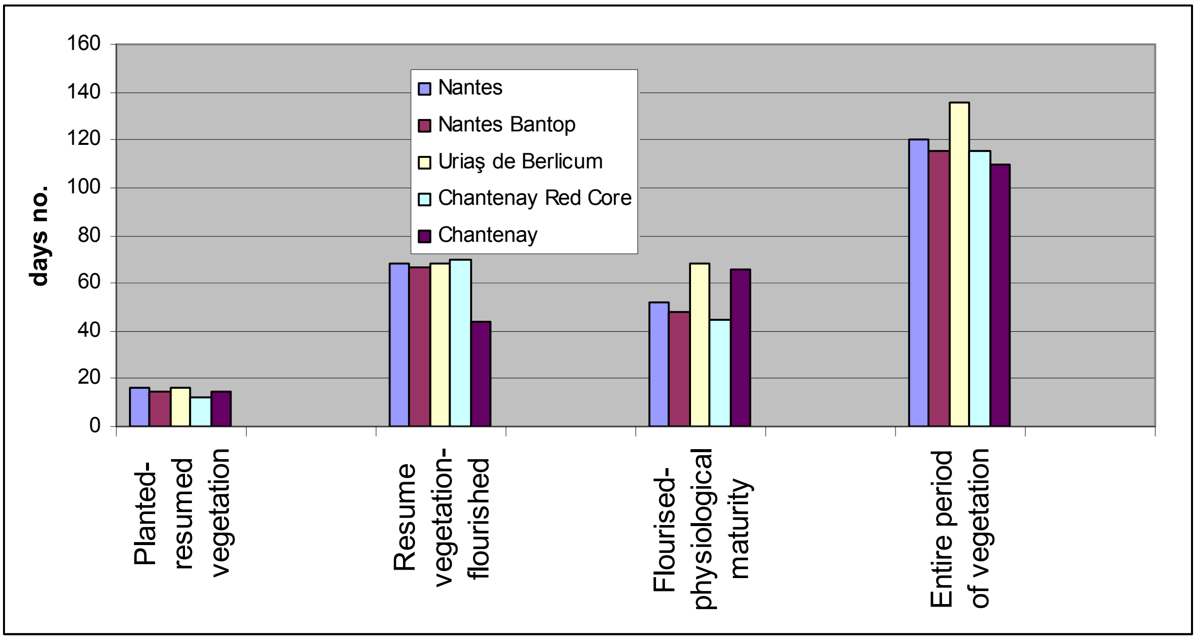

Fig.4. Duration of phenophase and of vegetation period to the carrot varieties

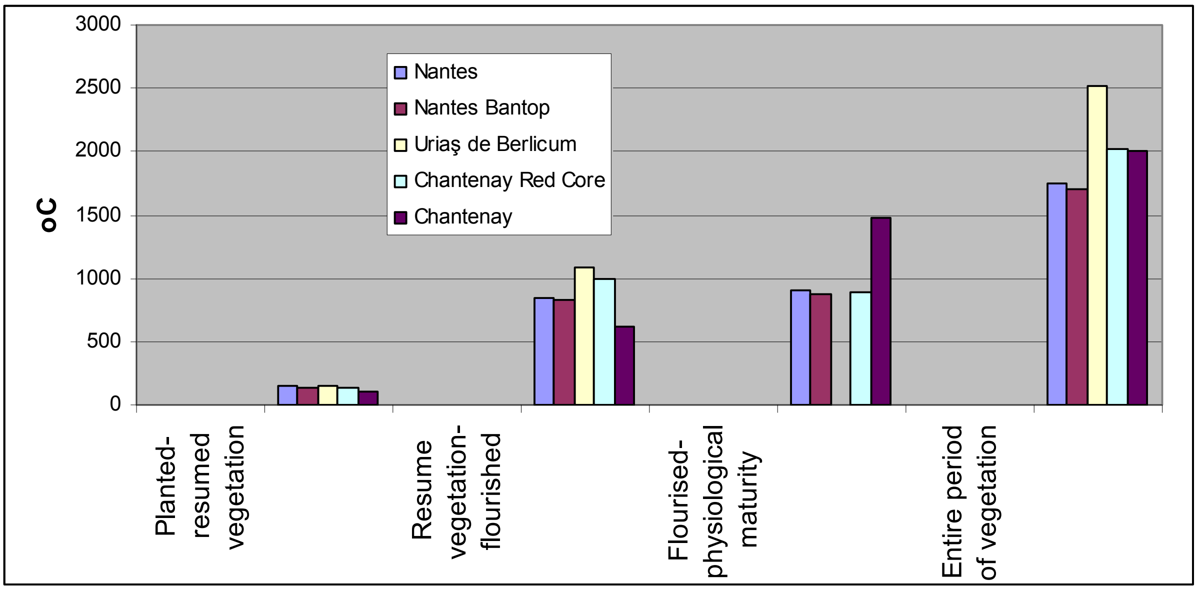

Fig. 5. Temperature degrees on phenophase of the carrot varietes, mid-average/2 years

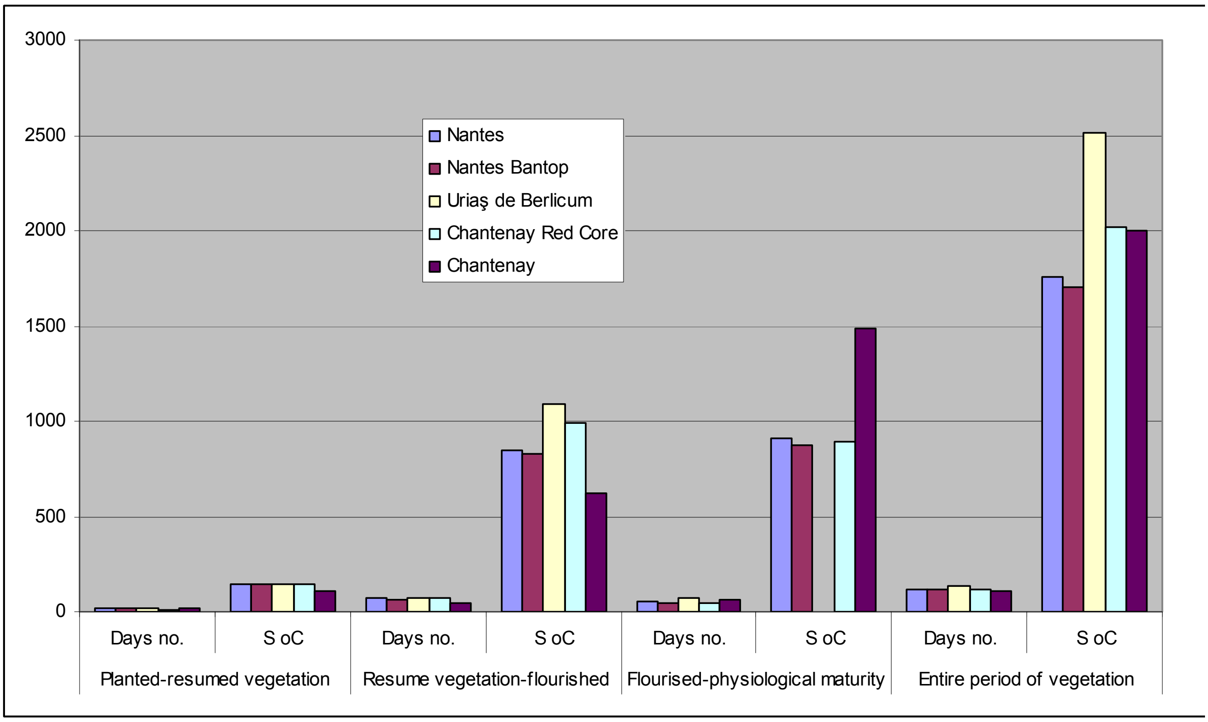

Fig. 6. Duration of vegetation phenophase to seed plants and the average of temperature degrees on phenophase specific to carrot varietes, mid average on 2 years to SCDL Buzău

Influence of the methods of crop arrangement in protected field under the application of modern crop technologies on the productive potential of some watermelon hybrids

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Keywords: technology, field, crop, potential, seedling.

ABSTRACT

The field crop technology applied to watermelons, with its improvements, has become a „modernized crop technology in down tunnels of polyethylene foil", compared with the „improved classic crop technology". The methods of crop arrangement, important technological steps, influence dramatically the level, quality and earliness of yield. The simplest of them is the method of direct seeding in open field (classic field crop technology), in antithesis with the method of seeding below mulch of polyethylene foil, drip irrigation and fertirrigation (improved classic field crop technology). The method of crop arrangement through planting of seedling in open field, crop protection with down tunnels of PE foil, mulch of PE foil, drip irrigation and fertirrigation, represents the advantages of crop technology modernization. This work presents the influence exerted by the methods of crop arrangement on the productive potential of the hybrids studied.

INTRODUCTION

The profitableness of a watermelon crop is influenced by several factors, of which the crop technology plays an essential role, given the influence of the crop arrangement methods on yield on the whole, and especially on the early yield.

In open field, we may initiate the watermelon crop, according to the cultivator's possibilities and to his objectives, with several methods: the method of arrangement in open field through direct seeding (when the climatic conditions allow this) and the method of arrangement in open field through planting of seedling (when the environmental temperatures are proper to take the seedlings in field).

These two methods represent classic methods for watermelon cultivation and they have been successfully applied in the legumiculture from our country.

The method of crop arrangement through planting of seedling in open field has been improved, with the replacement of the harrow and sprinkling irrigation methods with the newest and actual method of drip irrigation. This method, besides the substantial water saving, allows crop fertilization, and it is called fertirrigation.

So, we may call this method of watermelon crop arrangement in open field, with the improvements previously mentioned: ***„the improved classic crop technology of watermelons"***.

With the perseverance of experts in the improvement of this technology, protecting the seedling with down tunnels of plastic foil, applying a mulch of foil, too, on the soil within the tunnel and applying modern chemical fertilisers (Kemira-type – Cropcare, Ferticare, Agriplant), etc., we may obtain the advantages of a technology that is much improved than the previous one, called: ***„the modernized technology of watermelon cultivation in down tunnels of polyethylene foil".***

The classic crop technology, either through direct seeding in open field or planting of seedlings in open field, still uses Romanian fertilizers, which are of worse quality.

The most productive method to obtain early watermelon productions was the one in which the seedling was protected in tunnels of totally-punched polyethylene.

The system of protected watermelon crop in hothouses in our country has been practiced at small scale, but the extension of it is recommended due to its profitableness.

For crop success, a new system of watermelon cultivation in protected areas is recommended, in concordance with a technique improved by Răduică (1989), namely the grafting on a great-vigour parent stock. It recommends watermelon grafting on cucurbitaceous species that are resistant to diseases, with a strong root system, providing vigour and a big yield.

The production technology of watermelons grafted on vigorous parent stocks differs much from the technology of watermelon cultivation in field or in hothouse through a series of particularities that must be strictly respected. Any deviation from this crop technology, which seems complicated at the first sight, but it can be easily applied, may lead to fails (Răduică, St., 1989).

At the moment in our country, to obtain early productions, producers practise more and more crop protection with punched polyethylene foil and apply the „modernized watermelon crop technology in down tunnels of polyethylene foil".

MATERIAL AND METHODS

To attain our objectives, we arranged a bifactorial experience located at a family association from the commune Şofronea belonging to the Vegetable centre Curtici-Şofronea, within Arad's Vegetable-growing basin.

The aim of our researches was to study the behaviour of some watermelon hybrids in terms of production and quality (some hybrids are known, and some of them less known: Crisby F_1, Red Star F_1, Red Comet F_1 and respectively Sorento F_1), under differentiated conditions of crop arrangement, namely through direct seeding in field under polyethylene foil and through planting of seedling in down tunnels of polyethylene foil.

The objectives of our researches were focused on the establishment of the harvesting period for each hybrid, differentiated in concordance with the method of crop arrangement, of the number of fruits/plant and of the yields/plant, implicitly per hectare.

Factor A – Method of crop arrangement: a1 – Direct seeding under mulch of polyethylene foil, protection under down tunnels of PE foil and drip irrigation; a2 – Planting of seedlings under down tunnels of polyethylene foil and drip irrigation;

Factor B – Hybrid: b_1 Crisby F_1; b_2 Sorento F_1; b_3 Red Star F_1; b_4 Red Comet F_1.

The biological material used was represented by four watermelon hybrids from the companies Nunhems-Zaden (The Netherlands).

The experimental data obtained successive our researches was processed with the help of current statistical-mathematical methods.

RESULTS AND DISCUSSION

Table 1 presents technical data related to the watermelon crop arrangement, namely the production of seedlings (date of seeding, planting and its age) and the direct seeding under the mulch of PE foil, and also to the date of tunnel removal and the establishment of the harvesting period.

Table 2 presents information regarding production elements, with reference to the number of fruits per plant, mean fruit weight and implicitly to the production per plant and hectare. The variation limits of the number of fruits per plant are big ($a_1b_1 \rightarrow$ 2.1 fruits/plant compared with $a_1b_4 \rightarrow$ 2.8 fruits/plant or $a_2b_3 \rightarrow$ 2.4 fruits/plant compared with $a_2b_4 \rightarrow$ 2.9 fruits/plant), in a relationship of inverse proportionality with the mean fruit weight.

The mean yields per plant under the influence of a_1 range between 13.109 kg/plant in a_1b_4 and 19.327 kg/plant in a_1b_3 and between 13.763 kg/plant in a_2b_4 and 21.636 kg/plant in a_2b_3. The mean yield per hectare has values between 72.1 t/ha (a_1b_4) and 106.3 t/ha (a_2b_3) under the influence of a_1 (direct seeding under PE foil) and between 75.7 t/ha (a_2b_4) and 119.0 t/ha (a_2b_3) under the influence of a_2 (seedling planted in down PE tunnels).

The mean yield per hectare under the influence of factor B (the hybrid) oscillates between 73.9 t/ha in b_4 - Red Comet F_1 and 112.7 t/ha in b_2 - Sorento F_1. Compared with the experimental mean (Mx), the yield of b_2 - Sorento F_1 is bigger with 105.6%, while the yield of b_3 - Red Star F_1, b_4 - Red Comet F_1 and b_1 - Crisby F_1 is at the level of 119.6%, at 78.5% and respectively 96.1%.

The same table presents the quality of the watermelon yield in the hybrids studied. We may notice the yield quality in b_1 - Crisby F_1 (81.6-83.6%), followed by b_4 - Red Comet F_1 (82.1-83.7%) and b_3 - Red Star F_1 (80.4-82.2%). In one single case, the 1st quality yield decreases below 80% (in a_1b_2 – 78.3% and a_2b_2 – 79.6%).

Analyzing the 1st quality yield under the influence of factor B (the hybrid), we may observe that Red Comet F_1 and Crisby F_1 are on the first position, at an insignificant difference (82.9-82.7%), followed by Red Star F_1 (81.4%) and Sorento F_1 (79.0%).

Also, table 2 presents yield distribution under the influence of factor A in the four hybrids. We may remark, at the first analysis, that Crisby F_1 (b_1), with 70.3%, excels in its early production in July, followed by Red Comet (b_4) with 69.1% and Red Star (b_3) with 67.9% (under the influence of a_2).

Table 3 presents, according to the statistical calculations specific to the variance analysis method, the significances of yield differences in the comparisons made as effect of the interdependence between the experimental factors.

The unilateral analysis of the experimental factors at points 1 and 2 leads to the following conclusions:

- the significance of the yield differences between a_2 (seedling planted in down tunnels of PE foil) and a_1 (direct seeding under mulch of PE foil) is very significantly positive, proving the obvious superiority of a_2;
- the significances of yield differences from point 2 are distinctly significantly positive in three cases and very significantly negative in three cases, too. This proves the superiority of the hybrid b_2 - Sorento F_1 and b_3 - Red Star F_1 from the viewpoint of the yields achieved, compared with the hybrids b_1 - Crisby F_1 and b_4 - Red Comet F_1.

CONCLUSIONS AND RECOMMENDATIONS

The technology applied on watermelons cultivated in open field through direct seeding under mulch of PE foil or protected with down tunnels of polyethylene foil plays a dramatic role in the manifestation of the productive and qualitative potential of the hybrids studied.

The modernized crop technology (planting of seedling, crop protection in down tunnels of polyethylene foil, mulch of polyethylene foil, drip irrigation and fertirrigation) proved to be superior compared with the improved classic crop technology (direct seeding under mulch of polyethylene foil, irrigation and fertilization through the drip system), this statement being supported by the productive manifestation of the hybrids cultivated, in terms of quantity, quality and earliness.

The hybrids Crisby F_1 and Sorento F_1, belonging to the group with light green striped cover and Red Star F_1 and Red Comet F_1, belonging to the group with light green cover, were remarked especially due to the level of the yields achieved (Sorento F_1 – 99.5 t/ha; Red Star F_1 – 112.7 t/ha) and to yield quality and earliness (Red Comet F_1 – 82.9% 1st quality yield and 65.3% early yield and Crisby F_1 – 82.7% 1st quality yield and 64.66% early yield).

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TABLES

Table 1.Technical data regarding watermelon crop arrangement through direct seeding under mulch of polyethylene foil and through planting of seedling under tunnel of polyethylene foil

Factor A	Factor B	Earliness	Date of planting	Date of emergence	Date of tunnel removal	Period of harvesting
a1	b_1	E	-	20-23.IV.2007	23-25.V	15-30.VII.2007
	b_2	T	-	20-25.IV.2007		17.VII-7.VIII.2007
	b_3	T	-	20-24.IV.2007		17.VII-3.VIII.2007
	b_4	T	-	20-24.IV.2007		16-31.VII.2007
a2	b_1	E	20.IV.2007 22.IV.2008	-	22-24.V.	1-15.VII.2007
	b_2	T		-		3-22.VII.2007
	b_3	T		-		3.VII-8.VIII.2007
	b_4	T		-		2-16.VII.2007

- Date of seeding: for a_1 – 10.04.2007 and 12.04.2008
for a_2 – 17-20.03.2007 and 19-21.03.2008 (seedling age: 21 days)
- Crop density – 5500 plants/ha
- Earliness: E – extra-early; T - early

Table 2. Quality of the early watermelon yield obtained in differentiated technological conditions in field and down tunnels of polyethylene foil in 2007-2008

Factor A (Crop arrangement method)	Factor B (Hybrid)	No. of fruits/plant	Mean yield kg/plant	Mean yield t/ha	Mean yield %	Of which quality I t/ha	Of which quality I %	Yield distribution (%) July	Yield distribution (%) August	Mean yield for factor A kg/plant	Mean yield for factor A t/ha	Mean yield for factor A %	Of which quality I t/ha	Of which quality I %
a_1	b_1	2,1	14,709	80,9	100,0	66,0	81,6	58,9	41,1	16,009	88,1	100,0	70,9	100,0
	b_2	2,4	16,890	92,9	100,0	72,7	78,3	51,1	48,9					
	b_3	2,2	19,327	106,3	100,0	85,5	80,4	60,3	39,7					
	b_4	2,8	13,109	72,1	100,0	59,2	82,1	61,5	38,5					
Mean a_1		**2,4**	**16,009**	**88,1**	**100,0**	**70,9**	**80,5**	**57,9**	**42,1**	*	*	*	*	*
a_2	b_1	2,6	18,200	100,1	123,7	83,7	83,6	70,3	29,7	18,218	100,2	113,9	82,4	116,2
	b_2	2,7	19,273	106,0	114,1	84,4	79,6	63,2	36,8					
	b_3	2,4	21,636	119,0	111,9	97,8	82,2	67,9	32,1					
	b_4	2,9	13,763	75,7	105,0	63,4	83,7	69,1	30,9					
Mean a_2		**2,7**	**18,218**	**100,2**	**113,7**	**82,4**	**82,2**	**67,6**	**32,4**	*	*	*	*	*
Experience mean (Mx)	b_1	2,4	16,455	90,5	96,1	74,9	82,7	64,6	35,4	16,455	90,5	96,1	74,9	82,7
	b_2	2,6	18,082	99,5	105,6	78,6	79,0	57,2	42,8	18,082	99,5	105,6	78,6	79,0
	b_3	2,3	20,482	112,7	119,6	91,7	81,4	64,1	35,9	20,482	112,7	119,6	91,7	81,4
	b_4	2,9	13,436	73,9	78,5	61,3	82,9	65,3	34,7	13,436	73,9	78,5	61,3	82,9
Mean (Mx)		**2,5**	**17,114**	**94,2**	**100,0**	**76,7**	**81,4**	**62,8**	**37,2**	**17,114**	**94,2**	**100,0**	**76,7**	**81,4**

Table 3. Singular influences and of the interactions between the experimental factors in a watermelon crop under differentiated technological conditions

Variant	Mean yield (t/ha)		Relative yield (%)	Difference (± t/ha)	Significance of difference
1. Influence of crop arrangement methods on yield					
a2-a1	100,20	88,06	113,79	12,14	***
a3-a1	94,16	88,06	106,93	6,10	***
a3-a2	94,16	100,20	93,97	-6,04	000
DL 5%=1,04 DL 1%= 1,57 DL 0,1%= 2,52					
2. Influence of hybrid on yield					
b2-b1	99,46	90,51	109,88	8,94	***
b3-b1	112,68	90,51	124,49	22,17	***
b4-b1	73,91	90,51	81,66	-16,60	000
b3-b2	112,68	99,46	113,29	13,22	***
b4-b2	73,91	99,46	74,32	-25,54	000
b4-b3	73,91	112,68	65,60	-38,77	000
DL 5%=2,11 DL 1%= 2,91 DL 0,1%= 4,01					
3. Influence exerted by the interactions between different crop arrangement methods and the same or different hybrids					
a2b1-a1b1	100,10	80,90	123,73	19,20	***
a3b1-a1b1	90,53	80,90	111,91	9,63	***
a3b1-a2b1	90,53	100,10	90,44	-9,57	000
a2b2-a1b2	106,00	92,90	114,10	13,10	***
a3b2-a1b2	99,47	92,90	107,07	6,57	***
a3b2-a2b2	99,47	106,00	93,84	-6,53	000
a2b3-a1b3	119,00	106,33	111,91	12,67	***
a3b3-a1b3	112,70	106,33	105,99	6,37	**
a3b3-a2b3	112,70	119,00	94,71	-6,30	00
a2b4-a1b4	75,70	72,10	104,99	3,60	*
a3b4-a1b4	73,93	72,10	102,54	1,83	-
a3b4-a2b4	73,93	75,70	97,67	-1,77	-
a2b2-a1b1	106,00	80,90	131,03	25,10	***
a3b3-a1b1	112,70	80,90	139,31	31,80	***
a3b3-a2b2	112,70	106,00	106,32	6,70	***
DL 5%= 3,33 DL 1%= 4,63 DL 0,1%= 6,47					
4. Influence exerted by the interactions between the same crop arrangement methods and different hybrids					
a1b2-a1b1	92,90	80,90	114,83	12,00	***
a1b3-a1b1	106,33	80,90	131,44	25,43	***
a1b4-a1b1	72,10	80,90	89,12	-8,80	000
a1b3-a1b2	106,33	92,90	114,46	13,43	***
a1b4-a1b2	72,10	92,90	77,61	-20,80	***
a1b4-a1b3	72,10	106,33	67,81	-34,23	***
a2b2-a2b1	106,00	100,10	105,89	5,90	**
a2b3-a2b1	119,00	100,10	118,88	18,90	***
a2b4-a2b1	75,70	100,10	75,62	-24,40	000
a2b3-a2b2	119,00	106,00	112,26	13,00	***
a2b4-a2b2	75,70	106,00	71,42	-30,30	000
a2b4-a2b3	75,70	119,00	63,61	-43,30	000
a3b2-a3b1	99,47	90,53	109,87	8,93	***
a3b3-a3b1	112,70	90,53	124,48	22,17	***
a3b4-a3b1	73,93	90,53	81,66	-16,60	000
a3b3-a3b2	112,70	99,47	113,30	13,23	***
a3b4-a3b2	73,93	99,47	74,33	-25,53	000
a3b4-a3b3	73,93	112,70	65,60	-38,77	000
DL 5%= 3,66 DL 1%=5,04 DL 0,1% =6,94					

Possibilities of growing tomatoes with minimum intervention on the ground

Gheorghița Hoza

Keywords: *bio-composite mulch, tomatoes, no-tillage system*

SUMMARY

Worldwide, particularly in the U.S. a new method is experimented that promotes vegetable cultivation in a "no-tillage" system offering the benefits of protecting the soil structure and reducing production costs. Studies in this direction had so far led to progress in crop quality, quantity and earliness.

This research aims at developing an alternative system of mulch for growing tomatoes. With the technology of growth in bio-composite mulch it is desired to overlap the benefits of mulch in vegetable growing with the advantages of a bioactive film. The objectives were: to develop a technology for obtaining bio-composite mulch (vegetal mulch with bioactive film), developing a technology for growing tomatoes in this alternative system of mulching, and perform studies on the multiple effects of alternative agriculture in the bio-composite mulch regarding tomato production and quality of crops.

Results reveal the role of the bio-composite mulch on tomatoes growth and fructification, thanks to the nutrients from its decomposition. Flower formation in inflorescences was very good to floret IV, after which there has been a setback due to high temperature. Per plant, were formed between 27,2 flowers to witness and 33,8 flowers to V5, which shows the combined influence of microorganisms used in the bio-composite layer of vetches mulch and bioactive film. The fructification percentage in all variations of mulch was higher than the reference group, being between 59,5% in V4 and 68,2% at V3, while for the reference group it was 58.5%. Regarding the fruits production, the best results were obtained in the V2, 10,4 kg/m^2, followed by V3 and V5 with more than 9 kg/m^2. Fruit production was lower in the reference group, as it was grown without mulch, reaching 6,4 kg/m^2.

MATERIAL AND METHOD

Tomatoes culture was established in autumn vetches mulch mowed down in bud stage over which chemical mulch enriched with microorganisms (name bioactive film) was applied as a thin layer.

The bio-composite mulch (composed of vegetal mulch covered with bioactive chemical mulch added as a film) was applied as follows:

V1 - composite mulch without added microorganisms;
V2 - bio-composite mulch + *Azospirillum brasilense*;
V3 - bio-composite mulch + *Bacillus subtilis*;
V4 - bio-composite mulch + *Azospirillum brasilense* + *Bacillus subtilis*;
V5 - bio-composite mulch + *Azospirillum brasilense* + *Bacillus subtilis* + *Beauveria bassiana;*
V6 – reference group (without mulch).

The tomato culture was established in solarium and executed a day after the application of bioactive film above the vegetal mulch. Planting scheme used equidistance lines, with distance between rows of 70 cm and distance between plants in a row of 35 cm, using Buzău 1600 a national variety of tomatoes.

During growth the culture was groomed using specific technology. A series of observations and measurements were made to highlight the influence of bio-composite mulch on tomatoes growth and fructification. The observations aimed at studying: growth dynamics in plant height, distance pending the first inflorescence, inflorescences sequence, and the average number of leaves until the first inflorescence, the average number of flowers in inflorescence, the average number of fruit in floret, the percentage of bended fruits, fruit production and biochemical composition of fruits.

RESULTS AND DISCUSSIONS

Results on growth and fructification of tomatoes in the solarium

The vetches mulch has positively influenced the growth and fructification of tomatoes, leguminous plants being known as very good precursory for many vegetable species, including tomatoes, improving the physical-chemical properties of soil.

Tomato plants had a very good vegetative growth as a result of decomposition of vetches mulch which brings additional nutrients in soil. Thus, average plant height was higher in all-experimental variants except the non-mulched reference group who had a lower growth. Other parameters were not influenced by variations of mulch, as noted in table 1.

In terms of fructification, mulched variants had small influence on the formation of tomatoes flowers and fruits, these processes were more influenced by environmental conditions. Regarding the number of flowers formed in inflorescences, there are differences between variants and between the inflorescences of the same variant (figure1).

Flower formation had a good evolution until inflorescence 4^{-th} – $5^{-th,}$ after this stage a setback occurred due to excessively high temperature during the course of experience correlated with a very low relative humidity.

Application of the bio-composite mulch influenced fruit binding. Average fruit number in inflorescences followed the same evolution as flowers number. Number of bind fruits decreased greatly from forth inflorescence and coincided with the excessive increase of temperature, which affect pollen germination (figure 2).

The percentage of fruit binding was different, being influenced by mulch composition and especially by environmental factors (figure 3). The smallest percentage of fruit binding was obtained from inflorescences V and VI when the high temperatures associated with air dryness have contributed to flowers abortion. Was noticed an increase in the percentage of fruit binding to seventh inflorescence, however, the number of flowers was very small and the formed fruits were of lower quality.

The fruit production was affected by the bio-composite mulch, best results have been achieved at V2, 10,4 kg/m^2, followed by V3 and V5 with more than 9 kg/m^2. Fruit production was lower in the reference group since it was grown without mulch (table 2).

Biochemical, tomato fruits achieved a better evolution suggesting that bio-composite mulch is a suitable technology for tomatoes cultivation (table 3).

Unlike the reference group, mulched variants fruits had slightly higher water content; the value was between 94,4% in V5 up to 94,7% in V3 compared with 94,2% for the reference group. Soluble dry matter and lycopene content were noticeably affected by mulch variations, the reference group having a lower amount of both indicators. Mulched variants were determined as having an increased content of vitamin C in tomato fruits, mean values varied between 21,64 mg per 100 g and 26,06 mg per 100 g, while the reference group had a level of 20,1 mg per 100 g. Total carbohydrate content was slightly higher in experimental variations than the reference, the percentage being 3,48% in the case of the reference group compared with 3,82% for V3.

CONCLUSIONS

The conclusions following solarium research on tomato culture in bio-composite system have been:

• Reduced work with soil preparation, excluding the raising, mobilization and grind stages;

• Strengthened plants by improving mulch composition with microorganisms;

• Improved growth and fructification processes of tomato plants as a consequence of increased production on unit area;

• Improved fruit quality with increased content of vitamin C, lycopene, soluble dry matter and total carbohydrates.

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TABLES

Table 1 - Biometric indicators

Variant	Average number of leaves until the first inflorescence	Distance until the first inflorescence (cm)	Inflorescences sequence average	Plant height (cm)
V1	5,8	28,8	3,2	167
V2	5,0	27,8	3,6	172
V3	6,8	29,4	3,2	168
V4	5,4	30,4	3,0	175
V5	4,8	28,6	4,0	167
V6 Control	5,8	31,6	3,4	156

Table 2. Calculated production of fruit

Variant	Kg/plant	Kg/m^2
V1	2,20	8,8
V2	2,60	10,4
V3	2,30	9,2
V4	2,25	9
V5	2,27	9,08
V6 Control	1,60	6,4

DL 5% = 0,27 kg/pl 0,28 kg/m^2
DL 1% = 0, 39 kg/pl 0,40 kg/m^2
DL0.1% = 0,57 kg/pl 0,57 kg/m^2

Table 3. Biochemical composition of tomato fruit

Variant	Water content%	Soluble dry matter%	Lycopene%	Vitamin C mg/100g	Acidity Citric acid %	Total carbo-ydrate
V1	94,4	5,53	5,38	21,64	0,34	3,78
V2	94,4	5,66	4,5	21,49	0,30	3,61
V3	94,7	5,25	5,38	26,06	0,27	3,82
V4	94,6	5,36	5,83	25,90	0,29	3,52
V5	94,4	5,56	5,51	23,36	0,27	3,87
V6- Control	94,2	4,77	5,23	20,7	0,32	3,48

FIGURES

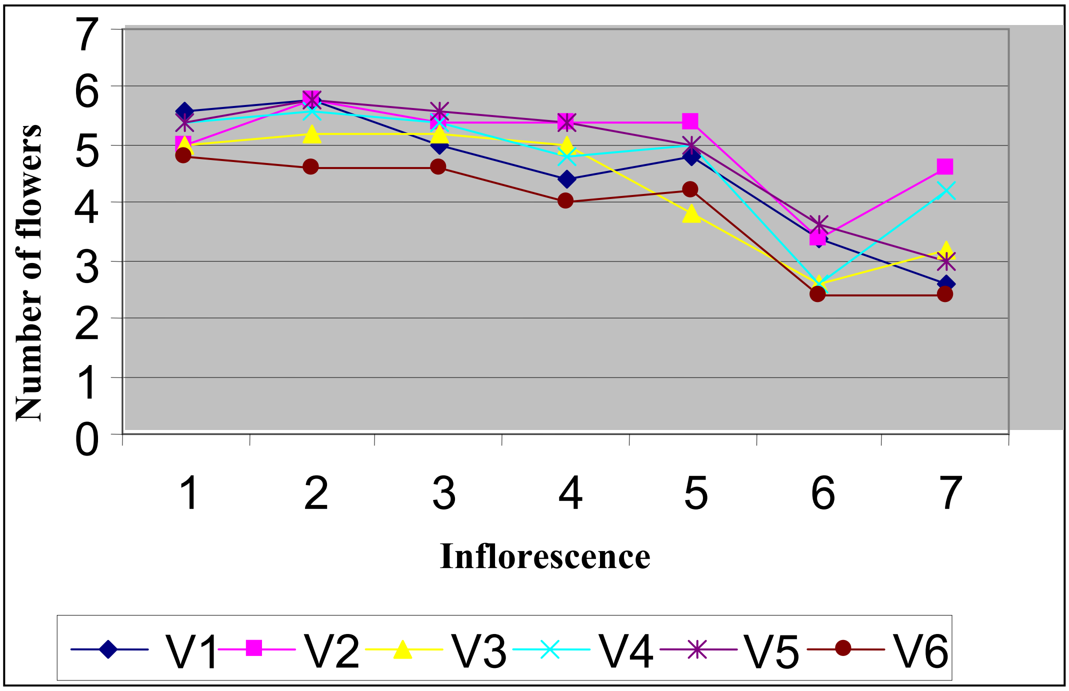

Fig. 1. Average number of flowers in inflorescences

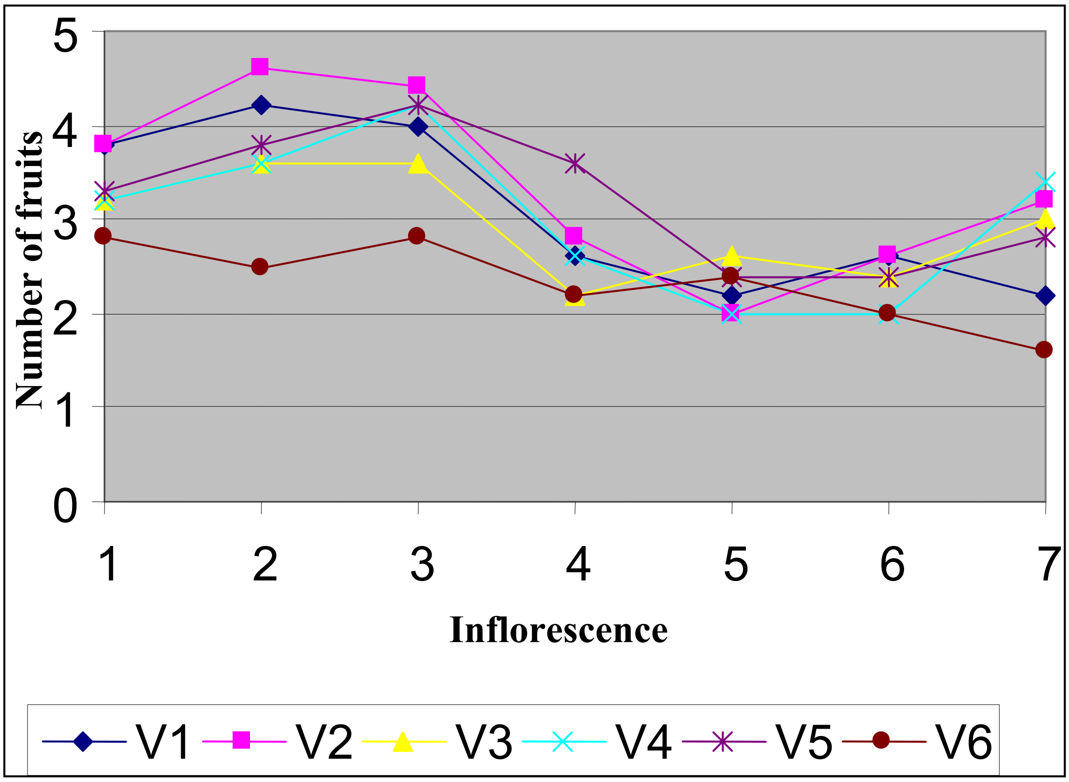

Fig. 2. Average number of fruits in floret

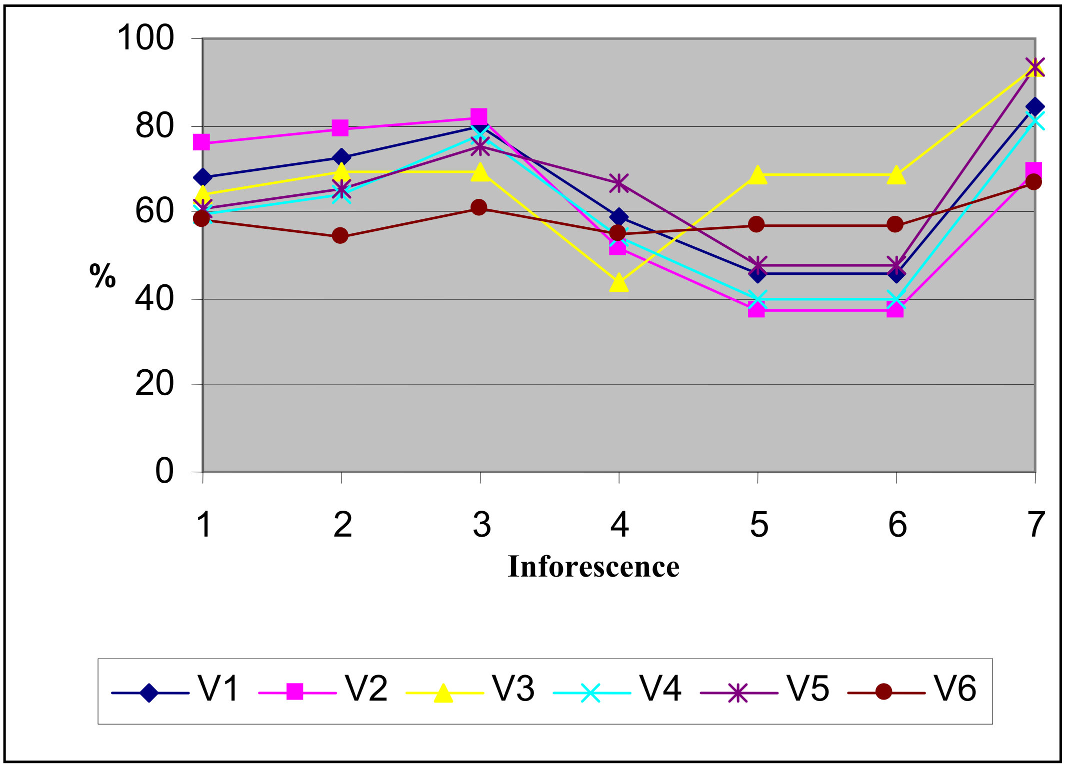

Fig. 3. Binding fruit percentage (%)

Effect of culture technique upon pickling cucumber hybrids in solarium tunels in the Tărtăşeşti-Răcari area (Dâmboviţa County)

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

ABSTRACT

The *Cucumis sativus* quality is highly influenced by the culture techniques and hibryds in solarium. Solarium experiment was conducted in 2009 using the next density: 48.000 plants/ha witch coresponde to row spacing 70 cm and 30 cm between plantes inside the row, grown for manual harvest. Profitability its directly linked to hibryd used, selling price and period of selling. On this experience we try to show the optimum density required to maximize the revenue. Results of this study suggest that hibryd Kybria have the bigest production at the density of 4.76 pl/sq.m, (48.000 pl/ha).

INTRODUCTION

The present paper wants to demonstrate how pickling cucumber quality may be influenced by hybrids and culture techniques. Most of the pickling cucumber in Dambovita County is grown for fresh alimentation use. To optimize yield and quality of commercial size fruits, most growers use low planting densities with over 30.000 plants on ha in many cases. In a survey conducted in Dambovita County in 2007, we found that some growers used row spacing as narrow 100 cm with 30 cm between plants inside the row, which corresponds to a density of about 33.333 plants ha. High plant density may increase relative humidity within the canopy and increase the duration of leaf wetness by reducing air movement and sun light penetration and low plant density have directly connection with profitability. High plant density could have significant impact on plant disease incidence. In this experiment was reported a significant increase in the incidence of *Pseudoperenospora cubensis, Spaerotheca fuliginea* and *Alternaria cucumerina.* Several studies have been conducted on the past regarding effect of plant density on yield and quality of pickling cucumber. In studies elaborated in Michigan using densities from 44.000 to 194.000 plants/ha, (Widders and Price 1989) showed that optimum planting density for cultivars Tamor and Castlepik was 77.000 plants/ha. In North Carolina, (Schultheis et al. 1998) found optimum densities of 200 000, 240 000, and 330 000 plants ha for cultivars Sumter, Regal, and H-19. These results suggest that optimum planting density may vary greatly among cultivars and growing conditions. On Tartasesti-Racari area no detailed study has documented its optimum plant density and cucumber yield.

Main objectives of this experience are as follow:

- Determining the production potential of some new hybrids has been used in the culture in Tartasesti-Racari area.
- Comparison of productivity and quality of fruit obtained in comparative culture conducted in 2009.

MATERIALS AND METHODS

The present paper wants to demonstrate how pickling cucumber quality may be influenced by culture techniques and hybrids. For achievement were established experience variations presented in table number 1.

Conditions of experiment Field experiments were conducted at the family farm, formed by 200 square metres solarium tunnels and 5 ha open field, cultivated with vegetables on 4 years rotation system. The soil pH was 8.13, and soil analized N-NH4:26.64, N-NO3:57.00, P-PO4:56.19, K:245.

Specific elements of technology: culture was established by planting seedling on 15/04/2009 with distance between rows of 70 cm and 30 cm between plants per row. One density was obtained by combination of row spacing and plant spacing inside the row. Plant spacing and row spacing were selected on the basis of Dambovita County current practices. Works were made specific care pickling cucumber type cultivation in solarium tunels. Experimental culture was harvested by hand, gradually, with registration repeating the production quality for each variant. Quantities harvested were pooled to establish production in accordance with experimental scale (variations). The experimental design was the latin square blocks with three replications. Pickling cucumber hibryds used: Pasarebo, Karaoke, Kybria, Componist was planted on 18.04.2009 (Table 1). Immediately after planting, foliar fertilizer (Cropmax) were applied and then soil fertilizer at a rate of 1 kg/ha (1:2:1/N-P-K) in a microirigation system. Because of the differences in the number of rows per hectare, in treatments the quantities of fertilizer was adjusted for row spacing.

Data collection: Pickling cucumbers were harvested manually on period of 15.05.2009 (27 days after planting day) up to 15.08.2009 (3 months after day piking starting). Fruith were harvested when about 30% of them have about 9-12 cm in long and sorted according to market standards.

RESULTS AND DISCUSSIONS

Regarding fruit number: as plant growing up in good condition results that numbers of fruits per plant increased. With increased density of fruith on terminal part of plant the fruit weight per plant decreased and fruit weight per unit area increased. This study results shows information that could help the farmers in Dambovita county. The performance of individual plants is directly linked to plant density. With plant density increased the results for fruit set per plant and fruit weight per plant decreased, and increased per unit area. Fruit quality is dependent of warm condition in harvest period. With increased plant density the low fruit set are directly linked to net photosynthesis (Schapendonk and Brouwer, 1984). Profitability of fresh pickling cucumbers it's directly linked to hibryd used, selling price and period of selling. In this study we try to show the optimum density required to maximize the revenue. Results of this study suggest that hibryd Kybria have the bigest production at the density of 4.76 pl/sq.m, (30.000 pl/ha).

CONCLUSIONS

Regarding number of fruith per plant, hybrid Kybria is in top with average of 18.65 and 37.12 (Table 2 and 3).

For average weigh of fruith, the heavest one are hybrid Karaoke with 90.9 g average and the smallest Kybria with 85 g.

Production per plant: Kybria 1.58 (+0.40) and 3.15 (+0.84) for the first mont of harvest and second one (Table 2 and 3).

Production per sq.m: Kybria 7.52 (+1.96) and 14.99 (+4.00) for the first and second month of harvest (Table 2 and 3).

Hibryd Kybria have the bigest productivity from four hybrids used, comparing with the control hybrid.

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TABLES

Table 1. Experimental variations in solar with pickling cucumber type, Tartasesti 2009

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

Table 2. Total production type cornichon cucumber in solarium, Tartasesti 2009, (the first month of harvest)

V.	Cultivar	No. of fruit per plant	Average weight (g)	Production per plant (kg)	Density culture	Total production (kg/sq.m)	Difference from the control
1	Control A	10.64	110	1.17	4.76	5.56	-
2	Pasarebo	10.58	87	0.92	4.76	4.37	-1.19
3	Karaoke	13.83	90.9	1.25	4.76	5.95	+0.39
4	Kybria	**18.65**	85	**1.58**	4.76	**7.52**	**+1.96**
5	Componist	13.71	87.2	1.19	4.76	5.66	+0.10

Table 3. Total production type cornichon cucumber in solarium, Tartasesti 2009, (two month of harvest)

V.	Cultivar	No. of fruit per plant	Average weight (g)	Production per plant (kg)	Density culture	Total production (kg/sq.m)	Difference from the control
1	Control A	21.02	110	2.31	4.76	10.99	-
2	Pasarebo	15.86	87	1.38	4.76	6.56	-4.43
3	Karaoke	29.80	90.9	2.71	4.76	12.89	+1.90
4	Kybria	**37.12**	85	**3.15**	4.76	**14.99**	**+4.00**
5	Componist	26.62	87.2	2.32	4.76	11.04	+0.05

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

Researches regarding the possibility of reducing the disease attack and pests on tomatoes by protecting the crops with photoselective foils

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Keywords: cultivars, protection, photoselection, foil, attack

ABSTRACT

Through the experiences evolved, we searched and determined the care in solar tomato plant's response, by applying some modern technological sequences-the use of this technique for proctecting the crops of some photoselective foils which were anti-condense, with addition of UV and IR, produced in Romania– on a modern biofond, represented by two different assortment varietes-classic, Cindel F1 and cherry-type, the Cerise variety.

INTRODUCTION

In the current modern agriculture, issues related to plants protection encompass an important link in mentaining a healthy market, with a minimum of financial effort and air pollution of the environment. It is well known the fact that the apparition and the amplitude of the attack degree of diseases and pests present important shifts, from year to year, from a crop cycle to another one, within or during the same year, but moreover within the same crop cycle, on the same species, depending on the manifold nurtured. Although growing and tilling plants in glasshouses is more expensive then care crops on fields, it proves its economical efficiency and viability through the fact that it can offer means through which it exceeds the drawbacks related to the climatic and biological abridgements of the production (Ciofu, 2006). The additional costs which tilling plants in glasshouses dictates are usually vindicated if the price obtained on the product unit is high (Dobrin, 2005). This appears when the production is of better quality, and when the production costs are compensated by the growth of the harvests.

MATERIALS AND METHODS

The experiment was developed during 2008, in the didactic sector and the experimental one, of of the University of Agricultural Sciences and Veterinary Medicine – Bucharest, Department of Vegetable Crops, studied the behaviour of two different varieties of tomatoes, on the pathogens agents' attack, and pests which are specific tomatoes in protected areas, in favorable conditions for protecting crops with different photoselective soils.

The experiment was made in tunnel type solars, of high type tunnel. We used the liniar arrangement of blocks method, which was formed of two factors**:**

Factor a - two gradations; it was represented by the cultivars

a_1= *Lycopersicum esculentum* var. *esculentum*: **Cindel(F1)**

a_2= *Lycopersicum esculentum* var. c*erasiforme*: **Cerise**

Factor b - eight gradations; It was represented by the photoselective foil used on the protection:

b_1: dark red
b_2: light red
b_3: dark yellow
b_4:light yellow
b_5:dark green
b_6: light green
b_7: white treated
b_8: white untreated

By combining the two factors, *16 variants* resulted, and they are presented in table 1.

The biological material used was represented by two different varieties of tomatoes, like **Cindel F1** (*Lycopersicum esculentum* var. *esculentum*), with specific durance for *Tomato spotted wiltd virus, Verticulium sp, Fusarium oxysporum* and **Cerise** (*Lycopersicum esculentum* var. c*erasiforme*).

The work method applyed in the experiment was:

- the necessary seedlings for the experiments were obtained in a warm glasshouse, by moving them in plastic hotchpotches of 200 ml;
- the establishment of crops, by tilling seedlings, was made on 10 april 2008, by the 70/35 cm scheme, resulting a number of 4 plants/mp.
- care of crops was made according to classic tehnology, and the fitosanitary treatments application was excluded, in order to follow the influence of the protection with photo selective foils upon the apparition and manifestation of the diseases' attack and pests.

The attack degree was determined, calculated on the frequence and intensity of the attack, through direct observations in the solar. The presence of the pathogens attack and foliar pests was expressed in values, at the end of visual examinations. The frequence was analysed (F%), the intensity (I%) and the attack degree (G.A.%). Ten fully-developed, mature plants were taken into study, for each variant, and 50 leaves per plant were analysed, in the end the average per variant being realized. For the factors' notation, a scale of notation of 0 to 4 was used (the quarters method), and the observations were made at the half of the harvesting period.

RESULTS AND DISCUSSION

Results regarding the pathogens' and the foliar pests' apparition and evolution on the varieties of tomatoes studied (table 2) showed that pathogens present in observations were *Alternaria sp.* and *Phytophthora infestans*

It can be seen that there are very big differences between the two varieties, regarding their endurance to diseases, especially in the mildew's case, because on *Cerise* variety, it wasn't attacked by mildew, although these varieties were put in the crop area, very close to each other. The highest values of the attack degree were noticed on *Cindel* variety, red foil (GA=5,88% for mildew and GA=9,52% for early), and the lowest values were noticed on green colour foils.

For *Cerise*, the green colour foils made the early blight attack favorable, in their case high values of GA (11,75 – 12,3%) being registered, while on the ones of yellow colour, the lowest values of GA were registered, of only 1,5 – 2,0%.

It is to be taken into consideration that very close to the end of the determination period (the second decade of July) a sizable presence of *Trialeurodes vaporariorum* population was noticed, which led to the apparition of *Capnodium salicinum* on leafs and also from the table it can be seen the fact that the Cerise variety is more endurant and stronger at the fumagine's establishment, after the white fly(of glasshouse) attack, but, being present at the end of the vegetation cycle, we believe it is not a danger for the obtained harvest. In conclusion, by analysing the information in fig. 1, regarding the fumagina's apparition, which settled especially on insects' excrements, we notice that *Trialeurodes* preffer yellow colour, followed by red colour and green colour, from the white foil.

CONCLUSIONS

Regarding the apparition and progress of foliar pathogens, if we analyse by comparison the two varieties, it is clearly seen that var. *cerasiforme* is much more durable and endurant at diseases than var *esculentum*.

From the researches made, it can be seen the fact that photoselective foils have the capacity to stimulate ori limit the development of the pathogen agents, and they can be considered an important link in reducing the number of fitosanitary treatments from crops, and, why not, in obtaining ecological products.

Along the preventive a remedial methods recommended in competence literature, the solars's coverage with photoselective foils, variously coloured or treated, it can limit the apparition and expansion of pathogens on tomatoes.

The apparition and evolution of the pathogen agents' and foliar pests' attack in tomatoes crops are conditioned also by the particularities related to the plants' endurance to these attacks. It is well known that, the less it is interfered; cherry type tomatoes have a strong imunitary system.

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TABLES AND FIGURE

Table 1. Experimental variants – year 2008

Variants	Descriere
V1 - a_1b_1	Cindel F1+ **dark red**
V2 - a_1b_2	Cindel F1+ **light red**
V3 - a_1b_3	Cindel F1+ **dark yellow**
V4 - a_1b_4	Cindel F1+ **light yellow**
V5 - a_1b_5	Cindel F1+ **dark green**
V6 - a_1b_6	Cindel F1+ **light green**
V7 - a_1b_7	Cindel F1+ **white treated**
V8 - a_1b_8	Cindel F1+ **white untreated**
V9 - a_2b_1	Cerise + **dark red**
V10- a_2b_2	Cerise + **light red**
V11 - a_2b_3	Cerise + **dark yellow**
V12 - a_2b_4	Cerise + **light yellow**
V13 - a_2b_5	Cerise + **dark green**
V14 - a_2b_6	Cerise + **light green**
V15 - a_2b_7	Cerise + **white treated**
V16 - a_2b_8	Cerise + **white untreated**

Table 2 The influence of varieties of tomatoes and the type of photo selective foil of protection upon the attack degree of foliar pathogens.

	Tested variants	Variety Cindel GA%		Varietaty Cerise GA%	
		Phytophthra infestans	Alternaria sp	Phytophthra infestans	Alternaria sp
1	**dark red**	**5.88**	**9.52**	0	8.00
2	**light red**	4.55	6.14	0	7.14
3	**dark yellow**	3.33	3.0	0	2.0
4	**light yellow**	4.16	2.5	0	1.5
5	**dark green**	3.00	4.5	0	**12.3**
6	**light green**	3.74	6.10	0	**11.75**
7	**white treated**	4.65	5.26	0	5.26
8	**white untreated(MT)**	5.15	6.25	0	6.25

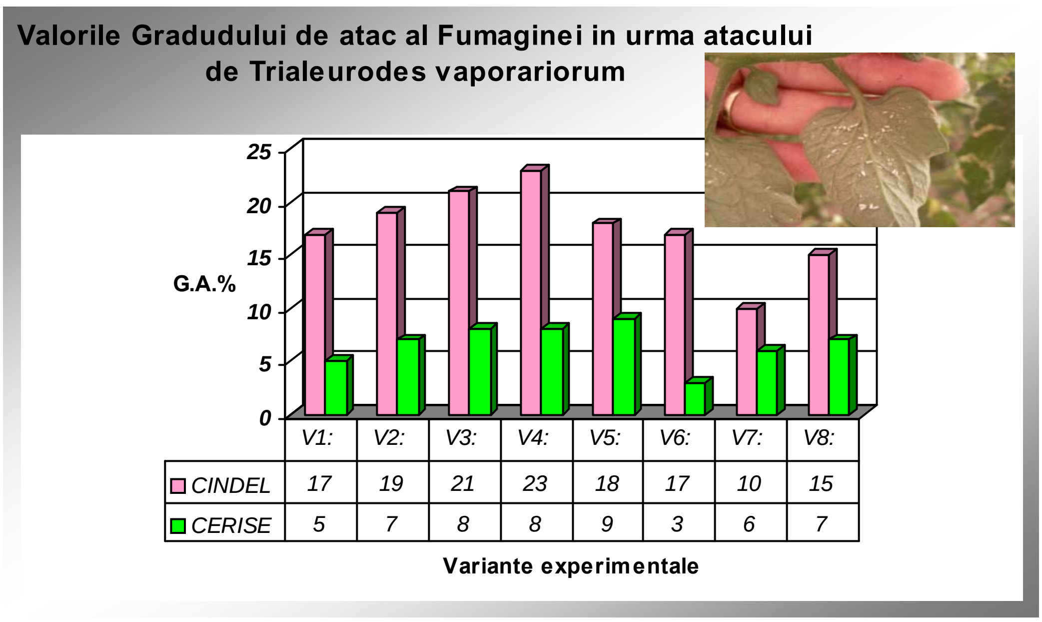

Fig. 1. Fumagina attack as a result of the white fly of glasshouse attack

Enzymatic determination of nitrates content, in case of some vegetable species cultivated in the field

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Keywords: onion, bell peppers, carrots, cabbage, fertilization

ABSTRACT

In this paper are presented results of the performed researches, for to establish the influence of fertilization treatments on nitrates content of some vegetable species, cultivated in the field: cabbage, carrots, bell peppers and onion. In the culture technology of these vegetables, they were applied the following fertilization variants (fertilizer being ammonium nitrate with 33% nitrogen): V1 = 0 kg nitrogen/ha; V2 = 100 kg nitrogen/ha; V3 = 200 kg nitrogen/ha; V4 = 400 kg nitrogen/ha; V5 = 800 kg nitrogen/ha. For to establish the accumulation potential of nitrates in vegetables cultivated in the field, it was used an enzymatic method. In the case of the high fertilization level, cabbage has the higher nitrates content (698.19 mg NO_3^-/kg), and bell peppers the lower nitrates content (61.70 19 mg NO_3^-/kg).

INTRODUCTION

Nitrates and nitrites are natural components of the soil from nitrogen mineralization of organic substances of plant and animal origin. Nitrogen mineralization takes place primarily through existing micro-organisms in soil. In areas with temperate climate, this process is carried out with maximum intensity in hot season (Bibicu, 1994).

A part of nitrate and nitrite is absorbed by plant roots and serves as feedstock for the synthesis of proteins and other nitrogen compounds, and the other is caused by surface water or crossing the land, retrieval – in rivers, lakes or into groundwater (especially in cloth water groundwater).

Plants absorb nitrogen from the soil, mainly in the form of nitrates or ammonia. On may intervenes and legumes fixing nitrogen gas by symbiotic bacteria, which is used in the synthesis of amides and amino acids. These organic compounds are then retrieve plant, which in turn ensures bacteria, the synthesis necessary carbohydrates.

The first changes that have nitrates in plants consist of two succesive reductions, catalised by nitrate-reductase and nitrite-reductase. Both enzymes are metallo-flavo-enzymes. Nitrate-reductase contains molybdenum, nitrite-reductase, iron and copper.

Conversion of nitrates into nitrites is, mainly in roots and leaves. The amount of nitrates in the existing in plant at a time, is the result of balance between the amount absorbed and used in proteino-genesis. A main cause of nitrate accumulation in vegetables is the use of nitrogenous fertilizers on crop land (Popa et al., 1986).

Depending on nitrates content of vegetables and fruits, these can be grouped in the following way (Gherghi et al., 2001):

- with high nitrates content (over 1000 ppm): onion, green garlic, beetroot, cabbage, orache, patience, leaves lovage, greenhouse lettuce;
- with average nitrates content (100 – 1000 ppm): yellow melons, cucumbers, field lettuce, potatoes, celery;
- with low nitrate content (under 100 ppm): cherries, morello cherries, strawberries, raspberry, tomatoes, green pea.

Field vegetables have a lower accumulation potential of nitrates, in comparison with those cultivated within protected environments (Bibicu, 1994).

MATERIAL AND METHODS

Within the performed researches for determination of nitrates content of some vegetable species, cultivated in open field, to which they were applied different fertilization variants, they were used: cabbage (*Buzoiană* variety), carrots (*Nabuco* variety), bell peppers (*Splendens* variety), onion (*De Buzău* variety). Samples were supplied by the Vegetable Research Development Plant for Horticulture Buzau. In culture technology of these vegetables, they were applied the following fertilization variants (fertilizer being ammonium nitrate with 33% nitrogen):V1 = 0 kg nitrogen/ha; V2 = 100 kg nitrogen/ha; V3 = 200 kg nitrogen/ha; V4 = 400 kg nitrogen/ha; V5 = 800 kg nitrogen/ha. For each fertilization variant, they were realised 4 repetitions.

For determination of the accumulation potential of nitrates in vegetables cultivated in open field, studied, it was used an enzymatic method. In this method, nitrate is reduced by the reduced nicotinamide adenine dinucleotide (NADPH), to nitrite, in presence of nitrate-reductase (NR):

$$NO_3^- + NADPH + H^+ \xrightarrow{NR} NO_2^- + NADP^+ + H_2O$$

Amount of oxidized NADPH is stoechiometrically equal with nitrate amount. Decreasing of NADPH amount is measured through absorbance at λ = 340 nm.

RESULTS AND DISCUSSION

Within experimental variant V1 (without fertilizer adding), nitrates content of cabbage is in the range 79.52 – 84.08 mg/kg. The average value of the accumulation potential of nitrates in this case is 80.76 mg/kg.

When is applied fertilizer, nitrates content of cabbage increases once with increasing of fertilizer dose (ammonium nitrate with 33% nitrogen). Thus, in the case of fertilization variant V2 (100 kg nitrogen/ha) cabbage has a nitrates content in the range 136.75 – 138.08 mg/kg, and the average potential of nitrates accumulation is 137.38 mg/kg, with 41.21% much more than in the case of none fertilizer applied.

Within fertilization variant V3 (200 kg nitrogen/ha) cabbage has a nitrates content in the range 288.94 – 290.75 mg/kg, and the average potential of nitrates accumulation is 289.95 mg/kg, of 3.59 times higher, than in case of none fertilizer applied.

Application of a fertilizer dose of 400 kg nitrogen/ha (fertilization variant V4), it determines increasing of 5.51 times of the average potential of nitrates accumulation in cabbage cultivated in these conditions, comparative with those non-fertilized. In the case of this fertilization variant cabbage has nitrates content in the range 444.54 – 445.92 mg/kg, and the average potential of nitrates accumulation is 445.32 mg/kg.

Use in the culture technology of a fertilizer dose of 800 kg nitrogen/ha (fertilization variant V5), it determines increasing of 8.65 times of the average potential of nitrates accumulation in cabbage cultivated in these conditions, comparative with non-fertilized cabbage. In the case of this fertilization variant cabbage has nitrates content in the range 697.63 – 698.85 mg/kg, and the average potential of nitrates accumulation is 698.19 mg/kg.

According to the obtained results, cabbage is a vegetable species with an average potential of nitrates accumulation.

Within fertilization variant V1 (without fertilizer adding), nitrates content of carrots is in the range 90.18 – 91.88 mg/kg. The average value of the accumulation potential of nitrates in this case is 90.85 mg/kg.

When is applied fertilizer, nitrates content of carrots increases once with increasing of fertilizer dose (ammonium nitrate with 33% nitrogen). Thus, in the case of fertilization variant V2 (100 kg nitrogen/ha) carrots have a nitrates content in the range 159.55 – 161.93 mg/kg, and the average potential of nitrates accumulation is 160.98 mg/kg, with 77.19% much more than in case of none fertilizer applied.

Within fertilization variant V3 (200 kg nitrogen/ha) carrots have a nitrates content in the range 199.85 – 201.85 mg/kg, and the average potential of nitrates accumulation is 200.83 mg/kg, of 2.21 times higher, than in case of none fertilizer applied.

Application of a fertilizer dose of 400 kg nitrogen/ha (fertilization variant V4), it determines increasing of 2.87 times of the average potential of nitrates accumulation in carrots cultivated in these conditions, comparative with those non-fertilized. In the case of this fertilization variant carrots have nitrates content in the range 260.53 – 261.44 mg/kg, and the average potential of nitrates accumulation is 260.62 mg/kg.

Use in the culture technology of a fertilizer dose of 800 kg nitrogen/ha (fertilization variant V5), it determines increasing of 4.3 times of the average potential of nitrates accumulation in carrots cultivated in these conditions, comparative with non-fertilized carrots. In the case of this fertilization variant, carrots have nitrates content in the range 389.72 – 391.50 mg/kg, and the average potential of nitrates accumulation is 390.49 mg/kg.

According to the obtained results it can be concluded that carrots are a vegetable species with an average accumulation potential of nitrates.

Within fertilization variant V1 (without fertilizer adding), nitrates content of bell peppers is in the range 11.53 – 14.04 mg/kg. The average value of the accumulation potential of nitrates in this case is 12.63 mg/kg.

When is applied fertilizer, nitrates content of bell peppers increases once with increasing of fertilizer dose (ammonium nitrate with 33% nitrogen). Thus, in the case of fertilization variant V2 (100 kg nitrogen/ha) bell peppers have a nitrates content in the range 17.03 – 19.25 mg/kg, and the average potential of nitrates accumulation is 18.17 mg/kg, with 43.86% much more than in case of none fertilizer applied.

Within fertilization variant V3 (200 kg nitrogen/ha) bell peppers have a nitrates content in the range 27.10 – 29.35 mg/kg, and the average potential of nitrates accumulation is 28.08 mg/kg, of 2.22 times higher, than in case of none fertilizer applied.

Application of a fertilizer dose of 400 kg nitrogen/ha (fertilization variant V4), it determines increasing of 3.22 times of the average potential of nitrates accumulation in bell peppers cultivated in these conditions, comparative with those non-fertilized. In the case of this fertilization variant bell peppers have nitrates content in the range 39.67 – 41.55 mg/kg, and the average potential of nitrates accumulation is 40.67 mg/kg.

Use in the culture technology of a fertilizer dose of 800 kg nitrogen/ha (fertilization variant V5), it determines increasing of 4.88 times of the average potential of nitrates accumulation in bell peppers cultivated in these conditions, comparative with non-fertilized bell peppers. In the case of this fertilization variant, bell peppers have nitrates content in the range 60.85 – 63.08 mg/kg, and the average potential of nitrates accumulation is 61.70 mg/kg.

According to the obtained results, bell peppers are a vegetable species with low potential of nitrates accumulation.

Within fertilization variant V1 (without fertilizer adding), nitrates content of onion is in the range 28.35 – 31.15 mg/kg. The average value of the accumulation potential of nitrates in this case is 29.46 mg/kg.

When is applied fertilizer, nitrates content of onion increases once with increasing of fertilizer dose (ammonium nitrate with 33% nitrogen). Thus, in the case of fertilization variant V2 (100 kg nitrogen/ha) onion has a nitrates content in the range 49.21 – 51.45 mg/kg, and the average potential of nitrates accumulation is 50.27 mg/kg, of about 1.71 times much more than in case of none fertilizer applied.

Within fertilization variant V3 (200 kg nitrogen/ha) onion has a nitrates content in the range 66.35 – 68.21 mg/kg, and the average potential of nitrates accumulation is 67.32 mg/kg, of about 2.28 times higher, than in case of none fertilizer applied.

Application of a fertilizer dose of 400 kg nitrogen/ha (fertilization variant V4), it determines increasing of 2.38 times of the average potential of nitrates accumulation in onion cultivated in these conditions, comparative with those non-fertilized. In the case of this fertilization variant onion has nitrates content in the range 69.20 – 71.35 mg/kg, and the average potential of nitrates accumulation is 70.21 mg/kg.

Use in the culture technology of a fertilizer dose of 800 kg nitrogen/ha (fertilization variant V5), it determines increasing of 2.78 times of the average potential of nitrates accumulation in onion cultivated in these conditions, comparative with non-fertilized onion. In the case of this fertilization variant, onion has nitrates content in the range 80.62 – 83.05 mg/kg, and the average potential of nitrates accumulation is 81.81 mg/kg.

CONCLUSIONS

Cabbage samples obtained in field culture, through application of 5 fertilization variants, have a potential of nitrates accumulation in the range: 80.76 mg NO_3^-/kg – 698.19 mg NO_3^-/kg. The minimum value of nitrates content is for non-fertilized cabbage, and the maximum value is for fertilized cabbage with 800 kg nitrogen/ha.

Carrot samples obtained in field culture, through application of 5 fertilization variants, have a potential of nitrates accumulation in the range: 90.85 mg NO_3^-/kg – 390.49 mg NO_3^-/kg. The minimum value of nitrates content is for non-fertilized carrots, and the maximum value is for fertilized carrots with 800 kg nitrogen/ha.

Bell pepper samples obtained in field culture, through application of 5 fertilization variants, have a potential of nitrates accumulation in the range: 12.63 mg NO_3^-/kg – 61.70 mg NO_3^-/kg. The minimum value of nitrates content is for non-fertilized bell peppers, and the maximum value is for fertilized bell peppers with 800 kg nitrogen/ha.

Onion samples obtained in field culture, through application of 5 fertilization variants, have a potential of nitrates accumulation in the range: 29.46 mg NO_3^-/kg – 81.81 mg NO_3^-/kg. The minimum value of nitrates content is for non-fertilized onion, and the maximum value is for fertilized onion with 800 kg nitrogen/ha.

ACKNOWLEDGEMENTS

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FIGURES

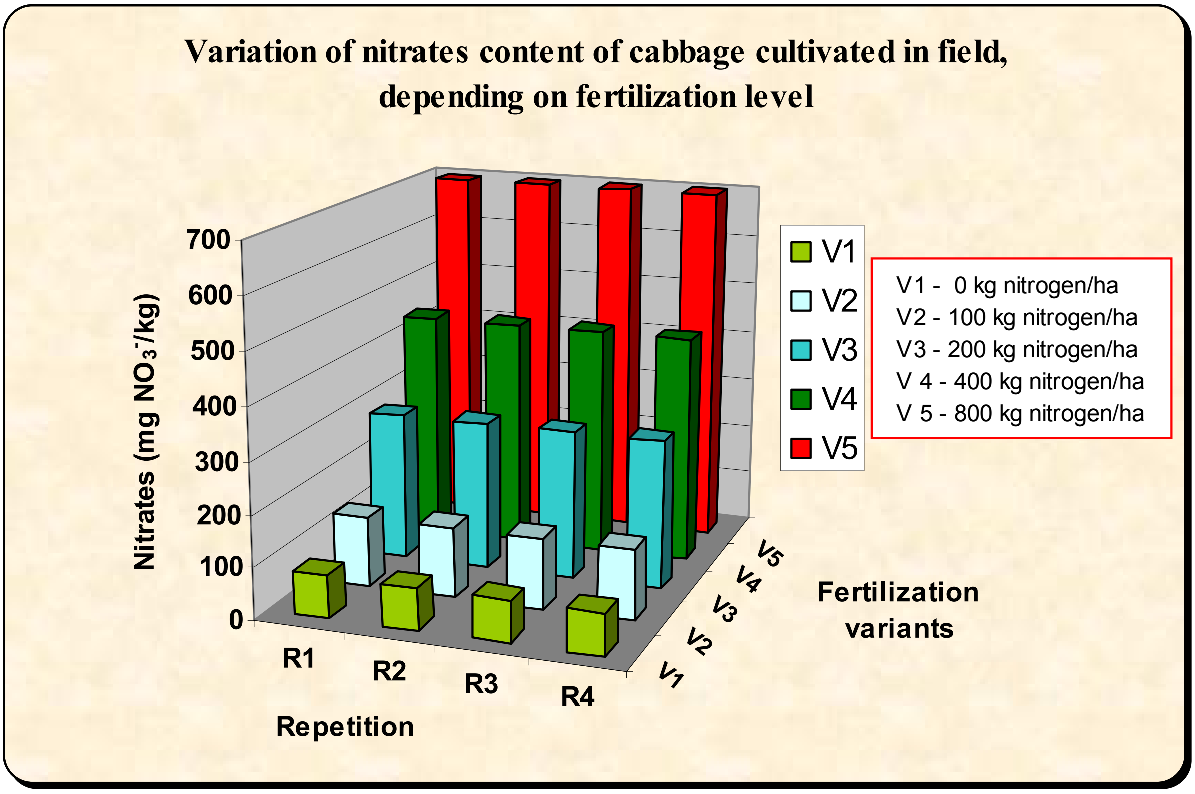

Fig. 1. Variation of nitrates content of cabbage cultivated in field, depending on fertilization level

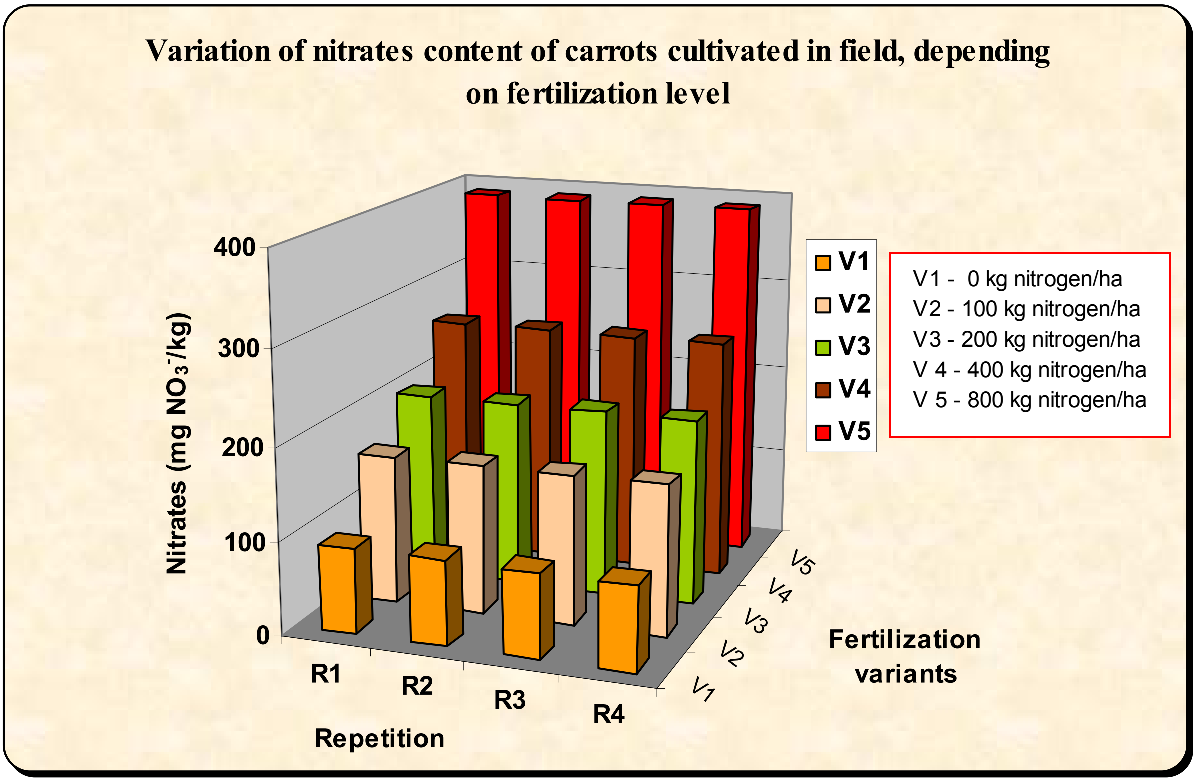

Fig. 2. Variation of nitrates content of carrots cultivated in field, depending on fertilization level

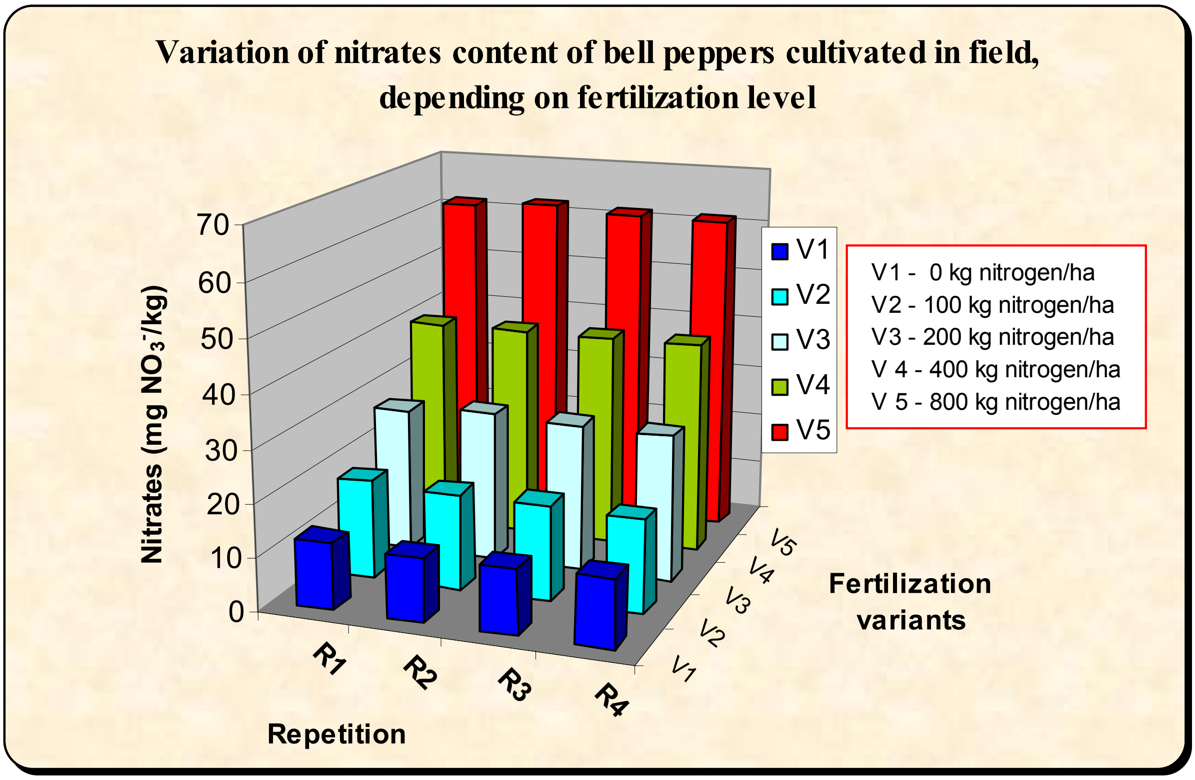

Fig. 3. Variation of nitrates content of bell peppers cultivated in field, depending on fertilization level

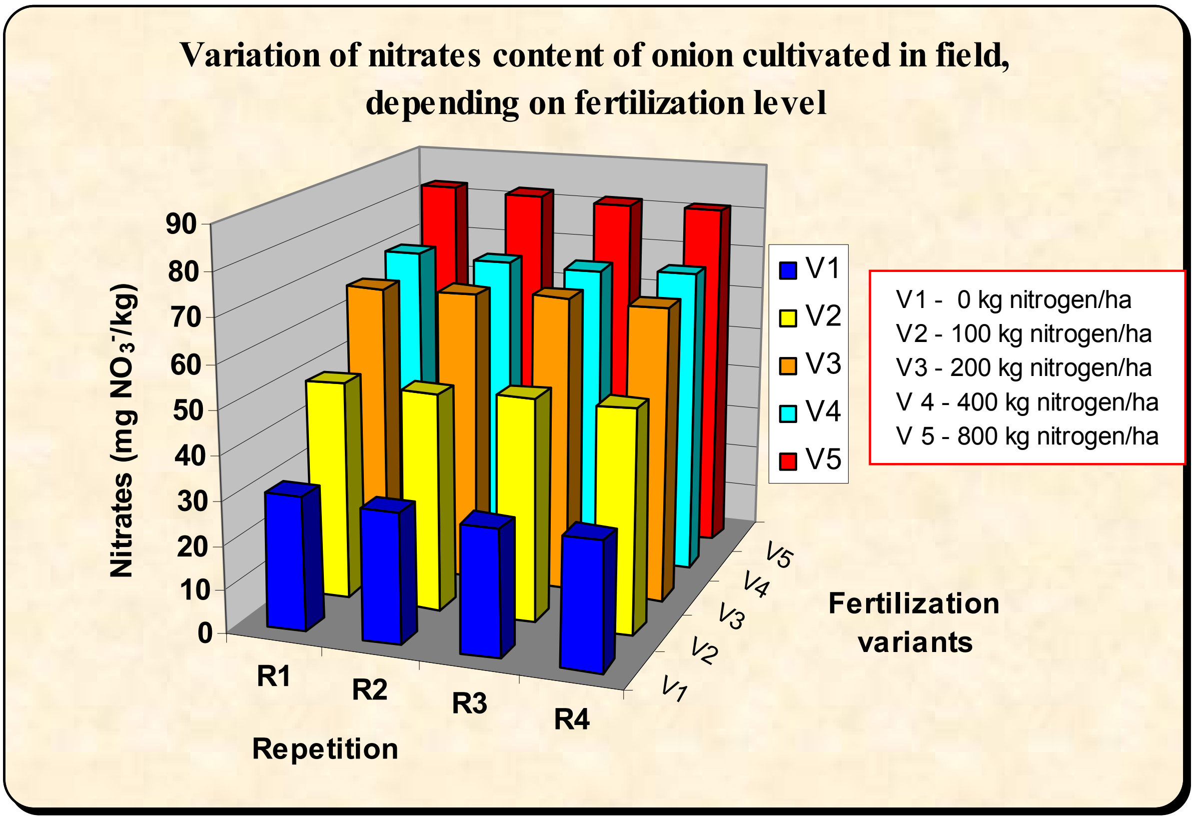

Fig. 4. Variation of nitrates content of onion cultivated in field, depending on fertilization level

Batat use for achievement of some food products, with high nutritional value, destined to individuals with gluten intolerance

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Keywords: batat, gluten-free bread, gluten-free cookies, iron

ABSTRACT

In this paper are presented the results of performed researches for achievement of some gluten-free products, competitive on the internal market and comparable with products from other countries, optimized from nutritional point of view, without alergen factor, but containing the necessary nutritive principles for correction of malabsorptive deficiencies, done by disease, reponding thus to the consumer special requirements. For the increasing of products nutritional value it was used batat piuree or it was done iron fortification (fortification agent – ferrous sulfate). The achieved gluten-free bakery products excell through sensorial characteristics and nutritional value.

INTRODUCTION

Gluten intolerance is a disease which affects both infants, school-children, teen-agers, and adult population. Unfortunately, medical statistics show a number increasing of the individuals affected by this disease.

Toxic factor in the case of gluten enteropathy is proteic fraction of wheat flour. Those two components of gluten (gliadin and glutenin) are toxic alike, but gliadin has the more pronounced action. The only known therapy in the case of gluten enteropathy is gluten free diet (Mogoş, 1997). Practical achievement of gluten free diet imposes to respect two major principles: total exclusion of foods with gluten and to compensate for deficiencies with other permitted foods.

Individuals with gluten enteropathy represent a special category of consumers, who, except affection of intestinal mucous membrane, show also vitamin and mineral deficiencies.

Batat tuberized roots show different textures, gustative qualities and content of minerals, vitamins, compounds with anticancer action and prevention of cardiovascular diseases. High content of vitamin A, especially in the case of varieties with orange pulp, it is considered to be one of the most important elements for to appreciate the batat nutritional value. In the same time, presence of ascorbic acid, tocoferol, vitamin B_6, biotin and pantotenic acid, iron, potassium and of other minerals, give to batat the role to counteract the acidity of other cereal- and meat-based food products, and through the antioxidant effect it protect cells for the dangerous effect of free radicals (Roşu, 2006).

In India, they were performed researches for to achieve spaghetes, which have batat in their composition. Alongside batat flour, for to increase protein content, they were used wheat flour, chick pea flour or defatted soy flour in their composition (Thirumaran, 1988).

Use of batat tuberized roots in the composition of bakery and pastry products (Indian bread without yeast, brioche with raisins, African doughnuts) determins an increasing of those β-carotene content, and, in the same time, a yellow, pleasant and attractive colour (Hagenimana, 1998).

MATERIAL AND METHODS

Experiments performed for achievement of food products with batat adding, destined to individuals with gluten intolerance, were done within the micro-production pilot plant of the Institute of Food Bioresources.

In the performed experiments they were used the following raw materials and materials: rice flour, batat, corn starch, margarine, sugar, eggs, powder milk, oil, nut, raisins, sodium caseinate, carboxymethyl cellulose, yeast, citric acid, sodium bicarbonate, ammonium bicarbonate, sodium chloride, ferrous sulfate.

Batat was added in composition of gluten-free bread and cookies as piuree. In the same time, it was achieved also the gluten-free bread fortified with iron (fortification agent – ferrous sulfate).

Technological process for obtaining of gluten-free bread with batat covers the following operations: raw materials and materials preparation, dough mixing, dough modeling, dough proofing, oiling, baking, cooling, and packaging.

Technological process for obtaining of gluten-free cookies with batat covers the following operations: raw materials and materials preparation, dough preparation, dough modeling, baking, cooling, and packaging.

The achieved products (gluten-free bread with batat, gluten-free bread fortified with iron, gluten-free cookies with batat and nut, gluten-free cookies with batat and raisins) were analysed from sensorial, physic-chemical and microbiological point of views.

RESULTS AND DISCUSSION

Tuberized roots of batat have a high nutritional value, as a consequence of content in glucides, β-carotene, vitamins C, B_2, B_6, calcium pantotenate, nicotinic acid, iron, calcium, magnesium and phosphorus.

Use of the batat piuree in composition of gluten-free bakery and pastry products is beneficial, bringing a contribution in minerals and vitamins in the diet of individulas with gluten enteropathy and, in the same time, having anti-inflamation action on the gastro-intestinal tract.

Sensorial and physic-chemical characteristics of the batat piuree are presented in table 1.

They were realized much more experimental variant of products *"Gluten-free cookies with batat and nut"* and *"Gluten-free cookies with batat and raisins"*, variable factors being quantities of rice flour and batat, in manufacturing recipe. The achieved experimental variants for these products, they were analyzed, first of all, from sensorial point of view, being chosen the optimal variant (table 2).

According to the obtained results after physic-chemical analysis, those two assortments of gluten-free cookies with batat adding, are remarkable through content of glucides, lipids, proteins and iron (table 3).

Product *"Gluten-free bread with batat"* was achieved in much more experimental variants, variable factors being the quantities of rice flour, corn starch and batat in recipe manufacturing. The achieved experimental variants for this product were analyzed, first of all, from sensorial point of view, choosing the optimal variant. In the same time, it was realized the product *"Gluten-free bread fortified with iron*" (fortification agent – ferrous sulfate). For this product were realized three fortification levels: 40 mg Fe/kg rice flour, 60 mg Fe/kg rice flour, 80 mg Fe/kg rice flour (tabel 5).

Sensorial analysis of product *"Gluten-free bread with batat*" proved that in the case of all experimental variants, the used fortification agent (ferrous sulfate) do not determine modification of sensorial characteristics (appearance, colour, taste and smell), in comparison with control sample (gluten-free bread non-fortified with iron). Thus, bread obtained from rice flour fortified with iron are in conformity from sensorial point of view with provisions of S.F. 7./2005 „Gluten-free bread”.

According to the achieved results of physic-chemical analysis, those two gluten-free bread assortments are remarked through glucides, proteins and iron content (table 6).

Microbiological analysis shown that bakery and pastry products achieved are in conformity with legislation in force from microbiological point of view.

CONCLUSIONS

Tuberized roots of batat have a high nutritional value, done by glucides, β-carotene, vitamins C, B_2, B_6, calcium pantotenate, nicotinic acid, iron, calcium, magnesium and phosphorus, thus being beneficial in diet of individuals with gluten enteropathy.

"Gluten-free cookies with batat and nut" and *"Gluten-free cookies with batat and raisins"* products have superior sensorial characteristics and excell through glucides, lipids, proteins and iron content.

"Gluten-free bread with batat" product has sensorial characteristics almost similar with those of conventional bread (achieved from wheat flour) and excells through glucides, proteins and iron content.

Sensorial analysis of *"Gluten-free bread fortified with iron*" product proved that the used fortification agent (ferrous sulfate) do not determine modification of sensorial characteristics (appearance, colour, taste and smell), in comparison with control sample (gluten-free bread non-fortified with iron). Product excells through glucides, proteins and iron content.

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TABLES

Table 1 - Sensorial and physic-chemical characteristics of batat piuree

No.	Characteristics	Batat piuree
1.	Appearance	- homogeneousness mass, viscous
2.	Colour	- intensely orange
3.	Taste and smell	- specific to boiled batat, without strange taste and smell (fermented, mould, etc.)
4.	Dry soluble solids, °R, la 20°C	10.55
5.	Soluble glucides,%	3.90
6.	Starch,%	8.15
7.	Proteins,%	1.41
8.	Lipids,%	0.13
9.	Vitamin C, mg/100 g	9.85
10.	ß – carotene, mg/100 g	3.88
11.	Total ash,%	0.54
12.	Iron, mg/100 g	0.41

Table 2 - Sensorial characteristics of product *"Gluten-free cookies with batat and nut"*

Characteristics	*"Gluten-free cookies with batat and nut"*
Appearance - external - internal	 - round shape with diameter of about 4 cm, light brown color, with brown points because of nut fragments - uniform mass, characteristic for an well baked product
Colour	- brown-yellow
Consistence	- easy rubbly, specific for cookies
Taste	- pleasant, of nut, product characteristic, without strange taste (bitter, mould, fermented, etc.)
Smell	- pleasant, specific for baked product

Table 3 - Sensorial characteristics of product *"Gluten-free cookies with batat and raisins"*

Characteristics	*"Gluten-free cookies with batat and raisins"*
Appearance - external - internal	 - round shape with diameter of about 2.5 cm, light yellow colour; on surface are presents aleatory raisins - uniform mass, characteristic for an well baked product, without **balls** or compact layers
Colour	- yellow
Consistence	- easy rubbly, specific for cookies
Taste	- pleasant, product characteristic, without strange taste (bitter, mould, fermented, etc.)
Smell	- pleasant, specific for baked product

Table 4 - Physic-chemical characteristics of product *"Gluten-free cookies with batat"*

Physic-chemical characteristics	*"Gluten-free cookies with batat and nut"*	*"Gluten-free cookies with batat and raisins"*
Moisture,%	9.70	6.80
Glucides,% d.m.	63.64	63.66
Lipids,% d.m.	28.07	29.35
Proteins,% d.m.	7.29	6.39
Ash,% d.m.	1.00	0.60
Iron (mg/100 g)	1.27	1.42
Energetical value, kcal/100 g	484.35	507.31

Table 5 - Sensorial characteristics of product *"Gluten-free bread with batat"*

Characteristics	***"Gluten-free bread with batat"***
Appearance - external - internal	 - product with parallelepiped shape; bright crust, with small cracks, light brown colour - mass with uniform pores, characteristic for a well baked product, without compact layers
Consistence	- elastic mass, non-wet to touch, non-rubbly, non-sticky
Taste	- pleasant taste, characteristic for a well baked product, without sour, bitter taste
Smell	- pleasant, specific for baked product

Table 6 - Physic-chemical characteristics of gluten-free breads

Physic-chemical characteristics	***"Gluten-free bread with batat"***	***"Gluten-free bread fortified with iron"****
Weight, kg	0.277	0.275
Moisture,%	47.00	43.59
Volume, cm^3/100 g	230	226
Glucides,% d.m.	81.91	85.14
Lipids,% d.m.	1.89	3.12
Proteins,% d.m.	14.37	10.53
Ash,% d.m.	1.83	1.21
Iron (mg/100 g)	1.65	3.50
Energetical value, kcal/100 g	213.12	232.04

*Results refer to product *"Gluten-free bread fortified with iron"* (fortification level 80 mg Fe/kg rice flour)

FIGURES

Fig. 1. *"Gluten-free cookies with batat and nut"*

Fig. 2. *"Gluten-free cookies with batat and raisins"*

Fig. 3. *"Gluten-free bread with batat"*

Technological elements for enhancing sweet corn earliness

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Keywords: Sweet corn, growing season, earliness, propagation method, propagation time

ABSTRACT

In our trial we compared the effect of propagation method and time on the growing season, yield and some valuable properties of sweet corn. The following technological variations were compared with the help of the variety Spirit (normal sweet, very early ripening): 1. transplanted plants with floating row cover (with 2 planting dates) 2. transplanted plants with no row cover 3. direct seeded plants with floating row cover (with 2 sowing dates) 4. direct seeded plants with no row cover. The application of direct seeding and floating row cover increased the earliness by 2 days in respect of germination and by 4 days in respect of the total growing period as compared to the treatment with no row cover. The 21 day transplant growing period reduced the growing period by 14 to 21 days. Earliness had a negative influence on fruit size, but this diminishment was not so great as to affect marketable ear numbers. Covering the seedlings in the early season was clearly beneficial, as the floating row cover provided protection for plants against lately spring mild frost. The combination of seedling grown plants and floating row cover resulted in a 28 day earlier harvest as compared to the traditional technology.

INTRODUCTION

Currently, Hungary is not considered as a major country on the markets of most vegetables in terms of quantity. The only exception is the sweet corn. Based on its present growing area, the sweet corn is the vegetable which is grown on the greatest area in Hungary and after the sudden and sharp decline in 2003 this plant returned in a rise after 2006. With a growing area of over 30,000 hectares Hungary is presently the first in the EU (Tömpe 2006).

Production is mostly carried out in accordance with the demands of the processing industry and foreign buyers in the framework of the so-called systems of production on order.

The exact timing, which is based on the knowledge of the growing period of the cropped variety, is an essential element in production being indispensable for ensuring an adequate product quality and for making an efficient use of processing capacities.

Production is dominated mostly by American hybrids, the growing periods of which are given by the breeding companies, generally in terms of unit of heat amount or of days. Hungarian production experiences, on the other hand, reveal that, partly due to the special climatic characteristics of the Carpathian Basin, partly due to smaller or greater differences in the elements of the production technology (habitat, fertilization system, and irrigation), the growing periods of the varieties may differ from the values offered. This represents a problem in the timing of harvest which is often a threat to product quality.

The recession mentioned above affected not only Hungary but also the holdings of the USA and Western Europe. In the case of the former, however, the increase in fresh consumption partly counterbalanced the rate of decrease. In order to promote fresh consumption, as well as to maintain and increase the sweet corn exports, it is necessary to promote investigations so as to be able to ensure a further increase in the growing area and yields of sweet corn with the help of the experiences.

LITERATURE SURVEY

Of the production technology elements, a number of researchers studied or are currently studying the sowing time of sweet corn. As early as in the beginning of the 20th century some researchers (Cserháti, 1901) highlighted the importance of the sowing date. Ripening can occur earlier when sowing earlier and using high quality seeds as compared to normal or late sowing. I'só (1969b) and Pásztor (1966), after their multi-year sowing date trial, concluded the following: in the case of an earlier sowing seed germination will be more protracted, but from the point of view of fruit maturing it was more favourable than late sowing. The greatest influence on early corn development is exerted by moisture and temperature, therefore early sowing is recommended on lighter soils. Early sowing is also recommended by Aldrich (1970) for the reason that the roots will penetrate deeper this way, from where they can get water even in periods of drought and the more intensive vegetative growth also takes place during the period of shorter daytime and this way the plants will be smaller and will be less prone to lodge. Several techniques are known in the art for the purpose of early fresh market shipments: seedling growing or direct seeding with temporary plant cover (Kurucz, 1998, Hodossi, 2004).

Direct seeded sweet corn under fleece cover showed earlier ripening and gave better yields in the experiments of Kassel (1990). The plots under fleece cover reached harvest maturity 12 days earlier as compared to the plots with no cover. Besides, a greater number of missing plants was observed in the plots with no cover. As a result of the greater plant number and the better ear set per plant yields were much higher in the plots with fleece cover.

According to another solution in use, the seeds are sown in 10 to 14 cm deep seed trenches and the latter are covered with floating row cover. The cover is removed 22 to 24 days after sowing. This gives 4-6 day earliness in emergence and 8 to 10 day advantage in growth and development (Hodossi and Kovács, 1996).

The most widespread method of seedling production is the use of soil blocks (Pereczes 1999) which can also significantly increase earliness. According to the trials of Kurucz (1998) seedling growing advanced harvest by 2 weeks. According to Hodossi (2004) 10 to 12 day earliness can be achieved by planting seedlings grown in soil blocks and 6 to 8 day earliness by seedlings grown in trays. The measurements of Kassel (1990) revealed that the ears of direct seeded corn plants under floating row cover could be harvested 10 days earlier as compared to the plots planted with seedlings and having no cover.

The combined application of seedling growing and floating row cover can advance harvest by 3-4 weeks as compared to the traditional technology and can give farmers a three to four times greater income (Kurucz 1998, Pereczes 1999).

MATERIAL AND METHODS

The experiments were set up in the year 2007 on an area equipped for irrigation at the Experimental Farm of the Faculty of Horticulture of the Corvinus University of Budapest.

The test variety was Spirit, a normal sweet corn with a very early growing period (85 days) and yellow kernels. The owner of the variety is the Syngenta. Average plant height is 159 cm, ear height is 37 cm. Average ear length was 19.6 cm in the variety comparison trials carried out by the Central Agricultural Office and average ear weight was 245 g (Kovács 2002). Heat sum requirements according to the variety owner is 760°C.

The following treatments were applied during the experiment:

P1 = uncovered direct seeded (Apr 4th)
P2 = covered direct seeded (Apr 4th)
P3 = covered plants grown from seedlings (Apr 4th)
P4 = uncovered direct seeded (Apr 19th); control
P5 = covered direct seeded (Apr 19th)
P6 = uncovered plants grown from seedlings (Apr 19th)
P7 = covered plants grown from seedlings (Apr 19th)

For the purpose of seedling growing, the seeds were sown on March 13th and March 30th in trays with rigid walls. The seedlings were grown for 3 weeks in both cases and then planted out at the 3 to 4 leaf phaenological stage. Part of the stand was covered with Novagryl floating row cover having a weight of 19 g/m^2 at the two propagation times (direct seeding and planting out) in order to enhance earliness. The floating row cover was removed on May 16th. The stand was created to contain 60,607 plants per hectare, according to the recommendations of the owner of the variety, at a spacing of 110+40x22 cm in twin rows.

Each plot had an area of 6x7m (8 parallel rows and 30 seeds sown in each row). The edge was the outer two rows of the 8 rows of the plot, respectively in 4 replications.

Fertilization was done by top dressing with N. No farmyard manure was applied.

In the application of the N top dressing rates (34% ammonium nitrate) we were careful not to apply an active ingredient dose of over 50 kg/ha in order to prevent salt damage. The area received two times herbicide application April 28th and May 28th, at a dose of Clio 0.15 l/ha+Stomp 3.3 l/ha+Dash 1.1 l/ha) and one mechanical weed control treatment (June 12th). A pesticide application took place on May 23rd, using Decis (0.15 l/ha). During the experiment, we studied plant growth rates and recorded the time of the occurrence of the major phaenological stages. For this purpose, we carried out regular observations (every 3 to 5 days) according to the following:

- beginning of seed emergence (appearance of first germs)
- large-scale emergence (80% germination rate)
- appearance of tassels (in 50% of the plants)
- beginning of tasseling (pollen shed has begun on the axes of tassels)
- 50% silking (silks have reached a length of 2 cm on half of the ears)
- milk stage (harvest)

During harvest the ears, together with the husks, were collected from the four central rows. After that 20 ears of average appearance were selected from each row and the following measurements were carried out:

- unhusked ear weight (grams)
- husked ear weight (grams)
- total ear length (cm)
- length of ear filled with developed kernels (cm)

Treatment P4 was regarded as the control. The time of direct seeding, as commonly used in production, was Apr 19th, without cover.

The statistical analysis of the results was carried out by using the programme MiniStat 3.3. When the standard deviations were identical the mean values were compared by pairs using the Tukey-Kramer test, while in the case of the non identical standard deviations the means were compared using the Games-Howell test (Vargha, 2000).

RESULTS AND DISCUSSION

Table 1 illustrates the times of the appearance of the first seedlings, as well as the times of the large-scale emergence relative to the direct seeded plants. It can be observed that the time of germination in the treatment sown at the first sowing date and having no cover had a three days delay as compared to the germination time of the covered treatment. In the case of the plants sown at the second sowing date the emergence could be considered practically contemporaneous, this way the cover had no influence.

Table 2 illustrates the number of days elapsed from the date of direct seeding or transplanting to the different phaenological stages.

According to the results of our experiments, the male flowers appeared in the shortest time in the transplanted treatments. The 21 day transplant growing, at this stage of development, resulted in 14 to 21 days earliness as considers the treatment P3, compared to the treatments P1 and P2 which had been direct seeded at a similar time. In the case of the treatments P3, P6 and P7, of a similar kind but containing seedlings of different transplanting dates, the planting P3 (even though having a 67 day absolute growing period, 4 days longer than those of the treatments P6 and P7, taking place 2 weeks earlier, resulted in four day earliness in harvest.

With the covered P7 and the uncovered P6 treatments, of the same transplanting date, no difference was observable in the length of the growing period.

Compared to the control (P4), the P3 treatment transplanted at the earlier date, could be harvested 28 days earlier, while the treatments transplanted at the later date (P6 and P7) 17 days earlier.

Some of major characteristics in connection with yield rating are summarised in Table 3.

In order to analyse the effect of the propagation method on the major characteristics in connection with yield rating we compared plots receiving identical treatments but including different propagation methods (direct seeding and transplanting) (P2-P3, P5-P7 and P4-P6).

Considering unhusked and husked ear weight, as well as total ear length, we found that, based on the statistical analysis (at $p<0.01$ level), significantly better results had been measured with the direct seeded treatments (P2, P5 and P4) than with the transplanted treatments (P3, P6 and P7). The same was seen for the length of ear filled with developed kernels, except for the treatments P4-P6 where no statistically observable difference was found. Considering yield amounts, we managed to reveal statistical (at $p<0.01$ level) difference only in the comparison of the treatments P2-P3.

In the evaluation of the propagation dates, we compared the results of the treatments P1-P4, P2-P5 and P3-P7 according to the aforementioned parameters.

Based on the statistical evaluation of the influence of propagation date it can be seen that, in the case of direct seeding, the treatment of the later sowing date, P4, widely used in production, gave significantly (at $p<0.01$ level) greater results than the treatment P1 only in terms of ear weight brutto (unhusked).

The treatment with the earlier direct seeded (P2), considering all the parameters tested (in connection with yield), gave statistically proven significantly (at $p<0.01$ level) greater results than the treatment of the later direct seeded (P5) treatment.

On the other hand in the case of the ear weight brutto (unhusked), we measured a significantly (at $p<0.01$ level) better result for the treatment of the later date P7, compared to the earlier treatment P3.

CONCLUSIONS

Based on the results of the experiments, the following conclusion can be made:

The technology with direct seeding and floating row cover, in the case of the variety Spirit, resulted in 3 days earliness in emergence and 7 days earliness in the total growing period, compared to the uncovered treatment.

The 21 day long seedling growing period reduced the growing period by 14 to 21 days. Earliness has a negative influence on ear size, on the other hand this decrease is not so great as to affect the income when the corn is sold by the cob.

The combination of seedling grown plants and floating row cover (P3) resulted in a 28 day earlier harvest as compared to the traditional technology (P4). This confirms the findings of Kurucz (1998) and Pereces (1999).

Considering the characteristics studied in connection with the rating of corn ears, the results of the treatment P3 are inferior to the results of the other treatments.

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TABLES

Table 1. Times of sowing and emergence of direct seeded treatments

Treatment	Day of sowing	Appearance of first germs	Large scale emergence 80%
P1	April 4th	Day 9th (13.IV.)	Day 12th (16.IV.)
P2	April 4th	Day 6th (10.IV.)	Day 9th (13.IV.)
P4	April 19th	Day 9th (28.IV.)	Day 11th (30.IV.)
P5	April 19th	Day 7th (26.IV.)	Day 11th (30.IV.)

Table 2. Rhytm of generative phaenophases

Treatment	Tassels appearance	Tasseling	Stigma appearance	Harvesting
P1	Day 51th (25.V.)	Day 54th (28.V.)	Day 64th (7.VI.)	Day 88th (2.VII.)
P2	Day 48th (22.V.)	Day 51th (25.V.)	Day 59th (2.VI.)	Day 81th (25.VI.)
P3	Day 37th (11.V.)	Day 40th (14.V.)	Day 48th (22.V.)	Day 67th (11.VI.)
P4 (control)	Day 54th (12.VI.)	Day 57th (15.VI.)	Day 61th (19.VI.)	Day 80th (9.VII.)
P5	Day 44th (2.VI.)	Day 47th (5.VI.)	Day 54th (12.VI.)	Day 73th (2.VII.)
P6	Day 33th (22.V.)	Day 36th (25.V.)	Day 44th (2.VI.)	Day 63th (22.VI.)
P7	Day 33th (22.V.)	Day 36th (25.V.)	Day 44th (2.VI.)	Day 63th (22.VI.)

Table 3. Some major characteristics relevant to rating of corn ears

Treatment	Ear weight brutto	Ear weight netto	Ear length	Filled ear length	Yield
	gram	gram	cm	cm	kg/m2
P1	274,5	223,8	18,4	16,8	1,52
P2	308,1	270,7	18,2	16,9	1,77
P3	231,8	179,4	16,4	15,5	1,36
P4 (control)	298,1	238,8	18,5	17,2	1,54
P5	279,7	219,5	19,7	18,3	1,57
P6	243,3	179,4	17,7	16,9	1,42
P7	260,8	191,9	17,4	16,0	1,46

Contribution for onion seed production technology improvement

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Keywords: seed, density, fertilizers, quality, cultivar

ABSTRACT

One important aspect in onion cultivation is the seed production.

The onion seed production level depends on the cultivar (for some cultivars the obtained quantities are big, for others are small), as well as on the applied technology, in which case an important role is played by the determination of the best doses and periods of administration of the fertilizers.

Following the performed experiments, two inland varieties being used (Briliant and Delicioasa), two densities and three fertilization variety, very interesting results have been obtained. We came with the conclusion that the onion seed production depends on the used cultivar, on the density and on the quantity of azoth inflicted by the implementation of the chemical fertilizers. The biggest production has been obtained for the density of 138 thousand plants/ha for the Briliant variety (830 kg./ha), while for the Delicioasa variety the biggest has been of only 363 kg./ha. The differences between the two fertilization varieties have not been big. There have been obtained production differences between 115 kg./ha and 150 kg./ha between the two experimented densities.

INTRODUCTION

One of the important parts from all the agrotechnical measures which ensures great vegetable productions is the provision with good quality seed, with cultural value and high biological purity.

Obtaining great production of vegetable seed in general, and onion seed in particular is influenced by the cultivar, by the pedoclimatic conditions, by the applied technology, great importance must be given to the best nutritional conditions.

Providing an adequate culture density and applying well-advised the fertilizers are the most efficient methods of enlarging the onion seed production.

MATERIAL AND METHOD

Two onion cultivars obtained in the last few years in Romania have been used (varieties): Briliant (brown bulb) and Delicioasa (red bulb). Two schemes of establishment of the culture have been used, the densities of 115 thousand plants/ha (96 cm x 8 cm) and 135 thousand plants/ha (75 cm x 8 cm) being obtained. The fertilizers quantities have been established depending on the density of the culture:

For the density 1 (115 thousand plants/ha) have been established the variants: V1 = Witness, V2 = N60, V3 = N120, V4 = N120P120 and for the density of 135 thousand plants/ha the same variants have been experimented.

Establishment of the experiments have been made on the 17.09.2008. The surface of the patch has been established at 30 mp. The fertilization with P has been made in autumn during the soil preparation and the azoth has been administrated at two moments: in spring after the start in vegetation and at the beginning of the formation of the stems. There have been applied all the maintenance works according to the technology of onion production for the seed production. There have been made observations and determinations' regarding the moment of the flower stems burst, the number of stems per plant, the flowering date, the number of seeds per stem, the number of seeds per plant, the load of seeds per stem, the load on seed per plant.

RESULTS AND DISCUSSION

The greatest productions have been obtained for the Briliant variety, at the density of 138 thousand plants/ha, for the variety at which have been applied N 120 and P120 (830 kg/ha).(Table 1)

There have not been obtained great differences between the fertilized varieties with N and P and the ones fertilized only with N.

The productions obtained for the Delicioasa variety have been considerably littler then the productions obtained for the Briliant (Table 2).

This difference is explained by the fact that there has been a bad weather period for pollination and fertilization for the Delicioasa variety, but also because the Briliant variety produces more seed.

From the two schemes, greater productions, for all varieties, have been obtained at greater density.

From the obtained data appears that the fertilizers with azoth influence much the seed production. By applying the fertilizers with P there are not obtained great differences in production.

The plants height (stems) and the blossom diameter are influenced by the fertilizers, especially by the N. These are not, however, proportionate to the fertilizers doze. For big dozes, the height of the plants is kept at close values to the varieties fertilized in moderation with N.

The seed quality is influenced by the doze of the fertilizers. MMB is influenced by the doze of N and P, in lesser amount.

The germination is influenced by the dozes of N and P. the great dozes of azoth influence in a bad way the seed germination.

CONCLUSIONS

The onion seed production is conditioned by the culture density, by the cultivar and by the quantity of the administered fertilizers..

Both for the Briliant variety and for the Delicioasa variety the greatest productions have been obtained for the varieties fertilized only with N.

The chemical fertilizers have brought production growth of up to 71% for the Briliant variety and up to 56% for the Delicioasa variety.

The medium production per plant is correlative to the number of floral steams per plant.

The medium seed production per flower steam is correlative to the number of steams per plant.

As the number of steams/plant is growing, the medium production of seed/steam is decreasing and the number of empty seeds and unfertilized flowers grow.

The biggest production per steam is obtained for the plants that make only one floral steam.

The seed quality is better for one steam and the percent of empty seeds and unfertilized flowers is fewer. The greatest onion seed production is obtained for the varieties which form preponderant only one floral steam.

The great differences in production between the varieties is explained by the fact that this year the weather conditions have been influenced in different ways the processes of pollination-fertilization, the Briliant variety being favoured because it has an earlier flowering. The number of seeds per blossom/plant has been considerably lesser for the Delicioasa variety, the processes of pollination-fertilization being made with difficulty because of the rains from the blossoming period.

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TABLES

Table 1. The onion seed production for the Briliant variety – 2009

No. crt.	Variant	Density kg./ha	115 thousand plants/ha	%	Density kg./ha	138 thousand plants/ha	%
			Dif. towards the Mt.			Dif. towards the Mt.	
1	Mt.	417	-	100	497	-	100
2	N120P120	715	293	171	830	333	167
3	N60	645	262	155	795	298	160
4	N120	605	220	145	747	250	150

Table 2. The onion seed production for the Delicioasa variety – 2009

No. crt.	Variant	Density Kg./ha	115 thousand plants/ha	%	Density Kg./ha	138 thousand plants/ha	%
			Dif. towards the Mt.			Dif. towards the Mt.	
1	Mt.	206	-	100	247	-	100
2	N120P120	323		156	363	116	147
3	N60	268		130	345	98	139
4	N120	237		115	327	80	132

Comparative study of some Bulgarian tomato cultivars under high plastic tunnels

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Keywords: *Lycopersicon esculentum*, high plastic tunnels, cultivar

ABSTRACT

The research carried out in 2009 at the Research Development Institute for Vegetable and Flower Growing Vidra. The purpose of this experiment was to study the behavior of some tomatoes cultivars (Balkan F1, Jar F1, Kom F1, Prekos F1 and Nazareth F1) from Research Institute for Vegetable Growing Plovdiv, cultivated under high plastic tunnels. The best results were gave Prekos F1, Kom F1 and Nazareth F1 hybrids with a yield higher than 75t/ha.

INTRODUCTION

In Romania, tomatoes are the most important crop growing in glasshouses and under high plastic tunnels have the biggest area and it is the most important species from economically point of view. Research for tomatoes breeding were made to the RDIVFG Vidra (Tănăsescu et al., 1989), RDSVG Buzau (Vânătoru, 2009) and RDSVG Işalniţa.

In the world were obtained many hybrids with high yield capacity and resistance/tolerance to different pathogens. Bulgaria is a country with tradition on vegetable growing, being recognized in Europe as a region with high yields on tomatoes and cucumbers.

MATERIALS AND METHODS

Research was done in 2009 at RDIVFG Vidra, under high plastic tunnels. The biological material was represented by 5 cultivars: Balkan F_1, Jar F1, Kom F1, Prekos F1 and Nazareth F1, with undetermined growing from Bulgaria. The experience was organized on randomized blocks. The date of planting was on April 10, 2009. Plant density was 4, 2 plant/m^2. Before planting were made the soil analysis (table 1).

RESULTS AND DISCUSSION

From tested hybrids Prekos F_1 is the earliest, first harvesting were made on June 15, 2009, after that Balkan F1, Jar F1 and Kom F1. Nazareth F1 may be considered a late hybrid, first harvesting being on July 16. Balkan F_1, Jar F1 and Prekos F1 have a middle vigor, while Kom F1 and Nazareth F1 have a high vigor.

The average number of flower in inflorescence varied from 5,3 at Prekos F1 to 6,8 l at Kom F1 and the average fruit number/plant from16 to Kom F1 and Nazareth F1 to 21,2 to Balkan F1. Balkan F1 and Jar F1 hybrids had middle fruits and the others 3 hybrids formed bigger fruits, with weight more than 100g (table 2).

The average yield varied between 59t/ha to Balkan F1 and 88t/ha to Nazareth F1. Very good results gave Prekos F1 hybrid which had the most part of the total yield as early production.

The biggest production realised Nazareth F1 (88t/ha) higher with 49% than Balcan F1 which was considered control variant. All hybrids realised very significant production in comparison with Balcan F1 (table 3).

Between average fruit weight and yield obtained is a positive correlation with distinct significance (Fig. 1)

CONCLUSIONS

Balcan F1 is an early hybrid, with middle vigor, which develop 5,3 fruits/inflorescence, middle fruits and 59 t/ha average yield.

Jar F1 is an early hybrid, with middle vigor, which develop 5,3 fruits/inflorescence, good setting fruits, middle fruits and 63 t/ha average yield.

Prekos F1 is a very early hybrid, with middle vigor, good setting fruits, average weight of fruits 107,1g and 76 t/ha average yield.

Kom F1 is an early hybrid, with high vigor, big fruits (123,5g) and high production (80t/ha).

Nazareth F1 is a late hybrid, with high vigor, big fruits (130,2g) and very good yielding (88 t/ha).

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TABLES

Table 1. Agrochemical soil analysis

Determination	Results	Interpretation
pH, soil reaction	6,5	Slow acid
MO, organic matter,%	6,0	Middle
F.C.w., field capacity for water	27	Middle
U., humidity,%	12	Very low
U as% from F.C.w	44	Very low
CS, solubile saltz concentration,%	0,1950	Good
N-NO3, nitric nitrogen, ppm	177	High
N-NH4, amoniacal nitrogen, ppm	-	Normaly
P_{H2O}, hydrosoluble phosphorus, ppm	6	Very low
K_{H2O}, hydrosoluble potassium, ppm	12	Very low
Ca_{H2O}, hydrosoluble calcium, ppm	189	Very good
Mg_{H2O}, hydrosoluble magnezium, ppm	93	High
Na_{H2O}, hydrosoluble sodium, ppm	112	High

Table 2. The principal phenological caracthers of bulgarian tomatoes cultivars

Cultivar	Average flowers/*infl*	Average no. fruits/*infl*	Fruit setting coefficient (%)	Average fruit weight (g)	Yield Kg/plant
Balkan F_1(M)	6,3	21,2	62	68,0	1,4
Jar F_1	6,5	20	77	75,8	1,5
Prekos F_1	5,3	16,8	79	107,1	1,8
Kom F_1	6,8	16	59	123,5	1,9
Nazareth F_1	5,7	16	70	130,2	2,1

Table 3. Average yield

Cultivar	Yield t/ha	Relative Yield	Difference of yield (t/ha)	Significance
Balkan F_1 (M)	59	100	-	-
Jar F_1	63	106,8	+4	***
Prekos F_1	76	120,3	+12	***
Kom F_1	80	137,9	+21	***
Nazareth F_1	88	149,1	+29	***

DL5%=1,78t/ha DL 1%= 2,58t/ha DL0,1%=3,88t/ha

FIGURE AND PHOTOS

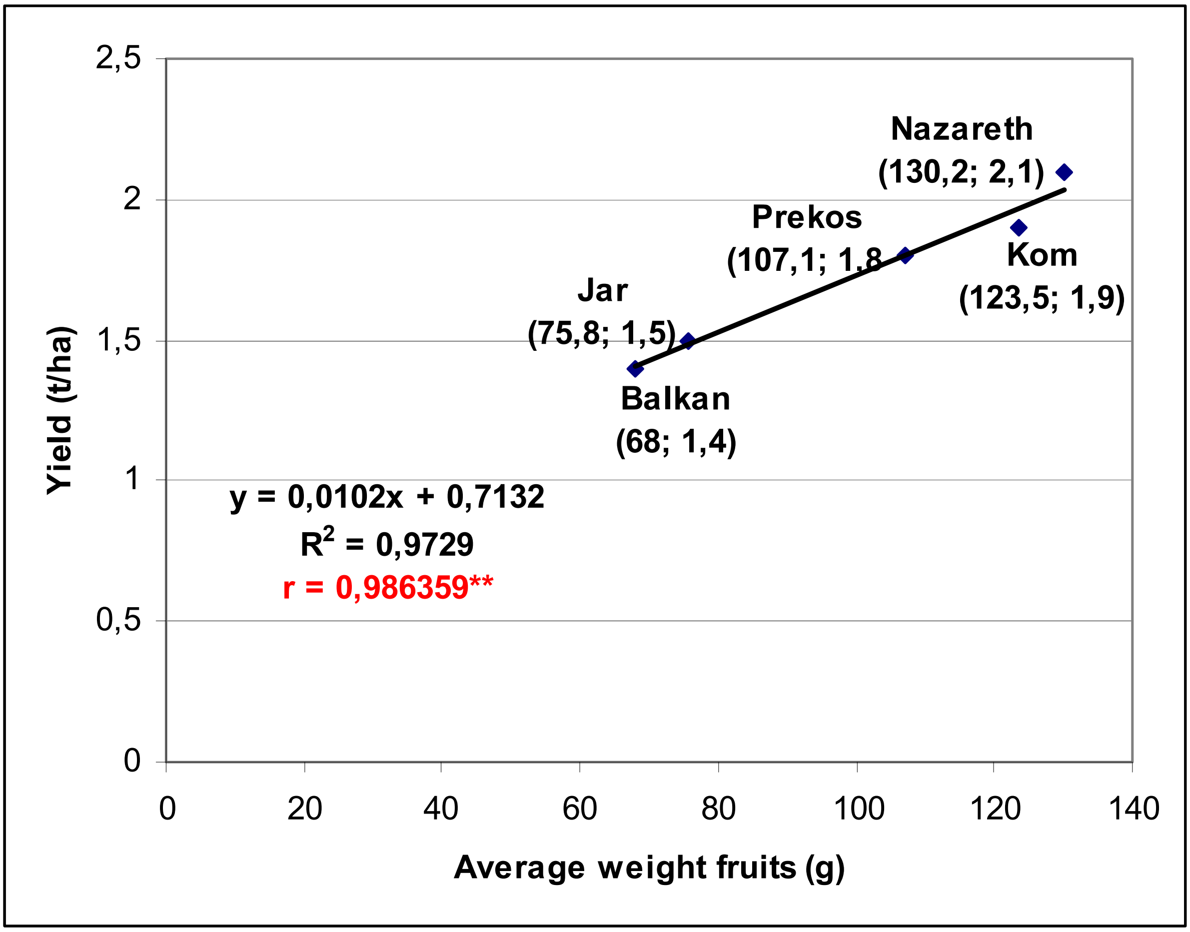

Fig. 1 Positive correlation between average weight and yield

Foto 1. Balkan F1

Foto 2. Jar F1

Foto 3. Prekos F1

Foto 4. Kom F1

Foto 5. Nazareth F1

Improved methods of obtaining lettuce and tomato seedlings

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Keywords: tomato seedlings, alveolar pallet, Jiffy pot, Jiffy 7

ABSTRACT

Improving the methods of obtaining vegetable seedlings is a necessity for the growth of their quality.

The present research presents the results obtained in 2008 within an experience with tomatoes. As biological material there has been used the tomato hybrid Cristal F1. The variants which resulted were the fooling: V1Mt -5/5cm nutritive cubes; V2 - 7/4/6.5cm plastic pot; V3 – 5/5cm alveoli pallets, V4 - 4/7.5cm Jiffy seven, V5 - 3.8/4cm Jiffy seven, V6 - 7/4/8cm Jiffy pot.

At the moment of planting there were differences between the variants, the seedlings produced in larger pots having superior phenological and physiological indexes.

INTRODUCTION

The necessity of finding certain solutions that will lead to the improvement of the quality of the seeding material in conditions of plant and soil protection and of ensuring economic efficiency induces the need to use biodegradable materials, nutritive mixtures containing smaller and smaller soil quantities, as well as optimal artificial environments for the development of the radicular system for the seedling reproducing plants, requirement imposed by the soil transfer of certain vectors and pathogens very dangerous for the ulterior development of horticultural plants (Ciofu Ruxandra si colab., 2003).

The peat pots offer great conditions for seedling growing due to the fact that peat is leachy, easy penetrated by water and air, and the radicular system easily spreads all throughout the pot, it easily retains water and the seeding is done together with the pot (Popescu V., Hoza Gheorghita, 2000).

The purpose of the research was to show the influence of the Jiffy plastic pots and of the nutritive cubes (the witness) on the growth and quality of the tomato seedlings.

MATERIALS AND METHODS

The present paper presents the results obtained in 2008 in an experience with tomatoes.

The biological material used was the Cristal F1 hybrid. The experience was organized within the research department of the Vegetable Growing Chair within UASVM Bucharest.

The seedlings were produced by coffret seeding at 22th of January and they were pricked out on February 10th in alveolar pallets and in different types of pots, having as results the variants in table 1.

The mounting of the experience was done according to the method of the blocks in a linear emplacement with 3 repetitions and the results presented here represent their mean. Within the experience there were used 30 plants per variant (10 plants/repetition) resulting a total of 180 plants. The age of the seedlings was 50 days for tomatoes.

During the vegetation period the seedling obtaining specific agro-technique was used; applying pesticide treatments to control diseases and germs was not necessary. The maintenance works were applied equally to all the studied variants.

Different observations and determinations were made regarding the effect of the different types of pots on:

- Seedling growing – the length and total weight of the plants, of the aerial vegetative apparatus and of the roots; of the number of leaves; of the radicular volume;
- Certain physiological indicators: membranes permeability, total ions content, chlorophyl and carotenoid pigments, dry substance and ash percentage of the seedlings before seeding.

RESULTS AND DISCUSSION

The growth indicators for the tomato seedlings are shown in table no 2.

The mass indicators for the tomatoes seedlings are given in table no 3 and figure 1.

The influence of the substratum volume typical for each type of pot on certain physiological and biochemical indicators of the seedlings is presented in table no 4.

The results regarding the influence of the type of pot on the tomato seedlings show that the height of the aerial part varied between 18 cm at V5 (Jiffy 7 with D= 4cm, h= 4cm) and 25 cm at V6 (Jiffy pot with D= 7cm, d= 4cm, h= 8cm), and the number of leaves varied between 5 (V5) and 8 (V6).

The radicular volume of the tomato seedlings was comprised between 1.5 cm^3 at V5 and 8.0 cm^3 at V2, the large size plastic pots fostering its development. This type of pot gave the best results in the case of lettuce as well.

The results regarding the influence of the type of pot and substratum volume on the total mass of the seedlings show that in the case of tomatoes, it being superior to that of the witness and the other variants, in the case of plastic pots seeding with D= 7cm, d= 4.5cm, h= 6.5cm (V2). As far as the mass of the roots is concerned, the best results were obtained, also, at the large size plastic pots seeding variant (5,0 g), while in the case of the nutritive cubes (V1Mt) and small size Jiffy 7 (V5) the mass of the roots was a lot smaller. These results are correlated with those regarding the radicular volume. It can be said that the type of pot and the volume substratum influences the growth of the seedlings, in the case of the large size plastic pots, balanced and vigorous plants are obtained, having the best report between the mass of the aerial part and that of the roots. (1 : 0.409), 2,1 bigger than at the witness (nutritive cubes).

At the tomatoes seedlings has been emphasized the direct influence on the growth process of the root, the radicular volume being larger at the variants having a 110-120 cm^3 substratum volume (V2-V3). Probably for these seedlings the water and mineral salts speed does not depend on the substratum volume but on its texture and thus on the water quantity available at the root level. The permeability index can be noticed to be very high, being influenced, mainly, by the membrane permeability and less by the total content in ions. At this specie, it varied between 0.38 at the nutritive cubes (too low membrane permeability and large selectivity) and 0.89 at Jiffy pot (due to the permeability which is too high and implicitly to the electrolyte leakage), without directly influencing the mineral substances accumulation in the leaves (ash). The content in assimilating pigments and the report between them as a measure of photosynthetic efficiency do not correlate with the maximum dry substance content determined for the different variants.

CONCLUSIONS

The type and sizes of the pots used for the pricking out of the tomato seedlings intended for the early crops in solariums and cold greenhouses influences the growing of the seedlings.

Between the Jiffy pots, the plastic pots and the nutritive cubes were registered differences.

The growth indicators most influenced by the pricking out variants were those in Jiffy pots in the case of which superior results were obtained as far as the height of the aerial part, the length of the roots and the number of leaves is concerned. The radicular volume registered a superior value at the variant pricked out in plastic pots.

The mass of the seedlings was influenced by the different types of pots, the best report between the mass of the aerial part and that of the roots being obtained in the case of the large size plastic pots (1:0.409), 2.1 times bigger than in the case of the witness (nutritive cubes).

The substratum influence on the growing process of the seedlings, on the substratum volume and its texture directly influence the growing process of the seedlings, is given by the distribution of the photo-assimilated between the plant's aerial part and the root, without directly influencing the permeability of the membranes, the mineral substances accumulation, the photosynthesis process and the organic substances accumulation.

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TABLES

Table 1. Organizing the experience

Specie/hybrid	Variant	The sizes of the pots used for obtaining the seedlings	Substratum volume (cm^3)
Tomatoes Cristal F1	V1Mt	Nutritive cubes l =5cm, h=5cm	90
	V2	Plastic pot with D= 7cm, d= 4.5cm, h= 6.5cm	110
	V3	Alveolar pallet with l = 5cm, h = 5cm	118
	V4	Jiffy 7 wiht D= 5cm, h= 7.5cm	125
	V5	Jiffy 7 with D= 4cm, h= 4cm	70
	V6	Jiffy pot with D= 7cm, d= 4cm, h= 8cm	80

h = height; l = side; d = small diameter; D = big diameter; b = small base; B = big base

Table 2. Growth indicators for tomato seedlings before seeding

Specie	Variant	Specification	Aerial part height (cm)	Roots length (cm)	Aerial part/roots report	No. of leaves	Radicular volume cm^3
Tomatoes	V1 Mt	Nutritive cube l = 5cm, h=5cm	20	16	1 :0.800	6	2.0
	V2	Plastic pot with D= 7cm, d= 4.5cm, h= 6.5cm	24.5	22	1 :0.897	7	**8.0**
	V3	Alveolar pallet with l = 5cm, h = 5cm	23	19	1 :0.826	6	5.0
	V4	Jiffy 7 with D= 5cm, h= 7.5cm	24	18	1 :0.750	7	4.5
	V5	Jiffy 7 with D= 4cm, h= 4cm	18	10	1 :0.555	5	1.5
	V6	Jiffy pot with D= 7cm, d= 4cm, h= 8cm	**25**	21	1 :0.840	**8**	4.0

Table 3. Mass indicators for the tomato seedlings

Specie	Variant	Specification	Total mass (g)	Aerial part mass (g)	Roots mass (g)	Aerial part mass/roots mass report
Tomatoes	V1 Mt	Nutritive cubes side=5cm, h=5cm	8.6	7.2	1.4	1 : 0.194
	V2	Plastic pots with D= 7cm, d= 4.5cm, h= 6.5cm	**17.2**	12.2	**5.0**	**1 : 0.409**
	V3	Alveolar pallet with the side = 5cm, h = 5cm	13.8	10.4	3.4	1 : 0.326
	V4	Jiffy 7 with D= 5cm, h= 7.5cm	13.4	10.8	2.6	1 : 0.240
	V5	Jiffy 7 with D= 4cm, h= 4cm	5.0	4.0	1.0	1 : 0.250
	V6	Jiffy pot with D= 7cm, d= 4cm, h= 8cm	9.5	7.5	2.0	1 : 0.266

Table 4. Physiological and biochemical indicators of the tomato seedlings before seeding

Specie	Specification	V1 Mt Nutritive cube	V2 Plastic pot	V3 Alveolar pallet	V4 Jiffy 7 with D=5cm	V5 Jiffy 7 with D=4cm	V6 Jiffy pot
Tomatoes	s.u. (%)	17.51	15.91	18.32	14.52	17.52	18.38
	Ash (%)	1.92	2.14	2.11	1.66	2.15	1.84
	Organic substances% (s.u. - ash)	15,59	13,77	16,21	12,86	15,37	16,54
	Permeability *Electrolyte leakage* (µS/g/20 ml AD)	322.6	295.29	496.67	486.04	326.84	715.37
	Total content in ions (µS/g/20 ml AD)	840	719	732	656	690	795
	Permeability index P/C	0.38	0.41	0.67	0.74	0.47	0.89
	Chlorophyl a(mg/100g sp)	108.77	109.60	106.92	118.70	92.57	101.79
	Chlorophyl b(mg/100g sp)	44.36	43.35	43.61	48.24	35.95	39.93
	Total chlorophyll (mg/100g sp)	153.13	152.96	150.53	166.94	128.52	141.73
	Chlorophyll a/chlorophyll b report	2.45	2.53	2.45	2.46	2.57	2.55
	Carotenes (mg/100 g sp)	3.262	2.953	3.050	3.617	2.755	2.960
	Total chlorophyll/Carotenes	46.94	51.79	49.35	46.15	46.64	47.88
	Radicular volume(cm^3)	2.0	8.0	5.0	4.4	1.0	4.0
	Substratum volume(cm^3)	90	110	118	135	60	80
	Radicular volume x 100/substratum volume report	2,22	7,27	4,24	3,26	1,66	5.0

FIGURE

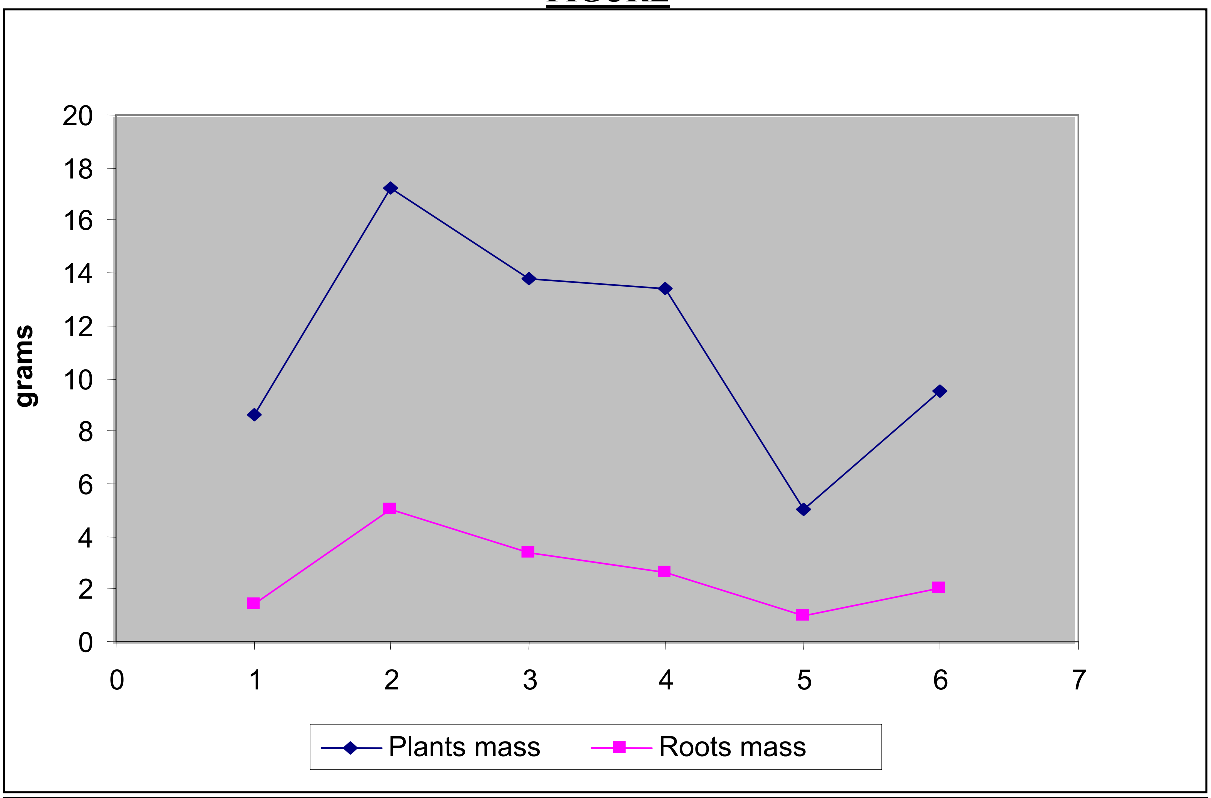

Fig. 1. Tomatoes seedlings growth indicators

Kristin – a new tomato variety obtained at SCDL Buzău

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Keywords: tomatoes, amelioration, segregation, genotype,

ABSTRACT

The necessity to enrich the inland tomato variety with special destination (fresh consume, industrialization, juice, paste etc.) leaded to the initiation of new research themes with precise amelioration objectives. Even from the establishment, the institution showed a great interest in what it concerns the amelioration of this specie. In the same time with the initiation of these research themes, that started in 1996 in collaboration with ICDLF Vidra, besides the valuable germoplasma base detained by the institution, there were bought new genotypes. Thus, our institution detains nowadays the most rich and valuable germoplasma base for tomato in our country. Nowadays S.C.D.L. Buzău collection field has over 200 tomato cultivars de, and the work field has 32 Sp cultivars and 23 SP which are in an advanced stage of amelioration. After the researches made, there was obtained and homologated Kristin – a tomato variety used for industrialization and appreciated as well by cultivators and processators.

INTRODUCTION

Tomato amelioration is a continuous process, where the researcher explores the genetic variability and selects the genotypes that own combinations of characters and characteristics in order to correspond to the nowadays necessities of the consumers.

The number and the value of these new genes combinations, which can be realized by amelioration, depend on the diversity and value of the available genes from the germoplasma collection (Leonte, 1996).

There must be specified that the ameliorator works with a hereditary potential whose expression can be favored or detained by the environmental conditions where the new creations are cultivated.

The amelioration objectives are influenced by different requirements (sometimes contradictory) of the cultivators and consumers, while the creation methods of hybrids and new varieties depend on the biological bases of the implied species (Drăcea, 1972).

The amelioration directions for the industrialization tomatoes foresee the procurement of new varieties and hybrids with high production potential, earliness, high quality and concordant physiological characteristics.

Romanian creations obtained until nowadays have had a mixed destination (fresh consume and industrialization). While the requirements of cultivators, processators and consumers have risen in what it concerns tomato variety with special destination (fresh consume industrialization, juice, paste etc.), there appeared the necessity to obtain these varieties.

S.C.D.L. Buzău has a tradition in tomato amelioration. In the over 50 years of activity, here were created valuable varieties, with well defined genetic constitution, that leaded to maintain these creations on the market for a long time.

From the establishment, in 1957, here were established hybridizing fields, obtaining hybrid tomato seed for the first time in our country (L10x Bizon Bulgarian provenance).
In order to continue the tradition, and according to actuality, S.C.D.L. Buzău has introduced tomato amelioration themes in its thematic research plan.

There were established precise amelioration objectives in order to obtain varieties and hybrids specialized on destination. Here were also created the tomato varieties: Buzău 22, Buzău 47, Buzău 1600, Diana, Siriana F_1, Capriciu etc.

MATERIALS AND METHODS

S.C.D.L. Buzău detains nowadays a rich germoplasma base preserved in the two collection fields (base collection and work collection).

The researches made in order to obtain this variety started in 1996, and the collection field contained at that time over 200 cultivars. The work field had over 60 cultivars in advanced amelioration stage, 30 of them were having an undetermined growing (SP^+) and 30 with determined growing (Sp).

The start point in order to obtain this variety was a hybrid form which segregated 4 biotipes in F_2, thus:

– L 23: 22%;
– L 22: 37%;
– L15:14%;
– L10: 9%;
–the rest of 18 percents to 100% were intermediate forms which were eliminated.

L10 proved to be a stable line during the amelioration activities, even if it had a lower percent in the process of segregation.

Considering the main amelioration objectives and also the genetic establishment of the main characters, there were obtained, in 2006, the tomato variety named Kristin. In 2008 it was inscribed for licensing at O.S.I.M., and short time after this variety was brevetted and protected.

The main amelioration objectives for this variety were the following:

– **productivity** represents the most important and the most used indicator for appreciating the tomato variety and the biologic material, during the amelioration process. It constitutes a very complex objective for the tomato crop, in whose implement there are implied many productivity elements determined by characters and characteristics controlled by polifactorial genetic systems. For tomatoes, this polifactorial characteristic is generally determined by genitors and by the influence of the environmental conditions. An important role in accomplishing this objective is taken by the germoplasma source utilized, which ensures the value of the genitors implied in the hybridizing process;

– **earliness.** The most valuable characteristic of the tomato varieties it is the earliness of production and the maturation capacity of a great fruit quantity in a short period of time;

– **fruits quality** conditions the economic value of the tomato variety. The main qualitative index of the tomato yield which are followed during the amelioration process are: aspect, shape, fruits uniformity, organoleptic characteristics, a higher percent of dry matter, soluble glucides, vitamins, less seeds. The taste of the fruits must be harmonious, as a result of the favorable report between acidity and the sugar content, the uniform color, at the peduncle insertion the pale colored zone must lack etc.;

– **environmental conditions.** One of the most valuable characteristics of the tomato varieties it is the adaptability to the environmental conditions;

– **tolerance and resistance to diseases and pests**. The active protection of the tomato plants against the pathogen attack is a genetic coordinate process. According to the concept „gene for gene", the plants resistant to diseases must have a dominant or half dominant resistant gene, and the pathogen must have a correspondent anti virulent gene. KIM (1997) mentions that there were isolated four main classes of resistant genes which codify the synthesis of ones substances that activate the protection mechanisms. The amelioration and creation of new tomato varieties and hybrids resistant or tolerant to diseases or pests represents an efficient way of prevention. During the last decades there were obtained resistant tomato creations on an ameliorative way by cross-fertilizing and selection, but especially by using modern biotechnological methods in order to transfer the genes responsible for resistance (Crăciun, 1981).

Besides these general amelioration objectives, there was also followed obtaining an appropriate variety for mechanized harvest.

The amelioration method used was hybridizing and segregation, and for the segregate biotypes there were applied the individual repetitive selection scheme.

There was used the culture technology specific to the field tomato (Ciofu, 2003). During many years, there was studied the possibility of establishing a culture by seedling and direct seeding in field. At the cultures established by seedling around the 1st of May, the fruits reached physiologic maturity in 15 July – 1 August. By direct seeding, the culture was established around the 15th of April, and the fruits reached physiologic maturity after 15th of August (table 1).

RESULTS AND DISCUSSION

After the intensive amelioration works that took place at S.C.D.L. Buzău, there was obtained the tomato variety named Kristin – destined to industrialization. Among the main characteristics of this variety, we mention:

- Early variety with a well defined genetic constitution remarkable for concentrated yield and maturation of fruits (over 80%);
- The plant has a determined growth (plants height 60cm);
- The short height of the plants and the reduced foliage permit the density increase for hectare and also an easy sustenance of the culture;
- The in flower is composed, the plant has a great coefficient of potential fertility (photo 1);
- The mean number of fruits in a truss is 6 (photo 2);
- Before maturity, the fruit presents a green callous;
- The fruit has a round shape (photo 3);
- The weight of the fruit is 80 – 120g;
- The physiological mature fruits are firm, have a red color in exterior, and inside they have a dark red color (this aspect constitute an advantage for the processators (photo 4);
- Mature fruits are very well kept on the plant all most 30 days, without depreciation (solar burn, splinter etc.), and after the harvest the keeping period surpasses 10 days;
- Do not present pedicel, character determined by the “jointless” genes;
- The fruits do not strip off with a stalk (very important aspect for the mechanized harvest);
- The variety presents resistance to *Verticilium dahlie rasa O*, *Fusarium oxisporum f. Sp. Lycopersici Rasa O, Phytophtora infestans, Pseudomonas syringae v.Tomate;*
- It can be mechanized harvested because the yield reaches maturity at the first harvest over 80%;
- The dry surpasses 6,7%;
- The yield potential is of 50 – 60t/ha, 2,5kg/plant if there were not applied any foliar or soil fertilization, verifying thus the natural genetic potential of the soil (table 2);
- Applying modern technologies of fertirigation and foliar fertilization leads to the significant yield increase for this variety.

CONCLUSIONS

After the amelioration works made at S.C.D.L. Buzău it can strongly affirm that the proposed objectives were accomplished by the homologation of the tomato variety with determined growing (Sp) – **Kristin** and also by obtaining a great number of valuable lines (over 30) which are in an advanced amelioration stage.

A part of these lines will be proposed for homologation, and another part is used as valuable genitors in obtaining F_1 hybrids.

Even if it was recently homologated, in 2006, the Kristin variety is really appreciated by the cultivators. A clear evidence in what it concerns the success of this variety consists in the fact that the institution has produced and sold over 500kg certificated seeds belonging to this variety.

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TABLES

Table 1. Phenological data to the Kristin variety in 2009.

Type of culture	Seeding	Springing	Planting	Flowering	Consume maturity	Nr. of days
Prin rasad	25 III	08 IV	05 V	24 V	15 VII	95 – 100
Prin semanat direct	15 IV	10 V	–	15 VI	20 VIII	100 - 105

Table 2. Testing the yield potential of the tomatoes for industrialization in the main vegetables centre in the country (2008)

Nr. crt.	Variety	Locality *						Media		STAS from total**	Early yield from total***
		Tc.	Ov.	Cl.	Cf.	Tu.	Tg.	t/ha	%	%	%
1	Roxana M_t	34,8	25,6	24,5	62,9	75,2	73,2	49,4	100	93,6	8,3
2	L 10	33,4	25,5	36	54,2	71,8	63,1	47,3	95,7	94,3	9,6
3	L 15	33,5	21,5	32,4	81	93.5	53,9	52,6	106,5	93,1	6,9
4	Kristin	31,2	22,7	51,6	71,8	108,9	63,1	58,2	117,8	93	8,1
5	L 66	31,8	22,3	37,2	74,5	76,4	75,6	53	107,3	93,3	7,2
6	L 67	30,9	25,2	36,7	68	71,3	77,5	51,6	104,5	93,4	7,9

* Locality: Tc. = Tecuci; Ov. = Ovidiu; Cl. = Călăraşi; Cf. = Calafat; Tu. = Turda; Tg = Târgovişte;

DL 5% = 10,3 20,9%
DL 1% = 14 28,3%
DL 0,1% = 18,7 37,8%

** Fruits with bigger weight than 33g;
*** Yield obtained until 31 July – south zone

PHOTOS

Photo 1. Kristin inflorescence

Photo 2. Truss of immature fruits

Photo 3. The shape and the color of the mature typical for this variety

Photo 4. Fruits that reached fruit – processing maturity

Bush bean variety with yellow pod "Ioana" obtained at SCDL Buzău

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Keywords: bush bean, wax bean – yellow, variety, line, genetic potential

ABSTRACT

In order to vary the bean variety with valuable Romanian creation, there has been improved a new amelioration strategy for these species. As a result of the amelioration works that took place in the Amelioration Laboratory at S.C.D.L. Buzău, in 2006 was obtained the "Ioana" bean variety, that represents a part of the bush beans with an yellow and extra soft pod.

The researches that were done mark out the high potential of yield and quality of "Ioana" variety (over 16t/ha), surpassing the control variant, Maxidor with 8,3t/ha.

Because of its proved plasticity, this variety can be successfully cultivated all over the country, in principal culture, and as well in successive culture, being an excellent precursory culture for most of the vegetable cultures.

The exceptional genetical habit detained by this variety offers the possibility of being cultivated as well in an ecological system, but also a great technological flexibility according to the machine system and the cultivators possibilities.

INTRODUCTION

Bush bean is appreciated for the content of vitamins and nutritive substances that increase the alimentary value, and also he use in cooking and industrial processing.

Our country offers favorable pedoclimatic conditions for this culture. In early spring culture (as a precursory plant) and as well in autumn culture (as a successive plant), bush bean is an excellent precursory plant for most of the vegetable cultures.

Lately, the pod bean culture has extended on large surfaces, because of the high request for consume, especially in preserved form. Pod bean represents valuable raw material for the can factories, where it is prepared simple or in combination with other vegetables, obtaining a great number of products solicited by the consumers during the whole year.

The lack of the Romanian creations for this species leaded to the apparition on the seeds market in our country of the imported species, commercialized at very high prices. These species were not tested in our culture sector and they do not always correspond to the requirements of the cultivators.

The low offering of the Romanian varieties at this species determined the cultivators to use climbing bean varieties with yellow pod that do not offer good results in all sectors of the country, but only in the hills areas, the north area of the country and Transilvania Hills. A consequence of this lack is the fact that the cultivators use the local varieties which are low productive, low quality and have a pronounced sensibility to the pathogens attack. Because of these reasons, S.C.D.L. Buzău introduced, since 1992, as a necessity in the bush bean amelioration, a valuable range composed from 12 lines, having the purpose to obtain valuable varieties in order to correspond to the cultivators needs.

MATERIALS AND METHODS

The amelioration activities done at S.C.D.L. Buzău, which were concretized by the judicious selection of the genitors, allowed the perfect knowing of the genitors, but especially of the genetical base.

The careful observation of the morphological, physiological and biochemical characteristics of the varieties and the lines of the range, but also testing the general combinative capacity leaded to the procurement of a valuable biological material for these species.

Besides the main objectives which were followed during the amelioration process, a great attention was given to the following objectives:
– introduction, verifying and processing in the amelioration process of the foreign varieties and, first of all, to the ones resistant to the pest and pathogens attack, which have great productivity;
– creation of varieties which are superior to the ones existent in culture by the means of intra- and inter-specific hybridation, back – cross and genealogical selection:

a) high production varieties (over 10t/ha), with high quality pods (extrasoft);

b) resistance to the main pathogen attack, especially to *Xanthomonas phaseoli, Pseudomonas phaseolicola* and *Colletotrichum lindemunthianum;*

c) resistance and adaptability to the environmental conditions.

During the experience, there were studied 11 lines which were in an advanced amelioration stage at S.C.D.L. Buzău. As a control variant, there was selected the Maxidor variety, which is consecrate among the cultivators. The experimental variants were the following: V_{1Mt} – Maxidor; V_2 – L_1 ; V_3 – L_2 ; V_4 – L_3 ; V_5 – L_4 ; V_6 – L_5 ; V_7 – L_6 ; V_8 – L_7 (Ioana); V_9 – L_8 ; V_{10} – L_9 ; V_{11} – L_{10} ; V_{12} – L_{11}.

The placing of the experience in field was made according to the Latin rectangle method, which presupposes a number of 4 repetitions.

The drilling was manually made on a moderate field with 3 ranges on a furrow at 40cm distance, assuring a mean density of 40 – 45 plants/m^2.

There were made the maintenance works provided by the culture technology of the bush bean.

During the vegetation period there were noted the main pheno-phases, and at the technical maturity of the pods and at the physiological maturity of the seeds, there were made biometric measurements and quantitative determinations regarding the pods yield.
Experimental data were statistically processed by means of the variant analysis method.

RESULTS AND DISCUSSION

After the amelioration activities that took place at the Amelioration Laboratory during a long period of time, L_7 cultivar proved his superiority to the other lines and also to the control variant in what it concerns productivity, quality and genetic stability. In 2006 the first variety of bush bean with yellow and cylindrical pod obtained at S.C.D.L. Buzău was homologated and introduced in culture with the name of “Ioana”.

The main characteristics of this variety are the following:

- Early variety with short vegetation period (40 – 60 days);
- The plant height is determined, having as mean height over 40cm;
- Each plant has 4 – 6 shoots and 15 – 25 leaves;
- The flowers are white, displayed in shot raceme; each inflorescence contains 2 – 8flowers, and the flower period displays during 15 – 25 days;
- The pod has a mean length, it has yellow color and circular transverse section;
- The pod has no string;
- The pods are high quality, yellow color and concentrate maturity, the variety being recommended to mechanized crop;
- The variety presents resistance to *Colletrotrichum rasa Lambda* and *Xanthomonas campestris;*
- The crop technology of the variety in the classical one, having no different technological requirements than the known varieties from the same group.
- The production potential is 16 – 18t pods/ha;
- It can be cultivated in early crop, before other cultures or successive, because of its short vegetation period;

- Because of the plants uniformity and also because of the pods technical maturity (over 80% at the first harvest), the variety is recommended to the mechanized crop;
- The pods can be used for fresh consume an also for industrialization;
- This variety can be cultivated also in an ecological system because it has a good ecological plasticity, being created in the pedoclimatic condition which are specific to our country;
- Comparative to the other lines studied the pods yield of the Ioana variety proved to be very positive significant (table 1).

CONCLUSIONS

The amelioration activities finalized with the homologation of the Ioana variety. Even if it was recently homologated, this variety is very appreciated among the cultivators. A proof of its success is the large quantity of certified seeds that was sold by the institution (over 5000kg until now). In the same time while obtaining this variety, the institution created one of the most valuable germoplasma collections for this species that exists in our country. This collection is concretized in lines which are in an advanced amelioration stage and will be homologated and used for next amelioration activities.

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TABLE

Table 1. Pods yield obtained from the bush bean in 2009

Experimental variant	Line or variety	Mean yield t/ha	Difference from the control variant t/ha	Signification
V_{1Mt}	Maxidor	8,725	–	–
V_2	L_1	11,875	+3,15	*
V_3	L_2	13,925	+5,2	***
V_4	L_3	11,775	+3,05	*
V_5	L_4	13,375	+4,65	**
V_6	L_5	13,25	+4,525	**
V_7	L_6	16,85	+8,125	***
V_8	L_7 (Ioana)	17,05	+8,325	***
V_9	L_8	11,125	+2,4	–
V_{10}	L_9	16	+7,275	***
V_{11}	L_{10}	15,825	+7,1	***
V_{12}	L_{11}	11,225	+2,5	–

DL 5% =2,856 t/ha
DL 1% =3,85 t/ha
DL 0,1% =5,11 t/ha

PHOTOS

Photo 1. Aspect from the ”Ioana” crop


Photo 2. ”Ioana” pods


Photo 3. Pods evolution at ”Ioana variety


Photo 4. ”Ioana” variety has no strings

Research concerning the influence of the hybrid, the density and the module of shading in the summer crops of broccoli

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Keywords: *Brassica oleracea L., convar. botrytis L. var. italica, Plench (1808)*, shading, space of nutrition, production, hybrids

ABSTRACT

Our research has followed the behaviour of three hybrids of broccoli of the summer crops, in tunnels covered with shading net of different colours, in comparison with an unshaded witness, and under the influence of four variants of densities. The biologic material consisted of the hybrids Chevalier, Milady and Belstar. The tunnels were covered with a dark green shading net, a green shading net with white stripes and a light green shading net, while the witness remained uncovered. We used several distances of planting: 57142plants/ha (70/25cm), 79365plants/ha (70/18cm), 40816plants/ha (70/35cm) and for the witness variant 31746plants/ha (70/45cm). The biggest mean main productions were obtained for the hybrid Chevalier, 28,717 t/ha (in the tunnel shaded with dark green net), 28,339 t/ha (the tunnel shaded with the green net with white stripes), 27,786 t/ha (the tunnel shaded with light green net), 22,309 t/ha (the unshaded witness), followed by the hybrid Belstar with 27,343 t/ha (the tunnel shaded with dark green net), 26,957 t/ha (the tunnel shaded with the green net with white stripes), 26,225 t/ha (the tunnel shaded with light green net), 20,499 t/ha (the unshaded witness) and Milady with 25,644 t/ha (the tunnel shaded with dark green net), 25,311 t/ha (the tunnel shaded with green net with white stripes), 24,580 t/ha (the tunnel shaded with light green net), 19,319 t/ha (the unshaded witness). The mean main production (t/ha) of the three hybrids cultivated in the dark green shaded tunnel was the biggest (27,235 t/ha), followed by the tunnel shaded with green net with white stripes (26,869 t/ha) and, finally, the light green shaded tunnel (26,197 t/ha), while the unshaded witness had the smallest production (20,709 t/ha).

INTRODUCTION

Broccoli is a very valuable vegetable and it is increasingly preferred by consumers. Thus, it is important to extend the consume of broccoli during summertime.

The application of certain technological measures, such as the shading of broccoli plants, can be very efficient and can help the cultivators to obtain some convenient productions during the hottest period of the year (July-August).

Broccoli is increasingly used in the intercalated systems, and the shading can appear when it is cultivated next to corn (Sanchez, G. E., and Wade, M., 2006, quoted by Francescangeli, N., and all., 2007).

The research carried out in our country (Dobrin, E., and Ciofu, R., 2003) demonstrated that broccoli can be grown in several systems of crops.

Broccoli was tested under production conditions including in summer crops and the results obtained were remarkably good (Zăvoianu, R., and Popescu, V., 2007).

MATERIAL AND METHOD

The experiment was developed in the year 2008, in the county Dâmbovița, near Lungulețu (the district Potlogi), 49 km away from Bucharest.

It was organized an experiment of the trifactorial type – using subdivided parcels with three repetitions: Factor A (the hybrid), with 3 graduations: a1=Chevalier F1**;** a2=Milady F1**;** a3= Belstar F1, Factor B-(density), cu 4 graduations: b1= 57142 plants/ha (70/25cm); b2= 79365 plants/ha (70/18cm); b3= 40816 plants/ha (70/35cm); b4= 31746 plants/ha (70/45cm), and Factor C (the mode of shading), with 4 graduations: c1= unshaded witness, c2 = the tunnel shaded with dark green net, c3= the tunnel shaded with green net with white stripes, c4= the tunnel shaded with light green net.

The densities of plantation of 5,7 plants/m^2 and 4,1 plants/m^2 correspond to the recommandations made in the literature concerning the technology of broccoli culture **(**Popescu and Atanasiu, 2000).

The crop of broccoli was realized from planting by seedlings produces in the greenhouse. The planting was executed the 9th May 2008, in boxes, while the emergence in mass of plants took place the 12th May 2008. The transplant was executed the 23rd May 2008, using plastic pots, during the phase with 1-2 real leafs. Until planting, the seedlings were taking care of according to the technology.

The planting of hybrids of broccoli at different densities took place the 13th June 2008.

During the period of vegetation, there were applied different works of maintaining: we completed the gaps, 5 days after the plantation, we watered it reputedly, every time it was necessary, but more often for the variant of the unshaded witness, we fertilized with Complex III, 300 kg/ha, 3 weeks after the planting, we controlled the pest (there was a bigger number of treatments for the unshaded witness), we realized repeated hoeing (3 times).

The harvest was done at the optimal moment, before the opening of the floral buds, first of all, the main inflorescence – the 17th August (the hybrid Belstar), 19th August (the hybrid Milady), 21st August (the hybrid Chevalier), secondly, the secondary inflorescence – 1st September (the hybrid Belstar), 2nd September (the hybrid Milady) and the 5th September (the hybrid Chevalier).

During the development of the experiment there were effectuated several observations concerning the biometrical parameters (the length of the stalk, the number of leafs, the diameter of the stalk, the foliar area) and production parameters (the mean weight of the main inflorescences, the total weight of the inflorescence, the mean main production, the mean secondary production, the mean total production).

The results were interpreted using the method of the variation analysis and there were calculated the correlations between the mean weight of the main inflorescences (kg/plant) and the density (plants/ha) and between the mean main production (t/ha) and the density (plants/ha).

RESULTS AND DISCUSSIONS

Results concerning the influence of the hybrid

Out of all the studied hybrids, it can be noticed from the table 1 that the hybrid Chevalier obtained the biggest mean main production in all the three variants of tunnels covered with shading net and at the unshaded witness variant.

In this way, in the version of the tunnel covered with the dark green net Chevalier obtained 28,717 t/ha, Belstar, 27,343 t/ha and Milady 25,644 t/ha. In the version of the tunnel covered with the white stripes net, Chevalier obtained 28,339 t/ha, Belstar, 26,957 t/ha and Milady, 25,311 t/ha. In the tunnel covered with the light green net, Chevalier obtained 27,786t/ha compared to Belstar, 26,225 t/ha and Milady 24,580 t/ha, finally, in the case of the witness unshaded, Chevalier hybrid obtained 22,309 t/ha, Belstar 20,499 t/ha and Milady, 19,319 t/ha.

Concerning the mean weight of the inflorescence (kg/plant), the situation is similar for the three hybrids: the hybrid Chevalier obtained the biggest inflorescence, followed by the hybrid Belstar and Milady (table 2).

Results concerning the influence of the planting density

There is, nevertheless, a relation of direct proportionality between the density and the mean main production (t/ha). Consequently, in all the variants of tunnels and in all the cases of hybrids studied, the largest production (table 1, figures 1,2,3) was obtained at the biggest density (79365 plants/ha). Between the mean main production (t/ha) and the density of plantation (plants/ha) there is a positive correlation and a very significant one (figures 7, 8, 9, 10).

You can notice from the table 2 and figures 4, 5, 6, that the experimental half-breeds and all the types of shaded tunnels with a net and unshaded witness, as the nutritional space grows, the mean weight of the main inflorescences (kg/plant) grows as well. A very significant, negative correlation was established between the mean weight of the main inflorescences (kg/plant) and the density of planting (plants/ha) (figures 11, 12, 13, 14).

Results concerning the influence of the shading mode

Out of all the shading nets used, we noticed that the biggest value of the main average production (table 3) for the three hybrids was obtained in the case of the tunnel shaded with dark green net (27,235 t/ha), followed by the tunnel shaded with green net with white stripes (26,869 t/ha) and the tunnel shaded with light green net (26,197 t/ha) and the witness unshaded (20,709 t/ha).

In table 3 it is presented the statistical representation of the results of production, where it can be noticed very important resemblances between the unshaded witness (the plants grown without the existence of a minimum protection against the high temperatures and the direct solar radiation) and every one of the three types of tunnels shaded with dark green, green with white stripes and light green.

CONCLUSIONS

In the summer crops, broccoli can be successfully cultivated only by using an efficient technological method, like the shading, that can ensure a production considerable in quantity and of a high quality.

Out of all the studied hybrids, the biggest mean main productions were obtained for the hybrid Chevalier, 28,717 t/ha (tunnel shaded with dark green net), 28,339 t/ha (tunnel shaded with green net with white stripes), 27,786 t/ha (tunnel shaded with light green net) and 22,309 t/ha for the unshaded witness, followed by the hybrid Belstar, 27,343 t/ha (tunnel shaded with dark green net), 26,957 t/ha (tunnel shaded with green net with white stripes), 26,225 t/ha (tunnel shaded with light green net) and 20,499 t/ha for the unshaded witness, and the hybrid Milady 25,644 t/ha (tunnel shaded with dark green net), 25,311 t/ha (tunnel shaded with green net with white stripes), 24,580 t/ha (tunnel shaded with light green net) and 19,319 t/ha for the unshaded witness.

The density of plantation influenced the mean main production. Therefore, the biggest productions were obtained at the density of 79365 plants/ha, while the least were at the witness variant (31746 plants/ha).

The mean weight for the main inflorescence (kg/plant) had grown at the same time as the density of planting had decreased, the biggest inflorescence being obtained at the witness density of 31746 plants/ha, while the least were obtained at the biggest density of 79365 plants/ha. At the density of 31746 plants/ha, the hybrid Chevalier obtained inflorescence with the weight of 0,633 kg/plant (unshaded witness), 0,766 kg/plant (tunnel shaded with dark green net), 0,760 kg/plant (tunnel shaded with green net with white stripes), 0,746 kg/plant (tunnel shaded with light green net), the hybrid Belstar obtained 0,570 kg/plant (unshaded witness), 0,723 kg/plant (tunnel shaded with dark green net), 0,716 kg/plant (tunnel shaded with green net with white stripes) and 0,702 kg/plant (tunnel shaded with light green net), while hybrid Milady obtained 0,506 kg/plant (unshaded witness), 0,660 kg/plant (tunnel shaded with dark green net), 0,654 kg/plant (tunnel shaded with green net with white stripes), 0,640 kg/plant (tunnel shaded with light green net). At the density of 79365 plants/ha, the hybrid Chevalier obtained inflorescences with the weight of 0,313 kg/plant (unshaded witness), 0,418 kg/plant (tunnel shaded with dark green net), 0,410 kg/plant (tunnel shaded with green net with white stripes), 0,405 kg/plant (tunnel shaded with light green net), the hybrid Belstar obtained 0,298 kg/plant (unshaded witness), 0,408 kg/plant (tunnel shaded with dark green net), 0,400 kg/plant (tunnel shaded with green net with white stripes), and 0,386 kg/plant (tunnel shaded with light green net), while the hybrid Milady obtained 0,278 kg/plant (unshaded witness), 0,372 kg/plant (tunnel shaded with dark green net), 0,365 kg/plant (tunnel shaded with green net with white stripes), 0,351 kg/plant (tunnel shaded with light green net).

The biggest mean main productions (t/ha) for the three hybrids were obtained at the broccoli plants grown in the tunnel shaded with dark green net (27,235 t/ha), followed by the tunnel shaded with green net with white stripes (26,869 t/ha) and the tunnel shaded with light green net (26,197 t/ha), the least productions were obtained at the unshaded witness variant (20,709 t/ha).

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TABLES

Table 1. The influence of the density on the production (t/ha) at the tested hybrids in all the four module of shading

Var.	The mean main production (t/ha)				The mean secondary production (t/ha)				The mean total production (t/ha)			
	The unshaded witness	The dark green net	The green net +white stripes	The light green net	The unshaded witness	The dark green net	The green net +white stripes	The light green net	The unshaded witness	The dark green net	The green net +white stripes	The light green net
The Chevalier hybrid												
V1	23,199	30,970	30,570	29,770	0,514	1,714	1,142	0,914	23,713	32,684	31,712	30,684
V2	24,841	33,174	32,539	32,142	0,952	3,015	2,380	1,984	25,793	36,189	34,919	34,126
V3	21,101	26,407	26,122	25,550	1,061	1,918	1,591	1,346	22,162	28,325	27,713	26,896
V4Mt	20,095	24,317	24,126	23,682	0,793	1,873	1,523	1,111	20,888	26,190	25,649	24,793
Average	**22,309**	**28,717**	**28,339**	**27,786**	**0,830**	**2,130**	**1,659**	**1,339**	**23,139**	**30,847**	**29,998**	**29,125**
The Milady hybrid												
V5	20,171	27,656	27,313	26,513	2,057	3,257	2,799	2,571	22,228	30,913	30,112	29,084
V6	22,063	29,523	28,968	27,857	2,142	3,730	2,936	2,777	24,205	33,253	31,904	30,634
V7	18,979	24,448	24,203	23,632	2,163	3,102	2,816	2,612	21,142	27,550	27,019	26,244
V8Mt	16,063	20,952	20,761	20,317	2,857	1,015	1,301	0,698	18,920	21,967	22,062	21,015
Average	**19,319**	**25,644**	**25,311**	**24,580**	**2,305**	**2,776**	**2,463**	**2,164**	**21,624**	**28,420**	**27,774**	**26,744**
The Belstar hybrid												
V9	20,456	27,999	27,599	26,799	2,399	3,771	3,257	2,914	22,855	31,770	30,856	29,713
V10	23,650	32,380	31,746	30,634	1,507	4,126	3,492	3,015	25,157	36,506	35,238	33,649
V11	19,795	26,040	25,754	25,183	1,551	2,326	1,877	1,795	21,346	28,366	27,631	26,978
V12Mt	18,095	22,952	22,730	22,285	1,904	1,270	0,730	0,666	19,999	24,222	23,460	22,951
Average	**20,499**	**27,343**	**26,957**	**26,225**	**1,840**	**2,873**	**2,339**	**2,097**	**22,339**	**30,216**	**29,296**	**28,322**

Table 2. The influence of the density on the weight of the inflorescences (kg/plant) at the tested hybrids in all the module of shading

Var.	The mean weight of the main inflorescences (kg/plant)				The mean weight of the secondary inflorescences (kg/plant)				The mean total weight of the inflorescences (kg/plant)			
	The unshaded witness	The dark green net	The green net +white stripes	The light green net	The unshaded witness	The dark green net	The green net +white stripes	The light green net	The unshaded witness	The dark green net	The green net +white stripes	The light green net
The Chevalier hybrid												
V1	0,406	0,542	0,535	0,521	0,009	0,030	0,020	0,016	0,415	0,572	0,555	0,537
V2	0,313	0,418	0,410	0,405	0,012	0,038	0,030	0,025	0,325	0,456	0,440	0,430
V3	0,517	0,647	0,640	0,626	0,026	0,047	0,039	0,033	0,543	0,694	0,679	0,659
V4Mt	0,633	0,766	0,760	0,746	0,025	0,059	0,048	0,035	0,658	0,825	0,808	0,781
Average	**0,467**	**0,593**	**0,586**	**0,575**	**0,018**	**0,043**	**0,034**	**0,027**	**0,485**	**0,636**	**0,620**	**0,602**
The Milady hybrid												
V5	0,353	0,484	0,478	0,464	0,036	0,057	0,049	0,045	0,389	0,541	0,527	0,509
V6	0,278	0,372	0,365	0,351	0,027	0,047	0,037	0,035	0,305	0,419	0,402	0,386
V7	0,465	0,599	0,593	0,579	0,053	0,076	0,069	0,064	0,518	0,675	0,662	0,643
V8Mt	0,506	0,660	0,654	0,640	0,09	0,032	0,041	0,022	0,596	0,692	0,695	0,662
Average	**0,401**	**0,528**	**0,522**	**0,508**	**0,051**	**0,053**	**0,049**	**0,042**	**0452**	**0,581**	**0,571**	**0,550**
The Belstar hybrid												
V9	0,358	0,490	0,483	0,469	0,042	0,066	0,057	0,051	0,400	0,556	0,540	0,520
V10	0,298	0,408	0,400	0,386	0,019	0,052	0,044	0,038	0,317	0,460	0,444	0,424
V11	0,485	0,638	0,631	0,617	0,038	0,057	0,046	0,044	0,523	0,695	0,677	0,661
V12Mt	0,570	0,723	0,716	0,702	0,06	0,040	0,023	0,021	0,630	0,763	0,739	0,723
Average	**0,428**	**0,564**	**0,558**	**0,543**	**0,039**	**0,054**	**0,042**	**0,039**	**0,467**	**0,618**	**0,600**	**0,582**

Table 3. The statistic interpretation of the results of the production

The mode of shading	The mean main production (t/ha)	Difference (t/ha)	Semnification
The unshaded witness	20,709	Mt	Mt
The tunnel shaded with dark green net	27,235	6,526	***
The tunnel shaded with the green net with white stripes	26,869	6,160	***
The tunnel shaded with light green net	26,197	5,488	***

$DL_{5\%}$ =0,042 t/ha

$DL_{1\%}$ =0,056 t/ha

$DL_{0,1\%}$ =0,073 t/ha

FIGURES

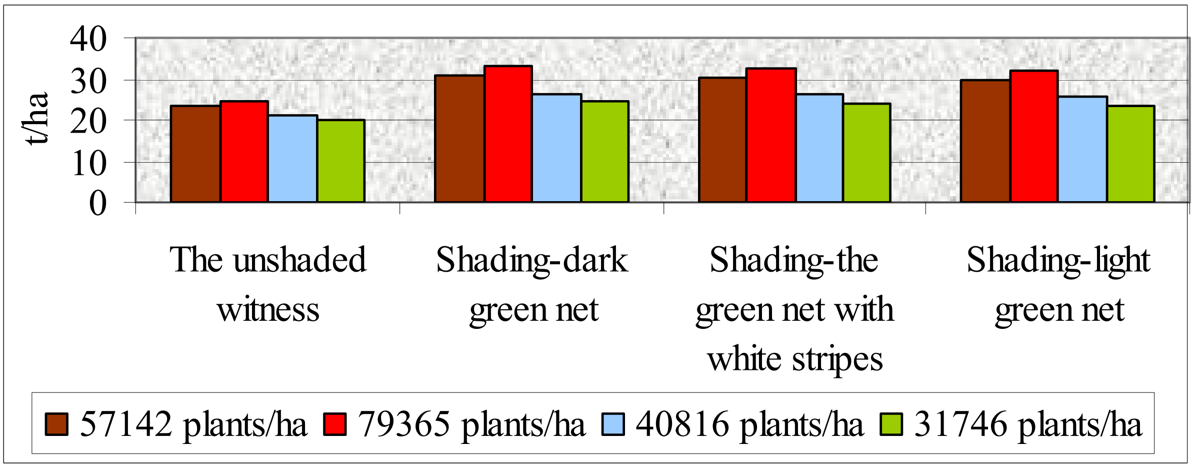

Fig. 1. The mean main production (t/ha), the Chevalier hybrid

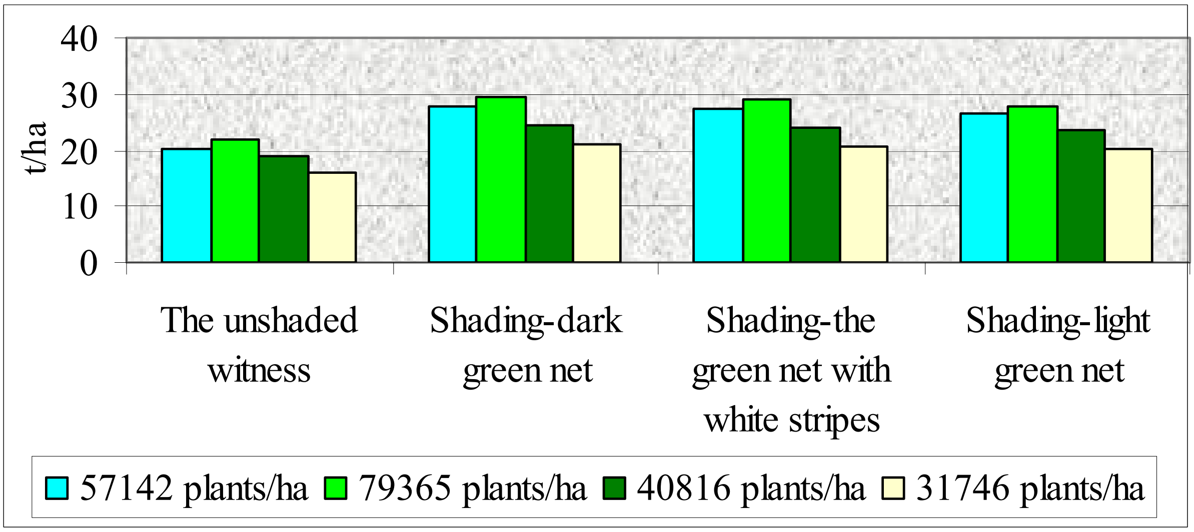

Fig. 2. The mean main production (t/ha), the Milady hybrid

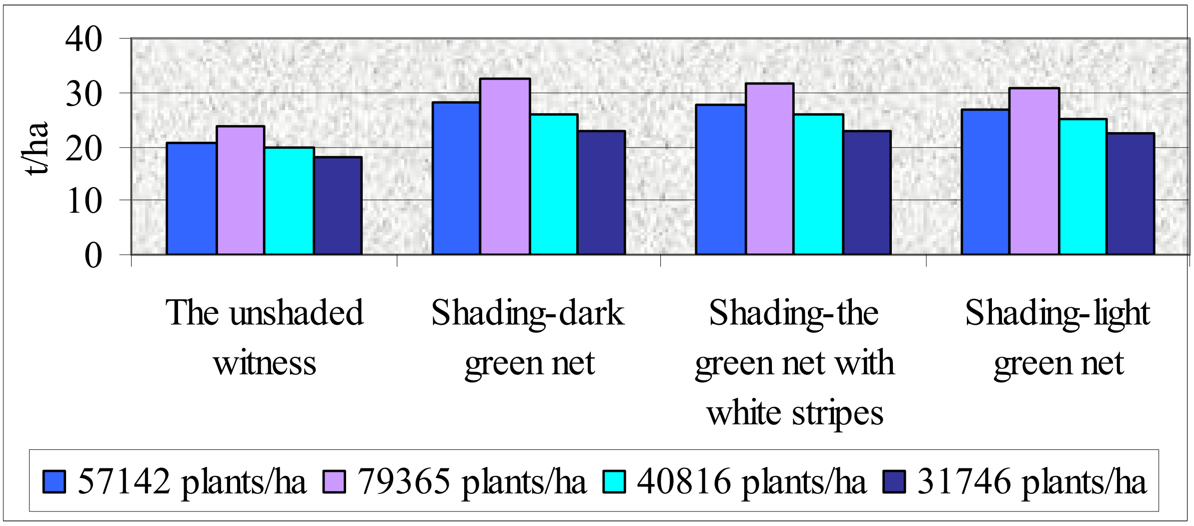

Fig. 3. The mean main production (t/ha), the Belstar hybrid

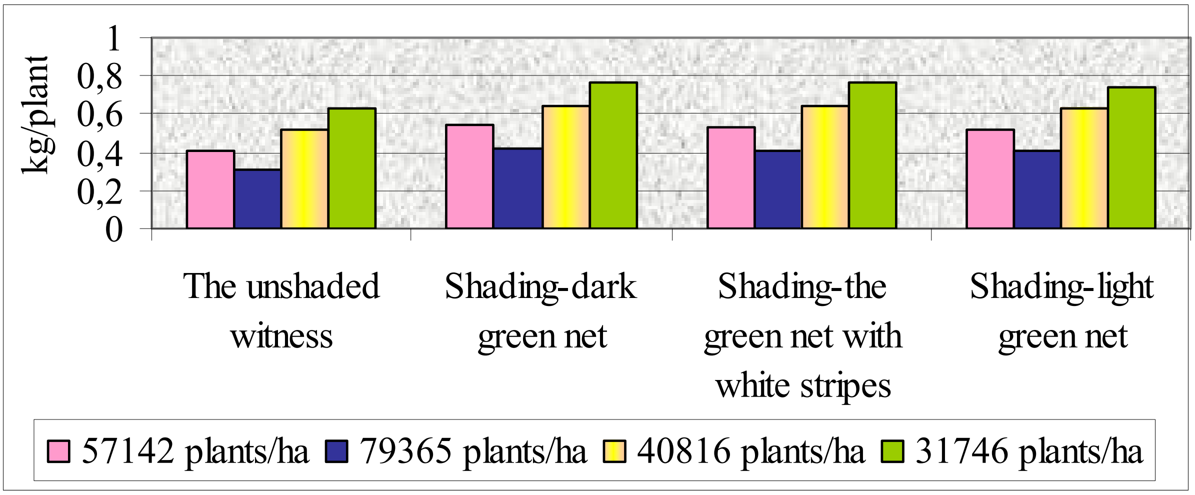

Fig. 4. The mean weight of the main inflorescences (kg/plant), the Chevalier hybrid

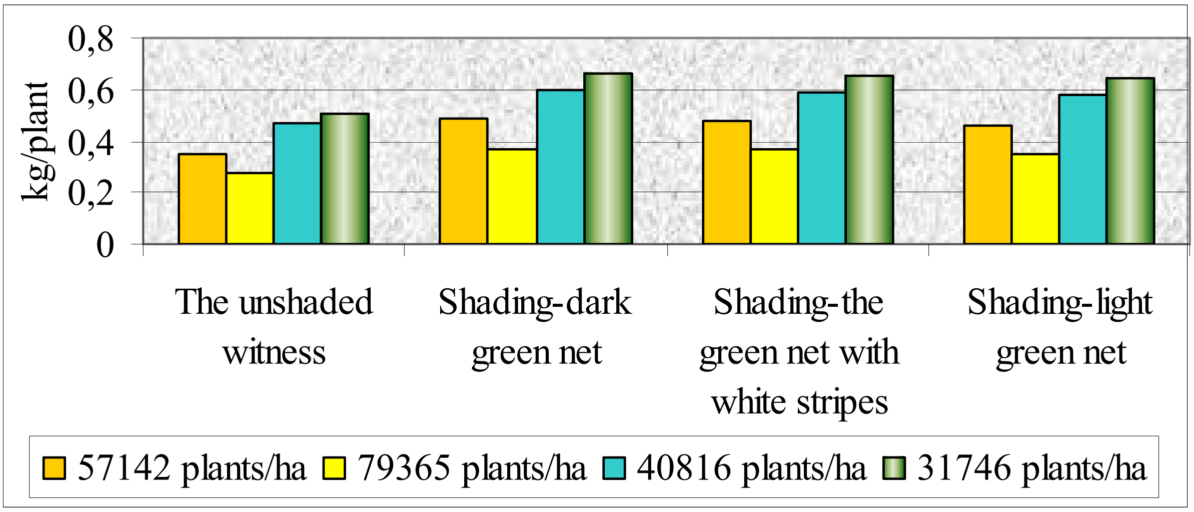

Fig. 5. The mean weight of the main inflorescences (kg/plant), the Milady hybrid

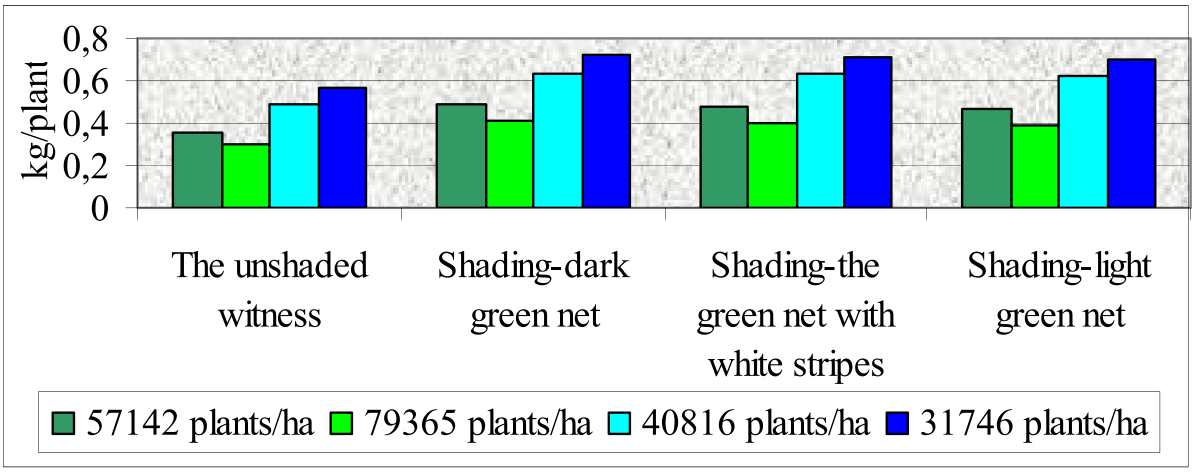

Fig. 6. The mean weight of the main inflorescences (kg/plant), the Belstar hybrid

The positive correlation between mean main production (t/ha) and plant density (plants/ha)

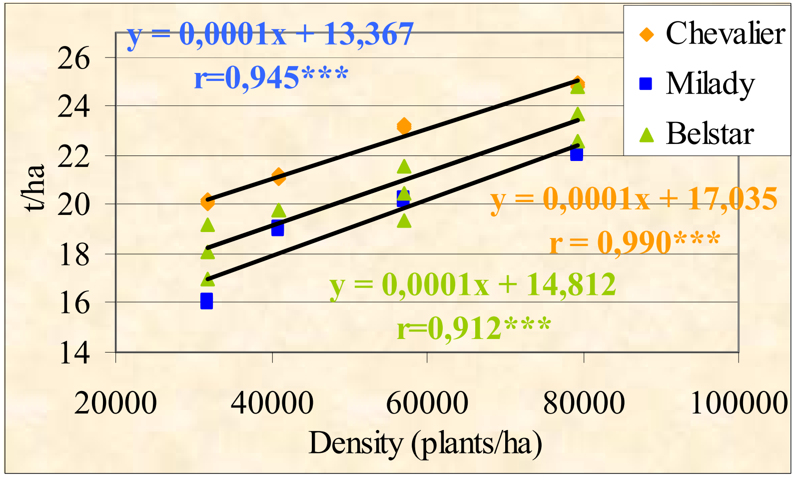

Fig. 7. The unshaded witness

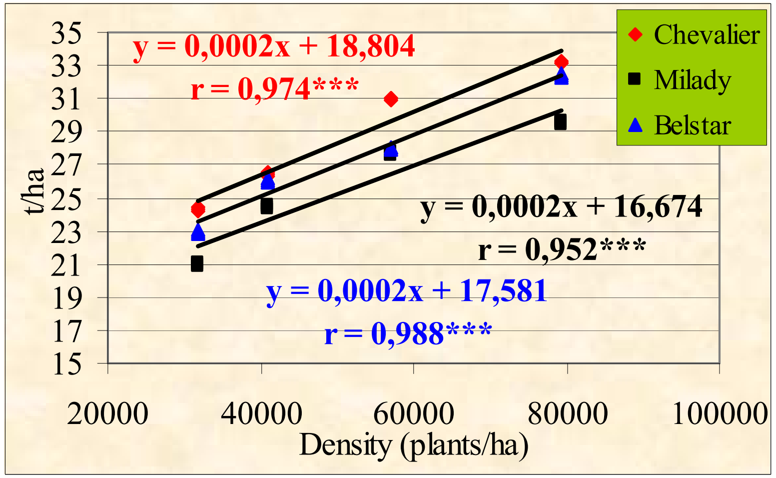

Fig. 8. The tunnel shaded with dark green net

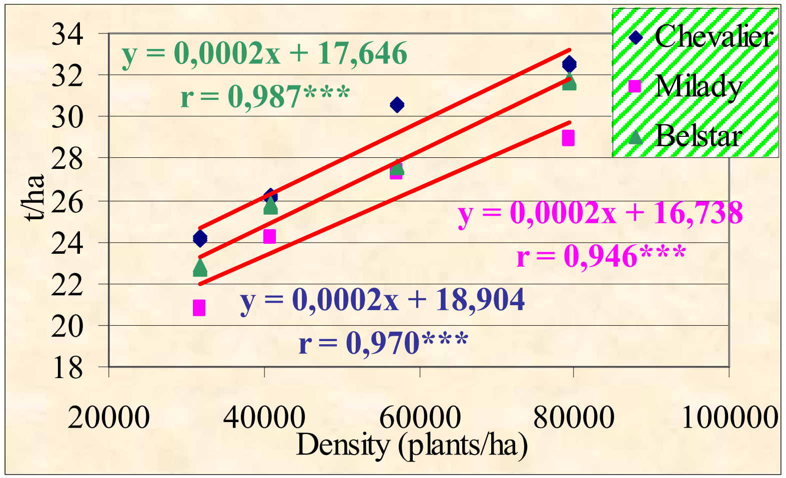

Fig. 9. The tunnel shaded with green net with white stripes

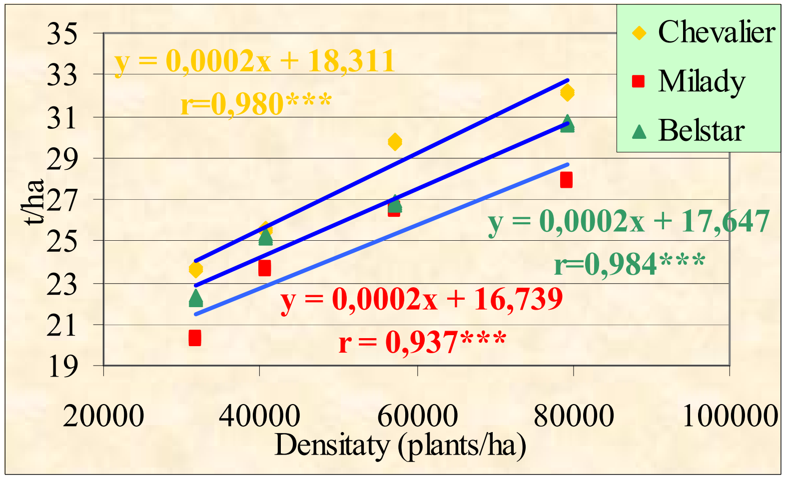

Fig. 10. The tunnel shaded with light green net

The negative correlation between the mean weight of the main inflorescences (kg/plant) and the plant density (plants/ha)

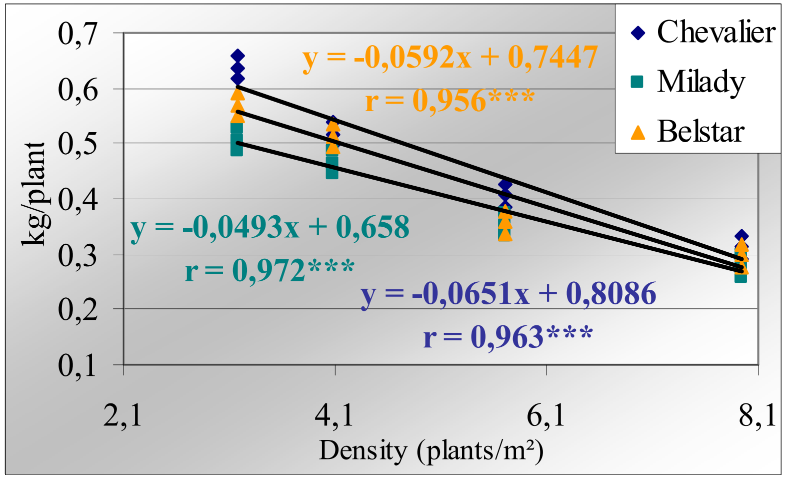

Fig. 11. The unshaded witness

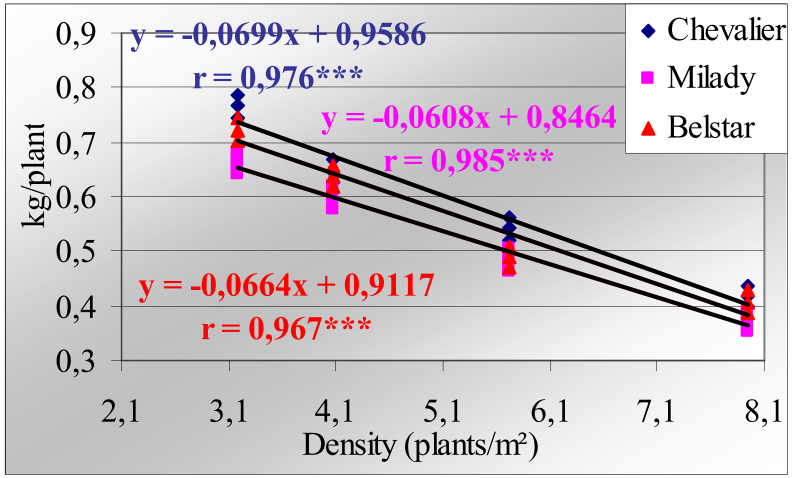

Fig. 12. The tunnel shaded with dark green net

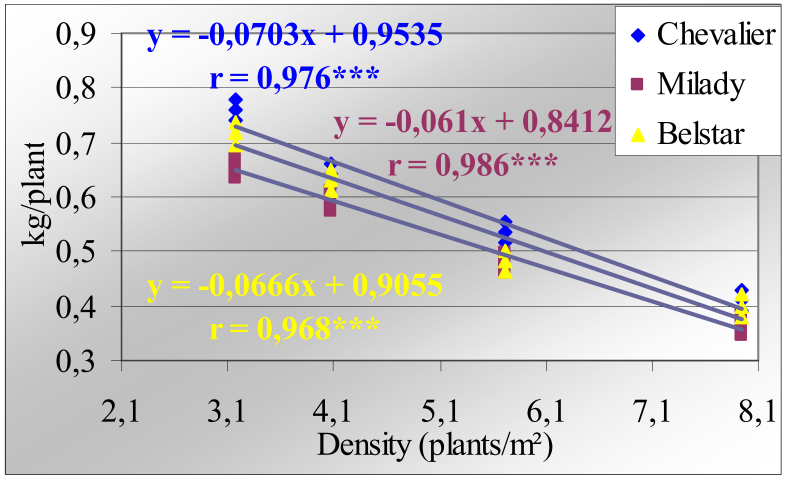

Fig. 13. The tunnel shaded with green net with white stripes

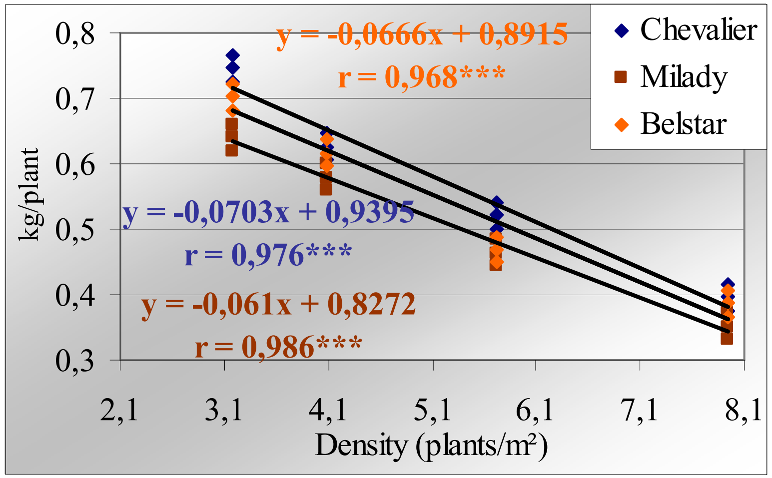

Fig. 14. The tunnel shaded with light green net

Fig. 15. View from the summer crop

Fig. 16. The unshaded witness, the tunnel shaded with dark green net, the tunnel shaded with green net with white stripes (left) and the the tunnel shaded with light green net (right)

Figure 17. The Chevalier hybrid

Figure 18. The Milady hybrid

Figure 19. The Belstar hybrid

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ORNAMENTAL PLANT

The use of ornamental grasses in designing green spaces

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Keywords: weeds, decorating, gardens, landscape

ABSTRACT

Ornamental grasses are highly robust plants, fussy and easy to grow. The species and varieties used for decorating gardens, yards and parks have been chosen for their beauty and for the great adaptation of different physical and ecological conditions that vary. All the grasses, both small and tall ones have smooth stalks that don't have woody structure as trees and shrubs. That's why most of the grasses get dry over the winter and during spring they regenerate from the root buds. For the research there were selected the most decorating and used ornamental weeds. So, for shady gardens different species of Carex, Luzula and Sesleria are best to use in small groups of weeds or as focal points. It is also recommended to use them in small gardens. Wet soils, swamps and ponds are ideal for Gliceria maxima, Molinia caerulea and Scirpus as they love water. For sunny and dry areas, Festuca, Leymus and Sesleria are ideal as they thrive best in these conditions. Some ornamental weeds are perfect for growing in pots on a terrace as they are used in landscape designs as "star plants" for example Pennisetum, and others due to the colorful leafs and spikes can decorate all the year round (Miscanthus).

INTRODUCTION

The majority of the cultivated weeds have their origins to the different prairies of the world so they are sun loving plants. In the shady places, at the base of the trees or on the Nordic part of the buildings can also grow a large number of weeds. The origin of these plants that tolerate shade is in the forests of the world. These also like rich and wet soils.
Depending of their height a few weeds that don't reach 100 cm are Briza media, Carex sp., Stipa barbata, Alopecurus pratensis, a.s.o. Taller plants like Miscanthus sinensis, Panicum virgatum and Calamagrostis acutifolia require space for a good growth and it's a reason why they should be planted in the back of the garden as single plants or near a wall as a plant group as they are good coverers.

MATERIALS AND METHODS

For realize of the works shown in the paper we have selected and described the most used ornamental weeds of the past years. The designs were done in private gardens by a graduate of the Faculty of Horticulture and Forestry section Landscaping Architecture.

RESULTS AND DISCUSSION

Examples of combining perennial weeds with different ornamentals are shown in pictures 1, 2, 3, 4, 5.

CONCLUSIONS

When designing a garden the people are looking for plants that shouldn't be replaced every year. That's why more and more people are looking for perennial grasses and bulbous plants. In these works, ornamental grasses are very popular as they have the quality to be used depending of the specie for shady and sunny gardens, rockeries, ponds, rivers, cascades, a.s.o

The diversity is given to the characters of the plant, height, shape and color of the leaves and spikes. The height can be very small (15 cm) to very big (250 cm) which aloud us to use them as ground coverers, isolated, "star plants" or focal points even in group as green screen. The smooth and soft texture of the weeds is a major attraction. The elegance of the foliage permit perfect matching with flowers, ornamental shrubs and conifers. Color of the foliage and spikes vary from bluish green to yellow, from the light green to the dark green passing different shades of purple green and red to ivory and golden yellow of the striped varieties.

The works done to the private persons are appreciated yet. It remains to the future to come with the replacing of the species when this will be required.

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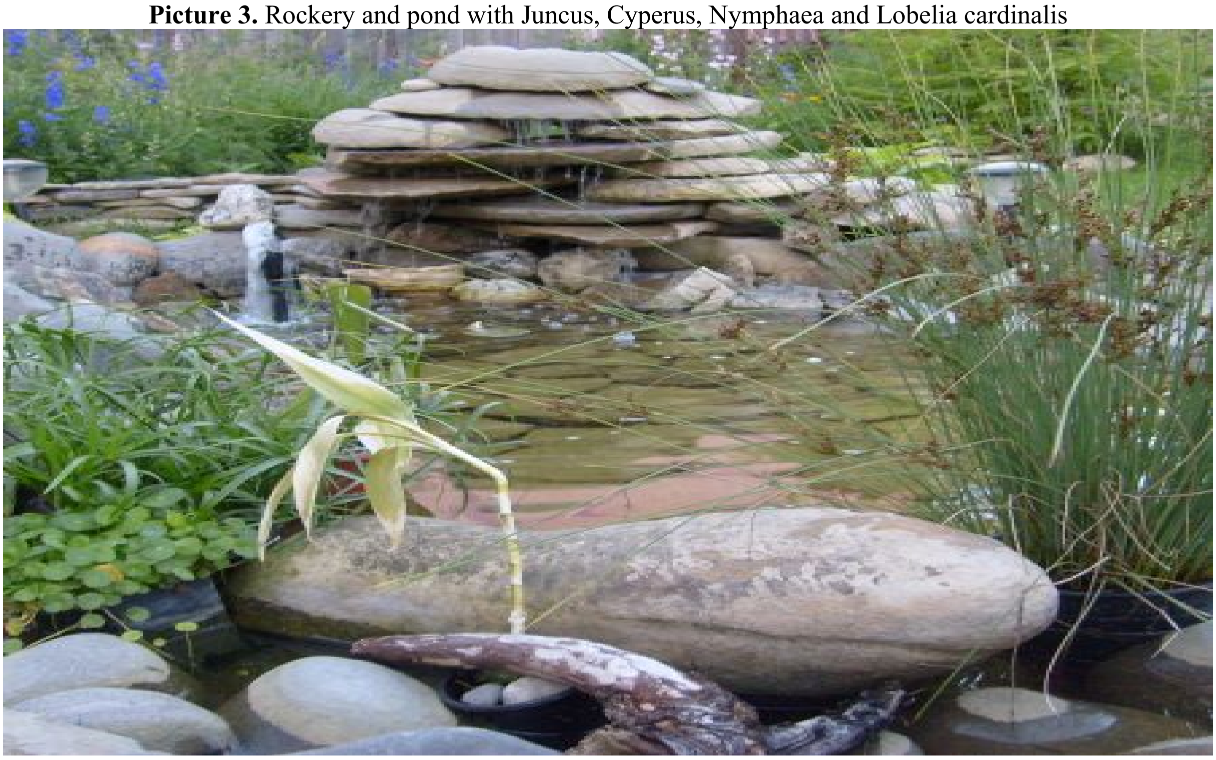
PICTURES

Picture 1. Pond with perennial weeds and water plants: Carex, Scirpus, Juncus, Thypha

Picture 2. Pond in a interior garden with different perennial grasses and ornamentals

Picture 3. Rockery and pond with Juncus, Cyperus, Nymphaea and Lobelia cardinalis



Picture 4. Rockery with different weeds Juncus, Festuca, Luzula, Phyllostakis and ornamentals

Picture 5. Pond with a great variety of weeds and ornamentals: Scirpus, Juncus, Festuca, Sesleria.

The behaviour of some new freesia varieties, cultivated in the conditions of a modern greenhouse at the didactic base of the Faculty of Horticulture and Forestry in Timişoara

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Keywords: Blue Sky, Calgary, Purple Rain, Texas, Troubadur

ABSTRACT

A tradition among the flower growers, appreciated for the beauty and delicate and unique perfume, Freesia enjoys a continuously growing cultivated surfaces, so that today it is one of the most cultivated cut flower worldwide (place 7). The culture is relatively simple and the big production on unit area makes possible the full recovery of the investment and guaranteed profit. A priority is keeping and attracting for cultivation the valorous varieties, far superior to the old varieties, with a great virus resistance. In terms of the actual research I mention that 20 new varieties of Freesia were placed at the Didactic Base of the Faculty of Horticulture and Forestry in Timisoara, all of them taken in research but in the following I will present data taken from 5 of them: Blue Sky (blue), Calgary (white), Purple Rain (purple-fuchsia), Texas (yellow) and Troubadur (reddish - orange). Data was taken of the inflorescence length, number of flower bud in inflorescence and the diameter of the first 3 flowers in inflorescence. The results show that between these facts there isn't a very tight relation so the varieties with a big number of buds in inflorescence didn't default the biggest inflorescences.

INTRODUCTION

The trends of modern society are to bring as closely as possible to daily life the beauty of nature and how can it be done better without flowers.

This fact hasn't escaped to the breeders who are looking permanently to create new varieties of Freesia by keeping the valuable existing ones and transferring the valuable characters to the new created ones. Some of these Freesia characteristics that have been improved constantly, from the discovery of the species and taking them into culture are: inflorescence length, a bigger number of ramifications, a great resistance to pests and diseases (being known that Freesia is sensitive to viruses).

It is important to improve constantly these aspects as they bring major profit to the growers even when the cultivated surfaces are not that large.

MATERIALS AND METHODS

The experience has been made on 20 new varieties of Freesia cultivated in conditions of a modern greenhouse at the Didactic Base of the Faculty of Horticulture and Forestry in Timisoara. The bulbs were bought from Holland being certified.

The setting of the crop was done at the beginning of October 2008 and the observations were made during the vegetation period of the plants. The planting scheme and treatments of the bulbs was done after the classic technology. The experience has been done for each variety individually, being monofactoryal, so, by excluding the margins each of the remaining rows has constituted a variant. The number of plants taken in research for each variant was 20 that mean 80 for each variety.

The results for 5 of the varieties (Blue Sky, Calgary, Purple Rain, Texas and Troubadur) for floral buds in inflorescence and diameter of first three flowers in inflorescence as well as the length of inflorescence were statistically interpreted by using variant analysis. The witness was represented by the average of experience for the researched character.

RESULTS AND DISCUSSION

Results for inflorescence length of Freesia varieties taken in research are presented in Table 1.

The data show that the best results were noticed to Texas V1 and the weakest to Purple Rain V3. Also, we notice that Calgary was very significant positive and Texas and Troubadur were significantly distinct positive to the witness. Opposite, Blue Sky and Purple Rain were very significant negative to the witness.

Results for floral buds number in inflorescence are shown in Table 2.

In the table we can see that the greatest values were recorded to Calgary which was very significant positive to the witness and Blue Sky by being significantly distinct positive to the witness. Purple Rain had the worst results, so being very significant negative to the witness. Texas and Troubadur didn't show significant differences to the witness.

Results for the diameter of the first flower in spike are presented in Table number 3.

By interpreting the results we notice the fact that Troubadur gave the best results being very significant positive to the witness while the worst results were noticed to Texas which was significantly distinct negative to the witness and Purple rain which was significant negative to the witness. Blue Sky and Calgary didn't show significant differences to the witness.

Results for the diameter of the second flower in inflorescence are presented in Table 4.

Here, we notice again that Troubadur had the best results being very significant positive to the witness. Purple Rain had the worst results being significantly distinct negative to the witness and Texas was significant negative to the witness. Blue Sky and Calgary didn't show any difference to the witness.

Results for the diameter of the third flower in inflorescence are presented in Table 5. The results show once again that Troubadur was very significant positive to the witness while varieties that didn't make it that good were Purple Rain which was significantly distinct negative to the witness and Blue Sky and Texas were significant negative to the witness. Calgary didn't show noticeable difference to the witness.

CONCLUSIONS

The research leads to the next conclusions:

For inflorescence length the best results were to Calgary, Texas and Troubadur and the worst were noticed to Blue Sky and Purple Rain.

The number of floral buds in inflorescence had the greatest values to Calgary and Blue Sky while Purple Rain gave the weakest results for this character.

Results for diameter of the first three flowers in inflorescence show that Troubadur gave the best results for all three characters while Texas and Purple Rain recorded the smallest values for these characters.

ACKNOWLEDGEMENT

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TABLES

Table 1. Inflorescence length of researched Freesia varieties

	V1	V2	V3	V4	Average	%	Diff.	Signif.
BLUE SKY	8.05	7.93	7.83	7.95	7.94	90.15	-0.87	ooo
CALGARY	9.8	10	9.88	9.75	9.86	111.92	1.05	***
PURPLE RAIN	7.38	7.7	7.05	7.13	7.32	83.05	-1.49	ooo
TEXAS	10.13	8.78	9.33	9.4	9.41	106.84	0.6	**
TROUBADUR	9.48	9.45	9.43	9.7	9.52	108.03	0.71	**
Average	8.97	8.77	8.7	8.79	8.81	100	0	WITNESS
sx	0.53	0.44	0.54	0.53	0.5			
s%	13.27	11.15	13.84	13.45	12.62			
DL5% - 0.41			DL1% - 0.56			DL 0.1% - 0.78		

Table 2. Floral bud number in inflorescence

	V1	V2	V3	V4	Average	%	Diff.	Signif.
BLUE SKY	12.45	12.2	12.1	12.15	12.23	104.62	0.54	**
CALGARY	11.95	12.55	12.4	12.6	12.38	105.91	0.69	***
PURPLE RAIN	9.5	10.1	10.05	9.85	9.88	84.51	-1.81	ooo
TEXAS	12.15	11.55	12.1	12.25	12.01	102.8	0.33	
TROUBADUR	11.85	12.05	11.8	12.05	11.94	102.16	0.25	
Average	11.58	11.69	11.69	11.78	11.69	100	0	WITNESS
sx	0.53	0.43	0.42	0.49	0.46			
s%	10.23	8.2	8.05	9.33	8.78			
DL5% - 0.35			DL1% - 0.48			DL 0.1% - 0.67		

Table 3. Diameter of the first flower in inflorescence

	V1	V2	V3	V4	Average	%	Diff.	Signif.
BLUE SKY	6.2	6.3	6.33	6.38	6.3	99.37	-0.04	
CALGARY	6.43	6.5	6.68	6.58	6.55	103.23	0.21	
PURPLE RAIN	5.43	6.35	6.15	6.18	6.03	95.03	-0.32	o
TEXAS	6.05	5.58	5.85	6.2	5.92	93.34	-0.42	oo
TROUBADUR	6.65	7.05	6.93	7	6.91	108.91	0.57	***
Average	6.15	6.36	6.39	6.47	6.34	100	0	WITNESS
sx	0.21	0.24	0.19	0.15	0.18			
s%	7.53	8.28	6.68	5.23	6.32			
DL5% - 0.3			DL1% - 0.41			DL0.1% - 0.57		

Table 4. Diameter of the second flower in inflorescence

	V1	V2	V3	V4	Average	%	Diff.	Signif.
BLUE SKY	5.85	6.03	5.98	6	5.97	99.25	-0.05	
CALGARY	5.85	5.88	6	6.08	5.95	99.04	-0.06	
PURPLE RAIN	5.4	5.85	5.73	5.65	5.66	94.13	-0.35	oo
TEXAS	5.93	5.48	5.8	5.85	5.77	95.92	-0.25	o
TROUBADUR	6.5	6.98	6.6	6.78	6.72	111.73	0.71	***
Average	5.91	6.04	6.02	6.07	6.01	100	0	WITNESS
sx	0.18	0.25	0.15	0.19	0.19			
s%	6.64	9.28	5.7	7.05	6.9			
DL5% - 0.22			DL1% - 0.31			DL 0.1% - 0.43		

Table 5. Diameter of the third flower in inflorescence

	V1	**V2**	**V3**	**V4**	**Average**	**%**	**Diff.**	**Signif.**
BLUE SKY	5.45	5.58	5.53	5.65	5.55	95.04	-0.29	o
CALGARY	5.58	5.73	5.8	5.73	5.71	97.73	-0.13	
PURPLE RAIN	5.2	5.43	5.53	5.55	5.43	92.9	-0.42	oo
TEXAS	5.75	5.15	5.5	5.8	5.55	94.99	-0.29	o
TROUBADUR	6.68	6.73	6.43	6.65	6.62	113.35	0.78	***
Average	6.01	5.72	5.76	5.88	5.77	100	0	WITNESS
sx	0.19	0.27	0.18	0.2	0.22			
s%	6.9	10.51	6.86	7.53	8.39			
DL 5% - 0.25			DL1% - 0.35			DL0.1% - 0.48		

Studies of vegetative multiplication of *Aucuba japonica* Thunb.

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Keywords: peat, perlite, rooting, stem cutting

ABSTRACT

Aucuba is a genus with three species but the Flora of China accepts ten species (seven endemic), now placed in the family *Garryaceae*, although formerly classed in the *Aucubaceae* or *Cornaceae*. The name of this genus is derived from Japanese "aoki" means "blue-tree" because the original unvariegated wilds form of this shrub has blue leaves. The most popular cultivars are "Variegata", "Maculata", "Crassifolia", "Crotonifolia", "Dentata" "Goldiana"and "Picturata".

Some species are used medicinally in folk remedies. Japanese laurel (*Aucuba japonica*) is a shrub (1-2m) native to woods in lowland and mountains all over Japan and China. In rich forest soils of moist valleys, dense forests, thickets, by streams and near shaded moist rocks in China. The leaves are opposite, elliptic to ovate, 5-8 cm long and 2-5 cm wide. *Aucuba japonica* has separate male and female plants. The flowers are small, 4-8 mm diameter, with four purplish-brown petals; they are produced in clusters of 10-30 in a loose cyme. The fruit is a red berry with 1 cm diameter. Birds often avoid them.

The *Aucuba* propagation is performed by growing stem cuttings in spring or semiripe cuttings in summer (August) and also by sowing seeds in containers in a cold frame in autumn. Cuttings can make from sprout apex, from fragments with 1-2 knots and fragments with a single leaf (Şelaru, 2006). The rootedness takes 3-4 weeks to ensure that the temperature of 20-22°C and high relative humidity (Cantor, 2008). In our researches a study was conducted to determine the best rooting substrate (peat, perlite+peat and perlite) and cutting length (6cm and 12 cm) for vegetative propagation of *Aucuba* genus.

INTRODUCTION

Aucuba japonica Thunb. is an evergreen, vigorous shrub, it is also called spotted laurel because of its variegated foliage that is attractive all year round (Fig. 1), it can be cultivated as houseplant or outdoors plant in warm-temperate areas. *Aucuba* prefers a place in shade, where the variegated leaves are at their best. If grown in containers, use loam-based potting compost. In the growing season water it freely and apply a balanced liquid fertilizer monthly but in winter water it sparingly. This plant is also very valuated for is tolerance to difficult growing conditions: full shade, dry soils, atmospheric pollution and salt winds. The only thing that doesn't like is a waterlogged soil. The plant prefers acid, neutral and basic (alkaline) soils and can grow in very acid and very alkaline soils.

It flowers mainly March through April, but occasionally has a second bloom at the beginning of autumn. Fruit drupes, fleshy, red when mature, black when dry, crowned with persistent calyx teeth, style, and stigma (www.flora.huh.harvard.edu).

In winter fat red berries on female plants punctuate the dark recesses of the leaves (Fig. 2). It is disease-free and extremely easy to grow. Plants are hardy to about -15°C. Pruning is seldom necessary because of the slow growth rate. The irregular, multistemmed habit of growth makes *Aucuba* a natural for informal plantings, while the dense, compact form makes it useful as a free-standing specimen in small areas (Gilman, 1999). The correcting cuts for height of plant are made in spring.

The aim of the research was to improve the current assortment of floricultural plants in Romania, with new varieties of ornamental species. In the last time the species *Aucuba japonica* are very appreciate and cultivated in our country, and that use to work on some aspects of rooting technology of vegetative multiplication of this species.

MATERIALS AND METHODS

The subject of our research was one *Aucuba* cultivar "Variegata", with yellow-spreckled glossy leaves and bright foliage which was followed the rooting process in three different substrates: peat, peat + perlite and perlite (Fig. 3).

The experience was established in 2008 in the didactical greenhouse of Floriculture Department from USAMV Cluj. The cuttings were made on 23.03.2008; it was consist in growing stem cuttings, which were harvested from mother plants, prepared in 2007-2008. The forming was performed at 1-2 mm below the base knot. The length of cuttings used for rooting was 6 cm and 12 cm. For each rootedness substrate were prepared 20 cuttings in 3 repetitions.

Every cutting was prepared for rooting with Radistim. After rooting of the cuttings the observation were quantified and the average are made (Fig.4). The obtained plants were moved into pots in greenhouse conditions (Fig. 5).

RESULTS AND DISCUSSION

In the substrate of peat and peat + perlite, the rootedness percentage was lower than the perlite substrate. In the case of peat, the number of rooted cuttings was 9 (V_1) and 11 (V_2). Concerning the process of rootedness in the substrate composed by peat + perlite, we can conclude that from the total formed cutting 12 (V_3) and 14 (V_4) were rooted. Using the perlite as rooting substrate the number of rooted cuttings shows higher values like 17 (V_5) and 18 (V_6), and we can consider the best rooting substrate for *Aucuba* (Table1).

During the experience, we determined the morphological characters of the rooted cutting in all substrate (peat, peat+perlite and perlite).

Analyzing the unilateral influence of rooting substrate on morphological characteristic at the *Aucuba* variety (Table 2) we can notice that the cuttings from mixt culture (peat and peat+perlite) achieved a length difference of 0.98 cm better than in the peat, being significant. In the perlite the length of rooted cuttings was higher with 2.12 cm than the cutting rooted in peat (control).

Looking the results we note that the morphological characters were influenced also by cutting type. Using the second type (12 cm) of cutting the rooting process are better and the length was higher 1.64 cm than the control (6 cm), being very significant (Table 3).

The combined influence of factors (Table 4 and 5) on morphological characteristics at the *Aucuba* variety shows that the best rooting substrate was the perlite and the cutting type which influence positive the rooting process was the second type (12 cm).

CONCLUSIONS

Based on the obtained results the following conclusions can be made:

1. The stem cuttings rootedness was influence by the rooting substrate. The best results were obtained using rooting substrate made by perlite.
2. The cutting type influences also the rooting process of *Aucuba*. The second type (12 cm) shows the higher values in the all substrates.
3. The higher morphological characters of the rooted cuttings were better in the when we used the perlite as rooting substrate and the second type of cuttings (12 cm).

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TABLES

Table 1. Results regarding the rooting of the *Aucuba* cuttings in the different type of substrate (peat, peat+perlite, perlite)

No. crt	Experimental variants	Total no. of cuttings	Length rooted cutting -cm-	No. of rooted cuttings	% of rooted cuttings
1	"Variegata" peat+6 cm	20	10.3	9	45
2	"Variegata" peat+12 cm	20	14.9	11	40
3	"Variegata" peat+perlite+6 cm	20	11.2	12	60
4	"Variegata" peat+perlite+12 cm	20	11.6	14	70
5	"Variegata" perlite+6 cm	20	10.7	17	85
8	"Variegata" perlite+12 cm	20	14.5	18	90
Average of variants		20	11.5	13	65

Table 2. The unilateral influence of rooting substrate at the *Aucuba* variety

Substrate	Length of rooted cutting		±D	Significance
	cm	%	cm	
Peat (control)	10.63	100.0	0.00	-
Peat+perlite	11.62	109.2	0.98	*
Perlite	12.75	119.9	2.12	**
DL (p 5%)			0.87	
DL (p 1%)			1.44	
DL (p 0,1%)			2.69	

Table 3. The unilateral influence of the cutting type on morphological characteristic at the *Aucuba* variety

Cutting type	Length of rooted cutting		±D	Significance
	cm	%	cm	
6 cm (control)	10.84	100.0	0.00	-
12 cm	12.49	115.2	1.64	***
DL (p 5%)			0.59	
DL (p 1%)			0.89	
DL (p 0,1%)			1.43	

Table 4. The combined influence of factors (substrate+cutting type) on morphological characteristic at the *Aucuba* variety

Experimental variants	Length of rooted cutting		±D	Significance
	cm	%	cm	
V_1 (control)	10.30	100.0	0.00	-
V_3	10.97	106.5	0.67	-
V_5	11.27	100.0	0.00	-
V_2	11.97	106.2	0.70	-
V_4	10.97	100.0	0.00	-
V_6	14.53	132.5	3.57	***
DL (p 5%)			1.02	
DL (p 1%)			1.54	
DL (p 0,1%)			2.48	

Table 5. The combined influence of factors (cutting type + substrate) on morphological characteristic at the *Aucuba* variety

Experimental variants	**Length of rooted cutting**		**±D**	**Significance**
	cm	**%**	**cm**	
V_1 (control)	10.30	100.0	0.00	-
V_2	11.27	109.4	0.97	-
V_3	10.97	106.5	0.67	-
V_4	10.97	100.0	0.00	-
V_5	11.97	109.1	1.00	-
V_6	14.53	132.5	3.57	***
DL (p 5%)			1.13	
DL (p 1%)			1.80	
DL (p 0,1%)			3.16	

FIGURES

Fig. 1. Aucuba plant

Fig. 2. Berries of Aucuba

Fig. 3. Rooting substrate

Fig. 4. Aucuba rooted cuttings

Fig. 5. *Aucuba* rooted in mixt substrate

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Selection of new Gladiolus hybrids at USAMV Cluj

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Keywords: breeding, cultivars, ornamental characteristics, corm

ABSTRACT

Low cost and ease of culture are reasons glads are popular today. Gladiolus can add an air of beauty to any room in the house. They can also be used in landscape designing, holiday and other activities as ornamental plants. The modern gladiolus cultivars offer a diversity of colours, shapes, and sizes available in few other flowering plants. It is cultivated in almost countries of the world where spring and summer conditions are favorable.

In the last period, in many countries the production value of gladiolus cut flower was increased. The cultivated area of new gladiolus cultivars will expand since gladiolus demand is increasing, encouraged by more stable production of high quality flowers.

This paper describes the new 6 *Gladiolus* hybrids ('H9/10', 'H 12/10', 'H16/2', 'H 17/1', 'H215/5', and 'H514/1') obtained at U.S.A.M.V. Cluj-Napoca, department Floriculture by breeding activity. These hybrids where observed in our Transylvanian behaviors and recorded for the following morpho-decorative characteristics: blooming time, colour of florets, plant height, spike length, number of florets per spike, media florets diameter and number of florets open in the same time.

In 2009 the hybrids H 215/5 were certified under the name 'Coral Pasion' and hybrids H 514/1 were certified under the name 'Medina' and the others hybrids following to be monitoring in comparative field and will be tested at ISTIS Bucharest for homologate.

INTRODUCTION

Gladiolus were recognized over 2000 years ago growing in the field of Asia Minor and were called "corn lilies". The European species were cultivated for more than 500 years and renowned for their striking, colorful flowers.

Today *Gladiolus* is one of the world's most important horticultural plants, valued both as an ornamental garden subject and as a cut flower crop for bouquets and arrangements.

Very few flowers match the complex ancestry of *Gladiolus* and a revision of the South African species (Lewis et al., 1972) has further complicated the understanding of its development.

Expert breeders and amateurs have devoted more than a century of hybridizing and selection to modify the plant to the colorful, blossom laden varieties in demand today.

Entire new strains were being developed in the last century, with many hybridizers keeping their crosses secret. As selling, trading, profit and pride were at stake.

Before move onto the modern gladiolus of today, it is important to say that the African species were really responsible for the wide diversity of colour, from and unique variations in modern gladiolus. Thousands of hybridizers and millions of crosses made by people long forgotten over the past 200 years have brought us to where we are today. Many species were not necessarily beautiful, most having small florets and low bud count. Many opened only one or two florets at time, with a bud count of for or five. Who knows, may be a species still undiscovered in Africa may hold the secret to a healthier gladiolus or a colour still not achieved. The elusive highly scented gladiolus may be growing right no in the mountains behind a rock, still to be discovered. The gene to make our modern cultivars hardy still has yet to be found.

Many of lines today can probably trace their roots to Central and Southern Africa, where the summer flowering species were discovered. More colour and variations were achieved around 1880 by Victor Lemoine of France. He produced the race *Gladiolus lemoinei* from *G. gandavensis* or *G. bechelyensis* with *G. purpureoaurtus*. The hybrids extending the color range into the browns, greens and deep reds. Many of these descendants are where get our color range today (http://en.wikipedia.org/wiki/Gladiolus).

The breeding and selection work of *Gladiolus* in Romania began in 1953 at the Research Station Cluj-Napoca, by Rudolf Palocsay (Neagu et al., 1976) and where continued by Dr. Lucia Litan, Dr. Maria Cantor. In Romania this activity is limited because of the small number of researchers that are working with this species and also because the process of new cultivars registration was and continues to be very slow. In Romania, Gladiolus is now grown extensively as commercial cut flower crop but also as landscaping plants and in home gardens.

A total of 41 new gladiolus cultivars were released by Research Station Cluj, Floral Institute Vidra and University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca and Bucharset from 1953 to 2008. Today the most representative are: 'Speranta', 'Cipriana', 'Candida Ali', 'Excelsa', 'Clujana', 'Ramona' 'Amethyst' (Cantor et al., 2008).

Development of genomic resources will be important for future breeding work. Improvement of gladiolus cultivars will be directed towards ornamental characteristics and disease resistance through traditional and molecular-aided breeding methods. Some of these traits may be improved by genes from wild *Gladiolus* species which can be used as a reservoir and efforts have been undertaken towards identifying and screening closely related species for resistance factors. The development of virtually all horticultural traits will be facilitated by the development of genomic resources. Phenotypic information is need for can develop the genetic resources. Only through the development of significant genetic and genomic resources will the role of key genes be elucidated, leading to an increase in the efficiency of breeding.

Genetic transformation is, potentially, a valuable tool for improving gladiolus. Genetic transformation of selected gladiolus cultivars, with genes conferring specific traits of interest may create new phenotypes useful for different purposes of the grower and the consumer.

The objects of the studies were the screening and assessment of 6 *Gladiolus* hybrids under temperate conditions, considering various parameters of vegetative growth and floral characters besides their demand in the floral market.

The culture of new hybrids it is a good way of increasing the *Gladiolus* production (Manley, 1969).

MATERIALS AND METHODS

Our breeding program at the UASMV Cluj-Napoca, department of Floriculture was aiming for creating new cultivars was oriented on improvement of the main characters: earliness, color of florets, high plants, number and form of florets, number of corm and cormels and also the resistance to disease.

Germplasm used for our crosses was:

- Cultivars imported from the entire world;
- New hybrids are obtained in Romania.

Breeding methods were intraspecific hybridization, followed by conventional selection and vegetative multiplication by corms and cormels. Every year, 25 to 40 different crosses and self-polenisation are made in the field (Fig.1). The plants selected are propagated by corms and cormels and evaluated in the field trials in comparison to standard cultivars or parents. Also 20 plants of each hybrid were selected randomly for recording various parameters of vegetative and floral characters.

The new *Gladiolus* hybrids, the subject of the research in our experimental field during 2006-2008 periods, was 6 hybrids: 'H9/10', 'H 12/10', 'H16/2', 'H 17/1', 'H215/5', and 'H514/1**'.**

The corms were planted in the period of 2006 to 2008. These where observed in our Transylvanian behaviors and recorded for the following morpho-decorative characteristics:

blooming time, colour of florets, plant height, spike length, number of florets per spike, media florets diameter and number of florets open in the same time.

The hybrids were compared with the average of experiment of the cultivars. Data obtained were statistical interpretation. The results were calculated and analyzed, using the standard deviation (by limited difference method) (Ardelean, 1986).

For blooming season we used the follow earliness approximation:

VE (very early) - under 70 days; E (early) - 70-74 days; EM (early midseason) - 75-79 days; M (midseason) - 80-84 days; LM (late midseason) - 85-90 days; L (late) - 91-99 days; VL (very late) - 100 days or more.

RESULTS AND DISCUSSION

The observations and the measurements of main characteristics of gladiolus hybrids are presented in the following tables (1 and 2). Analyzing those tables we can conclude:

The hybrids studied have a rich range of colours of the flowers from white (H 8/11, 514/1), pink (H12/10) to red coral (H215/5). The varieties with various stripped or different colours on lip petals or midribs are completing the range of the colours (H 9/10, H16/2). There is a large variation of varieties regarding the colour intensity and clarity of the flowers (Fig. 2).

It is a very important to know the blooming time of the cultivars for echelon the flowering on this species on a longer period. The flowering time depends by cultivars.

The *Gladiolus* hybrids need for blooming over 75 days (H 8/11 and H16/2) having an midseason and over 80 days having a late midseason for blooming for others hybrids.

Plants height of *Gladiolus* hybrids were over 100 cm, the most vigorous were the next: H12/10 (110.5 cm) and H16/2 (108.7 cm) while hybrid H8/11are with less vigorous, less than 100 cm.

The value of average for this character is 104.9 cm.

Concerning the plant height H12/10 hybrid have a very positive significance of difference, H16/2 have a distinct significance difference.

For cut flower it is very important to obtain varieties with long, rigid spike and that will conserves its elasticity characteristic during the storing.

The floral length of the hybrids studied was between 68.4 cm (H514/1) to 93.5 cm (H12/10) with an average 79.7 cm.

The spike length has between 45.2 cm (H 514/1) to 59.7 cm (H 16/2). This property it is very important for cut flower and the vigorous varieties would make an exceptional cut flower for exhibition, good for marketing, terrific arrangements and corsages. The value of average for this character is 52.4 cm.

The hybrids under study show between 15.4 up to 17.0 florets per spike. We should mention the hybrid, which are more florets per spike: H 215/5 (17.0 buds). Generally the florets have a good placement and attachment and can make nice show spikes with commercial attributes.

The average value of this character is 16.1 florets. From statistical point of view 'H215/5' cultivar presents a distinct significant difference.

The florets studied have diameter between 8.9 cm (H8/11) and 11.5 cm (H12/10). The flower with medium diameter gives an elegant aspect to spike (H 9/10, H 16/2, H 215/5). H12/10 has a distinct positive significance.

As a result of our research activity we report two new cultivars which were homologated in this year: ‚Coral Pasion' (H 215/5) and 'Medina' (H 514/1) which were obtained by intraspecific hybridization method followed by clonally selection and vegetative multiplication.

"Coral Pasion" has a multiple middle sized red coral florets with good simultaneous flowering. This cultivar has vigorous growth, over 100 cm. Days to flowering of "Coral Pasion" is late midseason flowering having with an average 89.4 days in summer season.

Spike having 17.0 florets with 9.8 cm diameter, having good multiplication capacity.

"Medina" is flowering after 82.3 days. The plant height is 105.6 cm. The flower color it is white light cream, having a good position of florets with 10.1 cm in diameter. This variety is very health and propagator.

CONCLUSIONS

- The new Romanian gladiolus hybrids are more vigorous, producing grater number of florets with superior quality, have a new color of flower and are distinguished by a long blooming time.
- The hybrids contribute to improving the assortment of Romanian *Gladiolus* for landscape use or cut flower or as genetic material, which will be used for new crossing in order to obtain new cultivars.
- Two hybrids were certified under the name 'Coral Pasion' and 'Medina' in 2009. These new gladiolus cultivars homologated contribute to improving the Romanian *Gladiolus* assortment and are multiplied for promoting in commercial culture.

ACKNOWLEDGEMENT

The authors are grateful to Dr. Eugenia Hărşan, director of Fruit Research Station Cluj to make available the experimental field, Drd. Lenuța Chiş for collaboration.

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TABLES

Table 1. Colors and other characteristics of the flowers hybrids

Hybrids	Colors	Characteristics
H8/11	white-banan ruffled outside of petals with lightly green blotches on lower petals	- good flower head length with very good mechanics; - very good health and propagation;
H 9/10	Light pink petals with dark pink lines	- nice dark foliage good placement of florets; - extremely healthy and easy propagator;
H12/10	dark pink with white narrow on the petals	- ramrod straight spikes and stiff stems attributes to this well standing glad; - flowerheads are florets superior placement;
H16/2	medium ruffled cream with red lines with red mark on centre petals	- very simply ruffled florets; can make an excellent show spike; - very straight, consistent and the good propagator of beautiful healthy corms;
H 215/5	red coral, deep velvety	- extremely healthy, nice dark foliage and a prolific propagator of beautiful corms and cormels;
H514/1	white light cream	- early and is a pleasure to grow; - impeccable cutflower and very healthy;

Table 2. Morphological characters of the main characteristics of *Gladiolus* hybrids

Hybrid	**Blooming season (days)**	**Plant height (cm)**	**Floral stem (cm)**	**Spike length (cm)**	**No. of florets/ spikes**	**Diameter of florets (cm)**
H8/11	76.3 ^{o}	98.0 ^{o}	73.1	51.0	16.2	8.9 ^{o}
H 9/10	85.5	100.7	77.2	49.7	15.7	9.6
H12/10	82.7	110.5***	93.5***	59,0**	16.1	11.5**
H16/2	78.6	108.7**	85.9**	59.7***	15.9.	9.0
H 215/5 (Coral passion)	89.4*	105.7	80.2*	49.8	17.0**	9.8
H514/1 (Medina)	82.3	105.6	68.4^{oo}	45.2^{oo}	15,4	10.1*
Mean of experiment (control)	82.5	104.9	79.7	52.4	16.1	9.8
DL 5%	12.9	3.4	4.1	3.0	2.8	1.6
DL 1%	18.1	4.8	5.7	4.5	3.8	2.1
DL 0,1%	23.65	6.5	7.8	6.1	5.4	2.8

FIGURES

Fig. 1. Experimental breeding field of *Gladiolus hybridus*

Fig. 2. New hybrids of *Gladiolus* obtained

Researches regarding the phenology of some allium species and cultivars in the condition of Craiova city

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Keywords: rustic bulbous, umbellas, phenophases, the duration of the decoration

ABSTRACT

Allium gender comprises various species of rustic bulbous, also called geophytes, very interesting considering the decorative aspect. There are over 700 perennial and biennial species of Allium, with flowers disposed in inflorescences, umbella, spherical type (A. albopilosum, A. schubertii) or tassel type (A. molly, A. oreophilum). The phenology of some species and cultivars' hybrids of Allium gender was studied in the ecological conditions of Craiova city during 2008-2009 period. The biological material came from Holland and it was made up of four species: A. albopilosum (syn. cristophii), A. schubertii, A. oreophilum, A. molly and three cultivars: A. 'Mars', A. 'Mount Everest' (new hybrid), and A. 'Purple Sensation'. The main phenophases (emergence, the appearance of the flower bud, the coloration of the bud), the period of flowering and the decorative characteristics of Allium species and cultivars were studied. According to the decorative characteristics, it was established the duration of the decorative period and the means of usage of the studied species and cultivars. The decorative Allium is easy to be cultivated and it becomes perennial very fast because of the various and large number of species and cultivars, distinctive through the colour of the inflorescences (umbrellas) and height. These species of geophytes plants of Allium gender are less known and used by floricultors in our area. That is why in this paper there are presented the results of the research regarding the phenology of some species and cultivars (new hybrids) of ornamental Allium in the cological conditions of Craiova city.

MATERIAL AND METHODS

The biological material came from Holland and it was made up of four species of Allium: A. albopilosum (cristophii), A. Schubertii, A. molly, A. oreophilum, one cultivar: A. "Purple Sensation" and two hybrids: A. "Mars" and A. "Mount Everest"(new hybrid).

The behavior of these decorative plants was seen about in the didactic field of Floriculture discipline from Craiova city.

The classic technology of culture was applied during the research. The planting started in October 2007 and observations were made during the 2008-2009 period.

The aria is situated on a plane ground with clay sandy texture, safe from the air course. The area is characterized by a temperate continental climate with hot summers and not very cold winters, with thermic and pluviometrical contrasts, the maimum amount of precipitation being registered at the end of spring, the begginig of summer.

The observations and determinations done were concerned with:

- The phenophases of vegetation for Allium species and cultivars (the spring, the appearance of the flower bud, the colouring of the bud, the blooming), the duration of decorative qualities depending on the period of blooming.
- It was established the number of days from the spring to the blooming and concerning the blooming, three aspects were followed: the beginning, the mass and the end of blooming.

According to the species and cultivars behavior in the culture, the most indicated way of use was recommended.

RESULTS AND DISCUSSION

In 2008, the spring took place in February, in the interval 15.02-20.02 for all three species: A. albopilosum, A. oreophilum, A. schubertii. The appearance of the bud in this year took place on 7.04 for A. schubertii, 21.04 for A. albopilosum and on 7.05 for A. oreophilum. The period from the appearance of the bud up to its colouring was longer for A. schubertii and A. oreophilum (30-35 days) and short (12 days) for A. albopilosum.

The number of days from spring to blooming was between 90-92 days at A. oreophilum and A. albopilosum and 114 days at A. schubertii.

The beginning of blooming took place in the first half of May for A. schubertii and A. albopilosum and in the last decade for A. oreophilum.

The decorative period was between 16 days at A. schubertii and 37 days at A. oreophilum.

In 2009, specie: A. molly, two hybrids: A. “Mars” and A. “Mount Everest” and a cultivar: A. “Purple Sensation” was introduced in the culture in order to diversify the assortment.

As for the spring, comparative with the year 2008, it was noticed that in 2009 it took place a month earlier at A. schubertii (20.01), because of the special climatic conditions, and at four of the studied species and cultivars, the spring took place in the first half of February(A. albopilosum, A. oreophilum, A. “Purple Sensations” and A. “Mount Everest” hybrid), while the A. “Mars” hybrid sprang on 3.03 and at A. Molly species the spring took place later, on 25.03 (graph. 1).

The growing and development process from the spring up to the blooming lasted 52 days at A. molly and 114 days at A. schubertii (graph. 2).

As for the blooming, it took place the earliest at A. “Purple Sensation” cultivar (25.03), then in the first decade of May the next species bloomed: A. schubertii, A. albopilosum, A. oreophilum and A. “Mars” and A. “Mount Everest” hybrids, while A. molly was the last to bloom, on 15.05.

The blooming period was between 14 days at A. molly speces and 21 days at A. “purple Sensation” cultivar (graph.1).

The main decorative element at Allium gender is represented by the flowers grouped in umbellas. The inflorescences can be huge, spherical, dense umbellas, as we can notice at A. albopilosum, A. schubertii, A. “Mount Everest”, A. “mars” and A. “Purple Sensation or tassels at the small species like A. oreophilum and A. molly.

The colours differ depending on each species and cultivar. Therefore, A. albopilosum (The Star of Persia) has silver-purple starlike flowers, grouped in huge, globe inflorescenses, with a 20-25 cm. in diameter, “A. Purple Sensation” cultivar and A. “Mars” hybrid presented spherical, dark-violet inflorescenses, with starlike flowers and 12,5 diameter, and at A. “Mount Everest” hybrid, the inflorescence was perfectly round, having a pure-white colour and a 15 cm diameter. A. schubertii’s flowers (200) are grouped in a huge, purple-pink inflorescence, with a diameter of 43 cm. A. molly(yellow garlic) has golden-yellow flowers which are grouped in wide umbrellas having green striations which star from the middle up to the base of the petals, with a 5.3 cm diameter and A. oreophilum species has bell-shaped, purple-red flowers grouped in wide, spherical umbrellas with 4.5 cm diameter.

The length of the flower is very different, between 4.3 cm at A. oreophilum and 37 cm. at A. schubertii species.

CONCLUSIONS

1. The number of days from spring to blooming is between 52-63 days at A. molly species and A. “mars” hybrid and 92-114 days at A. albopilosum and A. schubertii species.
2. The blooming took place at the beginning of May(4-9.05 interval) for all the species and cultivars in the year 2008 and 2009, except for the A. Purple Sensation cultivar, which bloomed on 24.04 in 2009.
3. The average duration of the decoration was between 14 days at A. molly and 21 days at A. “Purple Sensation”.
4. We recommend the studied plants from Allium gender for the following uses:

- High species like A. schubertii, A. albopilosum, A. “Purple Sensation” cultivars and A. Mount Everest and A. “Mars” hybrids should be planted in groups, at trees and scrubs borders, in rounds;
- Small species like A. molly and A. oreophilum are suitable for cliffs or rocky areas and they can also be used as flower blurs;
- As long lasting cut flowers, they can be used alone or in flower bouquets along with Iris and Gypsophilla(the bride’s flower), in order to create an especial effect;
- As sear flowers: A. albopilosum, A. schubertii, A. “Mars”, A. ”Mount Everest and A. “Purple Sensation”.

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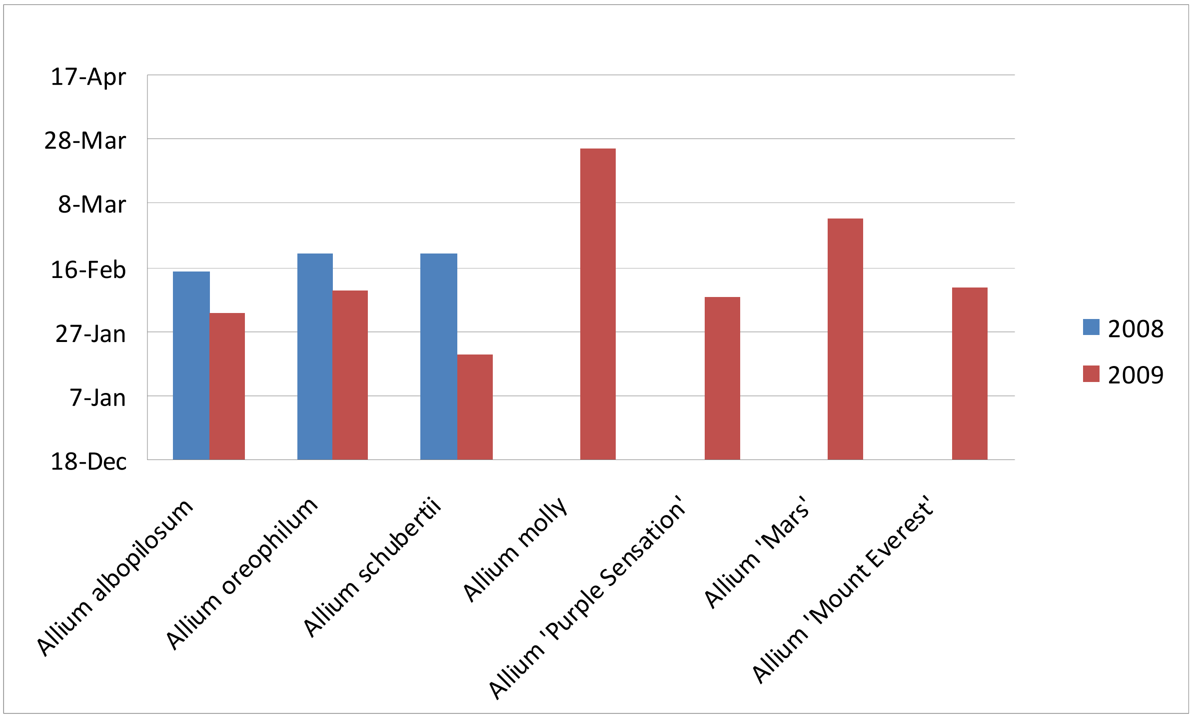
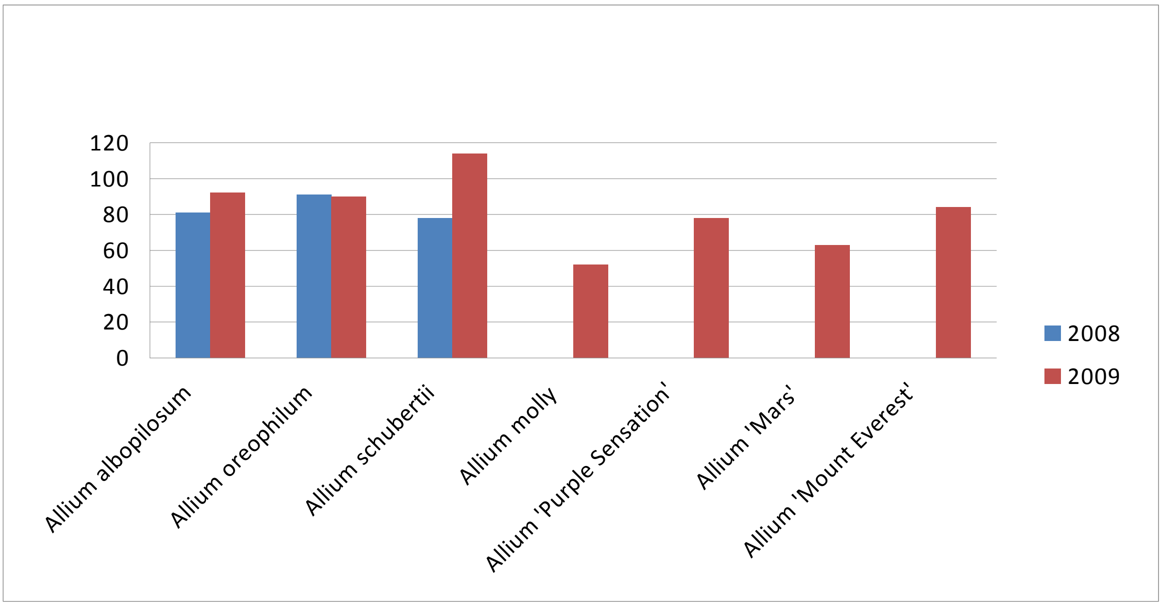
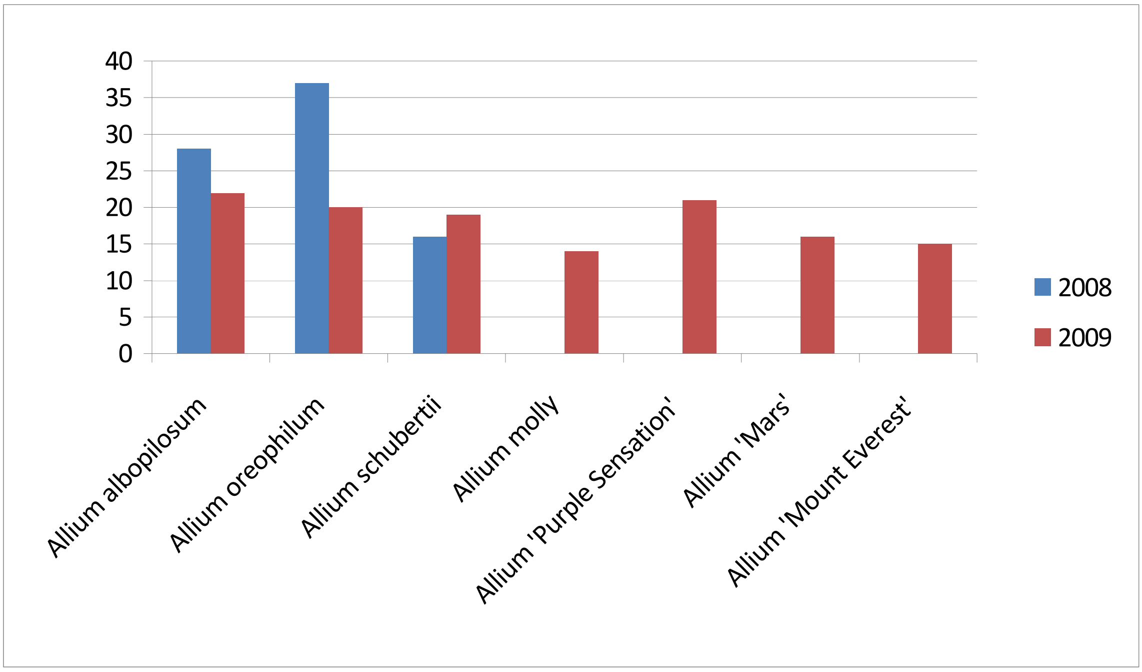
FIGURES



Graph 1. The period of spring at the *Allium* gender plants studied in the interval 2008-2009



Graph 2. The number of days from spring to blooming



Graph 3. The period of decoration at the *Allium* species and cultivars studied in the interval 2008-2009

The determination of the decoration period regarding some species and cultivars of Tulip gender

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Keywords: geophytes plants, species and cultivars, the decorative period

ABSTRACT

Tulips are one of the most important species of rustic bulbous known since the Persians (1200) because both the scientific name of *Tulipa* gender and the popular one of the tulip flower are originating from Persia. These beautiful decorative plants are geophytes, plants which have underground storage structures called 'bulbs'. The behavior of some species and cultivars of *Tulipa* gender was studied in the climatic conditions of Craiova city, during the period 2007-2009. The biological material came from Holland and it was made up of 3 species: *T. gesneriana, T. tarda (syn. dasystemon), T. turkestanica* and 4 cultivars: *T. greigii 'Quebec', T. viridiflora 'Hollywood Star', T. 'Heart's Delight' and T. 'Queen of the Night'*. There were studied the main phenophases (the spring, the appearance of the flower bud, the period of blooming), the morphological characteristics and the decorative qualities of the studied species and cultivars. The decoration period was established and recommendations were made regarding the way of use according to the decorative qualities. The rich and varied assortment of species and cultivars makes the tulip suitable for almost any kind of floral arrangement. Tulipa gender comprises perennial species of rustic bulbous which bloom at spring(March-April) and become part of some beautiful decorative combinations. There are used in the decoration of green spaces, in groups of plants on greenswards, and they can also be planted in flower spots, in forced cultures or for apartments decoration. Small size species with coloured flowers an be used in alpin spaces or in the foreground of mixt borders. But the tulip is mainly cultivated for simple bouquets or in combination with other spring flowers. During the last years, the competition on the bulb market has permanently grown, emphasizing the demand of flowers and bulbs of high quality in the majority of the European countries. In this paper are presented the results of the researches regarding the behaviour of some species and cultivars of Tulipa gender, in the ecological conditions of Craiova city, during the period 2007-2009.

MATERIAL AND METHODS

The biological material came from Holland and it was made up of three tulip species: *T. gesneriana, T. tarda dasystemon, T. turkestanica* and four cultivars: *T. viridiflora "Hollywood Star", T. "Heart's Delight", T. "Queen of the Night" and T. greigii 'Quebec'*.

The behaviour of the tulip species and cultivars was seen about in the didactic field of the Floriculture discipline from Craiova city. A classic technology of culture was applied, the planting took place in October 2007 and observations were made during the period 2008-2009.

The area is situated on a plane ground with clay-sandy texture, away from the draughtiness. The area is characterized by a temperate – continental climate with hot summers and not very cold winters, with thermic and pluviometrical contrasts, the maximum amount of precipitation being registered at the beginning of summer. The dominant winds come from NE and W. The summers of the years 2007 and 2008 were extremely hot in these areas, the annual average temperature being of 12.4°C in 2007 and 11.9°C in 2008 and the average amount of precipitation registered 752.5 mm in 2007 and 474.7 mm in 2008. The observation and the determinations were done during the period 2008-2009, in spring, and they were concerned with: the main phenophases(the spring, the appearance of the flower bud, the colouring of the bud, the blooming), the morphological characteristics and the decorative qualities(the average height of the floral stem, the length and the diameterof the flower, the colour of the flowers).

It was established the number of days from the spring to the blooming and the duration of blooming. According to their behaviour in the culture, it was recommended the most indicated way of use for these species and cultivars of *Tulipa*, as decorative plants.

RESULTS AND DISCUSSION

In 2008, the spring took place in the interval 12.05 at *T*. tarda dasystemon and 20.05 at the other studied plants.

The number of days from spring to blooming was between 41 days at *T. "Heart's Delight"* cultivar and 71 days at *T*. turkestanica.

The appearance of the flower bud took place in the last decade of March (21-25.03), less T. viridiflora 'Hollywood Star' and T. tarda dasystemon at which the appearance of the bud took place at the beginning of April (1-7.04). The period from the appearance of the bud up to its colouring was short enough, about a week long, except for T. viridiflora 'Hollywood Star' at which this process lasted 3 weeks,.

The beginning of the blooming, the mass blooming and the end of the blooming took place in April, the duration of the blooming being between 8 days at T. turkestanica and 12 days at T. tarda dasystemon species.

In 2009, T. gesneriana species and T. 'Queen of the Night' cultivar were introduced in the culture. Because of the gentle winter, the spring took place earlier in 2008, in the last decade of January (20-25.01), less T. tarda dasystemon and T. 'Queen of the Night' cultivar which sprang at the beginning of February (1-4.02) (Graph 1).

The growing and development process from the spring up to the blooming lasted 56 days at T. 'Heart's Delight' cultivar and 82 days at T. gesneriana species (Graph 2).

The appearance of the flower bud took place in the first decade of March(2-12.03), except for T. tarda dasystemon species and T. 'Queen of the Night' cultivars, at which the floral bud appeared on 22.03 (Graph 3).

As for the blooming, it took place in the last decade of March at T. 'Heart's Delight' and T. turkestanica, and in the first decade of April (2-11.04) at T. greigii 'Quebec', T. viridiflora, T. tarda dasystemon and T. gesneriana. The latest blooming took place for T. 'Queen of the Night' on 16.04.

The decoration period was between 11 days at T. viridiflora 'Hollywood Star' and 19 days at T. gesneriana species and T. 'Queen of the Night' cultivar (Graph 4).

The climatic conditions have an important role in the growth and development of tulips. The annual average temperature was 12.4°C in 2007 (in March-April: 7.6-12.9°C), the annual amount of precipitation: 752.5 mm (in March and April: 51.3-0 mm) and in 2008, the average temperature was 11.9°C (in March-April: 8.3-12.4°C) and the amount of precipitation was 474.7 mm (in March-April: 16.1-59.6 mm).

An important decorative element that determines the way of use of the flowers is the height of the stalk. From this point of view, the cultivar whith the highest stalk is T. 'Queen of the Night' (73 cm), followed by T. gesneriana (54 cm), T. greigii 'Quebec' and T. viridiflora 'Hollywood Star' (31 cm). The other species and cultivars have heights between 20-25 cm, and the smallest height was registered at T. 'Heart's Delight' cultivar (15 cm).

The main decorative element at Tulipa gender is represented by the flower which decorates both by aspect and by its varied colours. Considering the studied plants, most of them(five) have only one flower on a stalk and two of them: T. tarda dasystemon and T. turkestanica have more than one flower(multiflowered species).

The tulip flowers present 6 tepalous, straight endings and varied colours: white, starlike, with yellow in the centre at T. tarda dasystemon and T. turkestanica, red tepals with green at the base at T. viridiflora 'Hollywood Star', white lemon-yellow internal tepals, the external ones being blue chequered with a purple shade at T. 'Hearts Delight', orange-red with black spots at T. greigii 'Quebec', red-lila at T. gesneriana, dark purple at T. 'Queen of the night'.

CONCLUSIONS

1. The number of days from spring to blooming is between 41-42 days (at T. 'Heart's Delight' and T. greigii 'Quebec' cultivars) and 77-82 days(T. 'Queen of the Night' and T. gesneriana.
2. The blooming period of the researched species and cultivars was at the beginning of April in 2008 and in 2009, except for T. 'Heart's Delight' cultivar which bloomed in the last decade of March.
3. The average duration of the decoration was between 10 days at T. viridiflora 'Hollywood Star' and aproximately 19 days at T. gesneriana.
4. The average height of the flower stalk was different, from 15 cm at T. 'Heart's Delight' and T. tarda dasystemon, 27-38 cm for most of the species, to 78 cm at T. 'Queen of the Night'.
5. We recommend the studied tulips for parks and garden decoration, as it follows:
   - in alpinaries, in the foreground of the mixt border for the following species: T. turkestanica and T. tarda;
   - groups on the lawn, mass planted, rocky gardens and even in containers or window boxes – the T. 'Heart's Delight' cultivar;
   - as cut flowers: *T. viridiflora 'Hollywood Star', T. greigii 'Quebec', T. gesneriana* şi *T. 'Queen of the Night'.*

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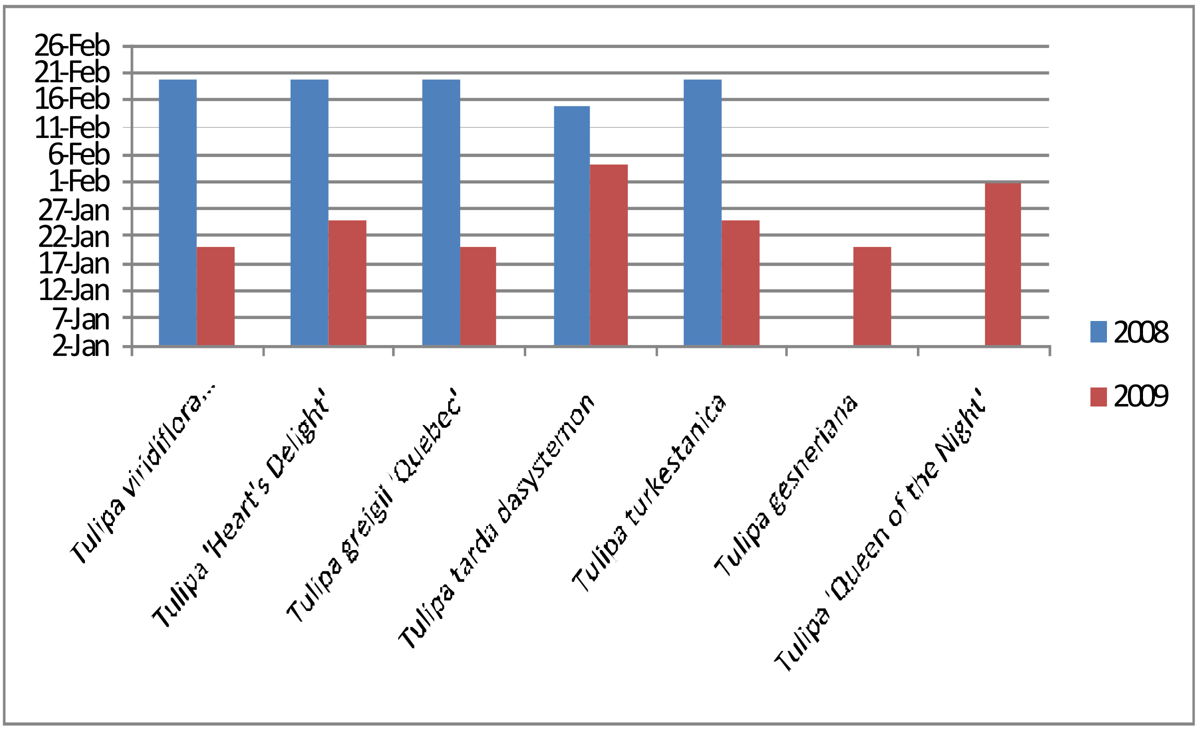
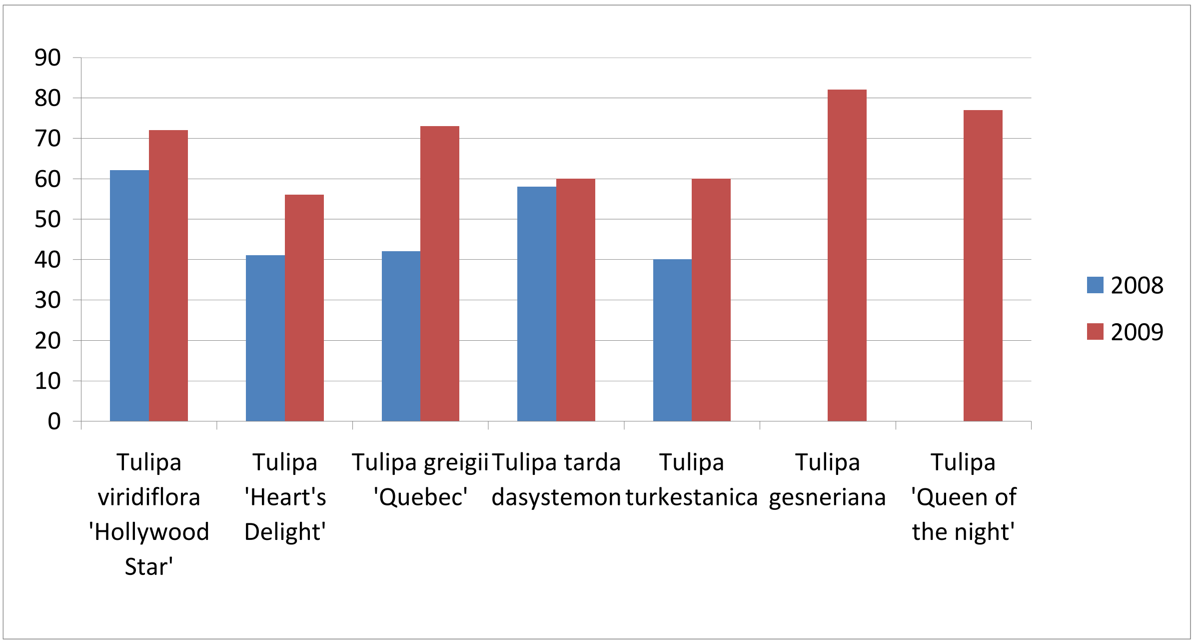
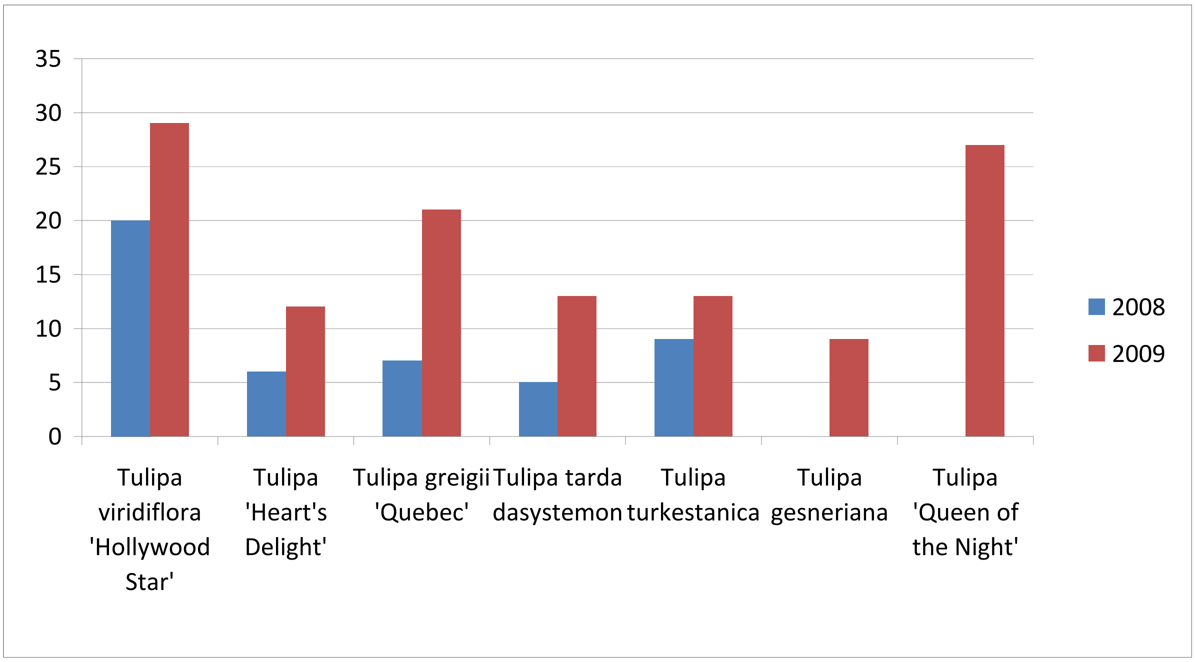
FIGURES



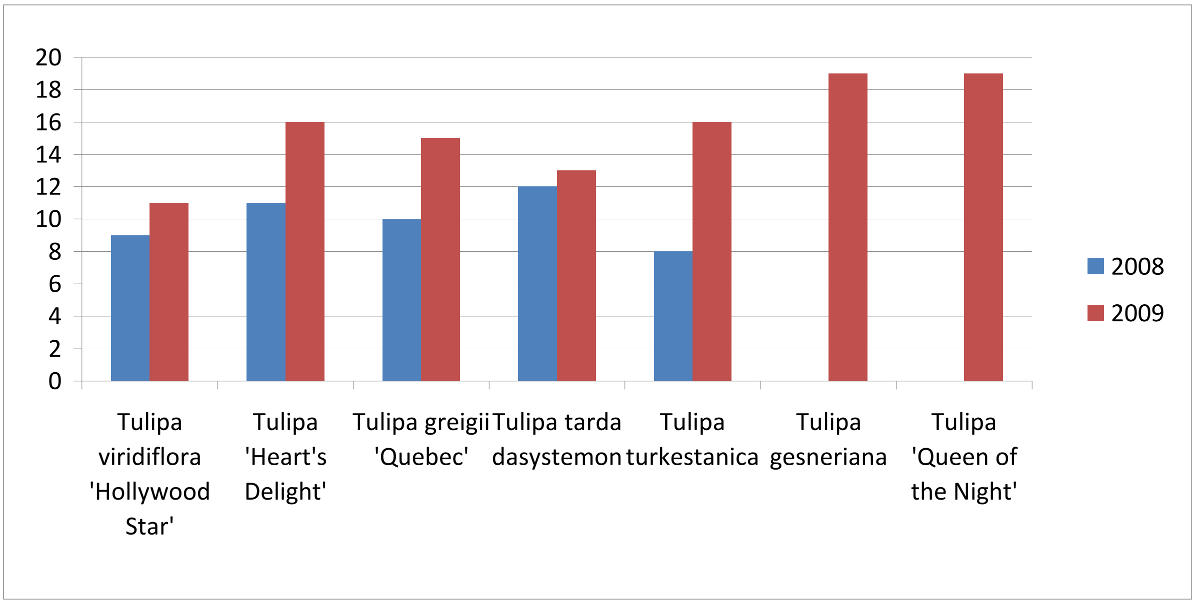
Graph 1. The spring period at the Tulipa species and cultivars studied in the 2008-2009 periods



Graph 2. The number of days from spring to blooming at the rustic bulbous plants from Tulipa gender in the 2008-2009 periods



Graph 3. The number of days from the appearance of the floral bud up to blooming



Graph 4. The period of decoration at the rustic bulbous plants from Tulipa gender, in the 2008-2009 period

Study of anatomical particularities of foliar limb at succulent flower plants

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Keywords: cuticle, stomata, protective hairs, mesophyll

ABSTRACT

The succulent flower plants present some morphological and anatomical particularities which constitutes a criterion of taxonomic identification as well as a clue concerning their biological behaviour (the succulent plants are plants little pretentious as far as the water regime is concerned).The leaves are specialised in storing water, the *crassulacean* type structure (leaves with homogeneous mesophyll) characterizes the representatives of this group of plants. In this work are presented the results of my own observations regarding some anatomical structures of the foliar limb (mezophyll cells, epidermic cells and formations) at 9 species of flower succulent plants belonging Sedum (*Sedum linearum, Sedum mexicanum, Sedum morganianum, Sedum pachyphyllum*) and Senecio genra (*Senecio articularum, Senecio kleiniformis, Senecio piramidatum* and *Senecio rowleyanus),* establishing some differences existent among species and genra.

INTRODUCTION

The crassulacean type structure is present at the most succulent plants and characterizes the representatives of the Crassulaceae family.The foliar limb is in general bounded on both lower and upper sides by an epidermis formed of thickened cell membranes and covered with a cuticle more or less thick which restricts evaporation (that`s why only 1/10 of the vapours are removed through the cuticle, the rest being removed through the stomata). In some cases epidermal cells may be of large sizes contributing thus to water storage, alongside the mesophyll cells (Willert, 1992).

The leaf mesophyll is a homogeneous type,(there is no notice of a difference between the palisade parenchyma and spongy parenchyma).The large dimensions of mesophyll cells contributing thus to water storage. The chloroplast number decreases to the exterior towards the centre of mesophyll. Some mesophyll cells (peripherally cells) have uneven sclerenchyma membranes (Tarnavschi and all,1974).

The aim of this work was to set the structural particularities of the foliar limb (epidermic structures and mezophyll cells) at 9 species of succulents flower plants establishing some existent differences among genra and species.

MATERIAL AND METHODS

The biological material used was represented by mature leaves belonging to the 9 species of succulent flower plants *(Sedum linearum, Sedum mexicanum, Sedum morganianum, Sedum pachyphyllum, Senecio articulatum, Senecio jacobsenii, Senecio kleiniformis, Senecio piramidatum, Senecio rowleyanus*).The samples were gathered from the collection belonging to the discipline Floriculture, Faculty of Horticulture and to the greenhouse of the "Alexandru Buia" Botanic Garden from Craiova. In order to emphasize the structure of the leaves, at the level of the foliar limb, there were achieved tangential and transversal cut sections from the middle part of the leaf. The microscopic examination of devices was done at the OPTECH B4 microscope and the photos were achieved with a CANNON device.

RESULTS AND DISCUSSION

Sedum linearum

The thickness of the cuticle is 9,8 µm (figure1).

The epidermic cells have the walls powerfully corrugated.The medium value for the length of the epidermic cells is 139,5µm, for the width of the epidermis cells is 87,75µm and for the length of the stomata is 62,55µm. The density of stomata registered medium values of 31,80 stomata/mm^2 (upper epidermis) and 37,64 stomata/mm^2 (lower epidermis) (figure 2,3).Homogeneous mesophyll is form by round cells, which have approximately the same dimensions, 233,2 µm (length) respectively 184,9 µm (width).Chloroplasts number decreases from the periphery to the center (figure 4).

Sedum mexicanum

The thickness of the cuticle is 5,36 µm (figure 5).

The epidermic cells are polygonal, with corrugated walls.The medium value for the length of the epidermic cells is 249 µm, for the width of the epidermis cells is 45µm, and for the length of the stomata is 21,6µm.The density of stomata registered medium values of 79,50 stomata/mm^2 (upper epidermis) and 86,57 stomata/mm^2 (lower epidermis) (figure 6,7). Homogeneous mesophyll is form by oval cells, which have the length of 285,5 µm and the width of 227,28 µm. Chloroplasts number decreases from the periphery to the center of mesophyll (figure 8).

Sedum morganianum

The thickness of the cuticle is 4,5 µm (figure 9).

The epidermic cells are polygonal and have straight walls, with 6-7 sides.The medium value for the length of the epidermic cells is 137,25 µm, for the width of the epidermis cells is 92,25µm and for the length of the stomata is 42,3µm.The density of stomata registered medium values of 16,19 stomata/mm^2 (upper epidermis) and 16,78 stomata/mm^2(lower epidermis) (figure 10,11).

Homogeneous mesophyll, formed of 2-3 rows of polygonal cells (with 6–7sides) with dimensions of 135,42 length and 90,15 µm width, peripherally arranged, followed by 5-6 rows of round cells (oval) with dimensions of 360,1 µm length and 315,26 µm width.Oval cells have uneven sclerenchyma membranes.Chloroplasts number decreases from the periphery to the center (figure 12).

Sedum pachyphyllum

The thickness of the cuticle is 19,52 µm (figure 13)

The epidermic cells have corrugated walls with 4-5 sides.The medium value for the length of the epidermic cells is 301,5 µm, for the width of the epidermis cells is 166,5 µm, and for the length of the stomata is 120,6 µm.

The density of stomata registered medium values of 5,88 stomata/mm^2(upper epidermis) and 7,21 stomata/mm^2 pe (lower epidermis) (figure 14,15).

Homogeneous mesophyll is form by oval or round cells. The dimensions of mesophyll cells are 324,1 µm length and 225,57 µm width. They have approximately the same dimensions and uneven sclerenchyma membranes.Chloroplasts number decreases from the periphery to the center (figure16).

Senecio articulatum

The thickness of the cuticle is 2,7 µm (figure 17).

The epidermic cells have corrugated walls. The medium value for the length of the epidermic cells is 198 µm, for the width of the epidermis cells is 174,5 µm, and for the length of the stomata is 84,15 µm.The density of stomata registered medium values of 13,54 stomata/mm^2 (lower epidermis). The superior epidermis doesn’t have stomata (figure 18,19).

The mesophyll is formed of 2-3 rows of oval cells, measuring 180,5 µm in length and 95,34 µm in width, and a small number of chloroplasts (under the lower epidermis) and 3 rows with cells with an oval-round shape with dimensions of 92,67 µm length and 63,77 µm width and a great number of chloroplasts (under the upper epidermis).Cells of section centre have uneven sclerenchyma membranes. Water storage in this species is achieved at a stem caudex (figure 20).

Senecio jacobsenii

The thickness of the cuticle is 9,7 (figure 21)

The epidermic cells have corrugated walls, with 5-6 sides. The medium value for the length of the epidermic cells is 193,5 µm, for the width of the epidermis cells is 91,35µm, and for the length of the stomata is 63,45 µm.The density of stomata is 18,84 stomata/mm^2 (upper epidermis) and 21,79 stomata/mm^2 (lower epidermis)(figure 22, 23). Homogeneous mesophyll is form by oval cells with approximately the same dimensions, 207,4 µm length and 153 µm width.The chloroplast are uniform disperses in all mezophyll cells (figure 24).

Senecio kleiniformis

The thickness of the cuticle is 18,3 µm (figure 25, 26).

The epidermic cells have straight walls, with 6-7 sides.The medium value for the length of the epidermic cells is 207 µm, for the width of the epidermis cells is 117µm, and for the length of the stomata is 89,55 µm. The density of stomata registered medium values of 7,06 stomata/mm^2 (upper epidermis) and 29,4 stomata/mm^2 (lower epidermis)(figure 27). The mesophyll is differentiated in palisade parenchyma and spongy parenchyma (bifacial leaf reverses dorsiventral). Palisade parenchyma (under the lower epidermis) is composed of polygonal cells (5-6 rows) with a large number of chloroplasts, measuring 90,13 µm in length and 72,4 µm in width. Under the upper epidermis we can find the spongy parenchyma (3-4 rows) composed of oval or round cells of 315,25 µm in length and 225 µm in width that contain a small number of chloroplasts (figure 28)

Senecio piramidatum

The thickness of the cuticle is 6,32 µm (figure 29).

The epidermic cells have elongated straight walls, with 4–6 sides.The medium value for the length of the epidermic cells is 210 µm, for the width of the epidermis cells is 79µm, and for the length of the stomata is 124,65 µm.

The density of stomata registered medium values of 12,36 stomata/mm^2(upper epidermis), respectively 13,10 stomata/mm^2(lower epidermis) (figure 30,31).

Equifacial leaf, both under the upper epidermis and the lower is found the palisade parenchyma (2-3 rows) composed of elongated cells, with a high number of chloroplasts and measuring 93,25 µm in length and 45 µm in width.

Spongy parenchyma is composed of big cells, lacking chloroplasts and measuring 495,11 µm in length and 433,7 µm in width (figure 32).

Senecio rowleyanus

The thickness of the cuticle is 17,5 µm (figure 33).

The epidermic cells have elongated straight walls, with 6 sides.The medium value for the length of the epidermic cells is 100,35 µm, for the width of the epidermis cells is 70,65µm, and for the length of the stomata is 41,4 µm.The density of stomata is 22,96 stomate/mm^2 (upper epidermis) 26,5 stomate/mm^2 (lower epidermis)(figure 34,35).

Homogeneous mesophyll, the cells dimensions increases from the periphery to the center from 180,7 µm in length respectively 183,29 µm in width to 360,43 µm in length and 315,5 µm in width. The first lines (3-4) are composed of cells containing a large number of chloroplasts, the rest of the mesophyll cells don`t contain any chloroplasts. The first 2-3 rows are composed of small polygonal cells (5-6 sides), the rest of the cells are big ball-shaped and store water (figure 36).

CONCLUSIONS

The cuticle thickning varies in large limits between 2,71 µm *Senecio articulatum* and 19,52 µm for *Sedum pachyphyllum*.

Minimal values for the epidermal cells dimensions(L/l) presents *Sedum morganianum* (137,25/92,25 µ) respectively *Senecio rowleyanus* (100,35/70,65 µm) and maximal values *Sedum pachyphyllum* (301,5 /166,5 µm) respectively *Senecio piramidatum* (210/79 µm).

The stomata dimensions register values between 21,6 µm (*Sedum mexicanum*) respectively 63,45 µm (*Senecio jacobsenii*) and 120,6 µm (*Sedum pachyphyllum)* respectively 124,65 µm (*Senecio piramidatum).*

The stomata density is between 7,21 stomata/mm²(*Sedum pachyphyllum*) respectively 13,1 stomata/mm²(*Senecio piramidatum*) and 86,57 stomata/mm²(*Sedum mexicanum*) respectively 70,65 stomata / mm² (*Senecio rowleyanus).*

All the species of the Sedum genus prezents homogeneous mesophyll formed by oval or round cells of the same dimensions (L/1) (*Sedum linearum, Sedum mexicanum, Sedum pachyphyllum*) or of different dimensions (*Sedum morganianum).*The chloroplast number decreases to the exterior towards the centre of mesophyll.

The species of the Senecio type presents different types of mesophyll, as for example: homogeneous mesophyll (*Senecio rowleyanus*, *Senecio jacobsenii*), mesophyll differentiated in palisade parenchyma and spongy parenchyma-bifacial leaf *(Senecio articulatum*),bifacial leaf conversely dorsiventral (*Senecio kleiniformis)*, equifacial leaf (*Senecio piramidatum)*.

The chloroplast number decreases from the exterior towards the interior of the mesophyll, and in some cases are absent to this level (*Senecio piramidatum, Senecio rowleyanus*).

The homogeneous mesophyll of crassulacean type is not encountered to all the representatives of this group of plant (succulent plants).

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FIGURES

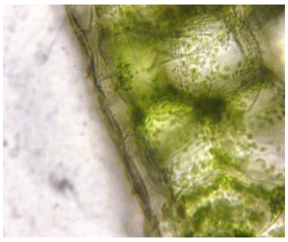

Fig. 1- cuticle
Sedum linearum

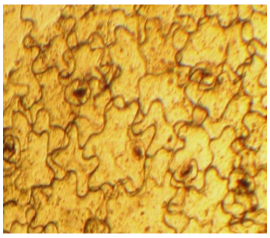

Fig. 2 - epidermic cells
Sedum linearum

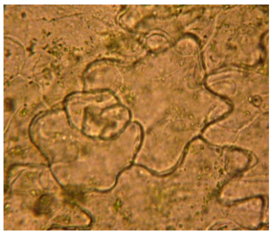

Fig. 3 – stomats
Sedum linearum

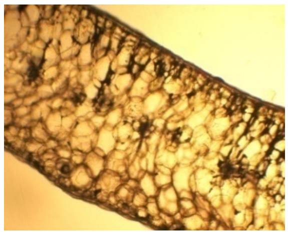

Fig. 4 - mesophyll cells
Sedum linearum

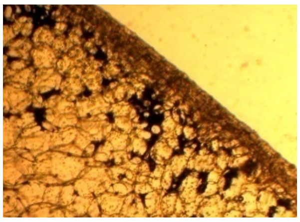

Fig. 5 – cuticle
Sedum mexicanum

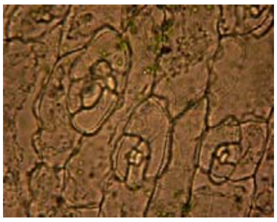

Fig. 6 – epidermic cells
Sedum mexicanum

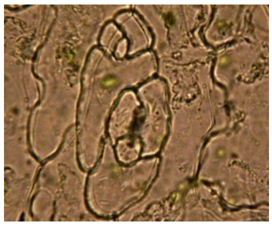

Fig. 7 – stomats
Sedum mexicanum

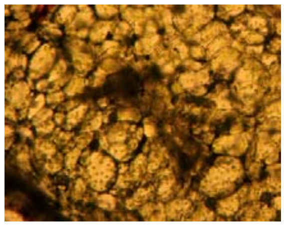

Fig. 8 - mesophyll cells
Sedum mexicanum

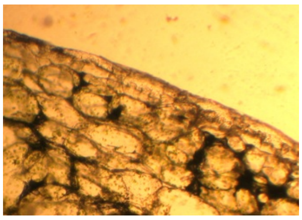

Fig. 9 – cuticle
Sedum morganianum

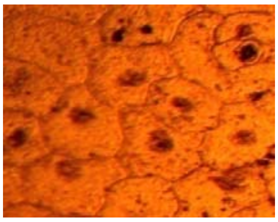

Fig. 10 – epidermic cells
Sedum morganianum

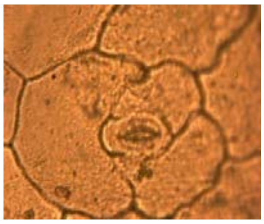

Fig. 11 – stomats
Sedum morganianum

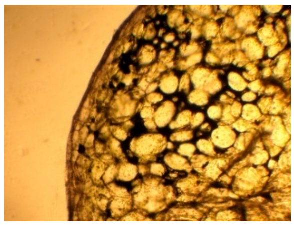

Fig. 12 – mesophyll cells
Sedum morganianum

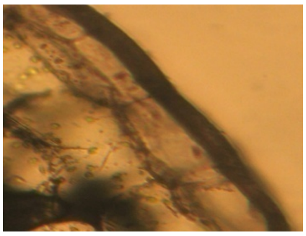

Fig.13 – cuticle
Sedum pachyphyllum

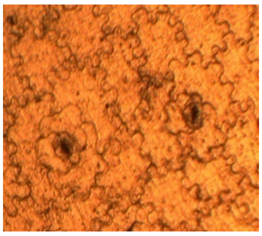

Fig. 14 – epidermic cells
Sedum pachyphyllum

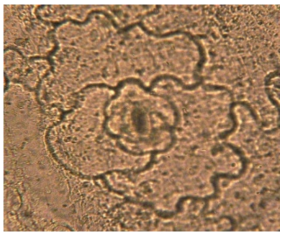

Fig. 15 – stomats
Sedum pachyphyllum

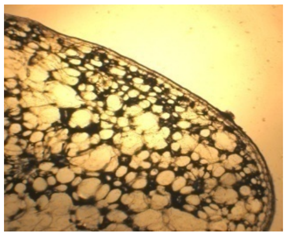

Fig. 16 – mesophyll cells
Sedum pachyphyllum

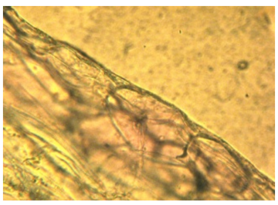

Fig. 17 – cuticle
Senecio articulatum

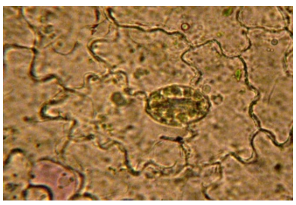

Fig.18 – stomats
Senecio articulatum

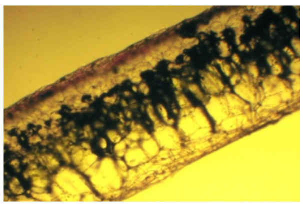

Fig. 19 – mezophyll cells
Senecio articulatum

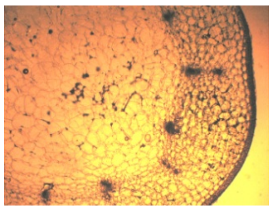

Fig. 20 – stem section
Senecio articulatum

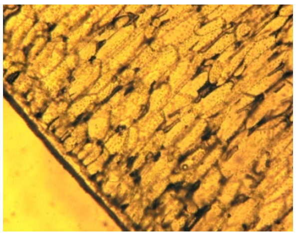

Fig. 21 – cuticle
Senecio jacobsenii

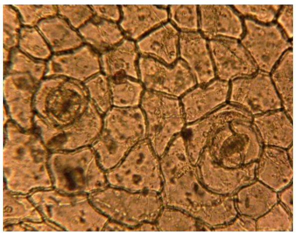

Fig. 22 – epidermic cells
Senecio jacobsenii

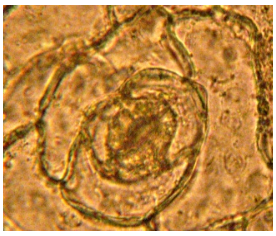

Fig. 23 – stomats
Senecio jacobsenii

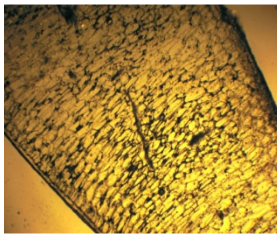

Fig. 24 – mesophyll cells
Senecio jacobsenii

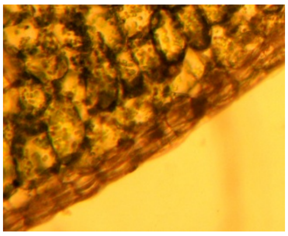

Fig. 25 – cuticle
Senecio kleiniformis

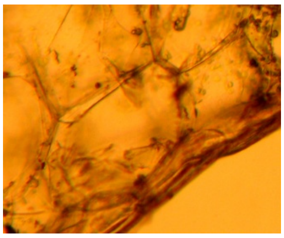

Fig. 26 – cuticle
Senecio kleiniformis

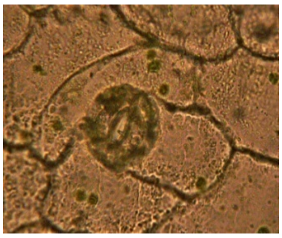

Fig. 27 – epidermic cells and stomats
Senecio kleiniformis

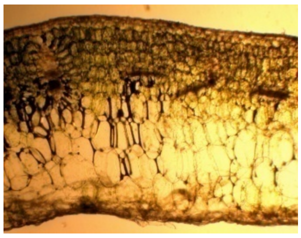

Fig. 28 – mesophyll cells
Senecio kleiniformis

Fig. 29 – cuticle
Senecio piramidatum

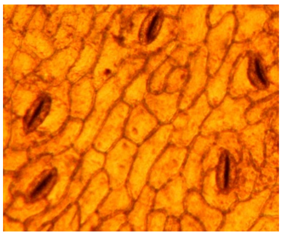

Fig. 30 – epidermic cells
Senecio piramidatum

Fig. 31 – stomats
Senecio piramidatum

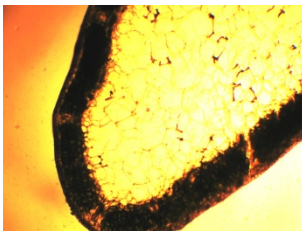

Fig. 32 – mesophyll cells
Senecio piramidatum

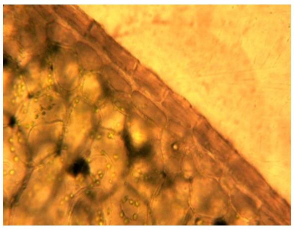

Fig. 33 – cuticle
Senecio rowleyanus

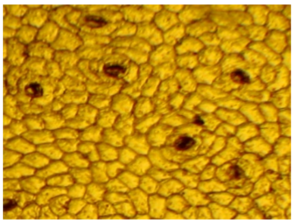

Fig. 34 – epidermic cells
Senecio rowleyanus

Fig. 35 – stomats
Senecio rowleyanus

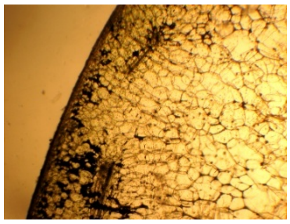

Fig. 36 – mezophyll cells
Senecio rowleyanus

Preliminary results regarding cultural behaviour of some peony cultivars

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Keywords: yield, quality, cut flowers, *Paeonia*

ABSTRACT

The purpose of this study was to identify from a large number of cultivars those with best behaviour regarding the yield and its quality, in the south area of the country. Most of the cultivars studied here coresponds to the quality standards for peony cut flowers, regarding both the average shoot length and the average diameter of floral bud. In this respect, the best results were obtained by cultivars of *Paeonia lactiflora* specie and some herbaceous hybrids.

INTRODUCTION

The assortment of peony cultivars on the Romanian market is preaty poor compared to that from countries with tradition in peony cultivation like China, Japan, United States, France, and, more recently, New Zeeland. In Romania, peony cultivation is limited, for the moment, at the small private households, which deals whith a small number of old cultivars..

The international quality standards stipulate that the flower bud diameter, in the „soft colored bud" stage proper for harvesting, „should not be less than 2,5 cm and the overall length of bud and stem should not be less than 60 cm, but in no case should the overall length be less then 50 cm" (Susan Stevens and colab., 1993).

In some peony cultivars we can observe a fenomenon of floral bud abortion in early stage of development, due to unsufficient chilling conditions during the annual growing cycle (Kamenetsky and colab., 2003).

For the yield of 2006, the year the observations were made, the ecological conditions from both 2005 and 2006 (Table 1) were very important, because in case of peony, the new shoots are initiated in the renewal buds at the end of June (the end of flowering period) and remain vegetative untill fall. During September, the apical meristem reaches the generative stage, but the floral differentiation is finished at the beginning of December (Barzilay Amalia and colab., 2002).

MATERIALS AND METHODS

The experiment was developed in the spring of 2006 at the Floriculture Department of Faculty of Horticulture, Bucharest. It was studied a colection of 97 peony cultivars, divided in 2 plots, depending on the planting year: 2003 (Plot 1) and 2004 (Plot 2).

In the tables presented, the listed cultivars belong to the specie *P. lactiflora,* if not mentioned otherwise.

At the planting time, the biological material was consisted of plant divisions with 1-4 eyes.

The main aspects studied were: the total number of shoots/plant, the number of floral shoots/plant, the number of floral shoots that reached anthesis, the average shoot lengh, the average diameter of floral bud in stage"soft colored bud" proper for harvesting.

There were made visual observations and biometrical mesurements.

RESULTS AND DISCUSSIONS

Regarding *the yield*, the number of floral shoots/plant and the number of floral shoots evolved to flowering were studied. In the first plot, the cultivar *Catharina Fontijn* evidentiated with all the floral shoots reaching anthesis. On the other hand, a negative example is the cultivar *Candy Stripe*, with only 4 floral shoots that reached anthesis of 13 total amount of floral shoots/plant. The cultivar *Rubra Plena* of *Paeonia officinalis* specie did not flower in 2006, because the two formed flower buds aborted in an early stage of development (Table 2).

In the second plot, the positive example is the cultivar *Wladislawa*, with 11 floral shoots evolved to flowering of the same amount of floral shoots/plant. Eight cultivars had all the flower buds aborted: *Adolphe Rousseau, Auguste Dessert, Cameo, Lilian Wild, Monsieur Krelage, Pico, Yellow Emperor, Yellow Heaven* (Table 3).

Regarding the *shoot length*, in the first plot only 3 of the studied cultivars (Itoh Hibrid *Yellow Dream*, *P. mollis* specie, *P. veitchii spp. Woodwardii*) had the average floral shoots length less than 50 cm. The highest value was obtained by *Jean E. Bockstoce* hybrid, 103 cm.

In the second plot, all the cultivars in study had the average floral shoots length more than 50 cm. The highest value of average floral shoots length was obtained by *Empire State* cultivar, 88.5 cm (Table 4).

Regarding the *average diameter of floral bud* in stage"soft colored bud"**,** 44 of the cultivars in the first plot had the average diameter of floral bud > 2.5 cm. The *Pink Giant* cultivar of *Paeonia lactiflora* specie has obtained the highest value, 5.5 cm.

In the second plot, 31 of the studied cultivars had values of the average floral bud diameter > 2.5 cm. The highest value (4.3 cm) belonged to the cultivar *Dinner Plate* of *Paeonia lactiflora* specie (Table 4).

CONCLUSIONS

Depending on the ecological conditions of the current year and of the year before, some peony cultivars show a negative fenomenon of floral bud abortion in early stage of development, with great influence upon the yield.

Most of the cultivars studied here (61 cultivars) coresponds to the quality standards for peony cut flowers, regarding both the average shoot length and the average diameter of floral bud. They can be highly recomanded to improve peony assortment on Romanian market.

All the other cultivars who does not corespond to the quality standards regarding the shoots length and the floral bud diameter are excelant landscape decorators, especially the *Itoh* hybrids, and also can be used for amazing floral arrangements.

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TABLES

Table 1. Monthly Air Average Temperature (Source: Romanian Statistical Yearbook)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2005	-	-	-	-	-	19.5	22.5	21.8	17.2	11.7	5.1	2.1
2006	-2.9	0.0	5.8	12.6	17.4	21.4	-	-	-	-	-	-

Table 2. The influence of flower bud abortion on peony flower yield (Plot 1)

Crt. No.	Cultivar	Total No.of Shoots/pl.	No. of Vegetative Shoots/pl.	No. of Floral Shoots/pl.	Floral Shoots with Aborted Bud		Floral Shoots Reaching Anthesis	
					No.	%	No.	%
1	BARBARA	11	1	10	0	0.0	10	100.0
2	CANDY STRIPE	16	3	13	9	69.2	4	30.8
3	CATHARINA FONTIJN	11	0	11	0	0.0	11	100.0
4	DR. ALEX. FLAMING	13	4	9	5	55.6	4	44.4
5	DOUC. De NEMOURS	10	4	6	3	50.0	3	50.0
6	F. KOPPIUS	11	0	11	3	27.3	8	72.7
7	FIRST LADY	7	2	5	2	40.0	3	60.0
8	FLEX FLAN	6	0	6	2	33.3	4	66.7
9	FRANCOIS ORTEGAT	10	1	9	1	11.1	8	88.9
10	GAYBORDER JUNE	3	0	3	1	33.3	2	66.7
11	Gen. Mac MAHON	11	5	6	0	0.0	6	100.0
12	HENRI POTIN	11	2	9	2	22.2	7	77.8
13	JACORMA	4	1	3	0	0.0	3	100.0
14	JAPPENSHA IKKU	13	7	6	5	83.3	1	16.7
15	KAKODEN	12	4	8	4	50.0	4	50.0
16	KANSAS	7	1	6	4	66.7	2	33.3
17	L'ETINCELANTE	12	3	9	4	44.4	5	55.6
18	Mad. GAUDISHAU	10	2	8	1	12.5	7	87.5
19	ROSALIE	10	5	5	4	80.0	1	20.0
20	ROSY DOWN	8	3	5	1	20.0	4	80.0
21	SNOW MOUNTAIN	11	1	10	2	20.0	8	80.0
22	URSINOW	14	9	5	2	40.0	3	60.0
23	VICTOIRE de la MARNE	9	2	7	2	28.6	5	71.4
24	W.T.TURNER	12	4	8	4	50.0	4	50.0
25	WHITE WINGS	8	1	7	0	0.0	7	100.0
26	Hy. CORAL CHARM	8	5	3	0	0.0	3	100.0
27	Hy.FLAME	3	0	3	0	0.0	3	100.0
28	Hy.JEAN E. BOCKSTOCE	2	0	2	0	0.0	2	100.0
29	MARTHA WASHINGTON	15	3	12	1	8.3	11	91.7
30	Mrs. EDUARD HARDING	8	2	6	0	0.0	6	100.0
31	PAUL BUNYAN	8	4	4	3	75.0	1	25.0
32	PILLOW TALK	6	1	5	4	80.0	1	20.0
33	PINK GIANT	4	0	4	1	25.0	3	75.0
34	PINK ROSEA	6	0	6	0	0.0	6	100.0
35	RACHEL	13	5	8	6	75.0	2	25.0
36	RASPBERRY SUNDAE	8	0	8	0	0.0	8	100.0
37	Hy.JOYCE ELLEN	6	3	3	2	66.7	1	33.3
38	Hy.LANING No. 8	6	0	6	0	0.0	6	100.0
39	Hy.LOIS ARLEEN	5	0	5	0	0.0	5	100.0
40	Hy.PAULA FAY	6	1	5	0	0.0	5	100.0
41	Hy.PEACHY ROSE	3	2	1	0	0.0	1	100.0
42	Hy.RED CHARM	7	3	4	0	0.0	4	100.0
43	Hy.Itoh YELLOW DREAM	8	3	5	3	60.0	2	40.0
44	Paeonia mollis	3	2	1	0	0.0	1	100.0
45	P. officinalis ALBA PLENA	6	0	6	0	0.0	6	100.0
46	P. officinalis ROSEA PLENA	5	0	5	0	0.0	5	100.0
47	P. officinalis RUBRA PLENA	2	0	2	2	100.0	0	0.0
48	Paeonia peregrina SUNSHINE	5	2	3	0	0.0	3	100.0
49	P. veitchii spp. Woodwardii	10	6	4	0	0.0	4	100.0

Table 3. The influence of flower bud abortion on peony flower yield (Plot 2)

Crt. No.	Cultivar	Total No.of Shoots/pl.	No. of Vegetative Shoots/pl.	No. of Floral Shoots/pl.	Floral Shoots with Aborted Bud		Floral Shoots Reaching Anthesis	
					No.	%	No.	%
1	ADOLPH ROUSSEAU	6	0	6	6	100	0	0
2	ALBATRE	8	0	8	0	0	8	100
3	ALBERT CROUSSE	4	0	4	3	75	1	25
4	ANGEL CHEEKS	3	0	3	0	0	3	100
5	ARGENTINE	6	2	4	1	25	3	75
6	AUGUSTE DESSERT	7	3	4	4	100	0	0
7	BARONESS SCHROEDER	5	1	4	0	0	4	100
8	BOWL OF BEAUTY	4	0	4	0	0	4	100
9	CAMEO	8	0	8	8	100	0	0
10	CLASS ACT	5	0	5	1	20	4	80
11	DINNER PLATE	2	0	2	0	0	2	100
12	EDULIS SUPREME	5	1	4	3	75	1	25
13	EMPIRE STATE	5	0	5	1	20	4	80
14	EVA	6	2	4	0	0	4	100
15	FIONA	9	1	8	3	37.5	5	62.5
16	GERMAINE BIGOT	9	2	7	5	71.4	2	28.6
17	GROVER CLEAVELAND	6	1	5	4	80	1	20
18	HAKODATE	6	0	6	1	16.7	5	83.3
19	INSPECTEUR LAVERGNE	9	0	9	0	0	9	100
20	KRINKLED WHITE	13	7	6	2	33.3	4	66.7
21	LA FRANCE	3	0	3	0	0	3	100
22	LADY ANNA	8	1	7	1	14.3	6	85.7
23	LADY LEONORA BRAMWELL	9	0	9	1	11.1	8	88.9
24	LAURA SHAILOR	4	0	4	1	25	3	75
25	LILIAN WILD	6	3	3	3	100	0	0
26	MARGARET TRUMAN	5	1	4	0	0	4	100
27	MONSIEUR KRELAGE	11	5	6	6	100	0	0
28	MULTIFLORA	2	0	2	0	0	2	100
29	PHILLIPE RIVOIRE	11	0	11	2	18.2	9	81.8
30	PICO	5	3	2	2	100	0	0
31	PINK PARFAIT	6	2	4	3	75	1	25
32	RED SARAH BERNHARDT	8	0	8	7	87.5	1	12.5
33	SEBASTIAN MAAS	2	0	2	1	50	1	50
34	SNOW CLOUD	4	0	4	0	0	4	100
35	TOP BRASS	6	2	4	2	50	2	50
36	TOURANGELLE	11	6	5	3	60	2	40
37	URSYN NIEMCEWEZ	8	3	5	1	20	4	80
38	WINE RED	11	0	11	2	18.2	9	81.8
39	WLADISLAWA	16	5	11	0	0	11	100
40	ZUS BROUN	8	0	8	6	75	2	25
41	Hy.APRICOT QUEEN	7	0	7	0	0	7	100
42	Hy.CONVOY	4	1	3	0	0	3	100
43	Hy.CORAL AND GOLD	5	0	5	0	0	5	100
44	Hy.CORAL SUNSET	2	0	2	0	0	2	100
45	Hy.CORAL SUPREME	2	0	2	0	0	2	100
46	Hy.Itoh YELLOW EMPEROR	6	6	0	0	100	0	0
47	Hy.Itoh YELLOW GEM	5	2	3	0	0	3	100
48	Hy.Itoh YELLOW HEAVEN	4	4	0	0	100	0	0

Table 4. Qualitative parametres of peony cultivars for cut flower production

Crt. No.	Cultivar	Average Fl. Shoot Length (cm)	Average Diameter of Fl. Bud (cm)	Crt. No.	Cultivar	Average Fl. Shoot Length (cm)	Average Diameter of Fl. Bud (cm)
1	JEAN E. BOCKSTOCE	103	3.4	1	EMPIRE STATE	88.5	3.0
2	Mad. GAUDICHAU	102.8	3.2	2	DINNER PLATE	82	4.3
3	JACORMA	102.6	3.4	3	CORAL AND GOLD	81.6	3.1
4	GAYBORDER JUNE	102	3.3	4	ANGEL CHEEKS	80	3.3
5	PILLOW TALK	102	4.5	5	SNOW CLOUD	79.5	2.9
6	CORAL CHARM	101.3	3.2	6	LAURA SHAILOR	77.2	3.2
7	KAKODEN	101.2	2.5	7	CLASS ACT	77.2	3.2
8	W.T.TURNER	100.7	2.5	8	CORAL SUNSET	77	3.3
9	LANING No. 8	100.6	3.1	9	INSPECTEUR LAVERGNE	76.3	2.1
10	FRANCOIS ORTEGAT	99.7	3.3	10	MARGARET TRUMAN	72.8	2.3
11	Gen. Mac MAHON	97.3	3.2	11	FIONA	72.3	2.8
12	L'ETINCELANTE	97	2.7	12	APRICOT QUEEN	72.1	2.8
13	URSINOW	96.6	3.1	13	BOWL OF BEAUTY	71.5	2.6
14	RASPBERRY SUNDAE	96.2	3.4	14	BARONESS SCHROEDER	71	2.5
15	HENRI POTIN	95.1	2.9	15	ALBATRE	69	2.3
16	CANDY STRIPE	94.5	2.1	16	CORAL SUPREME	68	3.2
17	ROSY DOWN	94.5	3.2	17	LADY L. BRAMWELL	67	2.3
18	CATHARINA FONTIJN	93.5	3.1	18	CONVOY	67	3.3
19	FLAME	93	3.5	19	WINE RED	65.5	2.5
20	PINK GIANT	90.6	5.5	20	LA FRANCE	64.6	1.5
21	JAPPENSHA IKKU	90	2.5	21	HAKODATE	62.8	2.4
22	WHITE WINGS	89.4	2.9	22	PHILLIPE RIVOIRE	62.2	1.9
23	VICTOIRE de la MARNE	88.6	3.0	23	RED SARAH BERNHARDT	61	2.4
24	DOUC. De NEMOURS	88.3	2.9	24	LADY ANNA	60.7	2.8
25	SNOW MOUNTAIN	88.1	2.8	25	ALBERT CROUSSE	59.7	3.3
26	PINK ROSEA	87	2.5	26	MULTIFLORA	59	2.8
27	BARBARA	85.4	3.3	27	ARGENTINE	58.3	2.2
28	FIRST LADY	85.3	3.2	28	GROVER CLEAVELAND	56.5	2.9
29	RACHEL	85	2.9	29	SEBASTIAN MAAS	55.5	2.3
30	JOYCE ELLEN	84	3.5	30	ZUS BROUN	55.2	3.0
31	DR. ALEX. FLAMING	83.5	1.8	31	GERMAINE BIGOT	55.1	2.4
32	FLEX FLAN	83.5	3.3	32	URSYN NIEMCEWEZ	51.7	2.0
33	RED CHARM	82.5	4.6	33	EVA	50.1	2.3
34	PAUL BUNYAN	82	3.7	34	YELLOW GEM	49.4	2.4
35	M. WASHINGTON	81.1	3.0	35	EDULIS SUPREME	48.8	2.7
36	Mrs. E. HARDING	80.1	2.9	36	PINK PARFAIT	48.3	3.0
37	F. KOPPIUS	79.3	2.9	37	CAMEO	47.1	0.0
38	KANSAS	75	3.1	38	WLADISLAWA	47.1	2.0
39	off. ALBA PLENA	70.8	3.2	39	TOP BRASS	46	2.6
40	ROSALIE	70	3.2	40	ADOLPH ROUSEAU	40.8	0.0
41	PAULA FAY	65.6	2.5	41	KRINKLED WHITE	40.6	2.1
42	peregrina SUNSHINE	64.3	2.2	42	TOURANGELLE	38.4	2.4
43	off. ROSEA PLENA	64	2.3	43	PICO	34.8	0.0
44	LOIS ARLEEN	62.2	3.0	44	MONSIEUR KRELAGE	31	0.0
45	PEACHY ROSE	50	2.5	45	AUGUSTE DESSERT	28.5	0.0
46	YELLOW DREAM	47.5	3.0	46	LILIAN WILD	22.5	0.0
47	mollis	42	2.5	47	YELLOW EMPEROR	11.6	0.0
48	veitchii spp. Woodwardii	40	1.7	48	YELLOW HEAVEN	4.5	0.0
49	off. RUBRA PLENA	0	0.0				

Preliminary results regarding the in vitro initiation and multiplication of *Prunus serrulata* var. *Kanzan*

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Keywords: *Prunus serrulata*, in vitro culture, explants, ratio of multiplication

ABSTRACT

The purpose of the research effectuated was to study the *Prunus serrulata"Kanzan"* variety behavior during the phases of initiation and in vitro reproduction. In view of the initiation of the culture there have been drawn explants, in the vegetative repose phase. The nutritive media used had a different content of substances in relation to the in vitro culture phase. In order to observe the initiation of cultures, was tested the influence of benzylaminopurine in concentrations of 0,5; 1; 1,5 mg/l. During the micro reproduction phase on a constant level of indolebutyric acid and gibberellic acid (0,1 mg/l), was tested the influence of benzylaminopurine (1; 1,4; 2 mg/l). In the room designated for growth were assured controlled temperature conditions (22 - 24°C), photoperiod (12 - 16 hours) and luminosity of 3500 lucs. The observations and registered data emphasized the influence of BAP over the growth and micro reproduction of explants. During the initiation phase of cultures were obtained 95% grown explants with normal aspect. Depending on the increase of cytokinin concentration from 1 to 2 mg/l, the rate of reproduction increased from 10,6 to 20,3 micro young shoots/explants. The reduction of the photoperiod to 12 hours determined the decrease of the percentage of plants growth and of the rate of reproduction.

INTRODUCTION

Prunus serrulata "Kanzan" is one of the most elegant and appreciated ornamental cherries, the decorative element of the plant being represented by long leaf stalk, deep pink flowers. They are double, big, long leaf stalk, abundant, with a deep pink color, swinging. Their blossoming is also very profuse.

The use of conventional methods, to multiply this dendrological variety has a very weak conveyance efficiency.

At the University of Pitesti, within the laboratory of Vegetal Biotechnologies we undertook studies for the purpose of establishing the in vitro reproduction biotechnology of the *Prunus serrulata* species.

MATERIALS AND METHOD

The biological material used for the initiations of the in vitro cultures was represented by explants composed of meristem and 2-3 foliar primordial, drew in the vegetative repose phase.

The disinfection of the biological material was achieved through:
- washing with tap water adding 2-3 drops of Domestos;
- rinsing with tap water;
- keeping in ethylic alcohol 94% for 10 minutes;
- keeping in calcium hypochlorite 6% for 20 minutes;
- rinsing in distilled water sterilized by autoclaving.

The drawing of the explants is achieved in aseptic conditions at the hood with laminar air flow under the binocular – eye glass. The nutritive medium used for the initiation of cultures and multiplication of explants have been complex, containing mineral salts grouped as micro and macro elements, vitamins, cytokinins, gibberellins, a source of carbon, and for solidification agar-agar (table 1).

Before the distribution of the nutritive medium in the culture recipients, the pH of the medium was verified and adjusted to the value of 5,6 – 5,8.

The steriliying of the nutritive sublayer was achieved through autoclaving at one atmosphere (121°C) for 20 minutes. The culture recipients, instruments, cassolettes have been sterilized in the air oven (120°C for 2 hours). The growing and multiplication of explants was achieved in controlled conditions of temperature (22-24°C), photoperiod (12-16 hours) and luminous intensity 3500 lucs.

The recorded data have been expressed in percentages of growth of the explants in the initiation phase of the cultures and ratio of multiplication (micro young shoots/explants) in the multiplication phase.

RESULTS AND DISCUSSIONS

In the initiation phase and micro reproduction the growth and reproduction was influenced by the composition of the nutritive medium and photoperiod thus.

The notes and recorded data emphasized on a constant level of the photoperiod of 16 hours that the increase of the concentration of BAP from 0,5 to 1 mg/l has caused the growth of explants in a percentage of 60 to 95%.

The increase of the BAP concentration to 1,5 mg/l has influenced negatively the growth of explants whose value reached 80%, the explants presenting the phenomenon of callus formation and vitrification.

The decrease of the photoperiod from 16 to 12 hours led to the achievement of some smaller percentages of grown explants, which depending on the BAP concentration, have been included between 61 at the concentration of 0,5 and 87 at the concentration of 1mg/l. In this case the BAP concentration of 1,5 mg/l has caused the phenomenon of callus formation and vitification and as a consequence the decrease of the growth percentages of the explants to the value of 71.

From the obtained results for the micro reproduction phase it was found that ratio of multiplication has increased together with the increase of the BAP concentration from 8,0 to 20,3 micro young shoots/explants regardless of the photoperiod.

Although, for the third version (2,0 mg/l BAP) a number of 20,3 micro young shoots/explants was obtained, these manifested the phenomenon of callus formation and vitrification comparing to V_2 (1,4 mg/l BAP), where RI was of 17 micro young shoots/explants but the plants have had a normal aspect.

Analyzing the influence of the second variable factor - the photoperiod, it has been observed that there are positive results through the increase from 12 to 16 hours photoperiod, the number of micro young shoots/explants has increased in V_2 from 14,3 to 17.

CONCLUSIONS

The results regarding the initiation and multiplication phases of the *Prunus serrulata “Kanzan”* variety led to the following conclusions:

- in the initiation phase the best results were obtained in the presence of BAP in the concentration of 1 mg/l;
- for micro reproduction, the use of a basic were medium Linsmaier – Skoog (1965) with an addition of fitohormones (0,1 mg/l GA and IBA; 1,4 mg/l BAP) has led to the highest rates of multiplication;
- as far as the influence of the photoperiod in the two phases is concerned, the best results were obtained in an illumination of 16 hours.

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TABLE

Table 1. Composition of media used for initiation culture and micro propagation

Components (mg/l)	Initiation culture			Micro propagation		
	V_1	V_2	V_3	V_1	V_2	V_3
NH_4NO_3	400	400	400	1650	1650	1650
KNO_3	1800	1800	1800	1900	1900	1900
$MgSO_4$	360	360	360	370	370	370
KH_2PO_4	270	270	270	170	170	170
$Ca(NO_3)_2$	1200	1200	1200	-	-	-
$CaCl_2$	-	-	-	440	440	440
$MnSO_4$	0,75	0,75	0,75	22,3	22,3	22,3
$ZnSO_4$	8,6	8,6	8,6	8,6	8,6	8,6
H_3BO_3	12,0	12,0	12,0	6,2	6,2	6,2
$CuSO_4$	0,025	0,025	0,025	0,025	0,025	0,025
Na_2MoO_4	0,25	0,25	0,25	0,25	0,25	0,25
$CoCl_2$	0,025	0,025	0,025	0,025	0,025	0,025
KI	0,08	0,08	0,08	0,83	0,83	0,83
Inositol	100	100	100	54,048	54,048	54,048
Nicotinic acid	-	-	-	2,462	2,462	2,462
Pyridoxine hydrochloride	-	-	-	0,616	0,616	0,616
Thiamine hydrochloride	0,4	0,4	0,4	0,674	0,674	0,674
Biotin	-	-	-	0,048	0,048	0,048
Panthotenic acid calcium	-	-	-	0,476	0,476	0,476
Riboflavin	-	-	-	0,376	0,376	0,376
Ascorbic acid	-	-	-	0,176	0,176	0,176
Choline chloride	-	-	-	0,104	0,104	0,104
Cysteine	-	-	-	7,269	7,269	7,269
Glycine	-	-	-	0,375	0,375	0,375
Gibberellic acid	-	-	-	0,1	0,1	0,1
3 indolebutyric acid	-	-	-	0,1	0,1	0,1
Benzilaminopurin (BAP)	0,5	1	1,5	1	1,4	2,0
NaFeEDTA	32,0	32,0	32,0	32,0	32,0	32,0
Sucrose (g/l)	40,0	40,0	40,0	40,0	40,0	40,0
Agar (g/l)	7,0	7,0	7,0	7,0	7,0	7,0

FIGURES

a **b**

Fig. 1. *Prunus serrulata "Kanzan"* in the vegetative phase (a) and repose phase (b)

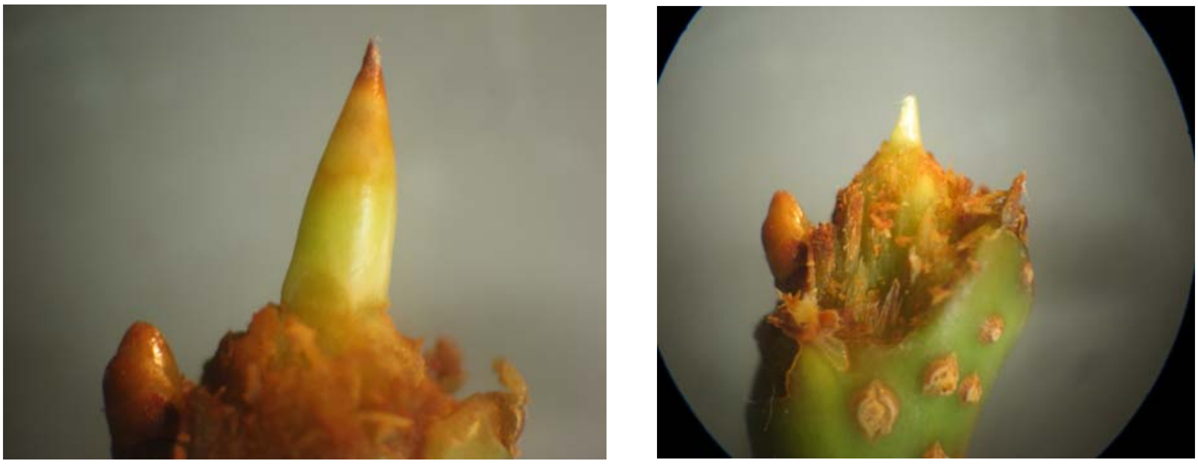
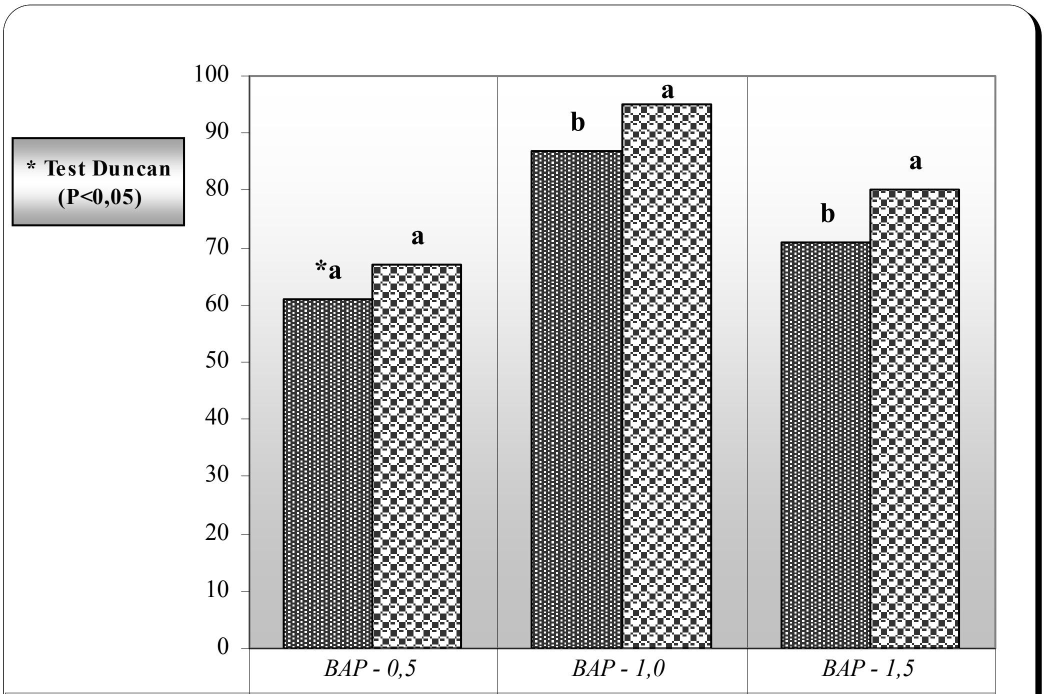
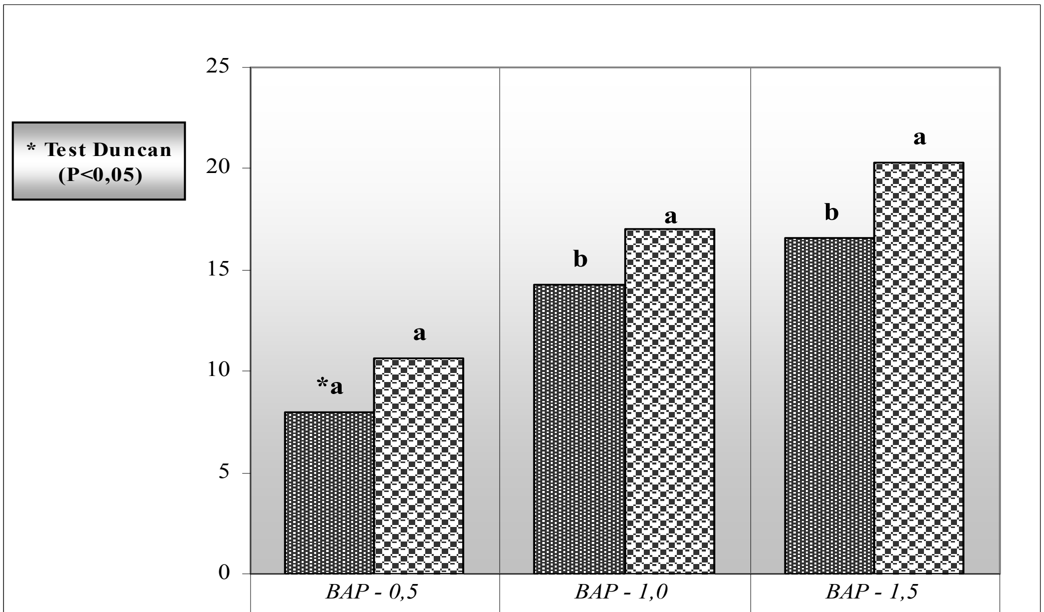


Fig. 2. In vitro initiation of *Prunus serrulata "Kanzan"*



	BAP - 0,5	BAP - 1,0	BAP - 1,5
Photoperiod - 12 h	*61,0*	*87,0*	*71,0*
Photoperiod - 16 h	*67,0*	*95,0*	*80,0*

Fig. 3. Growing of explants in function of nutritive medium composition and photoperiod



	BAP - 0,5	BAP - 1,0	BAP - 1,5
Photoperiod - 12 h	*8,0*	*14,3*	*16,6*
Photoperiod - 16 h	*10,6*	*17,0*	*20,3*

Fig. 4. Rate of multiplication in function of nutritive medium composition and photoperiod

Fig. 5. Aspect of multiplication stage of *Prunus serrulata "Kanzan"*

Fig. 6. Rate of multiplication at the *Prunus serrulata "Kanzan"*

Study of cation exchange regularity in marc grape compost substrate used in some ornamental plants culture

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Keywords: container culture, organic substrate, nutritive ions, exchangeable bases, pH

ABSTRACT

For the potted species, the case of ornamental plants the soil has been gradual substituted, into the cultural technologies, with substrates, in principal organic materials. Each nutritive substrate has a certain capacity to provide nutrients to the roots. This capacity depends on the nutrients which are present on the substrate not only in the solid phase but also in the liquid phase. The nutrition capacity depends on the following factors: chemical composition of solid phase, cationic change capacity, C/N ratio of the components in the substrate, ionic composition of liquid phase, and aeration condition in substrate, which assure a certain microbiological activity. The nutrition capacity of a substrate vary also with the cultural system, which differ with the cultivated species and the fertilizers used.

The substrates with low cationic change capacity, respectively with low retention by change of nutritive ions are more exposed to the nutrient leaching. This is the case of mineral and artificial substrates on which the acidification or alkalinization action of chemical fertilizers also increases. At the solid phase and liquid phase interface, a retention (adsorption) take place through the change with other cations present in the liquid phase, till an dynamic equilibrium is establish. The majority of nutrients retain are cations like potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), aluminum (Al^{3+}), iron (Fe^{3+}), which play an essential role in this change.

The plant culture on "active" substrates require information about the quantity of H^+ ions (pH), the quantity of adsorbed ions in substrate – the sum of potentially exchangeable cations (S_B), the level of base saturation (V%).

The research following to establish the cation exchange regularity in substrate variants with marc compost (waste resulted from vinification process) in mixture with forestry compost, leaves compost and peat in volumetric ratio of 1:1:1:0,5 (leaves compost: forestry compost: peat: marc grape compost). The substrate was used in some ornamental plant culture of *Tamarix tetrandra*, *Ligustrum ovalifolium* Aureum, *Chamaecyparis pisifera* Boulevard şi *Chamaecyparis lawsoniana* Stardust.

INTRODUCTION

Organic substrates present different compositions, starting with just one constitute to a mixture of different materials in variable proportions, with low or medium concentration of nutrients (Abreu et al., 2005).

Culture substrates can assure an equilibrate level of water and nutrients to the root system. The substrate provides support and nutrients for plant, and it represents an intermediary for nutrients supply from fertilizers. For the reason that the plant requirements regarding the physical, chemical and agrochemical characteristics of the substrates are very different, the selection of components for a certain substrate imply studies, researches and tests for each species or group of plants from the same family (Carrión et. al., 2005). The level of nutrients supply retained by the solid phase and dissolved in the liquid phase of the substrate is the most important agrochemical feature of substrates. From the chemical characteristics susceptible in modifying the chemical composition of liquid phase by change reactions with the solid phase, the level of nutrients supply has a determinant role (Anstett, 1976).

The solid materials used for the substrate preparation contain ions fixed or absorbed at the mineral or organic colloidal particle surface. This ions fixation take place due to the electrical charge at the surface of colloidal compounds and the presence of some terminal chemical functions, acidic functions of the organic compounds from the substrate. Usually, this trait is expressed in milliequivalents (meq) at 100g of material (soil, substrate). For substrates it can be expressed also volumetrically (meq/l substrate).

After the cationic change capacity, T, two groups of materials are distinguished: substrates with T greater then 0.1 meq/l, which are considerate “active” from chemical point of view; inert substrates from chemical point of view, with low T, under 0.1 meq/l.

Organic substrates with a high cationic change capacity (T) lose by leaching a reduced amount of nutrients and the risk of salinity is low.

The main objectives of the research following the exchange cations regularity (K^+, Na^+, Ca^{2+}, Mg^{2+}) on marc grape compost substrate, the retention and leaching phenomenon study of some nutritive ions in substrate and the nutritive elements balance in containers culture of the ornamental plants.

MATERIALS AND METHODS

The mixture ratio of the organic compounds used in substrate variants is 1:1:1:0,5 corresponding of leaves compost: forestry compost: peat: marc grape compost.

The development and growing of four ormanemtal species of *Tamarix tetrandra*, *Ligustrum ovalifolium* Aureum, *Chamaecyparis pisifera* Boulevard şi *Chamaecyparis lawsoniana* Stardust cultivated on marc grape compost substrate was monitoring. During the vegetation period was following by agrochemical analysis the dynamics of substrate agrochemical indicators for each plant species cultivated, these can offers information concerning the interaction of the substrate - plant roots - plant. Periodically was taken sampling from substrate to following the content of the nutritive elements and to evaluating the cation exchange in substrate used in ornamental plant culture (Madjar and Davidescu, 2008).

The variants of the substrate were agrochemical characterized by determining the pH, the content in exchange forms of Na^+, K^+, Mg^{2+}, Ca^{2+} and the sum of exchangeable base cations (Madjar et. al., 2008).

The exchangeable cations were extractable in $AcNH_4$, 0.5 M, pH = 4.65, in ratio 1:3 (Gäbriels and Verdonck, 1991).

RESULTS AND DISCUSSIONS

During the vegetation period the cations exchange content from substrate presents differences concerning the cation exchange regularity, that fact resulted from the correlation between sum of exchangeable base cations S_B (me/100g) and Na, K, Ca, Mg and pH (figure 1, 2, 3 and 4) obtaining at each moment of analysis.

The correlation establish for each moment of analysis in decrease order the relation of the cation depends on sum of exchangeable base cations S_B.

At the analysis date of 02.06.2008 cations exchange regularity established was:

$$\mathbf{Mg^{2+} > K^+ > Ca^{2+} > Na^+}$$

with correlation coefficient R = 0.6210 of the pH function depends by S_B.

The Mg, Ca and K ions correlated significant, and the monovalent ion of Na^+ correlated unsignifiant with S_B.

At the analysis date of 30.06.2008 cations exchange regularity established was:

$$\mathbf{Ca^{2+} > Na^+ > K^+ > Mg^{2+}}$$

with correlation coefficient R = 0.5440 of the pH function depends by S_B.

At the analysis date of 31.07.2008 cations exchange regularity established was:

$$\mathbf{Ca^{2+} > Na^+ > K^+ > Mg^{2+}}$$

with correlation coefficient R = 0.4559 of the pH function depends by S_B.

Correlations between S_B, the cations exchangeable content and substrate pH (figure 2, figure 3) released that in the case of Ca^{2+} the correlation is very distinct significant for the analysis moment of 30.06.2008 and 31.07.2008.

At the analysis date of 08.09.2008 cations exchange regularity established was:

$$\mathbf{Ca^{2+} > Mg^{2+} > K^{+} > Na^{+}}$$

with correlation coefficient R = 0.5919 of the pH function depends by S_B.

The Ca^{2+} bivalent ion content correlated significant with S_B, and unsignificant correlation for Mg, K, and Na.

The cation substitution and bonding strength in molecule complex increase with ions valence, that means with the number of positive charges, Mg^{2+} have a greater strength of substitution – bonding than that Na^{+}, respectively Ca^{2+} than that K^{+}. The cation attraction force of the absorbent surface negative charges increased directly proportional with the cation charges. The water molecules polarity from solution determines on cation surface a water molecules layer covering. The substrate retaining the cations with the highest power of absorption, as follows:

$$\mathbf{Ca^{2+} > Mg^{2+} > K^{+} > Na^{+}}$$

Cations desorption from substrate to the substrate solution vary in indirectly sense with the bonding strength of the complex molecule, that decrease with the valence increasing, with cation radius, with atomic mass and with polarization capacity and also with decreasing of hydration grade. Conform to these criteria, mono- and bi- cations are succeeded after following successions:

$$\mathbf{Na^{+} > K^{+} > Ca^{2+} > Mg^{2+}}$$

The Ca, Mg, K, Na exchange ions regularity can be describe by the correlation questions between ions and sum of exchangeable base cations, S_B. The correlation coefficients indicate if the intensity of the exchange process depends on the ratio between the ion quantity and sum of exchangeable base cation in correlation with the pH substrate.

The maximum exchange value was obtaining in the case of Na^{+}, follows in order by K^{+}, Mg^{2+}, Ca^{2+}. The exchange intensity successions for these cations are:

$$\mathbf{Na^{+} > K^{+} > Mg^{2+} > Ca^{2+}}$$

The exchangeable cations quantities increase with the solution concentration.

The cations from soil solution are not uniformly absorbed from organic matter that depends on soil reaction. Organic matter having the charges depending on pH the exchange capacity can be with a high variability. The retention by chelating bond stopped ions from leaching and these became plant available. In the case of retention by adsorption, if the total metal concentration increased the metal adsorbed percent decreased. Calcium and magnesium are specially bonding by the organic adsorbents.

CONCLUSIONS

1. The cation exchange process is described by the correlation between exchanged cation (Ca, Mg, K or Na) and sum of exchangeable base cations, S_B.
2. The correlation coefficients indicated if the cation exchange intensity depends on the ratio between each cation and sum of exchangeable base cations, S_B, correlated also with the substrate pH.
3. The exchanged cations quantity increasing with the solution concentration. The increasing doesn`t follow a linear equation.
4. The cation adsorption capacity increasing directly proportional with the content of the substrate solution salts.
5. The cations retained by chelating bonds become available to the roots plant because the leaching process has been blocked.
6. In case of substrates with high cationic change capacity, the nutrients lost by leaching are low and the nutrients are slowly released when plants require them.

7. The risk of salts accumulation and pH changing are small comparing with the substrates with low cationic change capacity substrates, which require repeatedly fertilizations with low doses.

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FIGURES

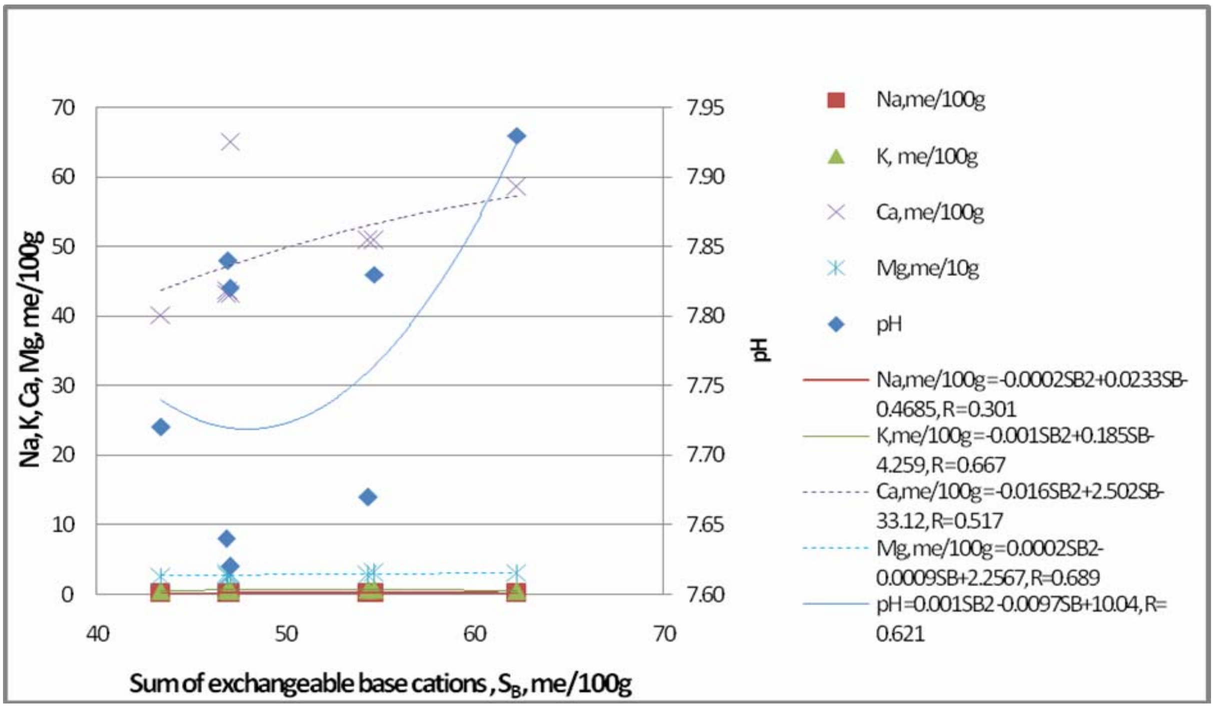

Fig. 1. Correlation between sum of exchangeable base cations S_B (me/100g) and Na, K, Ca, Mg and pH (02.06.2008)

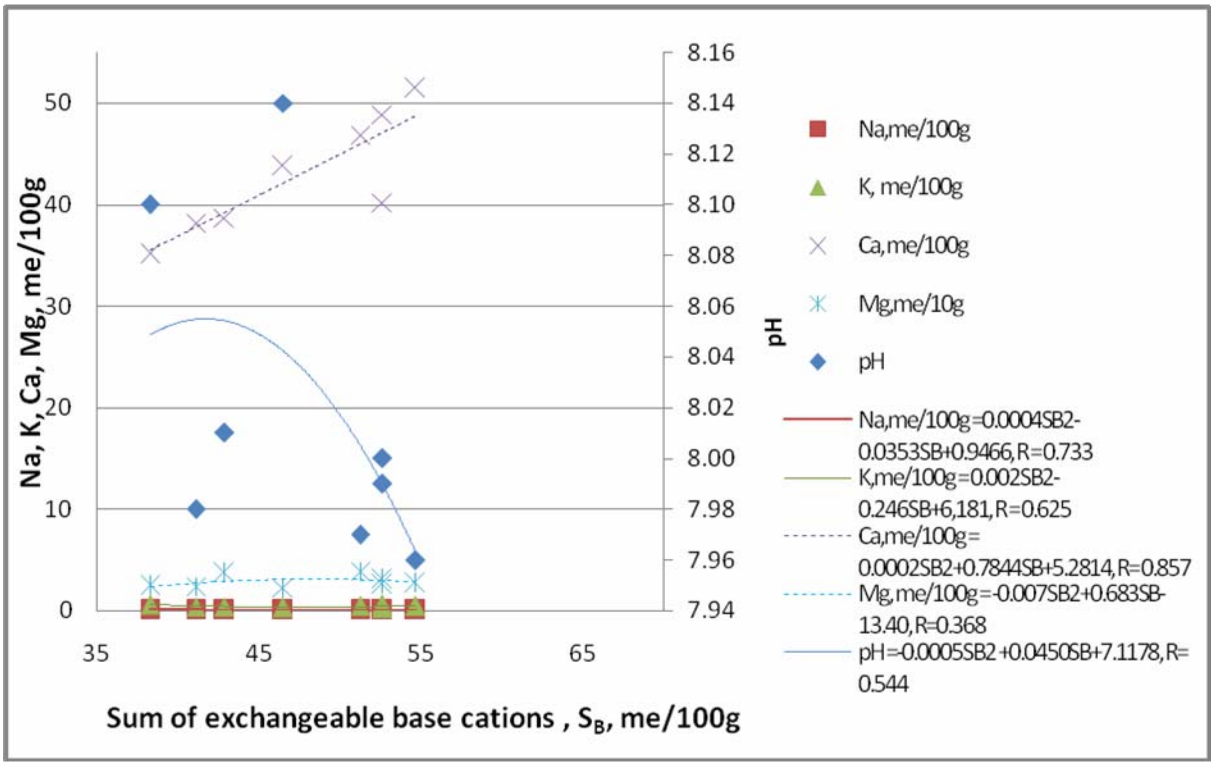

Fig. 2. Correlation between sum of exchangeable base cations S_B (me/100g) and Na, K, Ca, Mg and pH (30.06.2008)

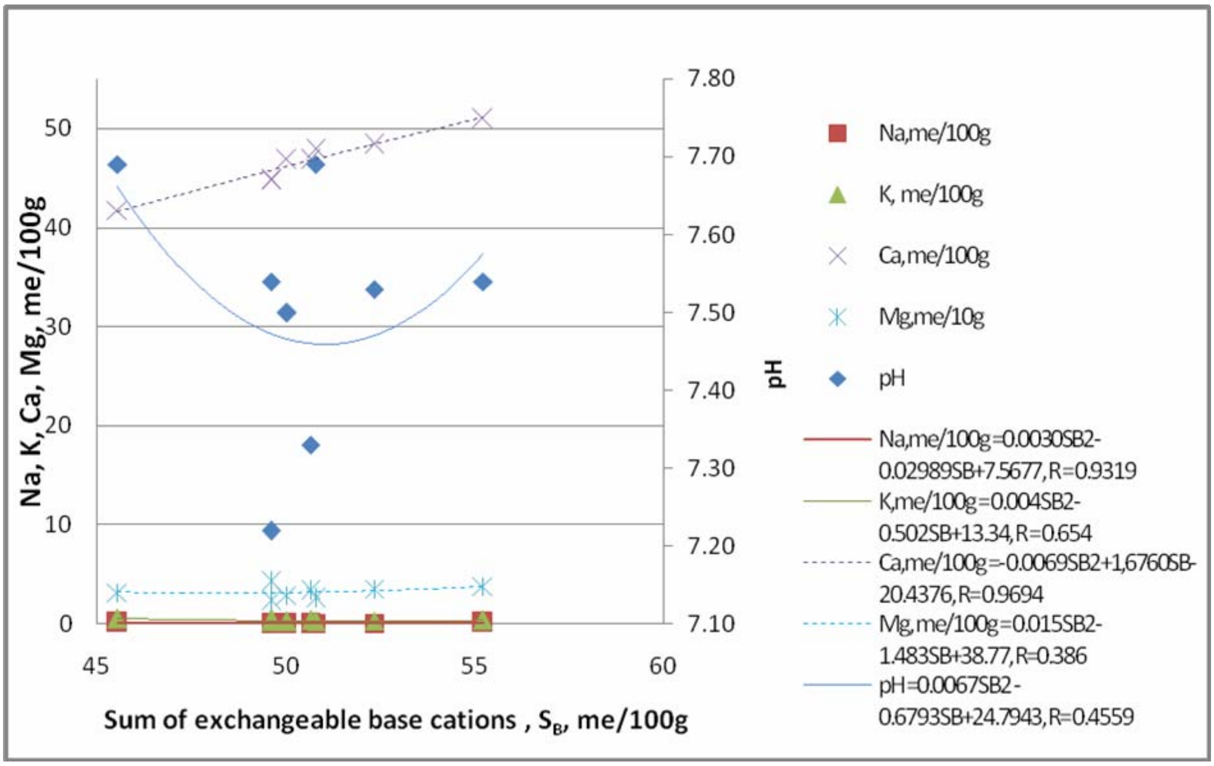

Fig. 3. Correlation between sum of exchangeable base cations S_B (me/100g) and Na, K, Ca, Mg and pH (31.07.2008)

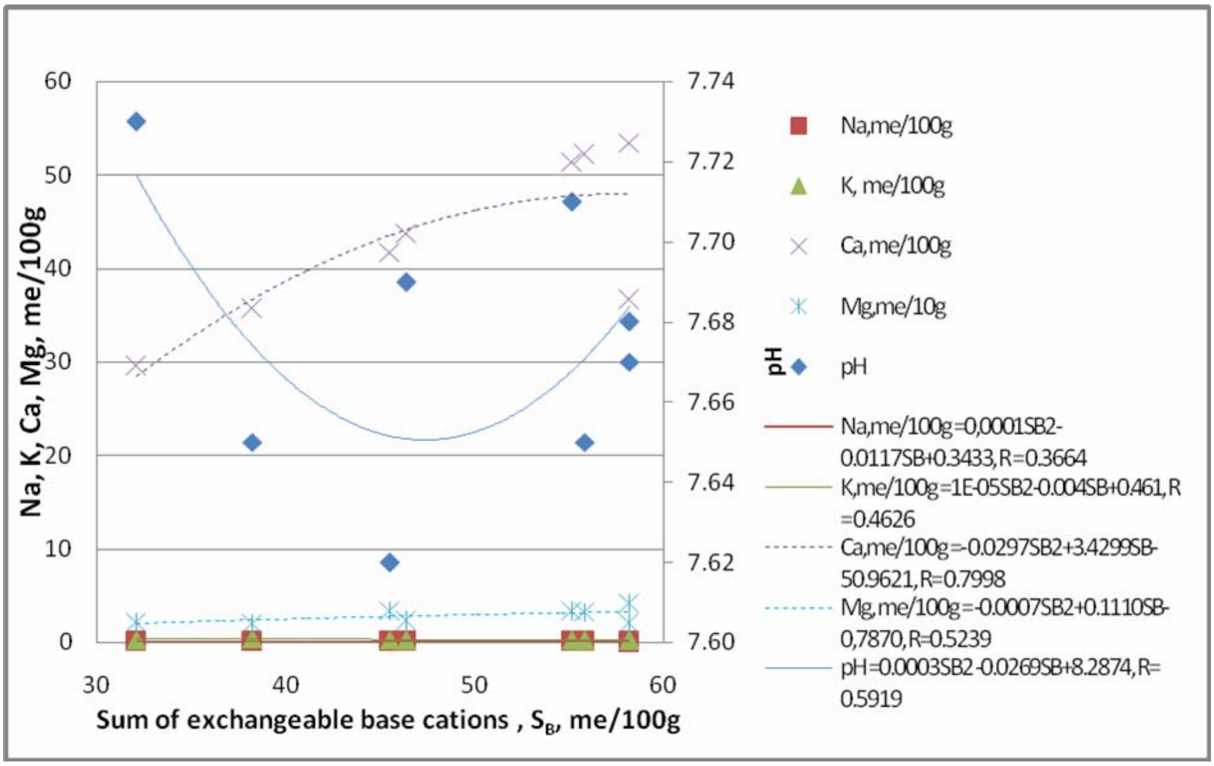

Fig. 4. Correlation between sum of exchangeable base cations S_B (me/100g) and Na, K, Ca, Mg and pH (08.09.2008)

Study regarding the growth and the development of *Spathiphyllum walisii L.* depending on the substratum's type and volume

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Keywords: *Spathiphyllum walisii* L., growth, substrate, duration of blossoming

ABSTRACT

Spathiphyllum is one of the best sold indoor plants, cultivated as a pot plant, being decorative through its leaves and flowers, having modest pretensions about the light, but also for the trade with cut flowers. Moreover, in accordance with a study made by NASA, it is a part of the 10 plants able to filter the noxes and to purify the air (it is very efficient for the removal of the alcohol steams, acetone, benzene and formaldehids). This paper follows to study *Spathiphyllum walisii* L. plants' behavior depending on the substratum's type and volume, with the aim of obtaining plants with a compact bush and with a period of blossoming as long as possible. From the researches that we have made, we can see that the best variant, from the number of inflorescences/ plant and of the length of the blossoming point of view, is the one in which the plants were cultivated in 12 cm pots in the substratum T+P 2/1 (V4).

INTRODUCTION

Spathiphyllum walisii is the top selling ornamental tropical foliage plant because, it addition to beautiful foliage, mature plants produce attractive white flowers that last several weeks. The natural flowering period for Spathiphyllum is generally Jan. through June. Natural flower production begins to decline over the summer and is at its lowest level during the fall months. The ability to induce Spathiphyllum to flower by applying foliar sprays of gibberellic acid (GA3) has made it possible to have a continual supply of blooming plants for sale (Henny, 1995). Treated plants typically flower within 9-12 weeks after treatment, depending upon time of year or cultivar. However, there are some side effects from treating plants with GA3 to induce flowering. Some flowers will have distorted spathes and/or spadices. Foliage of treated plants may have an altered appearance since new leaves produced after GA3-treatment are narrower than original leaves. It also should be noted that chemicals and their proper application can be expensive, and their use may become more restricted as environmental regulations increase. Therefore, other means need to be devel oped to insure a continuous supply of flowering plants.

The aim of ***the present work*** was to study *Spathiphyllum walisii* L. plants' behavior depending on the substratum's type and volume, with the aim of obtaining plants with a compact bush and with a period of blossoming as long as possible.

MATERIALS AND METHODS

The biological material was represented by *Spathiphyllum wallisii L* plants, from the collection of Floriculture Discipline of the Horticulture Faculty from Craiova. The vegetal material, which was obtained by separation the bush, was planted in pots with different sizes (diameter of 12,10, 8 cm) and three types of substratum (peat, peat+ perlit 2/1, peat+perlit 1/1), resulting the following 9 experimental variants: V1 –12 cm diam.xT; V2 –10 cm diam. x T; V3 –8 cm diam.x T; V4 –12 cm diam.x T+P (2/1); V5 (C) –10 cm diam.x T+P (2/1); V6 – 8 cm diam.x T+P (2/1); V7 - 12 cm diam.x T+P (1/1); V8 - 10 cm diam. x T+P (1/1); V9 - 8 cm diam. x T+P (1/1).

During one year after placing the experience, it was followed in evolution the rhythm of vegetative growth at *Spathiphyllum* plants, under the influence of the substratum's type and volume, but also the blossoming from the qualitative and quantitative point of view.

RESULTS AND DISCUSSION

Analyzing the average values of the 9 variants, it can be seen that the average height of the plants has registered big differences in the conditions of cultivating the plants in 12 cm pots (32,21-40,45cm), and small differences (1-2 cm) between substrata at 10, respectively 8 cm pots.

From the obtained results we can see that the plants cultivated in pots with a diameter of 12 cm have registered some values with 49% bigger than the plants cultivated in pots of 8 cm and with 26% bigger than the plants cultivated in 10 cm pots(V2). The composition of the culture's substratum hasn't influences the size of the plants that much, the average values registering between 28,22 cm (T+P 1/1) and 31,09 cm (T).

As a result of reducing the nutrition space, at the end of the experimental period, the average number of leaves per plant varied between 5,85 leaves/pl when the plants were cultivated in 8 cm xT pots (V7) and 19,4 leaves when the plants were cultivated in 12 cm xT pots (V1).

Depending on culture's substratum, significant differences registered only when we used 12 cm pots, to the peat substratum's advantage, which had stimulated the vegetative growth.

Depending on the substratum's volume, the average values of the number of leaves per plant were between 6,21 leaves (8cm) and 12,24 leaves (12cm), and depending on the culture's substratum, the values were between 7,31 (T+P 1/1) and 10,9 (T).

The average number of plants/pot, had a very different evolution in comparison with the other analyzed parameters; the variants which stood out from this point of view were V6 (8cm diam x T +P 1/2), followed by V1 (12 cm diam x T), that registered the highest values of the vegetative growths.

In V6 – pot 8 cm xT+P (2/1) culture conditions, it seems that it was stimulated the differentiation of the vegetative buds, even if at this variant there were registered minimum values of the vegetative growths.

The average number of inflorescences per plant had the highest values (2,6 flowers), at the plants cultivated in pots with a diameter of 12 cm, in peat (V1) and T+P 2/1(V4), while the minimum values of 0,8-0,9 infl./plant were registered for V3(12 cmxT) and V8-(10 cmxT+P1/1).

From the duration of blossoming point of view the best results were obtained at V2, V3,V4, V7 (153 days), in contrast with V6, V8, V9, where the blossoming took only 61 days.

Analyzing the two graphs, it can be seen that not all the variants where it was registered a big number of infl/pl also had a big duration of the blossoming (V1); as a result, the best variants from the blossoming point of view was V4 (12 cm pots x T+P 2/1).

CONCLUSIONS

The plants cultivated in 12 cm diameter pots have registered height plants values with 49 percent bigger than the plants cultivated in pots of 8 cm diameter and with 26 percent bigger than the plants cultivated in 10 cm pots(V2).

The composition of the culture substratum hasn't influenced that much the size of the plants, the average values being between 28,22 cm (T+P 1/1) and 31,09 cm (T).

Depending on the substratum's volume, the average values of the number of leaves per plant were between 6,21 leaves (8cm) and 12,24 leaves (12cm), and depending on the culture substratum, the values were between 7,31 (T+P1/1) and 10,9 (T). In V6 – pot 8 cm xT+P (2/1) culture conditions, it seems that it was stimulated the differentiation of the vegetative buds, even if at this variant there were registered minimum values of the vegetative growths.

The biggest number of inflorescence/plant was registered at the plants cultivated in pots with a 12 cmx T (V1) diameter and in pots with 12xT+P2/1 (V4).

The used substratum of culture and the size of the pots influences the number of infl./pl, but especially the beginning of the blossoming which was in March at V2, V3, V4, V7, in April at V1 and in May at V5, V6, V8 and V9.

The beginning of the blossoming was released 9 months after the establishment of the culture, while at other variants it was released after 11 months.

The longest period of blossoming was seen at V2, V3,V4,V7 (153 days), and the shortest one at V6,V8,V9(61 days).

From the researches that we have made, we can see that the best variant, from the number of inflorescences/ plant and of the duration of the blossoming point of view, is the one in which the plants were cultivated in 12 cm pots in the substratum T+P 2/1 (V4).

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FIGURES

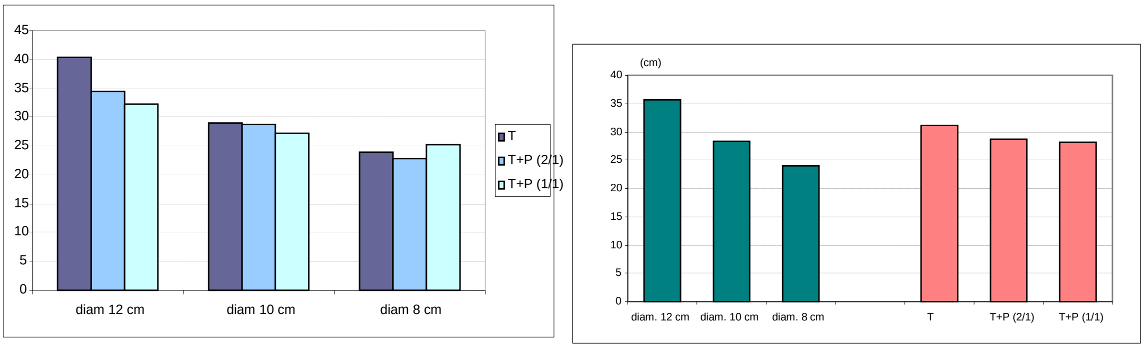


Fig. 1 The height of *Spathiphyllum walisii* L. plants

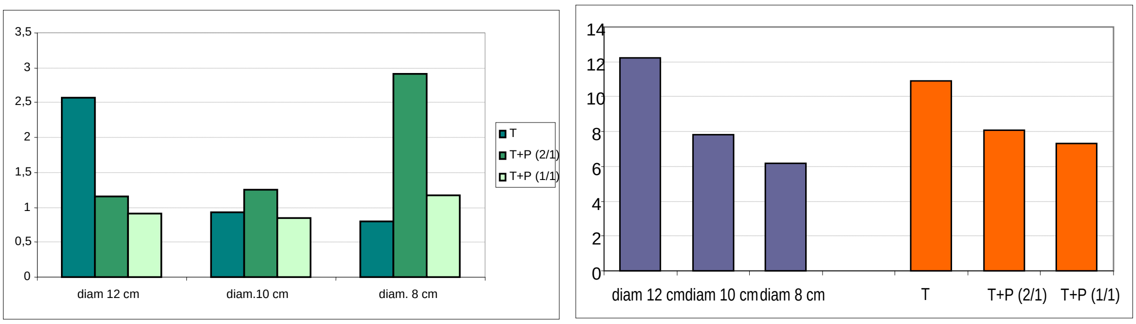
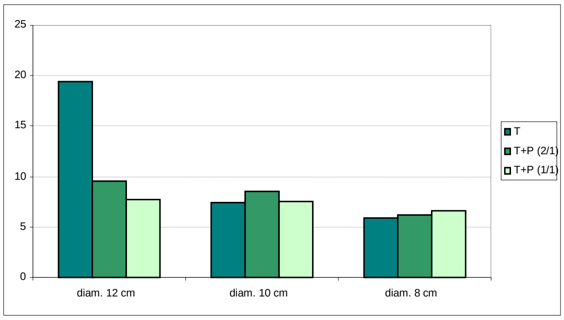


Fig. 2 The average number of leaves per plant



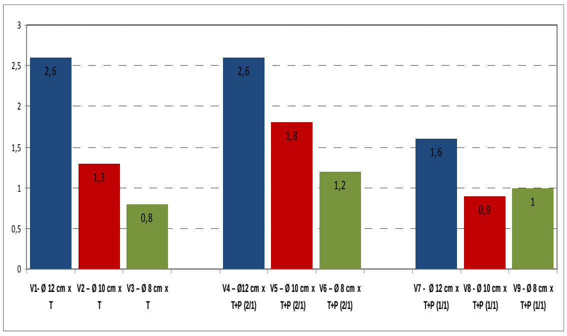


Fig. 3 The average number of plants/pot **Fig. 4** The number of inflorescences per plant

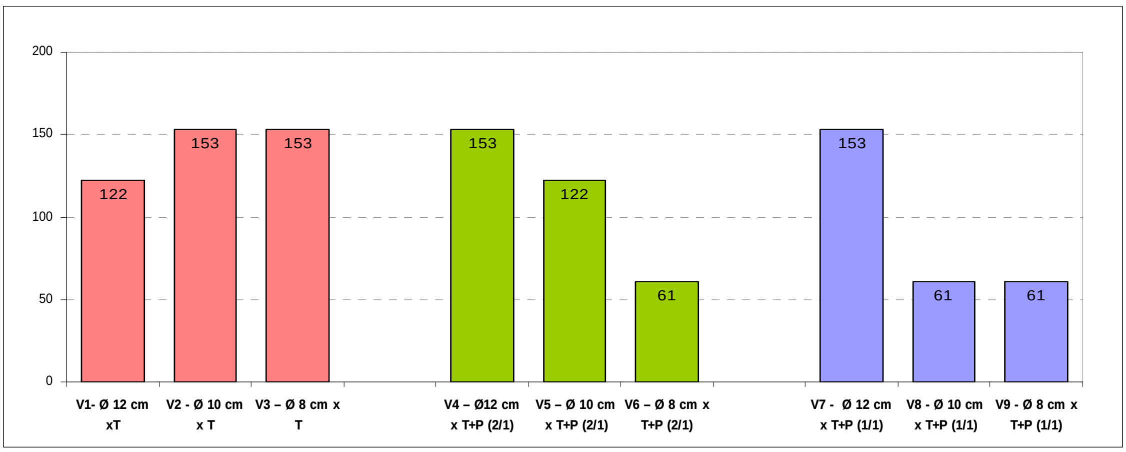


Fig. 4 The number of inflorescences per plant

Lucrări ştiinţifice USAMVB, Seria B, vol. LIII, 2009

Researches regarding the influence of the type and volume of the substratum on the evolution of *Anthurium andreanum Lind.* plants

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Keywords: nutrition space, reduced size plants, growth control, cultural methods, morphological characters

ABSTRACT

During the last years consumers' and producers' growing interest on the reduced size plants was noticed, interest justified by the numerous possibilities to be used in small spaces: apartments, family gardens, paved spaces, balconies and terraces, floral compositions. This paper presents the results regarding the obtaining small sized plants for *Anthurium andreanum Lind.*, a species with a big share in the cut flowers culture, but cultivated as a plant in pots. A cultural method was applied and observed, reducing the substratum volume (nutrition space) and the influence of the type of substratum on the growth and development of the plants. The main morphological characteristics observed were obviously influenced by the volume of substratum, the minimum values of the analysed parameters correspond the variant where the plants were cultivated in a reduced volume of substratum (7.5 cm diameter pots). As a consequence, reducing the nutrition space can be considered the cultural method in order to obtain the reduced size plants at *Anthurium andreanum Lind.*

INTRODUCTION

The anthuriums come from the tropical rain forests of South America and they are beautiful flowering plants, belonging to the Araceae family. *Anthurium andreanum* is grown for its large, glossy, brilliantly colored spathe with raised veining. This species grows to about 60 cm high, with large heart-shaped leaves. The flower consists of a red or pink, sometimes white spathe and a straight, yellow spadix. The main flowering season is the spring, but they can be in flower for most of the year.

The researches had in view the reduction of the *Anthurium andreanum* plants size, through the substratum volume used. It was noticed the growth and development dynamics of the plants, in different size pots and in various substrata of culture.

MATERIAL AND METHODS

The biologic material was made up of *Anthurium andreanum Lind*. plants from the collection of the floriculture discipline of the Faculty of Horticulture from Craiova city.

Two factors were taken into account: the size of the pots and the different types of substratum that were used. The plants that resulted from the separation of the bushes were planted in pots of different sizes (7.5 cm diameter - V1; 8.5 cm diameter - V2 and 10 cm diameter - control). The following types of substratum of culture were used: red peat + sand + earth of leaves (1:1:1); red peat + sand (1:1); earth of leaves + sand (1:1).

By repeated observations during the interval November 2007 - August 2008 the morphological characteristics were observed (the height of the plants, the number of leaves, the length and the width of the leaves, the number of inflorescences, the length and width of the spathe) and the evolution of the plants in the prospect of ulterior use of this cultural method in order to obtain reduced size plants.

RESULTS AND DISCUSSION

As for the influence of the substratum on the height of the plants, the best results were obtained in red peat + earth of leaves + sand and earth of leaves + sand substrata, no matter the size of the pots. The medium size of the plants registered smaller values in the red peat and sand substratum, as compared to the other substrata, the difference being bigger at the plants cultivated in 10 cm diameter pots (figure 1).

The results obtained show that after 9 months from planting in the pots, the biggest values of the vegetative growths were registered at the plants cultivated in 10 cm diameter pots (29.7 cm), and the most reduced values were registered at the plants cultivated in 7.5 cm diameter pots (22.6 cm). A reduction of the size of the plants as compared to the control variant, with 19% in the red peat + earth of leaves + sand substratum and with 22% in the earth of leaves + sand substratum, at the plants cultivated in 7.5 cm diameter pots (V1) is observed.

Because the rapid growth in height of the plants does not represent an advantage for the reduced size plants, the difference between V1 and the control, confirms the fact that by reducing the nutrition space, the rhythm of growth of the *Anthurium andreanum Lind.* plants is slower.

The medium number of leaves per plant was influenced by the substratum of culture. At the plants cultivated in 7.5 cm and 10 cm diameter pots, the biggest number of leaves (11.2, respectively 11.0) was obtained in the substratum made of red peat and sand, and at the plants cultivated in 8.5 cm diameter pots, the biggest number of leaves (11.6) was obtained in the substratum formed by earth of leaves and sand. The smallest number of leaves that appeared per plant (7.3) was registered at V1 in the earth of leaves and sand substratum, as compared to the other substrata of culture that were used (figure 2).

The influence of the substratum volume over the size of the leaves was also observed. 9 months from the planting in pots, an obvious reduction of the length of the leaves as compared to the control was seen as follows: with 26% at V1 and with 22% at V2, in the earth of leaves and sand substratum. In the other culture substrata, the medium length of the leaves had similar values, no matter the size of the pots (figure 3).

As for the medium width of the leaves, close values were registered at V1 and V2 in all three culture substrata. The highest value (7.1 cm) was registered at the control, in the earth of leaves and sand substratum, an the smallest value (4.0 cm) at V1, in the red peat and sand. A reduction of the width of the leaves as compared to the control with 21.5% at V1 and 26% at V2 was noticed in the red peat + earth of leaves + sand substratum. In the earth of leaves and sand substratum the width of the leaves was reduced with 37% at V1 and 32% at V2 as compared to the control. In the substratum made of a mixture of red peat and sand the width of the leaves had close values at all three variants (figure 4).

The culture substratum used and the size of the pots also influenced the number of inflorescences that formed on the plant. In the red peat+earth of leaves+sand substratum, the biggest number of inflorescences per plant was registered in March at all variants: 2.3 inflorescences at V2 and the control variant and 2.5 inflorescences at V1 (figure 5).

In the red peat and sand substratum the appearance of the inflorescences at V1 in November was observed as compared to the other variants, where it appeared later, in February at V2 and in March at control. The largest number of inflorescences per plant was registered in the interval January – June at V1, afterwards a reduction was noticed as compared to the other variants. Following the dynamics of the inflorescences number formed per plant in the earth of leaves and sand substratum, the highest values, during the entire period of the experiment, were obtained at the plants cultivated in the 10 cm diameter pots (V3). At these plants the blossoming was registered earlier, in November, as compared to the other variants, to which a blossoming delay was observed with 2 months at V1 and 3 months at V2.

The influence of the volume and of the type of substratum on the size of the spathe was also under research. It was observed that the highest values, both for the medium lengths of the spathe and for its width were registered in June-July at the control, and the smallest values at V1, in the red peat + earth of leaves + sand substratum. The medium length of the spathe had values between 3.5 cm at V1 and 4.3 cm at control and the medium width of the spathe was registered values between 2.5 cm at V1 and 3.3 cm at control. In the red peat and sand substratum the highest values of the lengths and of the widths of the spathe (3.3 cm and 2.5 cm) was noticed at the plants cultivated in pots with a 8.5 cm diameter, as compared to the other variants that were analyzed.

In the earth of leaves and sand substratum, the highest values of the length and width of the spathe (5.0 cm and 3.4 cm) were registered at the plants cultivated in pots with 10 cm diameter (figure 6).

CONCLUSIONS

The volume and the type of substratum used influenced the main morphological characters, the most noticeable reduction was observed at the plants cultivated in 7.5 cm diameter pots (V1).

The medium number of leaves per plant was influenced more by the substratum of culture used than of the size of the pots.

The beginning of the blossoming was seen after a months from the planting in pots in the red peat + earth of leaves + sand substratum, no matter the size of the pots, as compared to the other culture substrata, where the blossoming took place after 3-4 months from the planting.

The results that were obtained show that the cultural method that was applied (reducing the substratum volume) can be used in production to control the size of the *Anthurium andreanum Lind.* plants. The recommended substratum is earth of leaves and sand (1:1).

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FIGURES

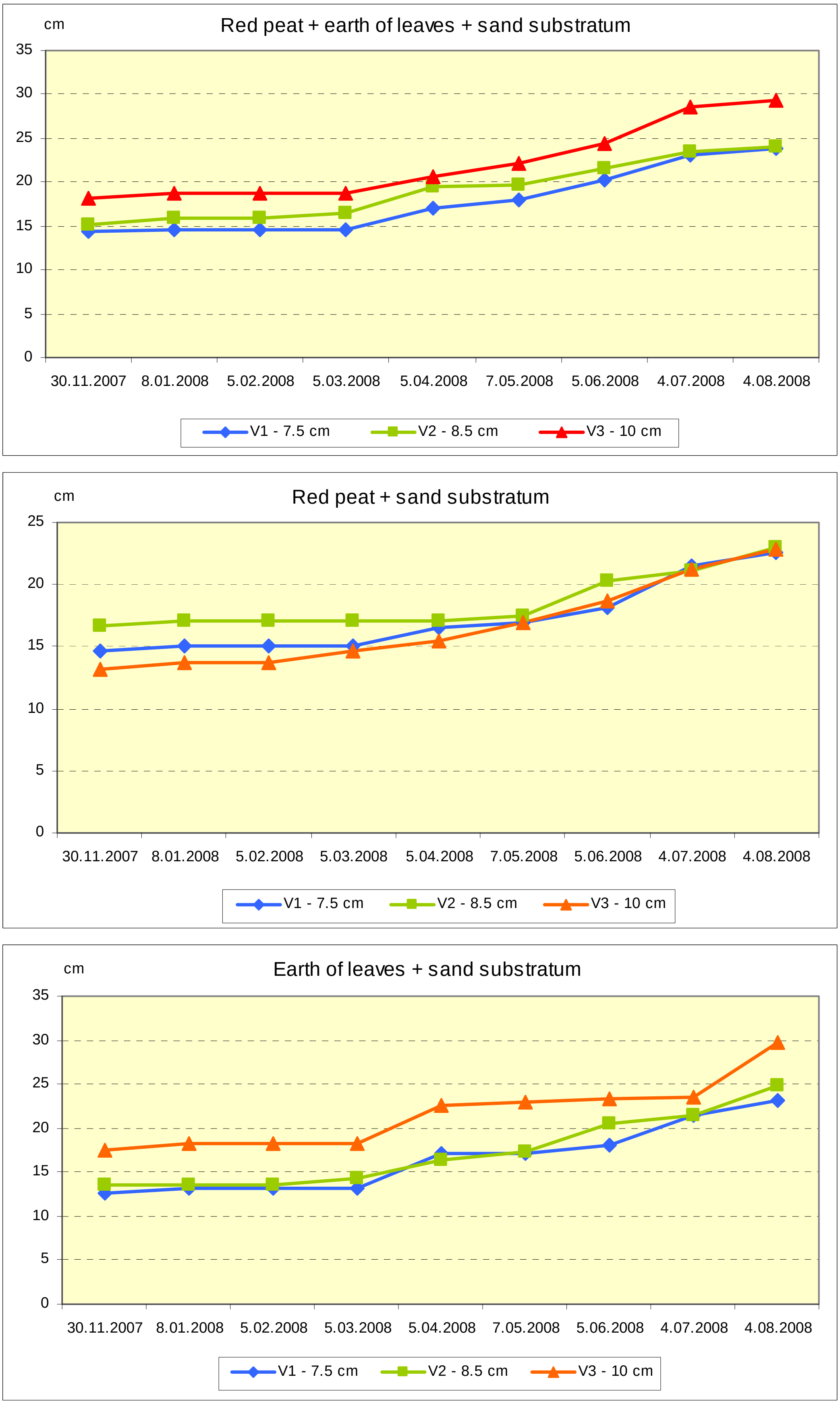


Fig. 1. The height of *Anthurium andreanum* plants

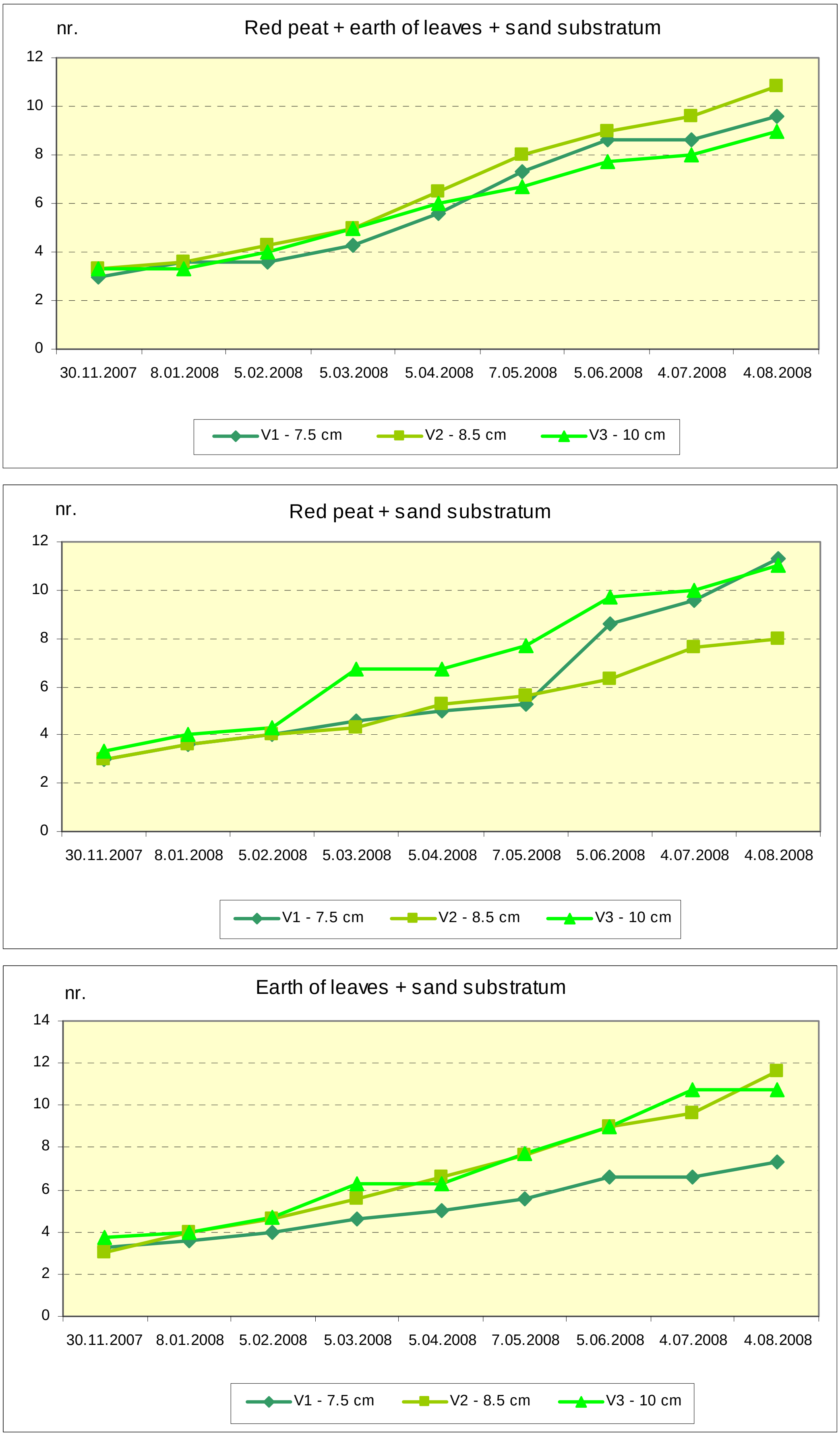


Fig. 2. The average number of leaves per plant

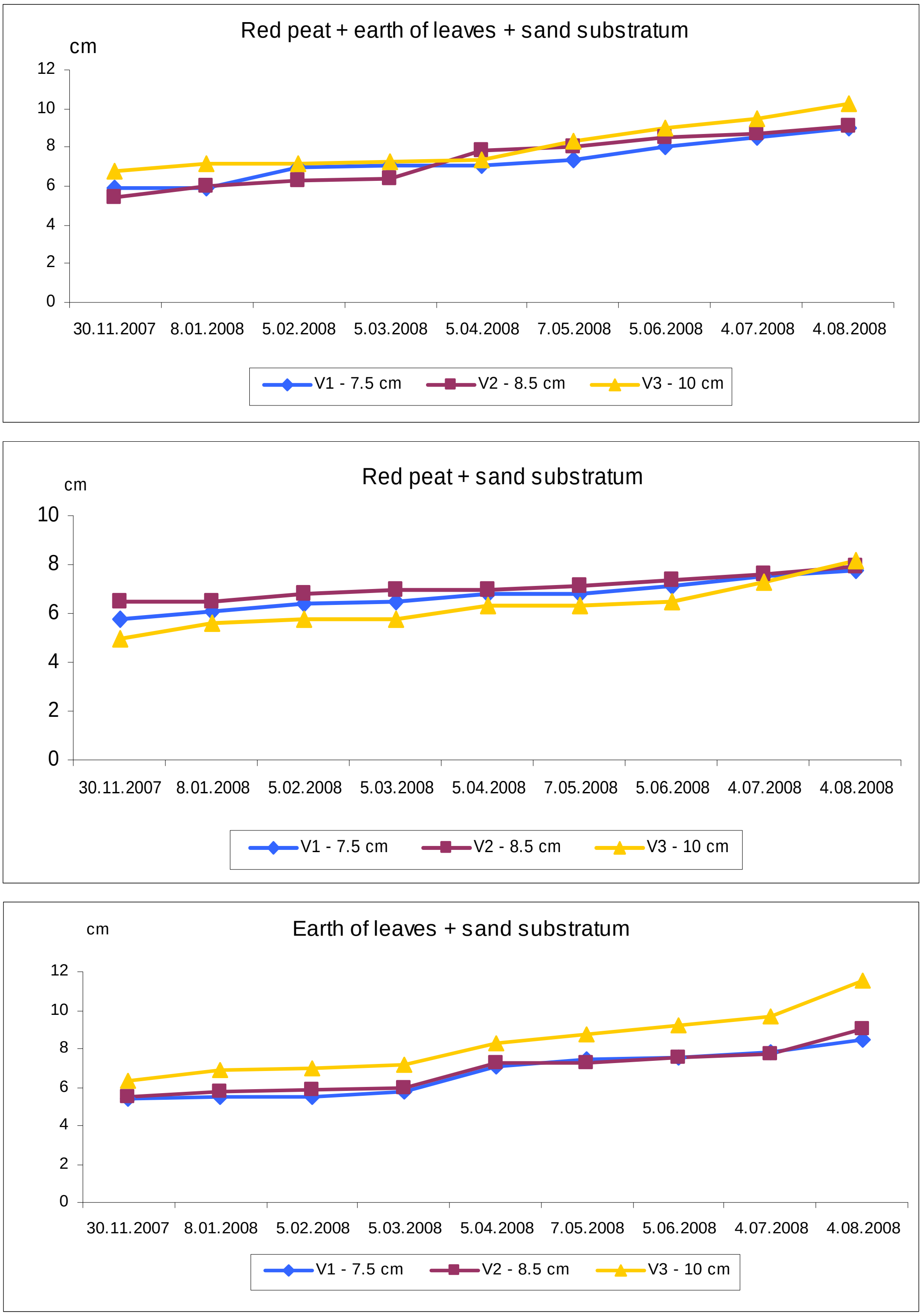
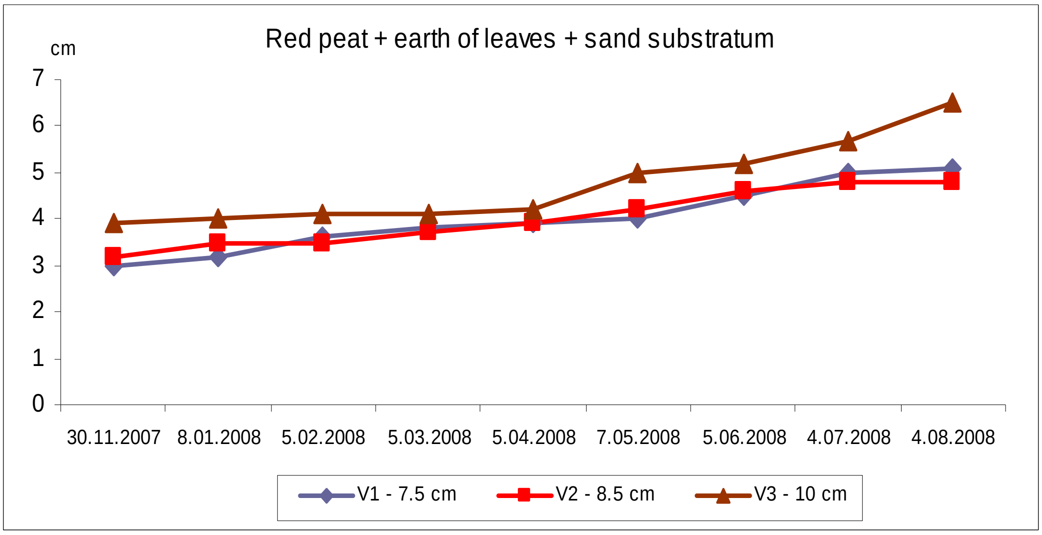
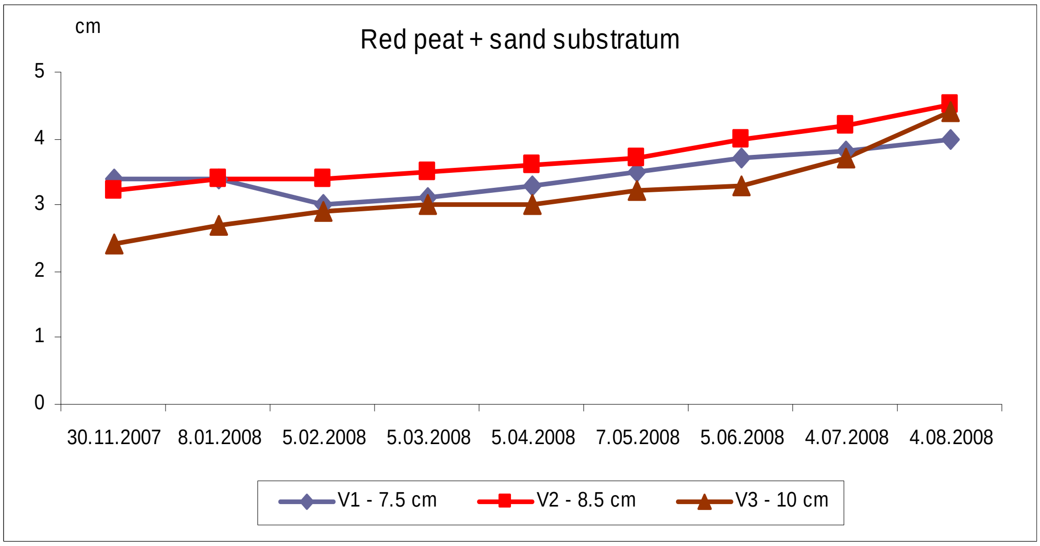


Fig. 3. The average length of the leaves





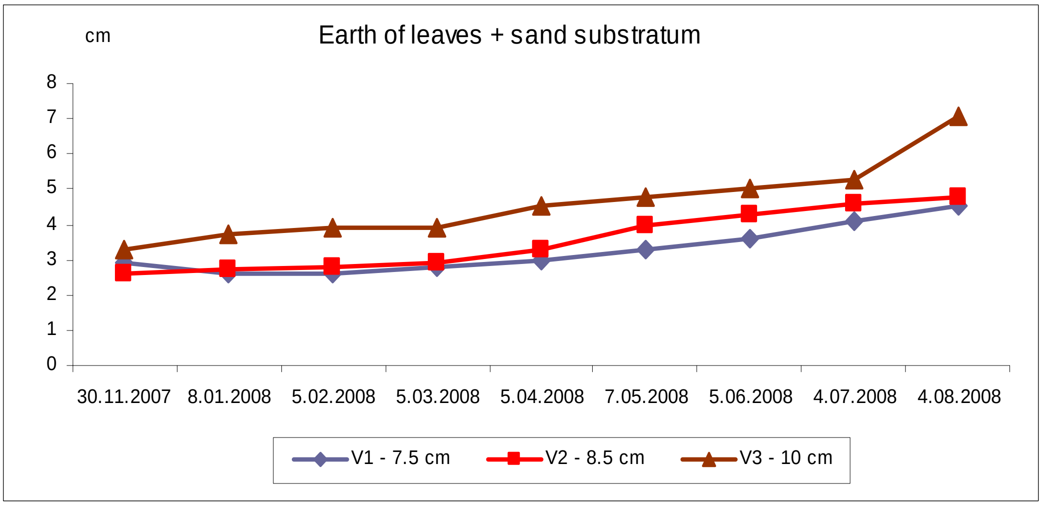


Fig. 4. The average width of the leaves

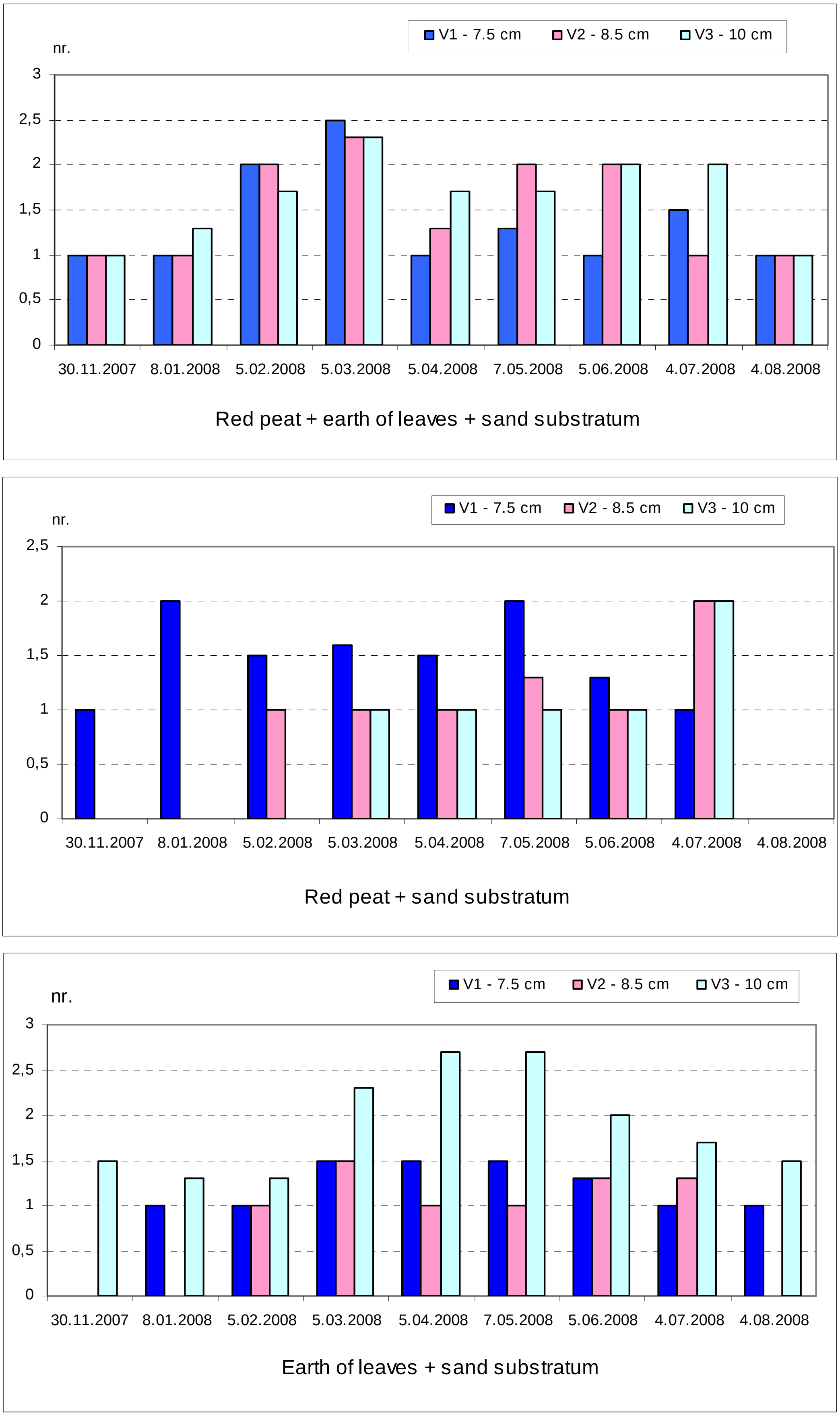


Fig. 5. The number of inflorescences per plant

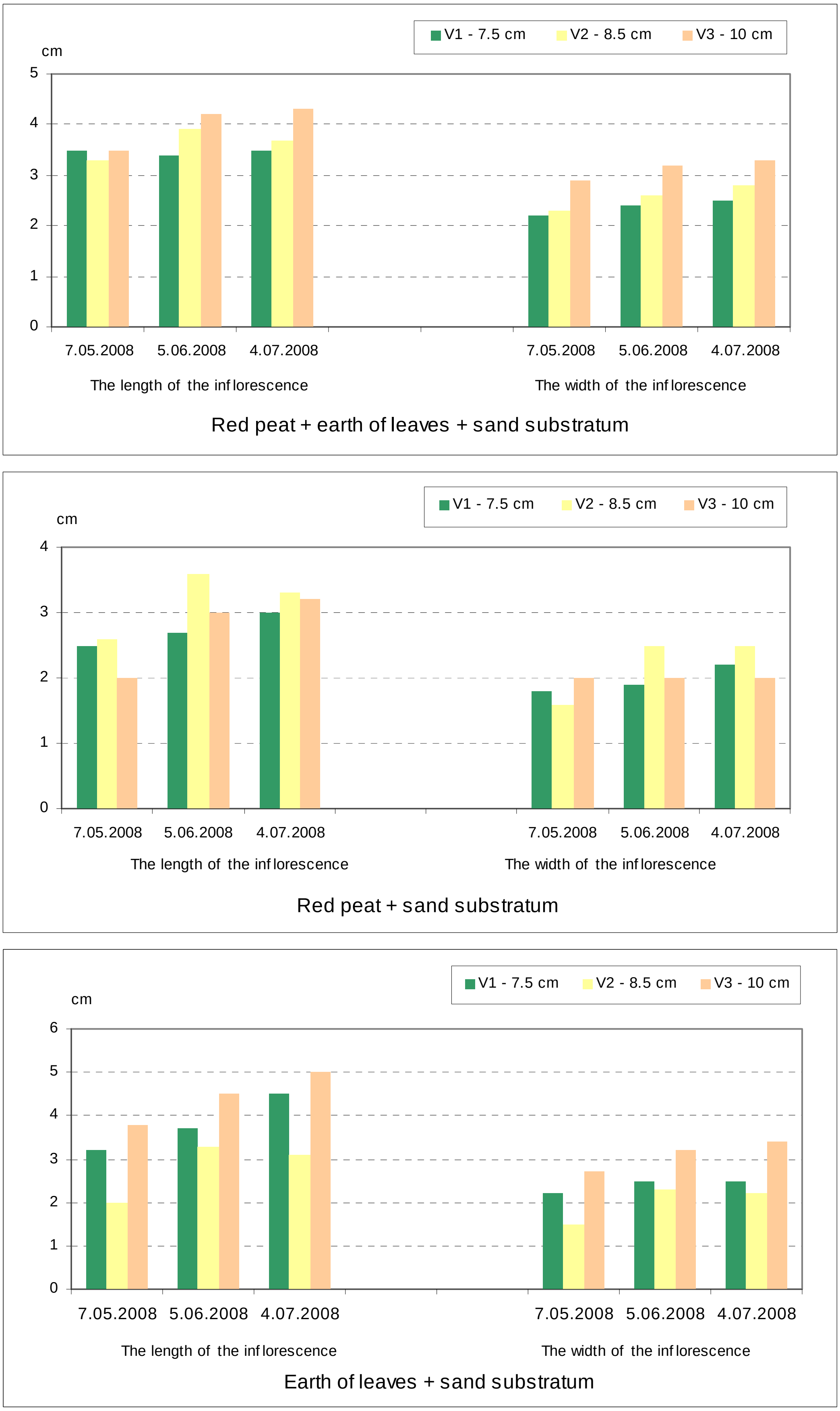


Fig. 6. The length and the width of spathe

Research on planting material production of *Petunia hybrida pendula*

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Keywords: germination potential, germination energy, growth and flowering phenology

ABSTRACT

This paper presents research results regarding sowing time influence on growth and flowering of *Petunia hybrida pendula* plants destined for planting in pots to design balconies and terraces. Petunia plants emergence start was recorded at 8.12 days after sowing according to the sowing period. Emergence was completed in 16-20 days after sowing according to the assured conditions as regards as the sowing period and environmental conditions (heat and humidity). Germination potential of Deep pink seeds variety is influenced by the sowing period (100% the sowing period I - February 16 and 82.7% the sowing period IV - March 20). Seeds of this variety have high germination energy (after 3 days of emergence start there have appeared 52% of seedlings at V1 and 44% at V4). Sowing period influenced the number of the appeared seedlings and especially those chosen as viable, decreasing from the time I to time IV and plants growth phenology and flowering, also. Deep pink variety has proven to be very early and very receptive to good light conditions during plant production. Plants valorification time was different depending on the sowing period. Using the 4 sowing periods (February 1- to March 20) it is provided a phasing scale plant production within April 3 - to May 11, for a period of 38 days.

INTRODUCTION

In the last 10-15 years following the energy crisis and the abandonment of the greenhouses complex, in our country had greatly increased imports of both cut flowers and those planted in pots, the flower market was invaded by many species and varieties in a range of shapes and colours. Thus, balconies and terraces of the blocks and of the new houses, the interiors of buildings, offices businesses, gardens and city parks are decorated with flower plants imported, many non- acclimatized plants to the specifically environmental conditions in our country.

Petunia occupy the first place in the hierarchy of annual flowers used in the decoration of summer - autumn of gardens, parks, building spaces (balconies, windows, terraces, stairs) etc. *Petunia hybrida Hort*. includes several species including the pendula variety, with long pendency position shoots and many flowers is suitable for planting in hanging baskets and pots to decorate balconies and terraces.

MATERIALS AND METHODS

Petunia hybrida seed was used, the type *Surfinia*, *Deep Pink* variety of Dutch origin, company Syngenta Flowers, production of 2007. Quality indices of seeds from the manufacturer were within the rules of the class category I.

Research has been conducted in 2009 in one of the greenhouses of the Department of Vegetable and Floriculture Department of Horticulture at the University of Agricultural Sciences and Veterinary Medicine Bucharest.

Sowing have been carried out in wooden boxes, on peat substrate, in rows spaced at 3 cm. Distance between seeds on a row was about 4-5 mm. This distance was used to eliminate seedling transplanting operation, they being planted in plastic pots with a diameter of 6 cm. Seeds were covered with a very thin layer of peat.

Sowing was done at 4 periods (February 16, February 25, March 10 and March 20) corresponding to the 4 experimentally variants. At each sowing period it was used the amount of 150 seeds. During seedling emergence and growth there were applied the care and maintenance works in the wet state of the substrate by spraying hot water at the ambient temperature using the sieve watering. Also, it was carried weeds removing and substrata aeration between rows by a slightly raising.

Experimental data were statistically processed using analysis of variance and significance testing of differences between variants was done with multiple comparison tests, Duncan test.

RESULTS AND DISCUSSION

Emergence starting of Petunia plants held in 8 days from sowing in the first sowing period (sown on February 16) at 10 days for periods II and IV - sowing on February 25, respectively March 20 and after 12 days for the period III - sown on March 10 (Table 1). Emergence was completed in 16-20 days after sowing, depending on the sowing period. Emergence duration was 8 to 10 days (8 days in V1 and V3; 9 days at V2 and to 10 days at V4).

Data presented in Fig. 1 indicates that the potential for seed germination in the case of period I is 100%. At other times of sowing germination potential range from 86.7% in period II and 82.7% at period IV, with insignificant differences between them, but significant regarding to the first period. It emphasizes that all sowing periods have germination potential values up to the minimum requirement value (70%) for seeds of Petunia (Stephen et al 1967, Royal Seeds Catalog, 1992, Şelaru, 1999, 2007).

Germination energy decreasing of Petunia seeds at V1 (period I) to V4 - period IV (Figure 2) can be explained by excessive growth of external temperatures, unable to maintain optimal temperature in the greenhouse at the appropriate species (optimum temperature is 18 – 20^0C) and greenhouse temperature increased to 28-30^0C. Excessive heat caused the overheating of the substrate and death in the sprouting germ.

The sowing period influences both the number of seedlings and the number of viable ones, which will become available plants (Table 2). After seedlings emergence part are losses in various stages, and their number increases from period I to IV registering significant differences between the first period and other periods, but insignificant between periods III and IV. As a consequence, the percentage of viable seedlings decreases from 97.3% for the period I to 82.3% for the fourth period. Destruction plant to a lesser extent in V1 and the higher proportion of V4 can be explained by the high temperatures that occurred in the last decade of March and the first decade of April.

Table 3 presents the phenology of growth and flowering in Petunia plants in function of the sowing period. It can be observed that plants emergency began to 8-12 days from sowing, and true leaves appeared in 22-27 days after sowing, depending on sowing period (13-14 days after the emergence beginning).

It states that at the first 2 days of the onset of true leaves it was carried out the transplanting directly in pots with diameter of 6 cm and using the same substrate. To plants growth at the stage of 4-6 well developed leaves (very important for determining the optimum time for planting in pots) are required other 11 days after the appearance first true leaves. This stage takes place after 33-38 days after sowing according to sowing period (Photo 1).

The emergence of floral buds is conducted at an interval of 35-40 days after sowing, and after 3-4 days flowers opening occurs. So, opening the first flowers (photo 2) takes place after 30-43 days after sowing depending on the sowing period (39 days to V1, 41 days to V4, and 42 days to V2 and 43 days to V3).

CONCLUSIONS

Deep Pink variety of Petunia, used in this research has proven to be very early and very receptive to good light conditions during seedling production period, petunia being a very demanding plant to light intensity.

Petunia hybrida pendula plants valorification time was different depending on the sowing period. Using the 4 studied sowing periods, it was assured a phasing plants production within April 3 to May 11, during a period of 38 days.

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TABLES

Table 1. Influence of the sowing time on the duration of Petunia plants' emergency

Variant	Sowing period	Emergence start		Emergence end		Emergence duration (days)
		date	Days from sowing	date	Days from sowing	
V_1	I – February 16	February 24	8	March 3	16	8
V_2	II- February 25	March 7	10	March 15	19	9
V_3	III- March 10	March 22	12	March 24	20	8
V_4	IV- March 20	March 30	10	April 8	20	10

Table 2. Influence of the sowing time on the Petunia emergence duration and plants seedlings viability

Variant	Sowing period	Used seeds amounts (no)	Emergence seedlings		Emergence seedlings and exhausted in different stages		Viable seedlings	
			no	%	no	%	no	%
V_1	February 16	150	150 a*	100	6a*	2,7	144 a	97,3
V_2	March 25	150	130 b	86,7	10 b	7,7	120 b	92,3
V_3	March 10	150	127 c	84,7	20 c	15,7	107 c	84,3
V_4	March 20	150	124 c	82,7	22 c	17,7	102 c	82,3

* Values in a column marked with the same letter present significantly different at 5% by Duncan test

Table 3. Influence of the sowing time on growth and flowering phenology of Petunia hybrida

Var.	Sowing date	Emergence		True leaves apparition		4-5 well developed leaves		Floral buds apparition		First flowers apparition		Sowing to flowering duration
		Date	Days from sowing	Data	Days from sowing	Date	Days from sowing	Date	Days from sowing	Date	Days from sowing	
V_1	February16	February 24	8	March 10	22	March 21	33	March 24	36	March 24	39	39
V_2	February25	March 7	10	March 21	24	April 1	35	April 4	38	April 8	42	42
V_3	March 10	March 22	12	April 6	27	April 17	38	April 20	40	April 23	43	43
V_4	March 20	March 30	10	April 3	3	April 24	34	April 29	39	May 3	41	41

FIGURES

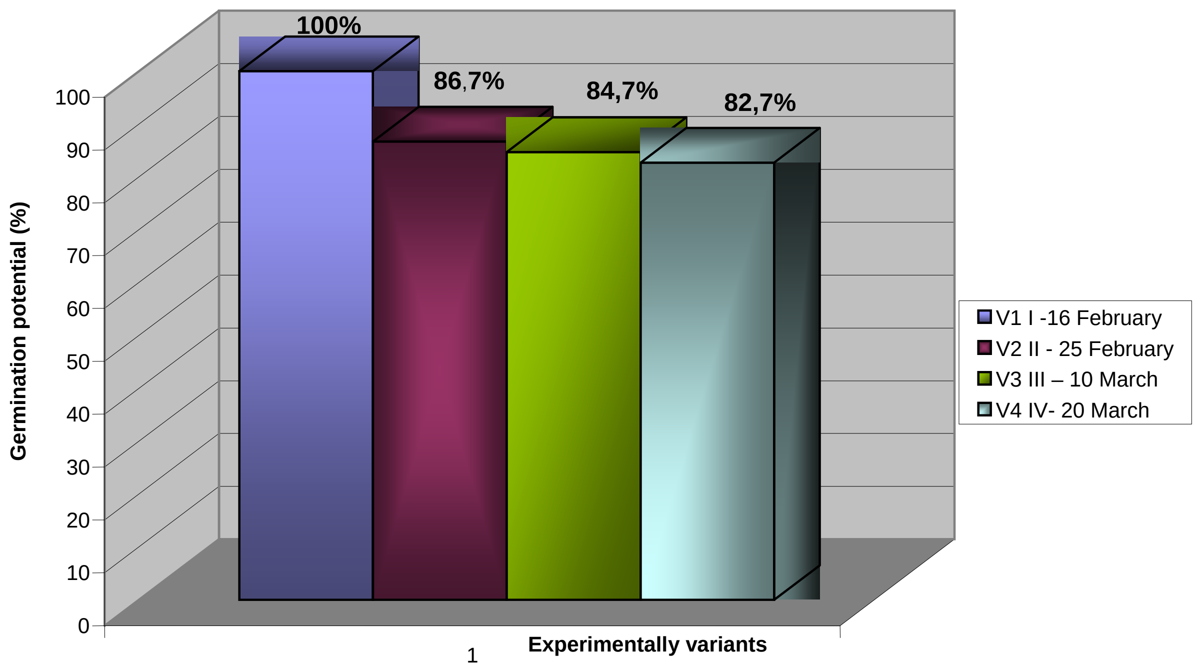

Fig. 1. Seeds germination potential in function of the sowing period

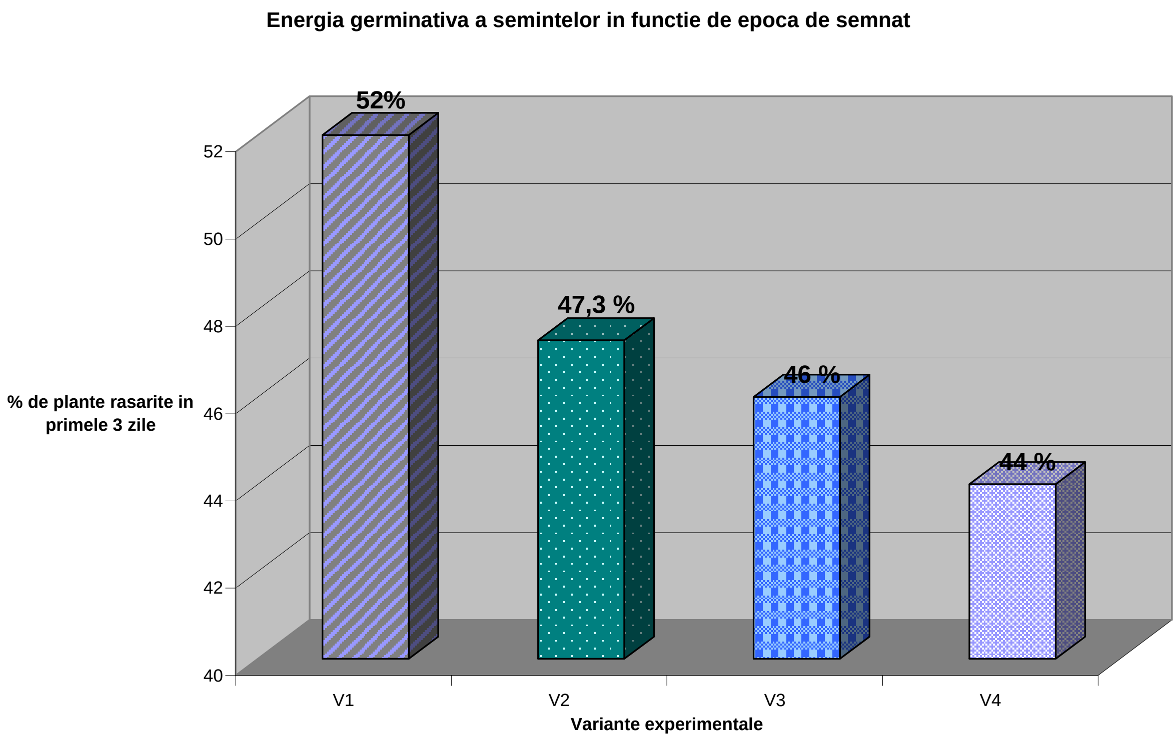

Fig. 2. Seeds germination energy in function of the sowing period

PHOTO

Photo 1. P. hybrida seedling at the stage of 4-6 true leaves

Research on the influence of the exposure location setting and the variety of flowering in some species flower

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Keywords: exposure, growth and development.

ABSTRACT

The paper presents results on the use of willow species *Petunia hybrida* flower (*Surfinia*) with two varieties, *Pelargonium peltatum* two varieties and *Verbena erinoides*, to the balconies and terraces design. There was studied the influence of the exposure site of the decoration with flower plants on willow plants flowering potential. The results highlight the positive influence of E and S-W exposure on the flowering plants of *Petunia h.p.* and *Verbena erinoides* and N and NW exposure on the flowering plants of *Pelargonium peltatum.* Some varieties have shown a greater number of flowers as *White Lime* for *Petunia h.p.* and *'Cascade Rot'* for *Pelargonium peltatum.*

INTRODUCTION

Exposure location decorated with willow flower plants play a key role in the harmonious growth and maximum plants flowering (Sanda, 1971, Sone et al, 1979). All species considered for the study are demanding to light because many sites are located in the N and N – W exposure. The purpose of the present work was to know plants behaviour in condition on terms of less favourable light intensity.

MATERIAL AND METHODS

To perform this research there were used three willow flower species.

- *Petunia hybrida pendula* (Surfinia) with two varieties:

White Lime with white flowers and *Shihi Prurple* with purple flowers;

- *Pelargonium peltatum* with two varieties: *Cascade Rot* with simple flowers, red coral and *Granatt* with double flowers, pronounced red colour;

- *Verbena erinoides*, violet flower selection. Plants used in experiments were produced in 2009 in a greenhouse of the Department of Vegetable and Floriculture of Horticulture Faculty of the Bucharest USAMV.

Petunia hybrida plants were produced by sowing in February and those of *Pelargonium peltatum* and *Verbena erinoides* by cuttings.

When the experiment was organized (June 17, 2009) set the level of plant growth and development needs and determined the length of primary and secondary shoots.

There have been identified 5 phases of development of the floral buds and flowers.

Phase I – floral bud (Petunia) or inflorescence (Pelargonium, Verbena) visible;

Phase II – floral bud, green inflorescences respectively;

Phase III – variety specifically colour appearance;

Phase IV - open flowers;

Phase V - senescence flowers, exhausted

During the period between June 17 and August 19 plants have been pursued in terms of ornamental value and there were weekly recorded number of open flowers (stage IV as development).

Experimental variants were represented by 4 exposure locations, were the pots with flowers have been placed:

V1 - Southern exposure;

V2 - South - West exposure;

V3 - Nordic exposure;

V4 - North - West exposure;
The experimental variant consisted in 3 pots of each variety.

RESULTS AND DISCUSSION

The level of plant growth and development when the experiences were organized

If the case of the species *Petunia hybrida pendula* (*Surfinia*), both varieties were used well-developed plants. Thus, the number of main shoots were 21.3 in the variety *'Shihi Purple'* and 23.2 in, *White Lime* ', length 27.2 cm and 28.1 cm respectively, the secondary shoots number was 30.1, *Shihi Purple* 'and 32.2, *White Lime'*, length 13.8 cm and 13.3 cm respectively, total floral buds and flowers in various stages of development was 66.2 in variety, *Shihi Purple* 'and 74.0 in variety *White Lime*, with significant differences between them (Table 1).

Based on the registered data it can be noticed that both varieties of *Petunia hybrida pendula* are similar in terms of vegetative growing, distinguishing more on flowering potential, the highest values being registered to the variety, *White Lime* '.

The obtained data on *Pelargonium peltatum* shows significant differences in growth and flowering between the two species, variety '*Cascade Rot* ' presented higher vegetative growth and flowering potential, as compared with the variety, *Granatt*' (Table 2), so the length of the main shoots and the inflorescences number was greater more than 2 times at variety, *Cascade Rot* ' as against to *Garnet*', and the secondary shoots number 3.5 times higher at the first cultivar, than at the second one.

Table 1. The level of plant growth and development when the experiences have been organized

Specie/Variety	**Main shoots (nr)**	**Length of main shoots (cm)**	**Secondary shoots (nr)**	**Length of secondary shoots (cm)**	**Bud flowers and flowers in different phases**
Petunia h.p. ,Stihi Purple'	21,3 a	27,2 a	30,1 a	13,8 a	66,2 b*
Petunia hyb. ,White Lime'	23,2 a	28,1 a	32,2 a	13,3 a	74,0
Pelargonium peltatum ,Cascade Rot'	4,1 m	25,4 m	6,5 m	7,9 m	10,0 m*
Pelargonium peltatum ,Granatt'	3,5 n	11,1 n	1,8 n	7,9 m	4,5 n
Verbena erinoides	3,3	11,4	2,7	5,6	3,0

* In a group (a - b for Pelargonium Petunia and only if a column, values marked with same letter are not significantly different at 5% by Duncan test.

At *Verbena erinoides* at the placing moment in the exposure location space plants had of 3.3 long primary shoots of 11.4 cm, 27secondary shoots with the average length of 5.6 cm and 3 inflorescences.

Plants flowering potential according to the exposure location - In the case of the species *Petunia hybrida pendula*, in both studied varieties the number of open flowers per plant is higher in eastern and southern exhibition as compared with the north and west to north - west (but values are higher in the variety *'White Lime'* compared with those determined in the variety *'Stihi Purple'*.

Summary results from the two varieties of *Petunia hybrida* used to decorate the 4 locations with different exposure (Table 6) shows the influence of the exposure and the variety of plants flowering potential.

Table 2. Summary of results on the influence of the exposure and variety on the number of open flowers per plant on *Petunia hybrida pendula*

Specification	Variety		Media on exposure
Exposure	**Shihi Purple**	**White Lime**	
Eastern	67,18 c*	76,45 a	71,82 A*
South - Western	66,58 c	78,51 c	72,55 A
Nordic	59,71 d	72,23 b	65,97 B
North - West	60,65 d	72,71 b	66,68 B
Media on variety	63,53 N*	74,98 M	

*In a group of letters (a...... b for Petunia and Pelargonium average for a column, values marked with same letter are not significantly different at 5% by Duncan test.

Apart from variety the average on the 4 exposure shows two groups: east and south-west and north and north-west respectively. Between the exposure of the group there was recorded a non-significantly differences (71.82 and 72.55 in the south and south-west exposure) and 65.97 and 66.68 at north and west exposure) but significantly between the two exposure groups. Also, it shows significant differences between variety averages (63.53 at variety *'Stihi Purple*' and 74.98 at the variety *'White Lime'*).

In the case of *Pelargonium peltatum* is was found that the north and north - west exposure provide a greater number of inflorescences with open flowers per plant, as compared with the east and south east - west exposure, for both studied species, but the values are higher in variety ' *Cascade Rot* ' as compared to those recorded in the variety' *Granatt* '. Summary results from the two varieties of *Pelargonium peltatum* used to decorate the 4 locations emphasised the influence of the various exposure highlights and variety on the plants flowering potential (Table 3).

Table 3. Summary of results concerning the exposure and variety influence on the inflorescences number with open flowers per plant, on *Pelargonium peltatum*

Specification	Variety		Media on exposure
Exposure	***'Cascade Rot'***	***'Granatt'***	
Eastern	6,93 b*	4,58 c	5,76 B*
South - Western	6,83 b	4,05 c	5,94 B
Nordic	10,25 a	6,25 b	8,25 A
North - West	10,60 a	6,38 b	8,49 A
Media on variety	8,65 M*	5,32 N	

* In a group of letters (A...... B for media exhibition, I..... I for media exhibition variety x) values marked with same letter are not significantly different at 5% by Duncan test).

Apart from the variety, there were found that between averages values on east and south-west on the one hand and between the northern and north - west exposure on the other hand there are not recorded significant differences as regard as the average number of open inflorescences per plant (5.76 and 5.44 in the eastern and south- western exposure and 8.25 and 8.49 in the northern and north - west exposure. It was also noticed significant differences between averages on variety (8.63 in the variety *'Cascade Ro't* and 5.32 at the variety 'Granat't).

The results (contrary to expectations, because the species *Pelargonium peltatum* is a pretentious species as regard as the light) are better at the N and NW exposure and it can be explained by the fact that during the experience period -17 June to 19 August, when there was excessive heat and drought, within these habitats there have been created favourable conditions to plants growth and flowering: less light intensity, lower temperatures, higher relative humidity.

At *Verbena erinoides* values representing the average number of inflorescences with open flowers per plant during the experiment presented in Fig. 1 shows significant differences between southern 6.60 and south-west (5.59) and between northern exposure (4.95) and north - west (5.08), but significant between the two groups of exhibitions, the values being higher at E and SW as compared with those determined at the N and NV exposure.

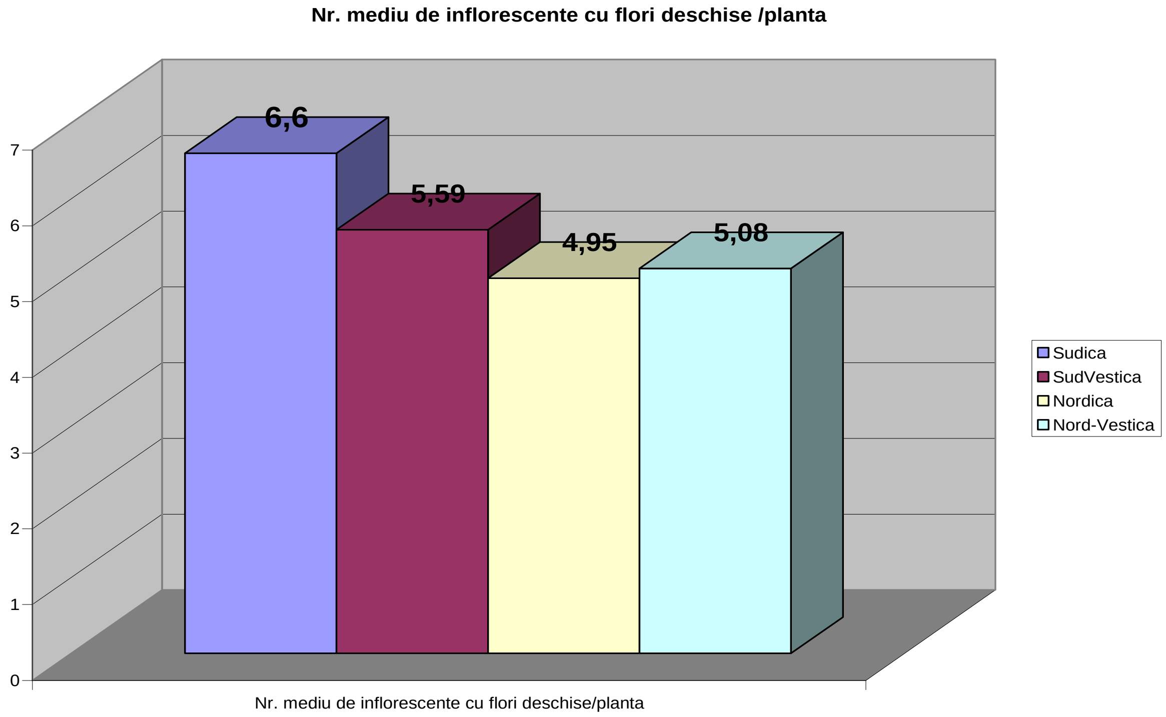

Fig. 1. Average number of inflorescences with open flowers/plant

CONCLUSIONS

The two studied varieties (*'Sihi Purple'* and *'White Lim'e*) of *Petunia hybrida pendula* (*Surfinia*) are similar in terms of vegetative growing, but there are differences in terms of the flowering potential, variety' *White Lime*' presenting a greater number of buds and flowers (74.0 compared with the variety *'Stihi Purple'*).

Pelargonium species recorded a greater number of open flowers per plant at N and NW as compared with E and SW exposure for the variety *'Cascade Rot'* as against '*Granatt*'. *Verbena erinoides* species was characterised by a higher average number of open inflorescences per plant determined to E and S-W as compared to N and N-W exposure.

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The peculiarities of Picea glauca 'Conica' vegetative propagation from cuttings in plant trays in dependence on the rooting medium

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Keywords: rooting hormone stimulator, number and, length of roots.

ABSTRACT

Cutting propagation is one of most significant area of the modern horticulture. The data on the peculiarities of *Picea glauca* 'Conica' vegetative propagation from cuttings in plant trays in dependence on rooting medium is presented in the paper.

INTRODUCTION

Dendrological decorative species are generally slowly growing, that is why the nurserymen's preoccupation consists in to obtain planting material of high quality in a relative short time (Davidescu et al., 2001). Cutting propagation is perhaps the most fascinating as well as frustrating area of plant propagation. Cuttings that rooted in high percentage last year may not fared as well this year (Dirr and Heuser, 1987). The variables involved in successfully cutting propagation are numerous and success is not necessarily guaranteed from year to year. Under the vegetative propagation understands the propagation of plant which is produced with the aid of some parts drawed from vegetative organs of plant so named cuttings. The specimens obtained by that way conserve biomorphologically characteristics of the species also its heredity peculiarities too. For that reason, vegetative propagation found a large implementation in decorative horticulture with a view to producing decorative planting material (Rubţov, 1961).

MATERIAL AND METHODS

The investigations concerning propagation from cutting in plant trays were performed in special greenhouses covered over by polyethylene and provided with fog system and evaporative cooling system for maintaining a moderate temperature and high humidity. The experience was organized in January, March 2007. The cultivar *Picea glauca* 'Conica' as biological material served.

For cutting the biological material of studied cultivar, follow trays variants of rooting media were established: perlite - 100%, peat + perlite - 50% + 50%, sphagnum - 100%. Concomitantly, follow variants of cutting treatment with hardwood rooting hormone stimulator were performed: V_1 - control, V_2 – IBA (indolebutyric acid) powder talc - 0, 3%. The treatments were performed by powdering the basis of cuttings. A single type of cuttings was used, specially, hardwood cuttings from two phase of vegetation: a) cuttings drawed during physiologically deeply resting vegetative period (January); b) cuttings drawed before the initiating active vegetation (end of March).

The experience involved two repetitions, for each variant a repetition included 25 cuttings. The cuttings were sticked in plant trays provided for plant propagation. The bottoms of the plant trays are perforated for ensuring the drainage and proper aeration, ulterior the plant trays together with planted cuttings were placed in the greenhouses and fixed on the plastic support, which also improves the aeration of the cuttings, such avoiding its putrefaction.

The determinations and biometric measurements performed after extracting the cuttings consist in: a) the number of rooted cuttings able for transplanting, b) the length of the primary root, c) the number of the primary root.

RESULTS AND DISCUSSION

The percent rooted cuttings in dependence of the hardwood rooting medium. The best results and, very significant for *Picea glauca* 'Conica', 62% or 31 units, were registered in the case of sticking the cuttings in the hardwood perlite - 100% medium, drawed before the initiating active vegetation (end of March) and, using the rooting IBA-powder talc - 0, 3% stimulator, at the same time evidencing its favorable action, however the control cuttings, untreated and, drawed in the same phenological period, were constituted only 38% or 19 units. The cuttings drawed during deeply resting vegetative period were achieved a rooting percent much than reduced, i.e. 30% or 15 units in the variant of treated cuttings and, 16% or 8 units in the case of those untreated (fig. 1, tab. 1).

In the case of another two variants of hardwood rooting media, the results were more reduced from the point of view of successfully rooting process, as follows:

peat + perlite - 50% + 50% (1:1) at the cuttings drawed and sticked in January the rooting percent constitutes 22% or 11 units in the case of those treated and, 14% or 7 units in the case of that untreated but, in March, 54% or 27 units at the treated cuttings and, 36% or 18 units those untreated (fig. 2, tab. 1);

sphagnum - 100%, in January, 14% or 7 units at the treated cuttings and, 8% or 4 units in the control variant, in March 38% or 19 units the treated cuttings and, 20% or 10 units in the control variant (fig. 3, tab. 1).

The average roots length. Over all the variants of the treatment with IBA- powder talc were established the considerable growing of the average length of cuttings roots. The most important results were evidenced at the cuttings rooted in perlite - 100% rooting medium, drawed at the end of March, achieving the length of 4, 26 cm (fig. 4, tab. 1).

The average number roots. This important quality indicator of the cuttings was positive influenced at the tested cultivar *Picea glauca* 'Conica' by the treatment with the rooting stimulator IBA powder talc, meantime, over the rooted cuttings in the sphagnum - 100% hardwood rooting medium, in the case of those cuttings during deeply resting vegetative period, i.e. January, this phenomenon being remarked in the case of another experimental studied media (tab. 1, fig. 5).

CONCLUSIONS

1. The highest rooting percent was established in the case of the hardwood rooting medium the variant perlite - 100%. Concomitantly, is established that the cuttings drawed and sticked at the end of March possess a higher rooting percent, comparatively with those sticked in January, event determined at all experimented studied rooting media. In conclusion, the optimal period of drawing the cuttings of the cultivar *Picea glauca* 'Conica' for rooting is the end of March.

2. In the case of treated cuttings with rooting hormone stimulator, the percent of rooting was higher, comparatively with those untreated.

3. The cuttings treatments with rooting hormone stimulator determine a good and considerable growing of the average number of the roots and of the average length of the roots, in conclusion the rooting quality increase.

4. The rooting media influences over the percent of rooting, the number and the length of the roots. In our case, the rooted cutting in the rooting medium of peat + perlite - 50% + 50% (1:1) positively increases the number of roots, thus contributing to obtain of a high quality of rooting cuttings.

The achieved success was obtained due to the correct establishment of the moment for cutting gathering, its treatment with the rooting hormone stimulator, realizing of the greenhouses effect and, fog system, also respecting of all agro-technical measures during vegetative multiplication by hardwood cuttings. The rooting resulted in all the tested variants of rooting media with various rooting percentage. Obtained results, i.e. the rooting more than 60%, are very important for the horticultural practice, because is opening the way towards the industrial rooting cutting of the cultivar *Picea glauca* 'Conica'.

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TABLE AND FIGURES

Table 1. *Picea glauca* 'Conica' rooting indexes in dependence on sticking period, rooting medium and hormone treatment

***Picea glauca* 'Conica'**							
Drawed period	**Rooting medium**	**Variants**	**Number of drawed cuttings**	**Number of rooted cuttings**	**Percent of rooted cuttings**	**Average number of roots per cutting**	**Average length of roots per cutting**
January	Perlite - 100%	Control	50	8	16	3,5 ± 0,19	3,18 ± 0,15
		Treated	50	15	30	4,13 ± 0,17	3,71 ± 0,04
	Peat + Perlite (1:1)	Control	50	7	14	4,29 ± 0,42	1,80 ± 0,09
		Treated	50	11	22	4,91 ± 0,21	2,19 ± 0,04
	Sphagnum - 100%	Control	50	4	8	5,00 ± 0,41	2,22 ± 0,13
		Treated	50	7	14	5,86 ± 0,26	2,66 ± 0,05
March	Perlite - 100%	Control	50	19	38	2,74 ± 0,18	3,77 ± 0,08
		Treated	50	31	62	3,19 ± 0,13	4,26 ± 0,03
	Peat + Perlite (1:1)	Control	50	18	36	3,44 ± 0,15	2,76 ± 0,07
		Treated	50	27	54	4,07 ± 0,12	3,32 ± 0,03
	Sphagnum - 100%	Control	50	10	20	4,30 ± 0,21	3,54 ± 0,10
		Treated	50	19	38	4,95 ± 0,16	4,17 ± 0,04

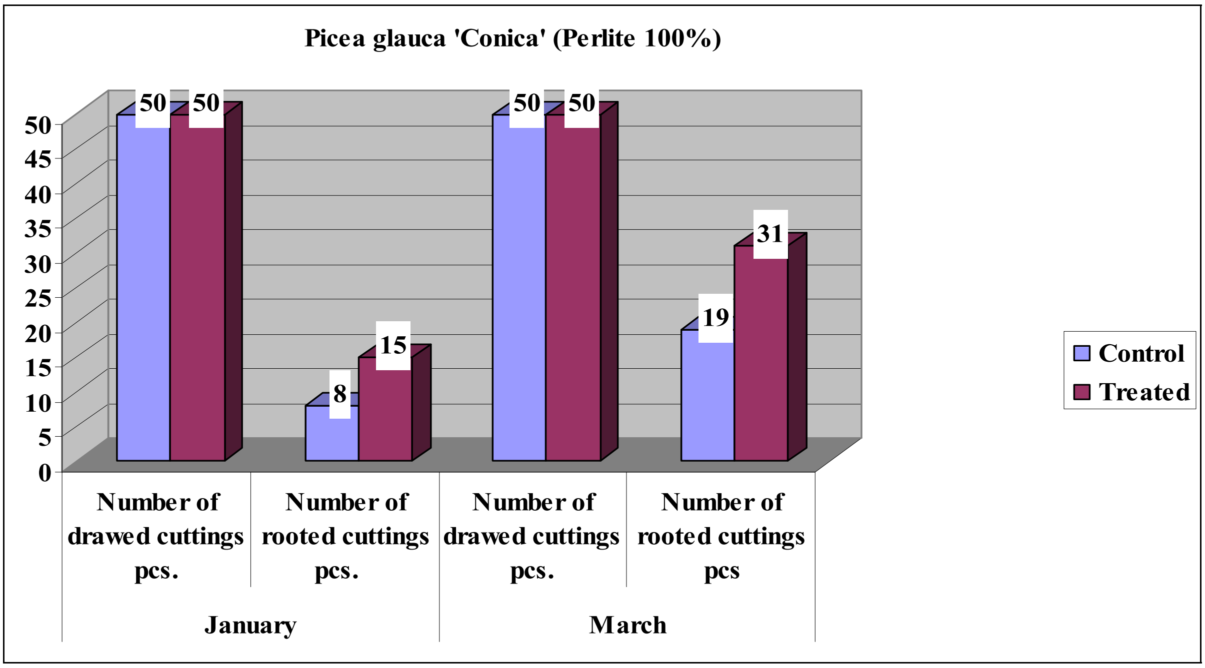

Fig. 1. Number of the rooted cuttings of Picea glauca 'Conica' sticked in Perlite 100% rooting media

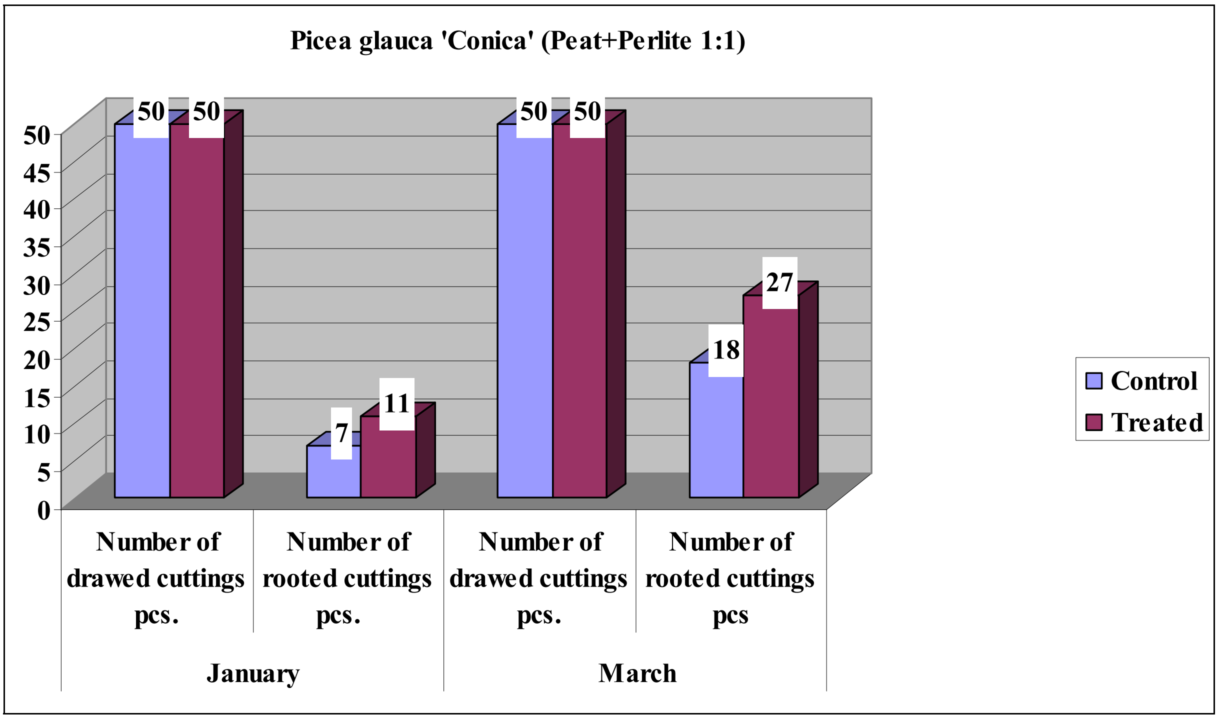

Fig. 2. Number of the rooted cuttings of Picea glauca 'Conica' sticked in Peat + Perlite 1:1 rooting media

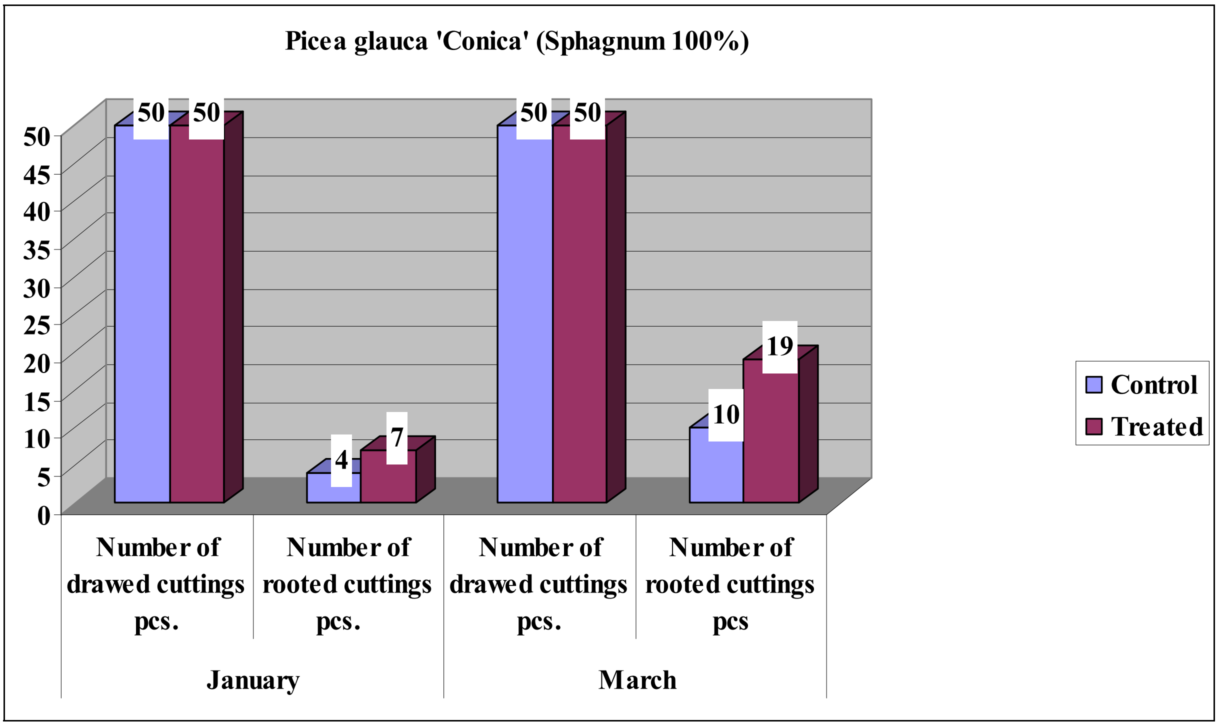

Fig. 3. Number of the rooted cuttings of Picea glauca 'Conica' sticked in Sphagnum 100% rooting media

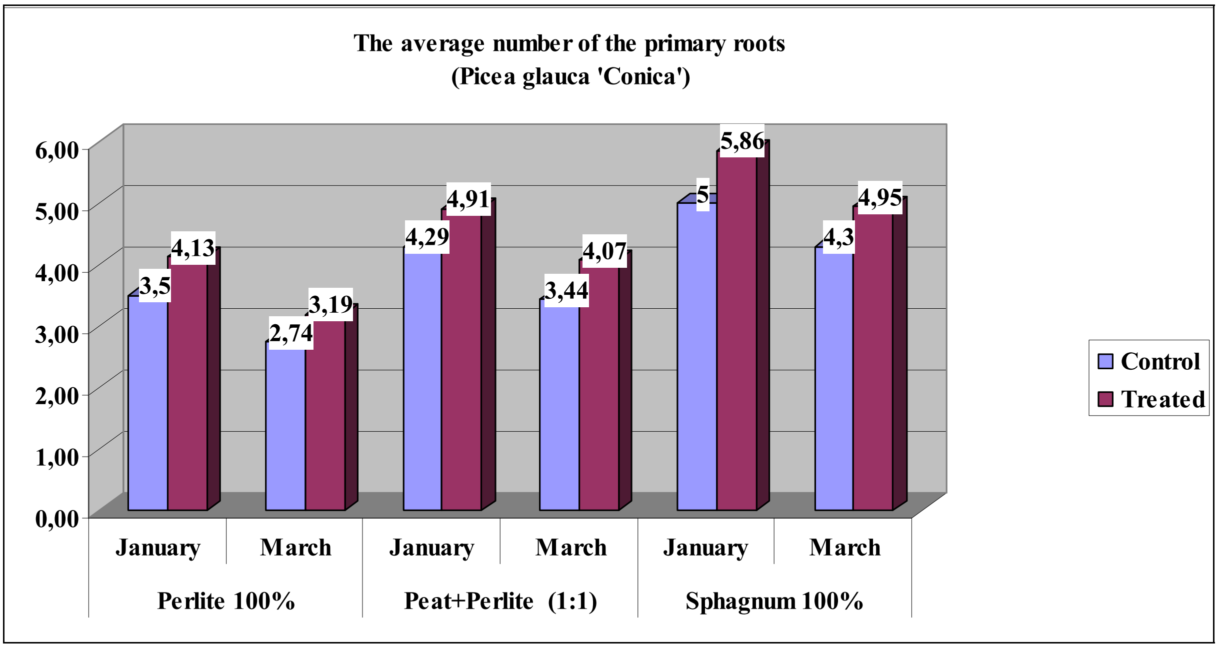

Fig. 4. The average number of the primary roots of Picea glauca 'Conica'

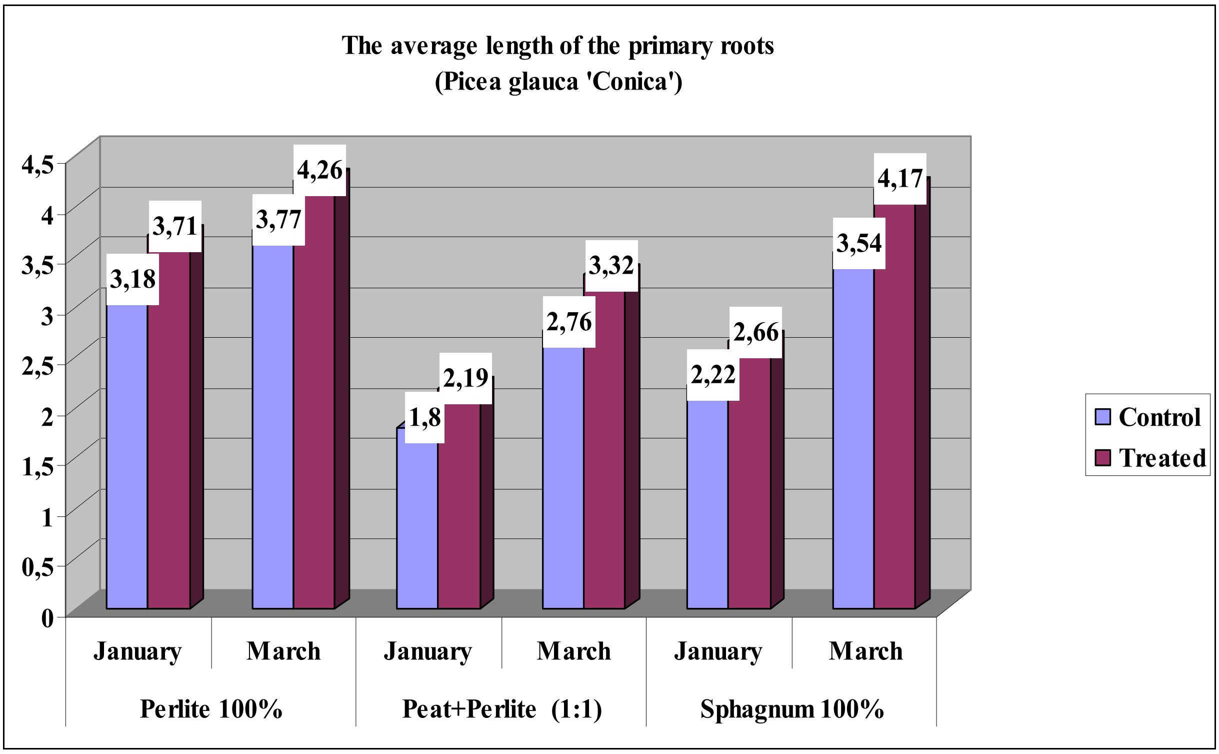

Fig. 5. The average length of the primary roots of Picea glauca 'Conica'

LANDSCAPE ARCHITECTURE

Proposed strategy for the development of an urban design in Astley Park

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Keywords: Urban design, parks, design concepts, design proposals

ABSTRACT

Astley Park in Chorley, Lancashire, is a Grade II listed park in the centre of the town. Third year degree students from Myerscough College were approached to develop a design for the redevelopment of an underused area of the park. Using local influences and historic information two design packages have been created to meet the design brief and overcome the challenges associated with the site. Building a working partnership with the client's early concepts has been developed over a six month period to produce 2 distinct designs for the same area.

INTRODUCTION

Astley Park in Chorley is a large historic park within the centre of the town. In 2005 a group of local residents founded the Friends of Astley Park; a voluntary group who share a love for the park and who now work in partnership with the council and other interested groups in preserving and enhancing the space within the park. The aim of the group is to ensure the park is maintained to the highest levels and to protect and preserve the park's wildlife and natural habitat.

In September 2008, Myerscough College was approached by the Friends of Astley Park with regards to the possibility of redesigning an area of the park as part of the final year degree students' work. The brief for the module was to offer the students the opportunity to demonstrate their skills of garden design to the maximum.

In fulfilment of the brief the designer was asked to produce a full client package which would include drawings, concepts and final designs in order to illustrate concise ideas to the client.

The primary clients for the purpose of this project will be the Friends of Astley Park. In addition to the work with this main group of people, further links will be made with Chorley Council, local schools, other local groups and charities in order to obtain a comprehensive brief of which to feed into the developing ideas and concepts.

An initial meeting was set up between the students and the Friends of Astley Park on the 15th October 2008, to ascertain the ideas of the group on which to build early concepts, the following points were raised:

- For the area to be welcoming and encourage more users.
- To be used as an entertainment area, amphitheatre, outdoor classroom and social gathering area.
- To attract more families, and not to exclude teenagers and young children.

HISTORY AND CURRENT USE OF THE PARK

Chorley is a market town in Lancashire, North West England. Astley Park lies close to the centre of Chorley and covers 43 hectares, with 2 main entrances into the park.

It has a range of facilities which include, football and rugby pitches, bowling greens, tennis courts, pitch and putt, play area, pets corner, woodland areas and café. At the heart of the park is Astley Hall, a Grade I listed Jacobean house (www.chorley.gov.uk).

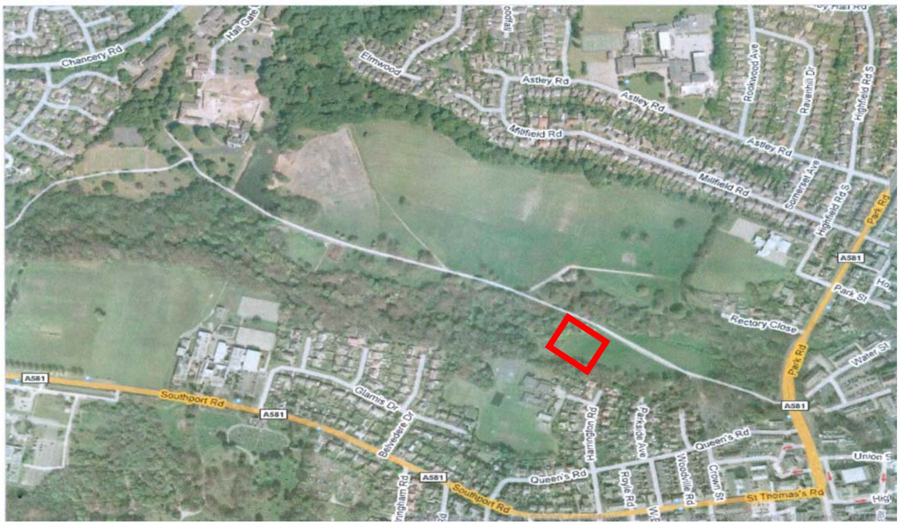
Astley Hall is described as one of the most unusual and yet least known of the gentry houses of the North West (Wright, 1998). The Hall was handed over to Chorley Corporation as a free gift from the then owner in 1922. Due to the richness of the history associated with this site it has earned Astley Hall Grade I listed status and the Park has been listed as Grade II.

Plate 1. The Park Road entrance
Source: View North East, taken at 11.20hrs, on 24.09.08, taken by Jayne Challender

Plate 2. Astley Hall
Source: View North West, taken at 09.45hrs, on 24.09.08, taken by Jayne Challender

Site Analysis

The area designated for redesign is situated at the East side of the park and accessed by the Park Road entrance, see Figure 1. The area has been highlighted red on the image, and the approximate size of the area is 5,300 $metres^2$.



Characteristics

The site lies in a north-easterly direction. Although there are existing mature trees lining two sides of the site, it is an open area and is exposed to winds. The site slopes upwards towards the rear of the plot and undulates across the site and creates a natural bowl shape in the centre of the site.

Due to the undulating nature of the ground there is also a frost pocket within the 'bowl' area of the site (see Plate 3).

Plate 3. Undulating ground showing potential frost pocket.
Source: View South East, taken at 10.00hrs, on 24.09.08, taken by Jayne Challender

The views in and around the site are very natural with lots of trees and shrubbery and plenty of open green space.

The land around Chorley is formed mainly of Bolder Clay/Glacial Till, this formation means that the land is naturally poorly drained. The area specific to the redesign within the park is mainly grit and rock, adding to the issues of drainage.

Climate information

The British Isles experiences a typically maritime climate, with prevailing south-westerly winds from the Atlantic Ocean. Maritime climates such as this experience generally cool summers and mild winters, with a much smaller annual temperature range, the average variation being about 10^{o}C. The climate of the western half of the British Isles is dominated by maritime tropical and maritime polar air, which means that it receives considerably more rainfall than in the east.

The chart in Figure 2 displays the monthly rainfall in millimetres (mm) over a four year period, from January 2005 to the end of October 2008, in relation to Chorley.

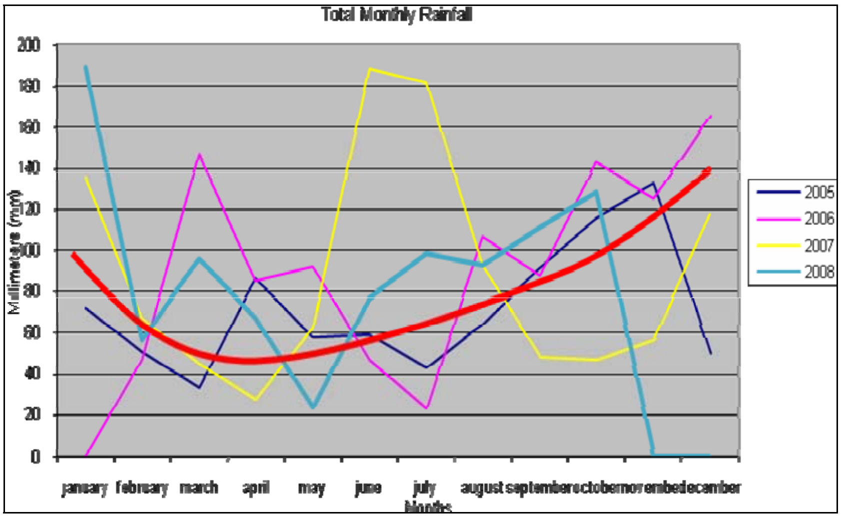


Fig. 2. Total Monthly Rainfall 2005 to 2008
Source: www.metoffice.gov.uk

Locally the area benefits from a mild climate with warm summers but wet winters**.** At present temperatures appear to remain fairly consistent year on year and local temperature ranges for the past 3 years can be seen in Figures 3 to 6.

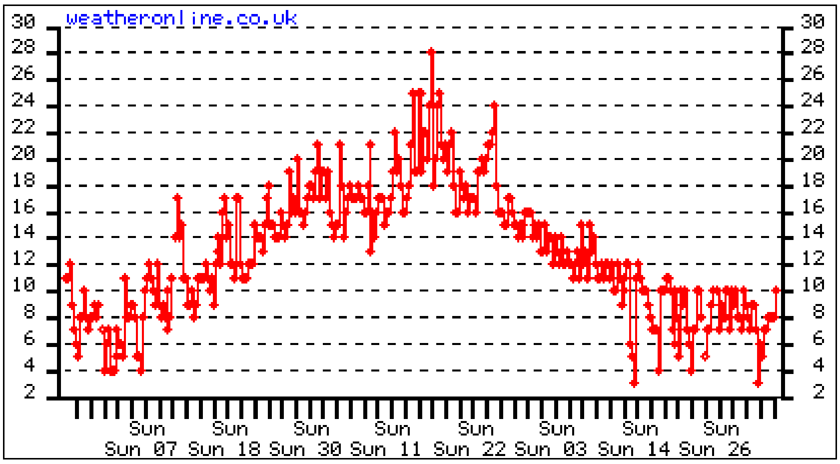


Fig. 7. Monthly Temperatures 2005

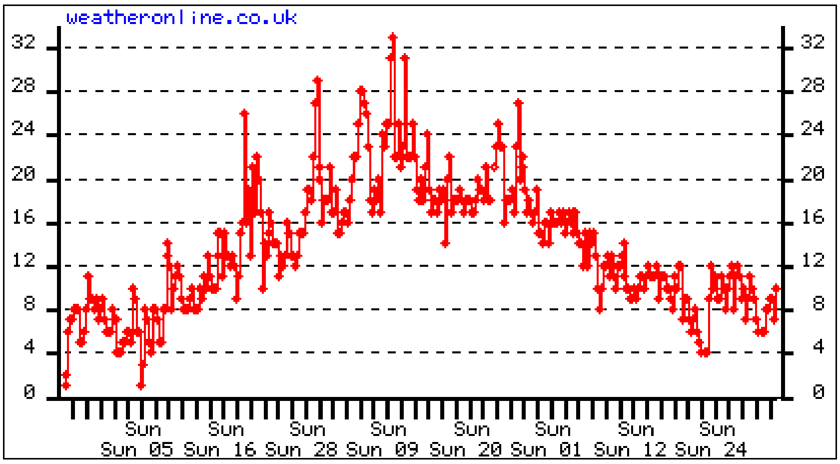


Fig. 8. Monthly Temperatures 2006

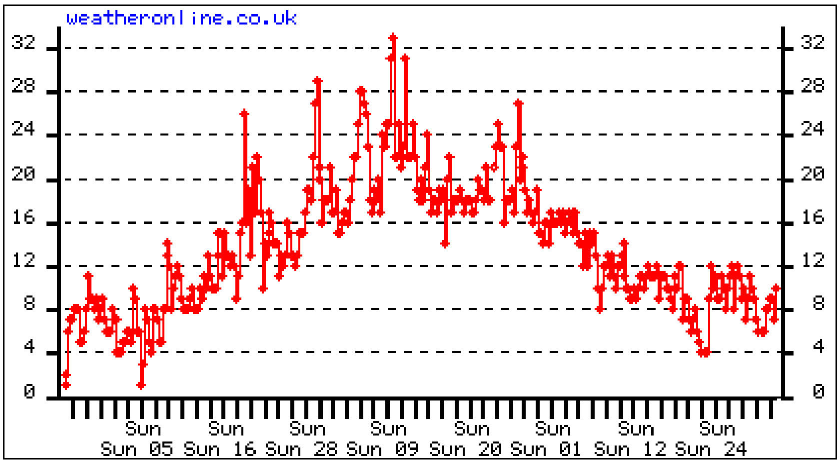


Fig. 9. Monthly Temperatures 2007

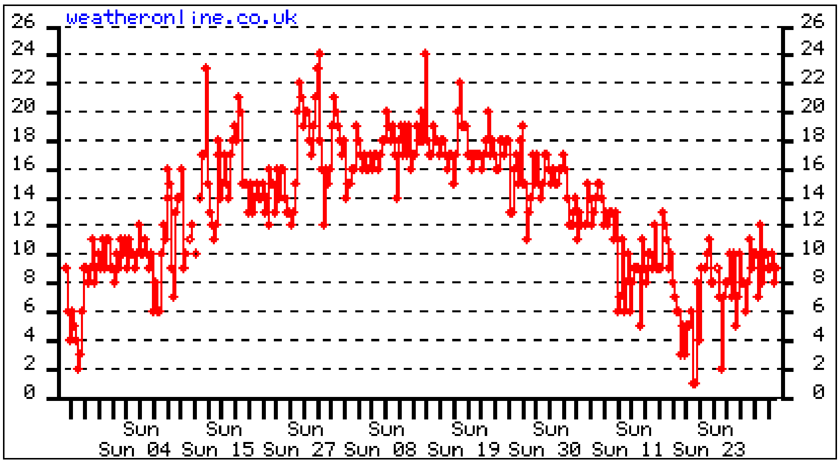


Fig. 10. Monthly Temperatures 2008

Source: Blackpool Weather Station (for Figures 3-6)

CHALLENGES

Throughout the comprehensive site survey and analysis it has been noted that the site has several issues which need to be addressed during the development of the design, these issues are as follows:

- This area of the park is extremely under used. The main path through creates a corridor which leads the visitor onto other areas but gives them no reason to stop and spend any time here.
- Although this area of the park is very green and open, aesthetically it is very non-descript. There are no elements of interest, nothing to hold the visitors attention and want to spend time here.
- There is not sufficient access across the site. The terrain is undulating and therefore difficult to walk over for those with mobility problems. The lack of paths over the area means there are no links to other areas which adds to the feeling of this being a corridor to the rest of the park.
- The drainage within this area is a real problem. The water logging of the north of the site and the wet ground in other areas following heavy downpours makes the area unusable.

In order for the final design to be successful all these issues must be addressed throughout the development phases of the project, in addition to meeting all the requirements of the client brief.

LEGAL AND PLANNING CONSIDERATIONS

The land associated with Astley Park is classified as Green Belt, and due to the rich history associated with the park it has been granted Grade II listed status by Chorley Council. The guidance associated with designated Green Belt areas will have implications on proposed developments within Astley Park.

Any development will have to maintain, and where possible enhance, the distinctive character of the countryside and to promote rural sustainability. It should promote the value of the Borough's built heritage and maintain and enhance the quality of the historic environment. It should also maximise the opportunity to participate in leisure and tourism activities.

CONCEPT DEVELOPMENT AND FINAL DESIGNS

The students involved in the redesign of the park were asked to develop their own individual ideas for the creation of a new and dynamic space within the park. The following design proposals were submitted by the students.

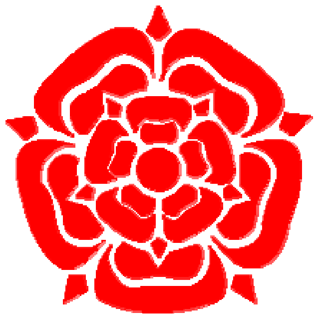
1. THE LIFE GARDEN

Inspirations for Proposed Design

The Cenotaph in Astley Park provides a place to remember the men of Chorley who gave their lives in many wars including World War I, World War II, Falklands, Iraq and Afghanistan. Chorley had many losses during these wars in particular World War I; many of these losses came from a local army regiment, The East Lancashire Regiment. These men became known locally as the Chorley Pals.

The designer believes it would be a fitting tribute to those who fell, to create a place that reminds generations of today and in the future of what was achieved by these brave men giving their lives.

The Emblem of the East Lancashire regiment contained a Lancashire rose as shown below.



A Lancashire Rose

It was from the above information that the idea of a 'Life Garden' was conceived.

Proposal

Astley Park is steeped in history and the designer feels that this is something that should be continued. To create something modern would be out of place and not in keeping with the character of Astley Park. Therefore the idea is to create a formal garden which will be planted in a modern informal style.

The original design contained a parterre style space using the Lancashire rose. This design proved to have too many segments, which would have caused access problems for disabled users and visitors with pushchairs. The design was subsequently changed and became a Poppy.

The Poppy still conveys the same message, the battlefield where many of the men fell is known as the Somme in France, and is now a Poppy field.

The proposal is to create a place where the freedom these people died for can be appreciated and enjoyed. This is not a garden for grieving or for sadness; it is a garden to celebrate life.

The Life Garden

The park is a memorial park which commemorates the Chorley men who died during World War I. Unfortunately since the park was designated several more wars have occurred including World War II, the Falklands, Iraq and Afghanistan.

The cenotaph within the park carries plaques to pay tribute to the fallen men of these wars; the author has decided to create a place which celebrates the freedom that these heroes fought for. A garden that provides a happy atmosphere, but also reminds of the freedom fought for.

There is to be the reinstatement of a bandstand, which will provide music, an outside classroom for the many schools in the area and also an area to exhibit local art work.

The planting in this area if set out in formal manner, but planted in an informal way the plants will include the Lancashire rose, the Freedom rose and poppies but planted along side grasses and perennials. This area will also contain a wall with blackboards encouraging people, particularly children, to leave messages for those whose lives have been cut short. There will be plenty of seating, something that is lacking within the current layout.

All the paths within the newly designed areas will take into consideration the needs of the disabled.

The Edible Forest

There is to be a forest which will contain trees, shrubs, flowers and herbs, all of which will be edible and which visitors will be encouraged to pick and eat. The fruits will be well identified by boards.

This area will continue into a picnic area containing nut trees and shrubs, again these will be well identified. There will be picnic tables placed randomly giving the freedom feel.

Throughout the edible forest it is also suggested that sculptures are randomly placed, designed and created by local groups including schools, church groups and any young persons groups within the borough of Chorley. By involving as many groups as possible it is hoped that more people will visit the park and take pride in it.

2. THE SPACE

The designer was inspired by the natural forms and existing structures that already existed within the park, both within the natural environment but also shapes and forms discovered within Astley Hall itself. Work created by a local ceramic artist also influenced the early design concepts.

The following ideas developed:

- To create an area where people can meet up and socialise. The introduction of seating would provide a place to relax and enjoy the park in this area. It was important to ensure a network of paths in order for the site to be accessed by all preventing exclusion. The area would be multi-functional, where people could gather and entertainment could be offered in the way of outdoor performances, educational activities, civic meetings and social gatherings.
- To introduce discovery, play and adventure. Providing a more informal and natural atmosphere where families can enjoy time with their children in a safe environment.

These two distinct areas will be joined harmoniously by naturally curving paths that flow from one area into the other. The design will take advantage of the natural shape of the land whilst adding more interest and functions within the area.

Proposal

The final recommendations are to create an area of the park which feels welcoming but at the same time has multiple uses for a varied range of users. The following forms the key elements of the final design.

a) Amphitheatre

The Amphitheatre is the focal point of the design. The area is created by forming both formal and informal terracing which provide a staged arena which can be used for a wide variety of functions, such as outdoor theatre and performance area, to be used for staging plays or musical concerts. The area will contain a large oak structure at the entrance into the arena, whilst looking natural and framing the view beyond, this structure will also be used as a backdrop for any performances staged in the arena.

The seating will be formed from natural stone and grass. The terraces will begin low at the entrance to the arena and then gradually increase in size towards the back of the area, offering both formal seating and low grass terraces for those with mobility problems. The choice of materials ensures that the arena can be used all year round.

The planting around the amphitheatre has been chosen in order to create a natural screen and also to define the area from other elements of the design. The planting is naturalistic and planted in swathes and blocks. The perennial planting and blocks of grasses will offer a textured effect with lots of movement within the scheme. The planting design has been planned to offer impact all year round, especially in winter, where the tall perennials will be left in order for their shapes and structure to be appreciated in weather such as frost and light snow.

b) Natural Play Area

This area has been designed to offer discovery and play. The natural play structures within this area provide opportunities for exercise and imaginative and creative play. It is a varied and flexible design which encourages natural play whilst providing informal seating to ensure that children can be closely supervised. All play structures will be constructed from wood, the surface of the central play/picnic area will be bark and within the area which contains the trim track there will be a continuous rubber surface which meets the requirements of BS EN 1177 and BS 7188.

The play area will be encircled by a low grass mound, a beautiful, natural feature which will define the play area but also give another element of natural play. A line of Acer griseum, the Paperbark Maple will naturally enclose the area whilst also remaining light and airy. This tree has bee chosen for its multi stemmed growth which will give a more open feel to the area but also will add interest in the autumn with its beautiful autumn colours and its peeling bark.

c) Woodland Sculptures

This area is an extension of the Natural Play area and where there will be a group of woodland structures erected. The area will be encouraged as an adventure area but also as an opportunity to examine and appreciate the skills shown in producing the sculptures. The area will be underplanted with spring bulbs, Galanthus nivalis 'Flore Pleno', the snowdrop and Hyancinthoides hispanica, the blubell.

d) Wild Flower Meadow

This meadow will be an extension to the planting proposed for the area of park to the north of the main path. The meadow will be an early summer flowing meadow which is once again underplanted with Hyacinthoides hispanica which will compliment and add to the beautiful Bluebells that already flower profusely in spring within the woodland to the west of the area. There will be access through the meadow towards the south of the area, this will be in the form of a mown grass path. The grass will grow through Safagrass matting which will ensure accessibility for all.

Summary

The design has been developed in order to be multi-functional but also to provide a range of opportunities for a wide audience. For this reason the title for the design will be THE SPACE, the idea being that it will provide areas for socialising and play, arts and culture performances can be delivered and finally there are opportunities for education and learning. This philosophy is encapsulated in the following way:

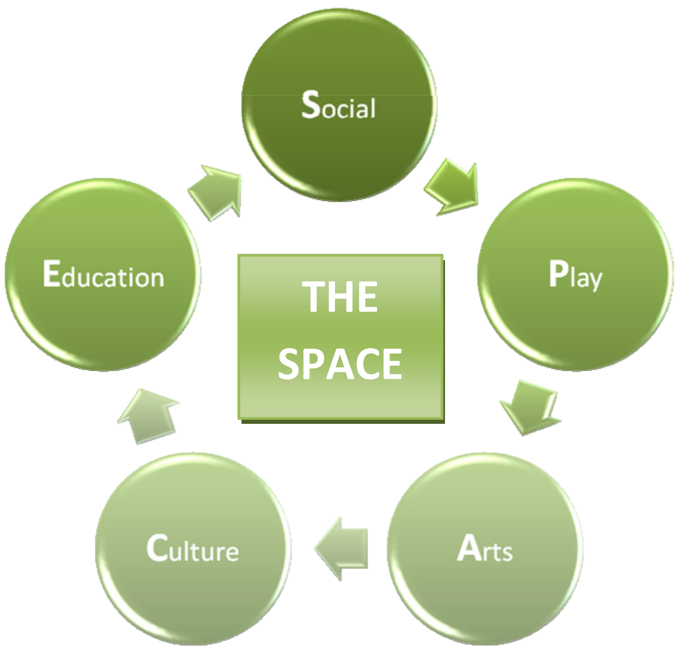


Fig. 12. THE SPACE – Design Philosophy

STRATEGY FOR DEVELOPING THE PROJECT

On completion of the final designs the proposals have been presented to both the Friends of Astley Park and representatives of Chorley Council and both designs were received with great enthusiasm. Decisions are currently being made as to the way forward and the following proposals have been made:

1. To combine elements from each design into one final design.
2. Chorley Council will take the proposals forward as part of their future urban design strategy.
3. For Chorley Council to apply for government funds in order to build the final design.
4. To implement the design fully within the next 2-5 years.

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Landscape maintenance - Aviatorilor Boulevard – Bucharest assessment of the vegetal components, analysis of the current situation and guidelines setup for a rehabilitation strategy

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Keywords: Romania, green space, urban,

ABSTRACT

Romania has at this time an inadequate system of landscape maintenance. The main problem consists in the lack of an accurate database for the public green spaces. In order to implement a coherent landscape maintenance strategy it is mandatory to lay-out a foundation by gathering data about different aspects regarding the green areas such as: dimension, soil characteristics, vegetal components, etc. Furthermore, besides the inventory, it is equally important to evaluate the vegetal fund. This action can allow a better use of resources in order to implement a viable landscape maintenance program. The present study aims to do "a radiography" of a given site – the north part of Aviatorilor Boulevard form Bucharest – in order to be able to do an accurate analysis, supported by data and to setup some guidelines for a possible rehabilitation strategy in order to preserve the landscape. An important aspect of this demarche relays in the fact that all the work evolves around the impact that vegetal element problems or changes will have in the overall image of an ensemble.

INTRODUCTION

Romania has at this time an inadequate system of landscape maintenance. The main problem consists in the lack of an accurate database for the public green spaces. This issue is also aggravated by the lack of coherent laws, rules and regulations regarding all the aspects related to the landscape subject. The main example is represented by the law *24/2007* (the law regarding the regulation and administration of the green spaces in urban areas) where a rather incomplete typology of urban green spaces is established without setting-up also the characteristics for every item. In order to implement a coherent landscape maintenance strategy it is mandatory to lay-out a foundation by gathering data about different aspects regarding the green areas such as: dimension, soil characteristics, vegetal components, etc. This data-base implies an enormous amount of work and has to be done as soon as possible. Besides this inventory of the green spaces, it is equally important to evaluate every one of the component elements: vegetal fund, constructive elements, out-door furniture, etc.

The present work aims to start an evaluation - with modest means – regarding the impact that the vegetal elements are inflicting to the overall image of a landscape. In order to do this, an emblematic space of Bucharest's was picked-up: the Aviatorilor Boulevard – "the north gate" of the city. The trees forming the roadside alignment are the main element, the force line of the landscape.

MATERIALS AND METHODS

The Cadastral Plan (scale 1:500) issued in 1990 (wired in 1991) by the *Project Bucharest Institute* was the base for this study. In situ observation regarding the trees species and the health situation of every plant were documented and the information was placed on the cadastral plan. For the healthiness level were established four typologies: medium condition, poor condition, very poor condition and dead trees (every type will be detailed farther in this paper). Also, photos documenting different aspects of the current situation of the vegetal elements were made (please refer to Fig. 1 to 3). At the end a software-based simulation was made in order to illustrate the proposed strategy.

RESULTS AND DISCUTIONS

Landscape assessment

At this time, Aviatorlor Boulevard it is perceive as a green corridor between two main green areas: Herastrau Park – in the north part – and Kiseleff Park – towards south. The poor condition of over 40 % from the total amount of trees strongly affects at this time the general image of the street's alignment.

Vegetation evaluation - Trees

The site survey that was made for this study showed that there is a total of 575 trees along the envisage segment of the Aviatorilor Boulevard. Each side of the boulevard (east and west) is bordered by four lines of trees. The main species used to create the roadside alignment is Tilia cordata. Beside Tilia - up until 9 % is represented by insertion of some new vegetal elements in spaces emptied for different reasons (decaying, cuttings, etc) along the street's alignment – there can be also find elements belonging to the following species: Fraxinus excelsior, Ulmus carpinifolia, Acer platanoides, Celtis australis and Ailanthus altissima. The location of each species can be observed in Fig. 4. Also, an assessment of the vegetal fund health situation is comprised in Fig. 5.

Most of the trees fund suffers form a series of unwise cuttings which resulted in important scars at the same level of the trunk, damaging also the specific shape for the roadside alignment trees. Likewise, due to the repair works for the city's underground equipment done along the Aviatorior Boulevard mainly in the last 10 years the trees root system suffered important injures and cuttings on the north-south directions (on both sides: the street and the sidewalk).

The new elements inserted in the roadside alignment are inadequate from the technical point of view in order to fulfil a proper ensemble because the insertion point for the first branches is not the usual one for the trees sitting in a roadside alignment. Furthermore, all the new inserted trees show serious injuries of the bark and the crown.

Health typology

Trees - medium condition (59 % from total amount of trees)

This type of vegetal specimens:

- doesn't presents any visible injuries or illnesses caused by diseases or pests;
- it reached the maturity/old age period, the estimated period of life left being in the range of 30 years conditioned by an attentive maintenance (regeneration cutting of the tree crown, prevention treatments against the specific pest and diseases, etc.).

Trees - poor condition (31 % from total amount of trees)

This type of vegetal specimens:

- presents visible illnesses, decaying of an important percentage of the crown, cavities, etc.;
- it reached the old age period, the plants' decaying being aggravated by the inadequate maintenance cuttings made in the last 10 to 15 years; the life expectation for this individuals it has a maximum of 10 years, conditioned of course by an attentive maintenance (cutting the decayed branches, treatments aimed to improve the health condition and to prevent future illnesses and pests settlement, etc.).

Trees - very poor condition (9 % from total amount of trees)

This type of vegetal specimens: missing

- presents significant deviations from the typical shape for the trees placed in roadside alignment due to serious injuries of the trunk and crown;
- shows evidence of illnesses of the exterior elements (bark, leafs), but also of the wood body (cavities and decaying of the wood at the trunk and branches level);
- a special part in this category is represented by the recent planted trees: this elements have reduced dimensions (trunk diameter between 2 and 5 cm, crown diameter of maximum 2,00

m, the insertion point for the first branches starts at 1,50 m form the ground level); part of this characteristics and also the fact that this plants have serious injuries (fracture of the main growth shaft under 2,00 m, absence of the bark on large surfaces, etc.)
- this type of trees has a life expectancy between 1 and 5 years, being in the same time a threat for the rest of the plants because of the huge disease risk.

Dead trees (1 % from total amount of trees)

On the studied segment there are four dead trees. Those elements are a treat for the rest of the vegetal fund through the dieses and the pest that they are carrying, but also for the cars and pedestrians traffic in the area.

Vegetation evaluation - Shrubs and Herbaceous Plants

Beside the trees, on this site there are also present some shrubs and plants that form the turf. However, those types of vegetation have little impact in the ensemble corridor-like image.

As mentioned above, the shrubs are very poor represented on the studied segment. Along the entire street a bead of Rosa sp. was set up towards the road side and Buxus sempervirens towards the pedestrian side. Beside the esthetical role, this element has also the task to maintain the security, forming a clear delimitation between the two types of users (cars and pedestrians). In the main green area (bordered by the side walk and the secondary access road) there were planted different species of shrubs as: Salix caprea 'Pendula', Cotoneaster horizontalis and si Juniperus sabina. The plant setup is inappropriate and in adapted to the site condition and it has only an esthetical purpose.

The herbaceous vegetation is represented only by perennial herbs (species as Poa pratensis, Lolium multiflorum, etc.) that form the turf at the ground level.

Landscape maintenance strategy for the Aviatorilor Boulevard site.

In order to preserve its visual character as a green corridor important rehabilitation works are mandatory to be done for the Aviatorilor Boulevard. In this respect, I am therefore proposing farther a possible strategy that can lead to the revival of the entire fund of trees composing the roadside alignment on one of the Bucharest's main arteries *(please refer to Fig. 6)*.

The starting point of this strategy will be the choice of a rapidly growing tree in the youth period - with the capacity to generate a significant vegetal volume - so that the image of the present landscape can be achieved in the shortest time possible. Taking in consideration also the problems that Tilia cordata can cause by its multiple young trunks growth and by its roots system characteristics it is obvious that another species has to be selected for the rehabilitation. In order to achieve better results, the new vegetal elements that will replace the old trees will have respects some characteristics: minimum 6,00 m height; crown diameter of 2,50 m; trunk diameter (at 1, 00 m from the ground level) of minimum 10 cm; the insertion point for the first branches will be at minimum 4,00 m.

In this scenario, the replacement will be made in a 4 steps program with a 5 year succession. Trough this stage programming, the main goal is the preservation of the ensemble image which will allow also the total renewal of the existing trees.

The first intervention will consist in eliminating the old vegetal element placed at the north (Charles de Gaulle Square) and south (Aviatorilor Square) end of the site and replacing them with new trees. Also, in this stage, every fifth row of old trees (the east-west direction) will be replaces with new ones, this action generating compact groups of 16 mature trees (4 rows, 4 trees on each row). From now onwards a landscape maintenance plan will be elaborated and implemented in order to form the crown of the new planted trees for a harmonious and viable roadside alignment.

After a first period of 5 years a second intervention will be made so that the next row of old trees (towards south) will be eliminated. The same intervention will be applied after another 5 years as the third step. In the last stage (after another 5 years), already having an important volume of renewed vegetation, the rest of the old existing trees will be eliminated (the next two rows towards south).

In this manner, in a 15 years period the complete replacement of this type of vegetation will be possible for the Aviatorilor Boulevard roadside alignment, without loosing at any time the ensemble's image.

CONLUSIONS

An important aspect of this demarche relays in the fact that all the work evolves around the impact that vegetal element problems or changes will have in the overall image of an ensemble. The study shows that almost half of the vegetal fund is damaged and therefore not sustainable. At this point it is wise to start a rehabilitation intervention. More information about green space vegetal elements allows a better understanding of the local problems and a more efficient intervention.

ACKNOWLEDGEMENTS

I am grateful to Senior Lecturer Dr. Landscape Designer Elisabeta Dobrescu for the valuable critics that she expressed about the above presented demarche. My thanks also go to the STUDIO BASAR team - arch. Alexandru AXINTE and arch. Cristian BORCAN - and to the ListeNoire duo - visual artist Ioana NEMES and visual artist Maria FARCAS - for their confidence to include my work results in the project that participated in the Bucharest Aeronautical Memorial Contest issued by The Romanian Order of Architects (O.A..R.).

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FIGURES

Fig. 1 - Dead tree

Fig. 2 - Tree in very poor condition

Fig. 3 – Insertion of a young tree

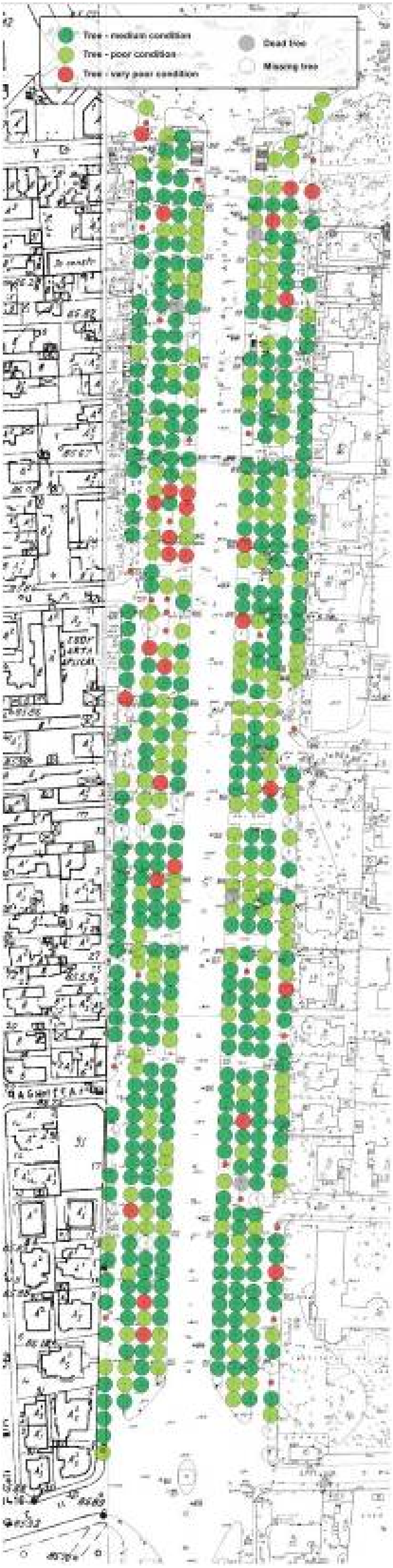

Fig. 4 - Species inventory

Fig. 5 - Health inventory

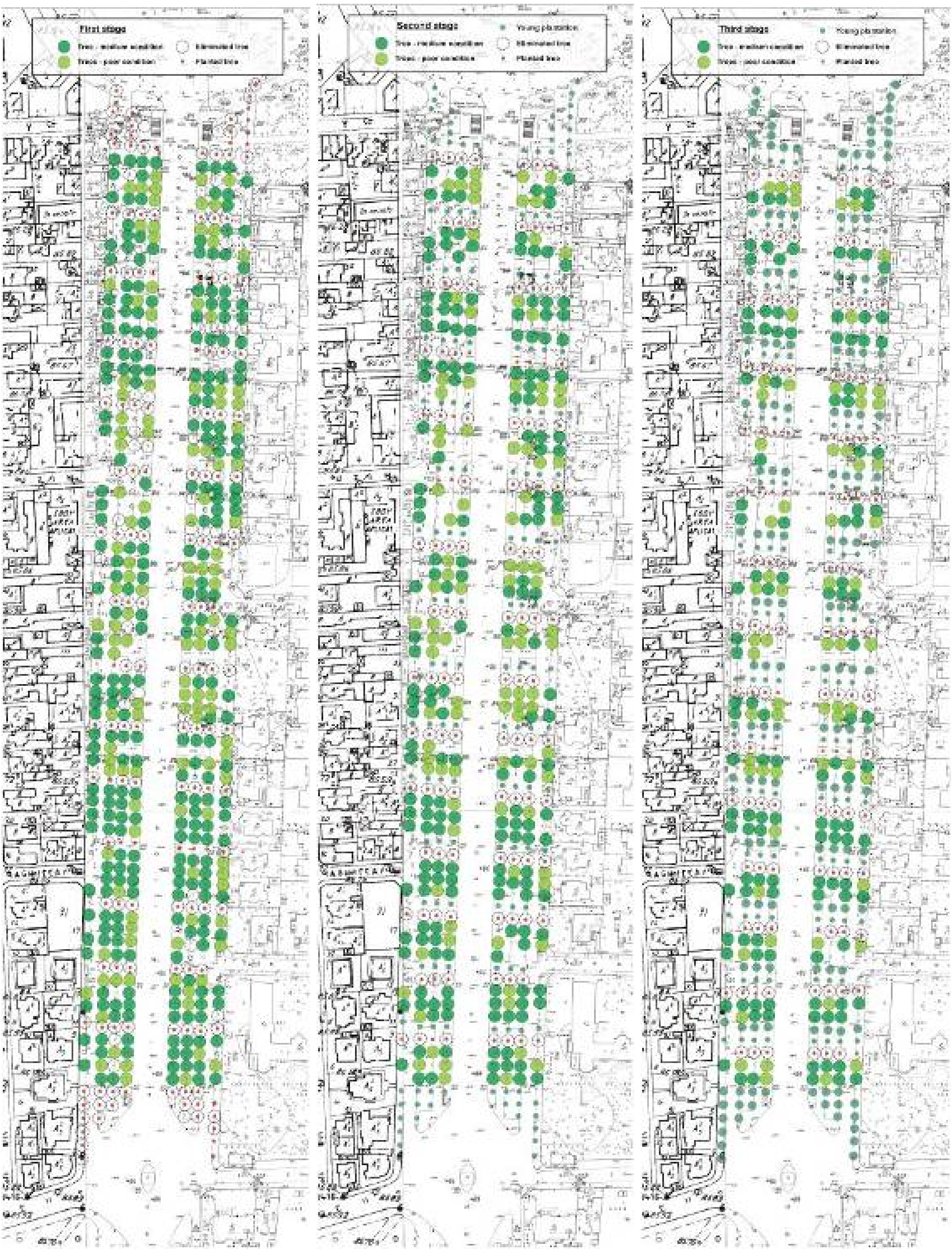
First stage
Trees - poor condition
Second stage
Young plantation
Trees - poor condition
Third stage
Young plantation
Trees - poor condition

Fig. 6 - Landscape maintenance scenario

Research regarding green area problems in the big parking plots

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Keywords: planting, maintenance, plant growth, physiological stress, climatic conditions

ABSTRACT

The present paper proposes to establish the determinant factors in the designing and realization of the parking plantations. A series of data have been studied among which: the general plan for traffic and parking areas systematization; the technical solutions for infrastructure, the depth and the practical volume for the plantations, the area climate and the microclimate generated by the constructed area. The present study is the first step in a program that proposes to analyze and to elaborate the criteria for establishing the types of plantations for parking areas (trees rows, hedges, shrub mass plantings), for selection of the varieties and the characteristics of the planting material (root ball or bare root plant material, high, trunk diameter). A case study have been done regarding the behavior of varieties planted in the parking areas of two large commercial centers in North and East of Bucharest, respectively conditions of planting and maintenance have been analyzed; the effect of the physiological stress; pollution effect, mechanical degradation.

INTRODUCTION

Parking lots and paved areas are essential urban features that tend to be unsightly in their basic form. Landscaping in and around parking lots and pavement improves appearance and local climate. (Bonnie Appleton, 2002). Trees are usually planted to provide a variety of benefits, including aesthetics, softening/screening of built form, establishment of a green structure and provision of shade. There are also ecological and environmental benefits. Green areas in parking are artificial spaces that offer restricted condition for ornamental plant growth and development. Low soil and planting volume, high temperature, limited water availability and pollution are unfriendly to trees and there are the main factors with negative influence on vegetation. In many parking areas plans, the provided tree planting spaces and tree species selection are made based on references for tree growth in park-like or natural settings (Grabosky, Jason, 2004). Even if is an general evidence that trees in parking areas are smaller and slower growing than in large green areas, there are only few date to prove the effect.

MATERIALS AND METHODS

A case study has been done regarding the behavior of different ornamental plants planted in the parking areas of two large commercial centers in North (Site A) and South-East (Site B) of Bucureşti City.

A series of aspects regarding the site and green areas systematization, the plant material and planting conditions have been studied. So, there were evaluated the general plan for traffic and parking areas systematization (reserved area for plantations and their configuration) and the technical solutions for infrastructure (concrete areas, paved, asphalted, the thickness of the constructed layer, the depth and the tracking way of the underground systems).

The depth and the practical volume for the plantations, the conditions of planting and maintenance (top soil, tutors, irrigation, pruning) and the area climate and the microclimate generated by the constructed area where also investigated.

Regarding the vegetation, it was studied the effect of local stress factors and the mechanical degradations.

RESULTS AND DISCUSSIONS

The Site A was planted in 2006, respectively the Site B in 2003. Both studied Sites, like many other supermarkets and business parks are well structured but provide low and inappropriate conditions for shrubs and trees.

An evaluation show that for the studied sites the total green areas ranged from 5,4% in Site B to 7% in Site A (Table. 1).

In the studied cases as also in the mostly parking plots, the green areas are structured as isolated spots and narrow continuous strips and only few surfaces are organized as larger, unitary green lots.

The main plantation types consist in rows and isolated plants for trees and masses or hedges for shrubs. The structure of vegetation is summarized in the table 2. In most of cases the trees and shrubs are associated in the same green areas.

For all green areas was provided vegetal soil, after a well cleaning of these places (Fig. 4). The depth of practical volume of soil ranged from 40-50 cm for shrubs to 1,5 m for trees.

All planting material was standard, good quality, ball root or in pot produced. The trees were delivered with straight trunk, with a minimum branching, 2,0-2,5 m height of trunk and from 14-16 cm to 18-20 in caliper, measured 1 m above ground level.

The drop irrigation system was provided only for the strip green areas.

Our studies showed a real influence of sites regarding the local climatic conditions. The temperature measured at 1 m respectively 2 m above ground, in June and July varied from 37 to 46 ºC. The temperature at 1 m high was higher with 1ºC to 3ºC in most of the cases (Figure 1).

Also, the temperature measured at midday (T12) in both, Site A and Meteorological Station (MT) indicated in all cases a higher temperature on site with 0.52 ºC to 4,26 ºC (Figure 2).

There were registered in all cases differences regarding the leaf wetness between Meteorological Station (MT) and Site A (Figure 3). Obviously, the leaf wetness was always lower in the both sites than in the Meteorological Station.

The stress of local climatic conditions was reflected in the lower leaves surface area for the plants in both studied sites comparatively with the same species planted in park-like area (Table 3).

There are evident differences as habitus, vegetative volume and general condition between the trees planted in spots and respectively in strips (Fig. 6 a, Fig. 6 b). Most of the planted shrubs, especially on the edge of green spots showed burn leaf and early defoliation.

Important plants damages are caused by the mechanical degradation, mostly generated by the visitors' pressure, car overpasses and snow storage in wintertime (Fig. 5).

CONCLUSIONS

As result of our studies we appreciate that the local microclimate, especially the temperature and humidity are badly influenced by the large paved areas.

The climatic stress conditions affect the plants by decreasing the leaves surface area and the plant growth rhythm. The general aspect of plants is also negatively influenced.

From the studied species, the most affected by the sites conditions are *Tilia platyphyllos*, *Potentilla fruticosa*, *Salix gracilis.*

The trees planted in spots are obviously more affected by the available soil volume than the trees planted in continuous strips.

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TABLES

Table 1. The balance of paved/green areas

	Total surface (ms)	Constructed areas (ms)	Paved areas (ms)	Green areas (ms)	Average of green areas (%)
Site A	220427	53887	166540	15700	7,00%
Site B	128000	48600	72448	6952	5,40%

Table 2. Vegetation structure on Sites

Deciduous trees	
Site A	**Site B**
Acer platanoides	*Acer platanoides Crimson King*
Acer platanoides Crimson King	*Platanus acerifolia*
Fraxinus excelsior	*Pyrus calleriana Chanticleer*
Quercus rubra	*Tilia platyphyllos*
Shrubs	
Site A	**Site B**
Cornus alba	*Cotoneaster horizontalis*
Deutzia gracilis Mont Rose	*Cornus alba*
Forsythia intermedia	*Potentilla fruticosa*
Rosa - City Flor	*Salix gracilis*

Table 3. Leafs surface area

Species	Site A		Site B		Control (Park-like) cm^2
	cm^2	Difference between Site A and Control (%)	cm^2	Difference between Site B and Control (%)	
Acer platanoides	105,12	0,52			105,67
Acer platanoides Crimson King	127,05	22,9	78,11	52,59	164,78
Berberis thunbegi Atropurpurea	1,67	33,03	1,1	55,81	2,49
Cornus alba	31,4	51,23	25,31	60,7	64,39
Deutzia gracilis Mont Rose	9,53	3,96			9,92
Forsythia x intermedia	16,59	2,95			17,1
Potentilla fruticosa			2,67	42,56	4,64
Spiraea japonica Golden Princess	5,5	41,88			9,46
Symphoricarpos albus			6,26	19,76	7,8
Weigela florida	32,36	26,47	21,62	50,88	44,01

FIGURES

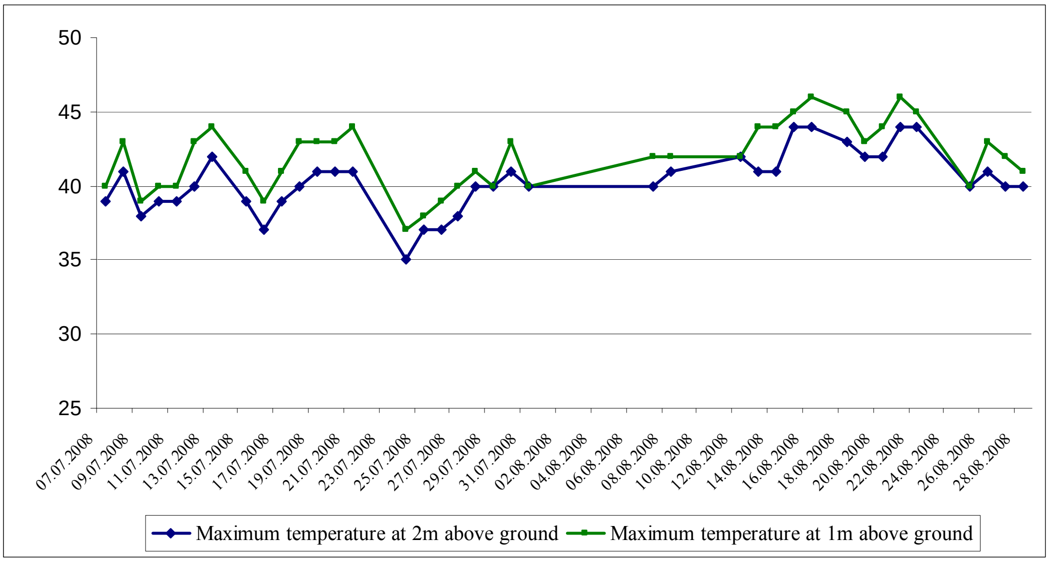

Fig. 1. Temperature level at 1 m and 2 m above ground on Site A (°C)

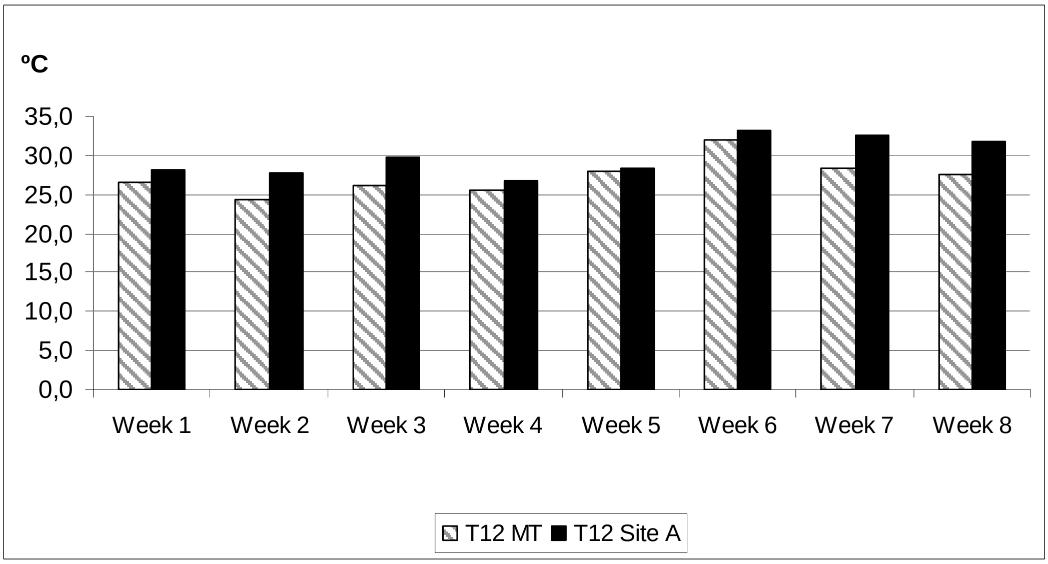

Fig. 2. The Site A influence on the T12 temperature in July and August

Site A

Site B

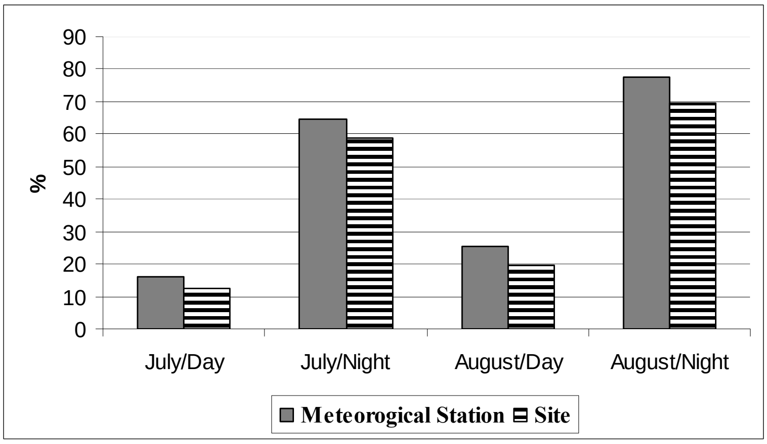

Fig. 3. The Site A influence on the leaf wetness

Fig. 4. Site A - strip cleaning

Fig. 5 Site B - shrubs plantation - intense traffic area

Site A – the strip after 2 years

Site B - mechanical degradations after 2 years

Fig. 6a. *Acer platanoides* Crimson King planted in continuous strip

Fig. 6b. *Acer platanoides* Krimson King planted in spot

Petrila – it exist life after the mine is closed

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ABSTRACT

This paper aims to present part of our research project on the post-industrial site-recovery in the case of Petrila, in Valea Jiului. The research project was developed between 2006 and 2008, considering not only the particular case of Petrila but the post-industrial ecological and social issues in general. In the following chapters we will try to explain our interdisciplinary approach that touch socio-economic, urban, architecture and heritage, territorial development, land use and other problems form the landscape point of view. The proposal that resulted from this research try to integrate various solutions for the complex problems, already present or that will occur after the mine closing, in a landscape conscious vision.

The research project will be divided into 2 major chapters: The first chapter presents syntactical-morphological analysis of the site and the second chapter, the presentation of the solution, which is divided into 2 subsections: the general proposal and the proposal off on site.

CHAPTER 1

TERRITORY ENROLLMENT

The Valley of River Jiu is situated on the South-East of Hunedoara County, developed on the South-West – North-Est direction, with cross-sections that varies between 15 km near the Câmpul lui Neag locality, and 25km near the Tirici locality. This region is composed from: Petroşani town, and others, like Uricani, Lupeni, Vulcani, Aninoasa, Petrila and the township of Banita.

Petrila town: The territory of this town is surrounded by Sureanu Mountain to the East, Vârful lui Pătru to the North, Parâng Mountain on the South and Petroşani town on West side.

The Mine Industry of Petrila is the biggest mine from the Valley and still extracts a big part of coal, but it is programmed to be closet in 10 years from now.

DACIA AND PETRILA, BETWEEN GLAMOUR AND RUIN

We started with tow famous Romanian brands. First is the brand "Dacia" which is the most popular car in Romania, and the second is the industrial cities; both have in common –" the golden age" (the communist era), when everything was flourishing.

In the present both are abandonee. In the future we have tow options': first, is to leave it like in the present, in ruins, second is to tune-up the town Petrila as well as young man tunes their old car to be more attractive and to carry on her life.

HISTORY

Before the mine opening, Petrila was dominated mostly by locals – momarlani - which were located within the city today. The city development was accelerated by the strong immigration of the work-force for the mine. In our days Petrila town is a mixture of people, composed by momarlani and barabe. (the workers arrived from various regions of the country, mainly from Moldavia).

MIGRATION TO THE VALEA JIULUI

The migration analysis show that 1859 is the peak migrations Valea Jiului. The Valley attracts workers both from Romania and abroad: Transilvania - Zona Haţegului and Apuseni Mountains; Roşia Montană, Abrud, Zlatna, Poiana Ruscă; Reşiţa, Maramureş and Secuime, Slovakia and Czech, Bosnia and Herzegovina, Austria, Germania, Poland and Italy (D. Boteanu, C. Jujan, I. Velica, *"Exploatarea minieră Petrila"*, pag. 16, editura Ager, 2004).

"How I came in Jiu Valley? For the money, what else? It is a lot of work, but at least you know the deal. That was before, I came in Petrila. We thought it would be a future... "(miner came from Moldavia, Petrila cited in (Magdalena Craciun, Maria Grecu, R. Stan *"Lumea Văii: Unitatea minei – diversitatea minerilor"*, pag. 32, editura Paideia, 2002).

After 1998 when they are first layoffs, most miners return to their native places. In 2003 some mining industries are closed and there is a sharp increase in unemployment. Following this work people begin to work abroad (Italy, Spain, United Kingdom).

INFRASTRUCTURE

In conclusion, Petrila's infrastructure is poorly developed, the city is accessible from one direction and all national roads (DN 7A, DN 66) that bring with them flows of people, either they pass near the city or stop in Petrosani.

- county road which crosses the city is not improved;
- industrial traffic is done all on it;
- lack of a secondary road leads to congestion and high levels of noise pollution;
- only a few streets are upgraded.
- existing railways are used only for industrial vehicles.
- once people traveled between and Petrila Petrosani with mocanita.

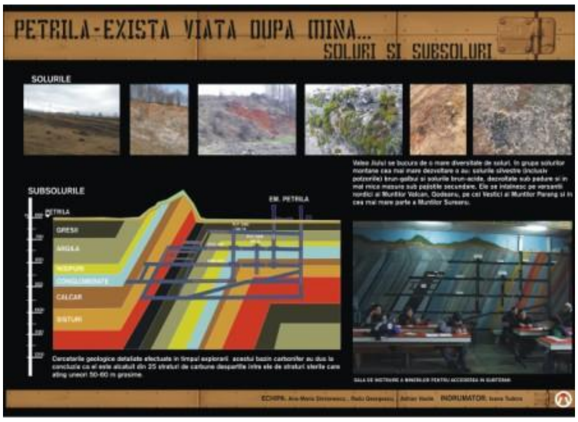
NATURAL AND BUILT HERITAGE

Studies in this territory have identified several areas of valuable natural and built heritage, which requires setting up a special protection, conservation and sustainable use.

Valuable natural areas that need protection is an important goal for the preservation of ecological balance and vision in the territory of the river Jiu Valley area but also on a much larger area.

Around Petrila town, at distances relatively small we found two natural parks: the natural park Gradistea and national park Retezat (on UNESCO list). Closer, but less important we found reservations: pass Bolii, pass Jiet and pass Taii. Natural and built areas (colonies howses, blocks), is a valuable potential for tourism development.

SOIL AND SUBSOIL



River Jiu Valley benefits from a wide variety of soils. most widespread soils from mountain soils group are: silvester soils (including potzoriile) brown-yellow and brown acid soils developed under forest and to a lesser extent in secondary grasslands. They meet on the northern slopes of the mountains Valcan, Godeanu on the Western Mountains of Parang and most of Sureanu Mountains.

Detailed geological research carried out during exploration of the coal field, led to the conclusion that it consists of 25 layers of coal, separated by layers of sterile, that sometimes reach 50-60 m thick.

VEGETATION

One of the natural elements that reflect the true variation of altitude, is vegetation. Following the disposition of the relief we met four main groups of vegetation:

1. Vegetation of meadow and river
2. Lowland vegetation
   (a) the forests of Quercus robur
   (b) the forests of Quercus petraea
   (c) the forests of Fagus sylvatica
3. Mixed vegetation
   (a) mixed forests of Fagus sylvatica and Picea abies
   (b) coniferous forests
4. Mountain vegetation
   (a) alpine vegetation
   (b) subalpine vegetation

1. The dominant species of meadow and river vegetation is: Salix capreaea, Alnus glutinosa, Carex, Salvia nutans, Linaria vulgaris, Achilleia milefolium, Taraxacum officinale, Capsella bursa-pastoris, Eqisetum arvense, Malva, Fragaria vesca, Impatiens noni-tangere, Hypericum perforatum, Colchicum autumnale.
2. Lowland vegetation: the dominant species of sub-oak forest are: Quercus cerris, Quercus frainetto, Quercus robur. In the woods of Quercus petraea we can meet other tree species such as Carpinus betulus, Ulmus carpinifolia, Fraxinus excelsior, Tilia cordata, Acer pseudoplatanus, Acer campestre.

Shrubs: Cornus sanguinea, Crataegus monogyna, Corilus avellana, Euonymus europaeus. Straw: Festuca altissima, species developed on humus: asperula odorata, Pulmonaria officinalis, Euphorbia amygdaloides, ferns: Dryopteris filix-mas, Polyipodium vulgare, Asplenium viridis, mushrooms: Amanita muscaria. Among the oak forests we meet, pastures and planted orchards.

The forest of Fagus sylvatica are found at altitudes between 500-900 m. It is mixed with: Sorbus aucuparia, Prunus avinum, Carpinus betulus; with shrubs: Spirea ulmifolia, Lonicera xilostrum, Daphne avelana, Corylus, Rubus hirtus; ferns: Dripteris filix-mas, Polipodium vulgar.

3. The Fagus sylvatica forests and coniferous forests is represented by the next species: Fagus sylvatica, Abies alba, Picea abies, but also of species like Fraxinus, Qercus, Ulmus, etc. We met also clusters of Betula pendula, Crategus monoggyna.

Area of coniferous forests is characterized by the predominance of Picea abies, and other species such as Abies alba, Larix decidua. On the ground in the same area we can find green moss and various species of ferns: Drypteris; muscle: Entodon screbenii, Politrichum commune, Hyloconium splendens, lichen: Usnea barbata, mushrooms: Boletus edulis, Lactasius delicioisus.

4. Subalpine vegetation cover areas from 1600-1800m altitude, and is represented by small grassy meadows and groups of Mountain Pine. Alpine meadows are the most common and are represented by associations of Festuca rubra, Poa media. Small shrubs are represented by Pinus montana, Juniperus comunis and hododendron kotschyi. Besides the existing shrubs we can alsoo find alder groves.

Alpine vegetation occupy the highest portions of the mountains, being the upper limit of the forest. Due to unfavorable environmental conditions, the vegetation is represented by short grassy lawns, alternating with subalpine shrubs and bushes.

Urban vegetation:

Dominant species of trees in Petrila are: Tilia cordata, Betula pendula, Picea abies, Larix decidua, Thuja occidentalis, Acer negundo, Acer campestre, Fraxinus excelsior. Shrubs: Syringa vulgaris, Cornus, Spiraea. *Hedgerows* are: Cornus sanguinea, Ligustrum vulgare, Hibiscus siriacus, Buxus sempervirens, Thuja occidentalis. *Alignment*: Betula pendula, Prunus cerasifera 'Nigra', Populus nigra, Populus nigra 'Italica'. Pioneer plants meet especially near boilerhouses, blocks and disused buildings. The most common species is Tanacetum vulgare.

Dumps heaps vegetation:

Pioneer vegetation found on the dumps heaps is divided in: the rock and ash dumps + slag. In the spring we find especially Tussilago farfara and other herbaceous such as Potentila argentea, Hieracium aurantiacum, Geum urbanum, Geranium robertianum, Poligalla, Cirsium arvense, Echium vulgare, Plantagum lanceolata and species of Eryingium.

Note! Herbaceous species found on this dumps heaps are specific species for subalpine floor.

Spontaneous vegetation is dominated by Betula pendula, monoggyna Crataegus, Rosa cannina.

Hydrophilic vegetation (pond) is composed of: bulrush (Typha latifolia), sedge (Carex riparia), reed (Phragmites communis). Planted vegetation is used for greening heaps and protection curtains, consisting mainly of Betula pendula, Populus nigra, Robinia pseudoacacia.

VISUAL IMPACT: TOWN, MINE, NATURE

1. The town of Petrila can be seen entirely only from nearby hills and we can see that the mine dominate the urban landscape.
2. The mine is situated on the outskirts of Petrila and is separated from the city by East River Jiu. With all this the mine dominates the urban city, it is perceived like the “Town center”. We can see the mine all around the city.
3. The nearby hills, mountains and peak, can be seen from any point of town, but also this beautiful landscape is on the second plane because the mine is first.

LANDSCAPE TIPOLOGY

We identified these types of landscapes:

- *Urban Landscape*: Blocks, workers' colonies, commercial landscape, the religious landscape, warehouses, alignments, cemeteries, community spaces, parks.
- *Industrial Landscape*: Buildings-concrete structure, iron installation, high voltage poles, disabled central heat, small industries, industrial railways, dismantled railway-bridge.
- *Landscape - dumps*: Funicular, waste dumps without vegetation, ponds, mine rough - repercussions of the method of extraction, dump heaps with vegetation, "green waste dumps, garbage dump.
- *Landscape areas*: Momarlani houses, religious landscape, dynamic landscape of forests, meadows, domestic landscape, gardens, momarlani fences.
- *Natural landscape*: Alpine meadows, coniferous forests, mixed forests, deciduous forests, detritus, gorges, caves, glacial lakes, meadow and river landscape, regularized river.

THE SOCIAL INQUIRY - *The mine seen true the eyes of townspeople*.

Those are some maps of Petrila made by townspeople in which we can see that they draw the mine. For them the mine represent a landmark, (because we can see the mine elevator from all around the city), a way of leaving. Some people say that: “If they close the mine the city will die”.

ANALYSIS CONCLUSION

In this - we came back to the comparison with DACIA the quality of water is poor near the spoil heaps lakes;
- The quality of air is better now, because the coal is now longer use for hitting.
- It’s a lack of public transportation because Petrila doesn’t have a railway station. Now the people use so called maxi-taxi.
- The landscape perception is poor it come in the second place behind the industrial landscape.
- The road quality is very poor because of the lorry/van of the mine.

We can enter in Petrila to separate roads, but they are both in poor shape.

THE VISION

In the present the mine percentage in the inhabitants view is more than seventeen percent, on the second place is the nature with 20%, the last place is the town that gain only 10%. And what we want for Petrila is that we equalize all of them somehow utopic vision, it will be better to be equal all of them, but we don’t know if we can manage that.

THE MISION

The mission means how we get to what we want in the vision.

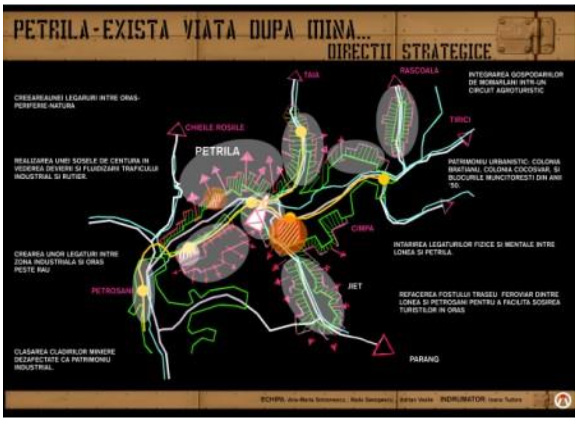
We want:
- to bring back the mountains in to the city life;
- to recreated the urban life;
- the rehabilitee and conversion the mine;
- ecologization and reecologization the spoil heaps;
- the mine will sustain further the city life.

CONCEPT

Petrila – EXIST LIVE AFTER MINE

The word (AFTER) - have to meanings:
- after with the meaning in behind (which is the succession in space);
- after with the principal meaning (which the succession in time);

STRATEGICAL AIMS (MACRO- STRATEGY)



- Create a connection between the city and nature;
- Create more bridge's across the River Jiu;
- Create a bypass road in order to deflect the industrial traffic;
- To protect the important mining building putting them under the jurisdiction of industrial heritage;
- Integration of households in a agrotouristic circuit;
- Strengthening fiscal links between Petrila and Lonea;
- Restorations of the former rail route between Lonea and Petroşani to facilitate tourist arrivals in the city.

STRATEGICAL AIMS – MINE (MICRO STRATEGY)

We divided this strategy on years, so in the first 5 years: we want to:

- Conversion of closed building;
- Conversion of water tank;
- Maintenance of funicular railway;
- A better link between city, mine and nature;
- To clean and improve the landfill;
- Declare building in the industrial heritage;

10 years: Recovery of bridge between the Mining building, and also recovery;
15 years: Spoil heaps - reecologization of old spoil heaps;
20 years: ecologization of new spoil heaps.

STRATEGICAL AIMS – PERYFERY (MICRO STRATEGY)

- To create some green areas at the outskirts of Petrila. That will pierce the urban tissue in order to integrate the city into the nature;
- To ease the access to property of residents in order to achieve a better accessibility to the city outskirts;
- Creation of links between town and mine;
- restoration of rail way track and restore to working order mocăniţa.

STRATEGICAL AIMS – CITY (MICRO STRATEGY)

- class in urban heritage the valuable buildings: Brătianu colony, Cocoşvar colony, Cocisblok;
- public spaces: creating an identity of space, but also a diversity by introducing multiple functions to increase their attractiveness;
- revitalization of cultural life by reopening the theater, cinemas and libraries;
- achieve a cultural tourist route (nature of satire quotes, cast on buildings) of local writer Ion Barbu;
- solving connection between: Petrila-Lonea (Petrila 1, Petrila 2), which are still perceived as two separate areas although of the same whole;
- upgrading sports areas.

CHAPTER 2
Subchapter 1
A) Cocosvar colony

Replacing old warehouses with new ones, having a proper structure in order to support their transformation into grassing roofs and hanging gardens.

Cocisblok's conversion

Cocisblok is conversion into a hotel for the accommodation supplement for future tourists. Block is owned by City Hall, with a reducing number of tenants were being filled at a rate of 30%. The building will be equipped with a parking lot with a total of 20 seats, for both visitors and staff.

Cultural tourist route - Route and a map with all quotations written on buildings of local writer Ion Barbu

Central Avenue - Central area is meant to be a promenade with a proposed alignment of Fraxinus excelsior. The street furniture items will have a minimalist design for a better integration in this area. Street lighting will be more discreet in order not to create discomfort to people in closer buildings with a view to the Central Avenue.

B) Spoil heaps

- populate pounds with fish;
- funicular rail ways use for people transport;
- forestation of old spoil heaps with easily adaptable species on degradate soils;
- areas for young artists to perform land-art;
- greening landfill;
- land-art from garbage;
- some areas are given entirely to the inhabitants of near-by Petrila for grazing sheep;
- promote local products.

In the work of botanic we aim to identify some easily adaptable species on spoil heaps, focusing on the vegetation of degraded soils. Following this work we have developed a herbarium of woody and herbaceous species existing in the spoil heaps. Noting that the identified vegetation is typical of sandy soils and.

To conclude the species used in the proposal will be those mentioned above. Management of vegetation on spoil heaps will be made in certain parts with the least interference, favoring development as natural biosystem.

We also proposed protection curtains near the landfill to stop spreading garbage.

C) Mocăniţa

It will call into operation mocăniţa, which will have passengers and cargo cars. She will be used to make the link between the villages near the city and to link with the railway station of Petroşani. The most important stations on the route will be EM Petrila Station and Leonoi station, which will be used as points of departure for the tourist routes. These two stations will be provided with tourist information centers and bicycle rental centers. The two sawmills located near City Hall and one inside the mine will move in Taii pass. Raw materials for furniture factory, proposed near the mine will be assured of those two sawmills, and will be transported with mocăniţa.

Traditions – Momarlani

- Encourage local products by making weekly market in villages near Petrila.
- Introduction of peasant houses in agro tourist circuit.

Tourist routes

Tourist routes proposed will be covered on foot or by bicycle. The only car travel route proposed it starts from the industrial park and goes towards Colt Fortress (the famous castle of Jules Verne). I propose that on land located on the hills near the town to be left foot path to facilitate accessibility to tourist routes.

Roşiile hills

I want to create a pinnacle point in the north of the city from where you can admire a beautiful view over the city and the mine. From this point you can see the light show of the industrial park. This pinnacle point would be embedded in the structure of the hill, not to destroy the natural appearance of the area.

Old boiler houses neighborhood will be processed either in bars, cafes, clubs, or in kindergarten, animation and art centers for children, or family counseling centers.

Subchapter 2

Sketches of the atmosphere

Achieving lakes by regulation of river Jiu with rubber dams, the cranes structure can be used for climbing, the structure of a former industrial building is closed with metal frames, which have at the base flower pots and vertical rods on which will develop plants, lighting poles with low light pollution, create wastewater treatment stations.

Mining equipment

- transformation of abandoned mining equipment in art objects.

- making boards of mining equipment name, origin, mark.(memory of mine – genius locci).
- their mode of exposure is done on a socket, grass, gravel, sand. It will be located outdoors.
- creating workshops for artists who have raw material, mining machines and iron; objects made by artists to be exhibited in the spoil heaps.

Workshops and mine school

Blacksmith shops will be functional point for visiting, school mine will be open to public and mine buildings will be illuminated to provide a light show at night.

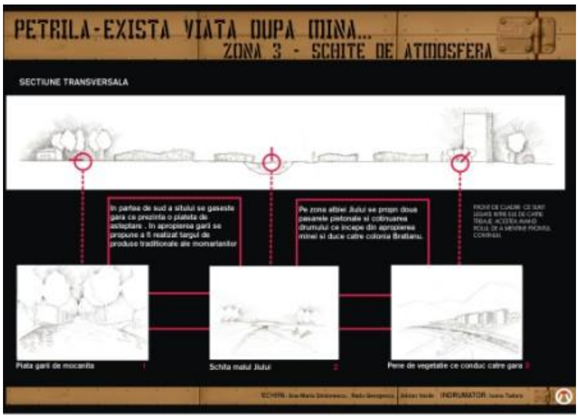
A) AREA WITH CLOSED MINING ACTIVITY

The area lies on the East-West axis of urban development of Petrila city. At the North of the site is the river Jiu, and in the South is the mining fance.

The project wants a transition from the urban space to a natural space. Interpenetration of the natural with urban will be made by creating an artificial hill that feathered extended urban texture by vegetation (street alignments). Urban texture continues its route through the created hill using cutouts made in the structure of the hill and the route is the same level with the city.

On the same level with the street and sidewalk I propos some clipping in the artificial hill in which we can find functions such as clubs, cafes, bars, craft shops, banks, shops, restaurants, train station.

B) AREA LOCATED AT THE INTERSECTION OF PETRILA TOWN AND VILLAGES BELONGING



- In the south of the site is proposed a train station, which presents a small square plaza;
- Over the Jiu River will be proposed two pedestrian bridges and one for auto.

Vegetation

For better results and visual integration we used native species resistant to climate and pollution. Vegetation used: Tilia cordata, Betula pendula, Juglans regia, Fraxinus excelsior, Malus domestica, Prunus spinosa, Alnus incana, Typha latifolia etc.

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The historical survey of Transylvanian (Romania) Castle Garden
An historical survey of Brâncoveneşti Castle Garden

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Keywords: castle gardens, Brâncoveneşti, the Kemény family, Helikon, protection of national monuments, Albert Wass.

ABSTRACT

The aim of our research is the evaluation of Brâncoveneşti Castle Park, assessing its actual stage as well as drafting its revitalization plan. The park's dynamical changes were studied using military maps, which turned out to be more precise than any other map. Topographical measurements were carried out during the survey, accompanied by a conclusion regarding the present state of the park. We also took measurements of every reference point of the studied area on the investigated site. Our geodesic assessments, together with the park's present state, contain the most important restoration and revitalization dates. The article also contains our conclusion and references about the investigation.

The Kemény Castle Garden of Brâncoveneşti

Brâncoveneşti is situated in the N-E part of the Transylvanian basin, along the upper part of Mureş River at 10 km from Reghin. Câmpia Transilvaniei (Transylvanian Field Area) borders it in the west and the Carpathians in the east starting with the Gurghiu Alps. Brâncoveneşti constitutes the *"N-E end of Hungarian ethnic group"*[1].

Compared to the gentle hills of Câmpia Transilvaniei, the upper part of Mureş River is grim, picturesque and girdled with fir trees, which was an important military frontier since Roman times. "God's Chair" Hill (1380 m) is a peak situated N-E from Brâncoveneşti, whose silhouette can be seen well from the castle in fine weather. László Kővári described the peak from the castle: *"It is on the right bank of Mureş, extending to the foothills of the Alps and it can be seen well from N-E of Brâncoveneşti. It is one of those peaks that forecast rain when foggy. It is one of the tallest peaks in the area. Fir trees surround it. There is clearing on its top, which is the most smiling, and the rock opened a gorgeous spring here. The appellation of this mountainous region and spring entitles us to believe that our ancestors used this mountain for pagan religious ceremonies; and the people like to think that the name derives from it: God's Chair Hill. According to tradition, it was Prince Saint Laszlo's (Ladislaus, King of Hungary from 1077 to 1095) favorite hunting place"*[2].

Brâncoveneşti Castle was built on the right bank of Mureş River's valley, so all in all we have a 60-70 km perspective in good weather conditions up to the northern part of the Alps or south towards Tg.-Mureş (Fig. 1).

As geographical names on old military maps testify, this area is also rich in salt, similarly to other parts of Transylvania. Many settlements have *Salt-well* in their appellation. The *Salt Spa* between Ideciu de Jos and Ideciu de Sus is a favorite place for holidaymakers.

The stamped brick found in the castle garden in 1847 testifies that an Illyrian troop camp used to be near the present day castle. The archeological excavations resulted in a Roman castrum in the English park. The castrum was part of "*limes dacicus*", a military frontier stronghold of Dacia's defense line closing the border of the Roman Empire towards south.

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[1] Köpeczi *et al.,* 1988, *Erdély története I-III.* Budapest, vol. I. 289.
[2] Kővári, 1853, *Erdély ritkaságai.* Kolozsvár, 78.

Szentiváni's travelogue (1837) mentions that the people of Brâncoveneşti *"lives on farming and rafting..."*[3]. Rafting was important, as before railroads only those forests were beneficial which were close to Mureş or other river, otherwise larger quantities of trees could not be transported[4].

Brâncoveneşti is first mentioned when the borderline between Goreni and Aluniş is drawn at Brâncoveneşti castle in 1228[5]. We can deduce from the content of the certificate that Brâncoveneşti was a royal 'last stand' castle, and as such, an economic centre as well. Royal castles used to have large estates as well, and some of them, presumably due to the poor management of King Andras II., entered the property of high-rank noblemen[6]. Although in the time of Turks with storm and stress Transylvanian castles usually played an important defensive role, Brâncoveneşti castle saw no battle at all. In 1558 it could still have been an attractive estate, as its owner, Ferenc Kendi was betrayed and killed for it by Menyhért Balassa[7].

From this moment on the owners of the castle changed rapidly until 1648, when the later monarch, János Kemény and his descendants obtained it.

A register of the estate was filed in 1648 by order of György Rákóczi II. on the occasion of bestowal. The inventory mentions that seven villages belonged to Brâncoveneşti manor on both banks of Mureş river: Brâncoveneşti, Săcalu de Pădure, Vătava, Ideciu de Sus, Deleni, Pietriş, Luieriu and a part of Suseni[8].

History of Tenure

József Biró sums up the castle's history of tenure as follows: *"Brâncoveneşti Castle has a varied and hectic past; it was almost the estate of all Transylvanian noble families or monarchs"*[9].

Ákos Barcsay, who was made monarch by the Turks, was very unpopular and was not really accepted as the real monarch. Soon after György Rákóczi's death the majority of Transylvanian Noblemen's Order appointed János Kemény, Rákoczi's famous general as monarch, and he was elected legitimate monarch after Ákos Barcsay's resignation on 1st January 1661. Brâncoveneşti estate belonged continuously to the Kemény family from Mănăstireni since 1663[10].

Evlia Cselebi, a Turkish traveler, wrote about monarch János Kemény the following: "*This leader is at home in all philosophical sciences, proving mastery in some strange and amazing sciences. When in chains, he said: If I escape from the ice pitfall and hostage, I have to be the king of Transylvania after King Rákóczi and I will pour ash onto the ottomans fireplace...but what's the use? I cannot live for long, as your Mehmet will kill me"*[11].

After the stormy changes of owners up to the 17th century, "*almost nothing happened in the castle*". The peaceful times favored intellectual life on the estate, so Brâncoveneşti became favorable to arts. Of its many cultural aspects[12] probably the most important is the

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[3] Szentiváni M., 1986, *Gyaloglat Erdélyben*. Budapest, 76.
[4] Köpeczi *et al*., 1988, as cited, vol. III., 1559.
[5] "*in curso eiusdem Morus ad castrum Wecheu, et sub castro Wecheu flectitur ad dextram manum*" (in Entz, 1994, *Erdély építészete a 11-13. században*, Kolozsvár, 181-182).
[6] Kelemen, 1982, *Művészettörténeti Tanulmányok*, Bukarest, 189.
[7] Forgách, 1941, Martinuzzi és Izabella históriája, in *Erdély öröksége,* vol. I., Budapest, 103.
[8] Kelemen, 1982, as cited above, p.191.
[9] Biró, J., no year, *Erdély művészete*, Budapest, 53.
[10] Keresztes, Gy.,1995, *Maros megyei kastélyok és udvarházak*. Marosvásárhely, 29.
[11] Karácson, I., 1985, Evlia Cselebi török világutazó magyarországi utazásai, Budapest, 81.
[12] Rumour has it that Werbőczi wrote a part of his Tripartitum (Hungarian Book of Law) here and monarch János Kemény also bequeathed us an impressive historical work here. Court of Appeal assessor, Simon Kemény

foundation of Erdélyi Helikon periodical. János Kemény returning from the US[13]He was not only a writer but also the organizer of literature life in Transylvania between the two World Wars, and while he was studying as a forest engineer in Wien he decided to consecrate his fortune to arts. He invited the 28 most representative figures of literary life of the time in his castle in June 1926, thus founding Transylvanian Helikon Society[14]. From this moment on Brâncoveneşti castle was the venue of literary meetings each summer for almost two decades. The participants many times confessed orally and in their writings how important the unifying force characteristic to Brâncoveneşti community was for both writers and Transylvanian Hungarian friends of literature. As Aladár Kuncz mentioned, "*among spiritual groups in Europe this was the most unified and universal minority corps"* [15].

When assessing the garden in 2004, the castle was the home of mentally challenged children. Public use was not new in the castle's life, as at the turn of the 19th century Mrs. Kata Kemény (born Wass) ran a seminary here[16].

3. History of the Building

"Transylvanian noblemen did not intend to build hospitable castles, so they wanted to have strongly fortified, rejecting castles massively set in the ground, which could protect them"[17].

Brâncoveneşti exemplifies best the medieval Transylvanian castle style[18]. It is Transylvania's largest river basin's northernmost world historical monument[19]. Its two

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IV., also lived here until his death in 1826, whose financial help was powerful, as Farkas Bolyai testifies: *"...hadn't it been for baron Simon Kemény, I would have been nothing."* (In: Biró, J.,1943, as cited above, 127); baron Zsigmond Kemény, the founder of Hungarian psychological novel also worked a lot in the castle. (In: Biró, J.,1943, as cited above, 106); The castle became the property of baron Kálmán Kemény in the 1880s, whose wife, Polyxena Bánffy was a favoured lady companion in the English court. Brâncoveneşti state school came into being in 1887 due to her (In: Pallós, A.., 1986, *Marostorda vármegye és Marosvásárhely Szabad Királyi város népoktatási intézeteinek története*, Marosvásárhely). Many prominent figures visited the castle when it belonged to the Keménys: János Bánffy, Rudolf heir apparent to the throne, the Welsh Prince, who later became King Edward VII. of England, József archduke, András Bethlen minister of agriculture (In: Siemers, Ilona, 1999, *Wass-kor*, Marosvásárhely, 90. Siemers was daughter of Wass family of Ţaga branch.)

[13] János Kemény was born in America, Pittsburgh, Pennsylvania, on 1st September 1903. His father, István, who was banished, had to settle in the US. Their mother could not take care of the children alone after the father's death, so she moved to her husband's Transylvanian relatives in Iara. So János was raised at his parental grandfather. Kálmán Kemény decided to settle the castle's case before his death: *"for good and all"*, thus he appointed János as the second heir of the castle and the fortune. After the death of Ákos Kemény in 1923, János Kemény inherited Brâncoveneşti castle.

[14] *"Brâncoveneşti Helikon Society can be labelled as neither a movement nor a trend. Its members were not linked by a common ideology. There was enough room for late romanticism, symbolism, realism and avant-garde ambitions under the Brâncoveneşti lime trees. It lacked organizational structure; common cause and common responsibility was its sole organizer force and its only "membership card" was János Kemény's friendly letter of invitation sent every summer. Some of its members were: Miklós Bánffy - conservatism, high-stepper manner; Ernő Ligeti - bourgeois radicalism; Károly Kós - popular democracy; Lajos Áprily - silent exigence; Áron Tamási - juvenile humour; Aladár Kuncz - liberalism, diplomatic suppleness; Sándor Reményik; Dezső Kovács; Sándor Makkai; Sándor Tavaszy; Károly Molter; Géza Tabéry; György Szántó; Imre Kádár; Jenő Szentimrei; Sándor Kacsó. Their periodical (Erdélyi Helikon), which appeared in 1928, represented the idea of public life based on literary-centered cultural work.* (In: Pomogáts, Béla, 1983, *A transzilvánizmus; Az Erdélyi Helikon ideológiája*, Budapest, 70-73, 78.)

[15] Adamovits, S., no year, http://www.cograf.hu/erma/erma53/kemenyjanos.htm.

[16] Biró, J., 1943, as cited above, 161.

[17] Csabai, I., 1934, *Az erdélyi reneszánsz művészet*, Budapest,19.

[18] Biró, J., no year, as cited above, 53-54.

[19] Kelemen, Lajos, 1982, as cited above, 187.

storeyed wings surround a narrow court; its massive walls, the four corner towers and the bastions show that it was designed for defense[20] (Fig. 2).

Various sources picture contradictory history regarding the history of the building. Comparing the descriptions we concluded the following:

In Roman times there was already a fortress (castrum) on the salient near Mureş River due to its strategic importance. The Crown erected an earthen castle here after the foundation of the state. After the Tartar invasion the medieval castle was built presumably re-using the stones of the castrum with quadrangular ground plan. Its oldest part is the S-W old tower and the adjoining southern wing. The oldest construction was built of Mureş stones, but later reconstructions were of brick[21]. The renaissance form derives from the 1537 and 1555 constructions carried out by Ferenc Kendi, Transylvanian voivode.

During Rákóczi's war of independence the castle suffered ravages and damages, but its restoration started in 1816 by order of Miklós Kemény, King's Chief Judge. During the 1848 revolution the castle was ravaged again. The "*stylish restoration"* was carried out according to the plans of István Möller (the famous restorer of Hunedoara castle) in 1908, when the old bastion was rebuilt and the castle was partially roofed over again. Biró mentions that this restoration *"makes its bleak, Transylvanian style insipid."*

Its present good condition may be attributed to the multiple restorations. Nevertheless, it is important to highlight that the castle never took part in any battles and the world wars left it undamaged. The retreating German troops only *"threw some amiable grenades and good wishes towards it"* in 1944[22].

The interior court was banked up, lost its old style; the well, which was devised by Sámuel Horváth hydraulic engineer in 1802, must have fallen victim of this banking up as well[23].

In front of the southern facade stood monarch János Kemény's barb dryer, facing Mureş River[24]. In the Rákóczi inventory an octagonal summerhouse is mentioned lying in front of the small gate of the inner castle. We may conclude the existence of a trellis from the shape of its ground-plan, which may have been where later barb dryer was. The most picturesque view of the valley was from the monarch's barb dryer where Mihály Szentiváni could presumably pry the rafts men. As László Kővári formulates, we can conclude that this roofed place was unexisting in 1866. We find it possible that the cornered gate building was later founded on this building. The 1864 Rohbock engraving and the 1866 picture in the Kővári book (dating from 1843) only portray the interior castle wall as well as a new, impressive building towards S-W from the castle, the two storeyed coach-house.

The castle was surrounded by an outer hedgerow plank and a moat, through which a drawbridge led into the castle yard.[25] The stone guarding lions at the entrance gate standing on the outer pillars of the bridge were destroyed during World War II.[26] The lions must have got in front of the gate in the 20th century, which is also supported by József Biró's remark: "*there are still statues scattered all over in Transylvanian parks; (...) among the newest ones the guarding lions at the entrance of Brâncoveneşti castle"*[27].

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[20] ***,1901, *Az Osztrák-Magyar Monarchia írásban és képben.* Budapest, vol. VII. 299-300.
[21] Kővári, L.., 1866, as cited above, 204.
[22] Kelemen, L., 1982, as cited above, 193.
[23] B. Nagy, Margit, 1970, as cited above, 312.
[24] Kővári, L.., 1866, as cited above, 204.
[25] György Rákóczi's I., Brâncoveneşti inventory (1648).
[26] http://www.kemenyinfo.hu.
[27] Biró, J., 1943, as cited above, 92.

History of the land and garden

The study of old maps reveals that although the castle was built on a height, the area around it is full of brooks, ditches and waterlogged lands. Endre Zrínyi, archeologist of Tg.-Mureş County Museum concluded that *"The initial castle was built on such a lucky place which is a mountain at the same time; but it was surrounded by mires and waters, so it turned to a difficult prey to enemies: a 'a castle on mountain and water"*[28].

We concluded from the initial stormy history of the castle's owners that the rapid changes of owners up to the 17th century was not favorable for creating a significant ornamental garden on the estate; anyway, this period was mainly characterized by profitable (kitchen) gardens of noblemen. Although one of the owners was the wife of György Rákóczi I., Zsuzsanna Lórántffy (famous for her garden activity), we have no knowledge of an ornamental garden in Brâncoveneşti similar to the one in Făgăraş. Nothing is known about showing a similar interest in gardens of Anna Lónyai, wife of monarch János Kemény. As Brâncoveneşti castle was János Kemény's favourite place to stay (1648-1662), it is likely that the castle's surrounding was made suitable for relaxation.

The 1648 register shows that the land around the castle had multiple functions. There is an orchard with apple, pear, sour cherry and plum trees, kitchen garden with red onions and saffron, a garden with fruit-trees, vineyard, flowers and a gardener's shed and a third, so-called *"Dogberry garden"* with fruit and vegetables. There are more gardens with various agricultural purposes (one for bee-hives, one with the barn, one for the sheep) accompanied by the buildings. However, their position is not known. There is a well in the castle's yard. The poultry yard had peacocks too. The estate also had grass-fields, wheat- and oat-fields as well as beech forests and oak forests[29].

There is no sign referring to garden on the first military survey[30]. Mureş River splits into two below the settlement with a wooden bridge on both branches. There is a mill at the lower part of the narrower Mureş branch, which was already mentioned in the 1648 register (Fig. 3).

The second military survey mentions the garden behind the castle. An important element is the avenue starting from and leading to the western corner bastion and the surrounded grove with trees to its east, which may be the old oak grove we can see today. The avenue ends in the road once leading to Bistriţa and, although there is no data about a baroque garden, it seems to be part of a baroque composition guiding the look of wanderers coming from N-W towards the castle tower. In the vicinity of the castle there were smaller outbuildings, including the two storeyed coach house. The Rose Forest can be found north from the castle, behind the garden. There is a surrounded place on a height in the forest that is cut through by Gödöcs and Leányvár brooks. This place becomes important from the angle of the next two military surveys. The uncontrolled river got three more islands below the castle.

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[28] Szépréti, Lilla, 1981, Régi és új világ. Kolozsvár, 78.

[29] Kővári, L.., 1853, Erdély ritkaságai. Kolozsvár.

[30] The maps regarding Transylvania were drawn between 1769 and 1773 (Josephinische Aufnahme). The exact date of the second military survey (Franzisische Aufnahme) referring to Transylvanian lands is difficult to ascertain. Although Emperor Franz II. orders another survey of the empire in 1806, the survey of Hungary's present-day territory only starts in 1829 and it lasts up to 1866. As for the Transylvanian parts, we only have forestry maps from the 1830s to the 1860s, *"which have been drawn by the local system (Sibiu – Ocna Sibiului) within the framework of the national survey. Thus the military survey of Transylvania in 1869 began within the above-mentioned national framework. As the third military survey was ordered in the same year, the mapping of the Transylvanian areas constitutes a shift towards it."* The third military survey was carried out in Transylvania between 1869 and 1873. The period between 1940-1944 brings the update of the third military survey maps (In: Vajda, Sz., 2003, *A Hadtörténeti Térképtár katonai topográfiai térképeinek bemutatása*, Budapest, Tájépítészet, 4th year, No. 2., 30-33).

Szentiváni's travelbook is from this period and it mentions the famous cherry orchards in Ideciu de Sus, belonging to Brâncoveneşti estate (Fig. 4).

The third military survey already mentions explicitly the *"Castle garden"* behind the castle. The surrounded bigger unit is divided into four smaller ones with regular tree plantations. The exception is the middle, almost triangular part, where the trees are scattered. There is a cemetery on the two sides of the farm road near the church. The garden continues up to Szálas Forest and Rose Forest, where after the Leányvár brook, near Gödöcs brook one can find buildings on the formerly mentioned surrounded area. This is "Villa Redal", according to the map caption. The area, which is west from Szálas Forest, is called 'Lake leg', so the area must have been marshland although it is situated far above the capricious island-builder and destroyer Mureş river. The boundary of 'Lake leg' is Patkányos brook, whose bed fits with the former road leading to Bistriţa. There is a regular area north from the castle on the abyss between Szálas Forest and the main road, which might as well be a look-out. According to the map, Reghin-Deda railway was already finished on the left bank of Mureş River (presumably the less swampy bank). The railway station is situated S-E from the Mureş bridge.

The third military (updated) survey from the 1940s already shows Mureş river meandering in a somewhat regular bed with a few smaller branches below Brâncoveneşti. Thus the settlement got further from the huge river. Nothing new can be seen of the castle garden on the 1:50000-scale map. Salt Spa is marked on both sides of Mureş river between Ideciu de Jos and Ideciu de Sus, south from Brâncoveneşti, where Kálmán Kemény's family used to take the Wass children of Ţaga branch (Fig. 5).

Based on castle descriptions of various ages we can somewhat picture the garden as well. The building and its surroundings create a particular impression. The castle with fir trees on top, orchards in the middle, and its bottom 'bolstered' by alder trees of Mureş offers an impressive view to the approaching people, especially from the valley or by train.[31] It is a landscape component with character throughout the centuries up to now.

The overall impression of the monument was highly influenced by its relevating vegetation: the pine-grove emphasizes the bleak mass of the castle, whereas the orchards gently offset it. József Biró also mentions the pine-grove in 1943. Not only the sight of the castle is impressive, but also the panorama from the castle is remarkable. The initial strategic look-out turned to an aesthetic experience over times. The *"roofed look-out place, monarch János Kemény's barb dryer"*, mentioned by László Kővári, is the oldest recorded (landscape) garden building.[32] Its position was not randomly chosen. The most beautiful view of Mureş valley is from the main facade of the castle. We know about the existence of this look-out at the back of the park starting from 1860s and even at the end of the 19th century: *"Taking a walk along the beautiful park of Brâncoveneşti we arrive at a peak from which we can see the villages in the narrowing valley"*[33].

Szentiváni describes the castle garden as a source of special memories: two family tombs, one of which older than a century, and the Roman road *"named after Trajan"*[34], which is also mentioned by Kővári: *"We can see the rampart of the Roman fortress with a 210 steps long side with still distinguishable tower feet at both ends. A Roman road led to this fortress which can be seeing even today"*[35].

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[31] Kelemen, L., 1982, as cited above, 187.
[32] Kővári, L.., 1866, as cited above, 204-205.
[33] In: ***, 1901, *Az Osztrák-Magyar Monarchia írásban és képben.* Budapest, vol. VII. 300.
[34] Szentiváni, M., 1986, as cited above, 78.
[35] Kővári, L., 1866*, Erdély építészeti emlékei*. Kolozsvár, 27.

The tombs mentioned by Szentiváni may have been parts of a sentimental garden as the third military survey from the end of the 19th century illustrates the ornamental garden authentically. Vilmos Hankó characterizes the park in 1896 as a result of aristocratic generosity, *"upon which century-old trees cast a dark shadow"*[36]. We also know the garden of Kálmán Kemény from Ilona Siemers' memories from the turn of the 19-20 century. According to Siemers, the *"real English park"* started from the flower garden behind the castle's northern wing, which was *"a grassy broad area variegated with century-old oak trees"*. These oaks dominate the castle garden today; their dendrological and landscape value is immeasurable.

There were more winding paths in the garden, one of them leading to Mureş hillside with benches here and there. After comparing Ilona Siemers' memoirs with the third military survey, a good question is whether the park extended or not across the surrounded area. However, there is neither path typical of landscape gardens or buildings to be accepted as look-outs. Still, look-outs may not be taken as buildings at all costs; it could have been a simple look-out spot either: *"...After a 30 minutes walk we got to a charming look-out. God, I have sat so many times there, reading and enjoying the silently teeming power of nature. I have often forgotten of both time and meals. The last frontier of the garden was there"*[37]*. The only building between the Rose and Szálas forests was the "cottage in the alps with the farm" on the pasture, which was also valuable as a landscape motive. In the memoirs of István Mikó "the garden ended in the forest blending into it almost abruptly..."* [38].

The tennis court also belongs to the vicinity of the castle known from Ilona Siemers' description. This was useless due to the lasting shadows of the fir trees, and because of the race-horse stables with racecourse for practicing, respectively. In those days the two stone guarding lions were still at the gate and the courtyard was cobbled with mossy stones[39].

"The serpentine path leading to the castle changed to a flower-edged promenade during the great settlement at the beginning of the 20th century, and rose trees blossom alongside in the former moat[40].

A position was advertised for a gardener in the "*A Kert*" ('garden') journal in 1899 to maintain the extensive Brâncoveneşti garden: "*Gardener wanted from 1st September this year, who is expert in all branches of gardening, such as planting flowers and indoor plants, improving roses, kitchen gardening and planting fruit-trees, creating flower beds and he shall be a practical person knowing floral design and understanding Hungarian...*"[41].

Brâncoveneşti castle garden was a prominent venue of Erdélyi Helikon, many minutes mentions the park as number one place of discussion even before the rooms of the castle:[42] *"The meeting, if weather permitted, started and finished under the old trees of the big park throughout the three days. There was an enormous table of millstone on the clearing between the tall oak trees with benches around where the discussions took place...After dinner we went for a walk almost each time in this big park whose sandy path was shining. Returning from*

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[36] Hankó, V., 1896, *Székelyföld*. Budapest, 335.
[37] In: Siemers, Ilona, 1999, as cited above, 95.
[38] Mikó, I., 1996, *Vár állott, most kőhalom*. Kolozsvár, 43.
[39] Siemers, Ilona (1999): as cited above, 86-88., 95-98.
[40] http://www.kemenyinfo.hu.
[41] *** *A Kert*, 1899, Budapest.
[42] *"The minute of the third Helikon meeting, Brâncoveneşti, 5-7 July 1928. Recorded on 5th, 6th and 7th July 1928, on the occasion of the third Erdélyi Helikon meeting of Transylvanian Hungarian writers' friendly working-group, whose series of sessions were held in the park and rooms of Brâncoveneşti castle thanks to baron János Kemény who made sacrifices and kindly invited us."* (In: Nemeskürty, I., 1988, *Édes Erdély*. Debrecen, 156.)

there, we would sit on the benches in front of the castle, on the so-called look-out. A glittering panorama set before our eyes of the land across Mureş"[43]. The Aladár Kuncz memorial table, designed by Károly Kós, was placed here later.

The castle's present state

The castle above the settlement dominates the area from the distance even today. The Kemény family was returned the castle, according to the latest news[44], which can be a ray of hope that Brâncoveneşti may become a centre of Transylvanian intellectual life again.

There are two ways to get to the rock projection serving as the "foundation" of the castle: a cobbled straight road past the reformed church and a serpentine. Some houses were built on the lower part of the serpentine that disturb the view.

The former coach house is situated right from the castle's entrance, whose facade still reveals some of its original style. The moat around the castle cannot be seen in full, it remained only on the northern and western side. Similarly to the Gorneşti moat, it is one of the few medieval garden relics.

There are three memorial plaques in Hungarian, Romanian and German to the memory of man of lettres János Kemény and the Erdélyi Helikon (Fig. 6).

There are more outbuildings west from the castle, which do not go well at all with the castle. A smaller playground and promenade was formed north from the castle, probably on the spot of the previous tennis-court.

In the vicinity of the castle there are almost exclusively Norway spruces (*Picea abies*) left inside the fence. There are other ornamental plants too, but none of them can originate from the stock of the former garden. There are other spontaneously planted leafy plants contributing to the flora along the serpentine near the fir trees.

János Kemény, his wife and his daughter Klió were buried in the back garden under the leafy boughs of centuries-old oak trees, and Albert Wass' (1908-1998) memorial was also erected here near the Aladár Kuncz memorial table.

From the relatively healthy oak grove, which might have been planted by György Rákóczi II., one could have a wonderful view upon the broad valley up to the Alps in case the thicket is removed on certain parts of the terrace. It could be an ideal look-out spot towards north.

An enormous orchard lies west from the castle. Drainage ditches run along the avenues to divert storm-water. The former orchard belonging to the estate must have been situated here. On the eastern side of the orchard we have presumably found the remaining of the old earthen castle, which may have been built on the foundations of the Roman castrum.

The plant stock of the former castle garden is illustrated by the attached geodesic survey and the list of plants (Fig. 7).

List of plants:

No.	English name	Latin name
1.	Pin Oak	*Quercus palustris*
2.	Common (English/Pedunculate) Oak	*Querqus robur*
3.	European Weeping Birch	*Betula pendula*
4.	European Black Pine	*Pinus nigra*
5.	Norway Spruce	*Picea abies*
6.	Common walnut	*Juglans regia*
7.	Small-leaved Lime	*Tilia cordata*
8.	Plane tree	*Platanus hybrida*

[43] Tamási, Á, *Vadrózsa ága*. In: http://www.mek.iif.hu/porta/szint/human/szepirod/magyar/tamasi_a/vadrozsa/vadrozsa.htm

[44] http://www.mediatica.ro

Baron György Kemény's sepulchre lies on the western side of the earthen castle. There are smaller ditches on the remaining corner arches of the square earthen castle, which may trace the place of the former bastions. A smaller hill can be seen towards the centre of the earthen castle, revealing the remaining of a stone wall in the middle.

There is a fine prospect over the Mureş valley towards south from the top of the earthen castle. Béla Fráter inherited his three-storeyed castle with park in Vălenii de Mureş from counts Rhédey of his mother's branch. It was only 500 metres north from Brâncoveneşti castle. *"The estate with its garden reaching the forest did not survive the war. The remaining of the last brick was brought to Budapest by my friend, commendatory Dr. József Hajós"* [45]. In all probability, this building may be identified as the project named "*Villa Redai*" on the third military survey map.

FIGURES

Fig. 1. Brâncoveneşti Castle

[45] Mikó, I., 1996, as cited above, 44.

Fig. 2. The medieval Transylvanian castle style

Fig. 3. The map of the first military surveying

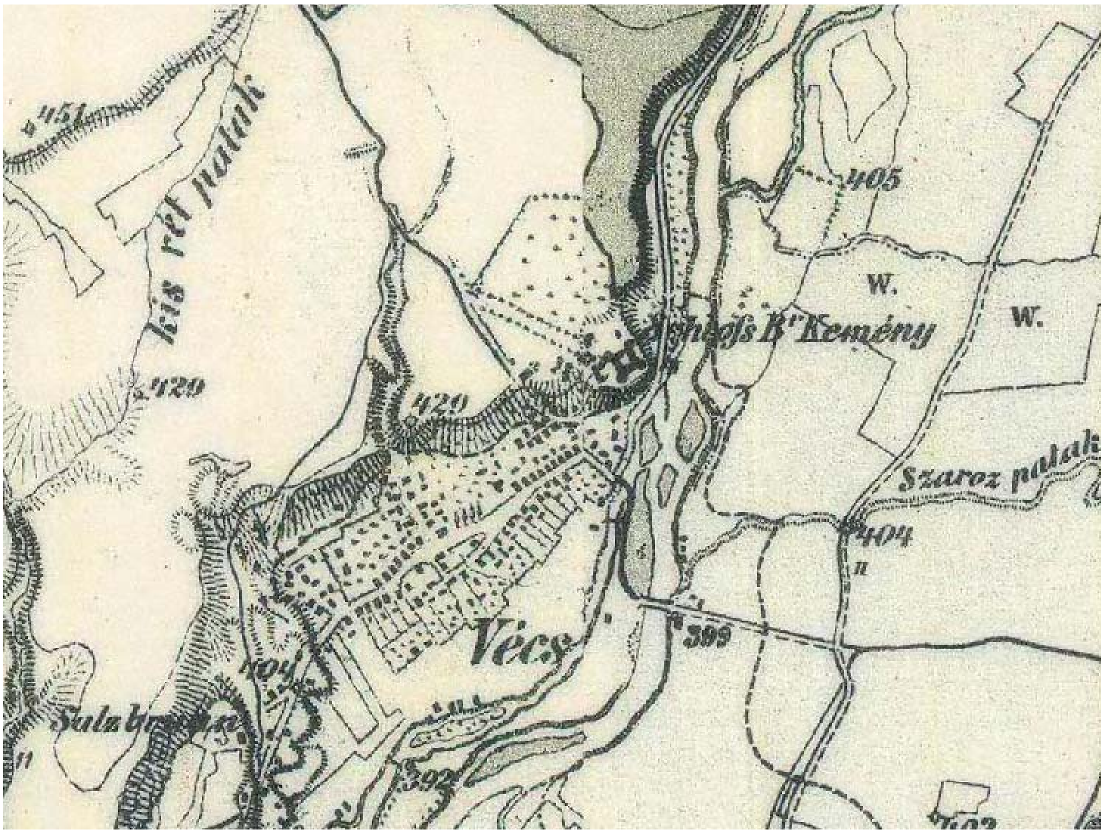

Fig. 4. The second military survey map

Fig. 5. The third military survey map

Fig. 6. The memorial plaques to the memory of János Kemény

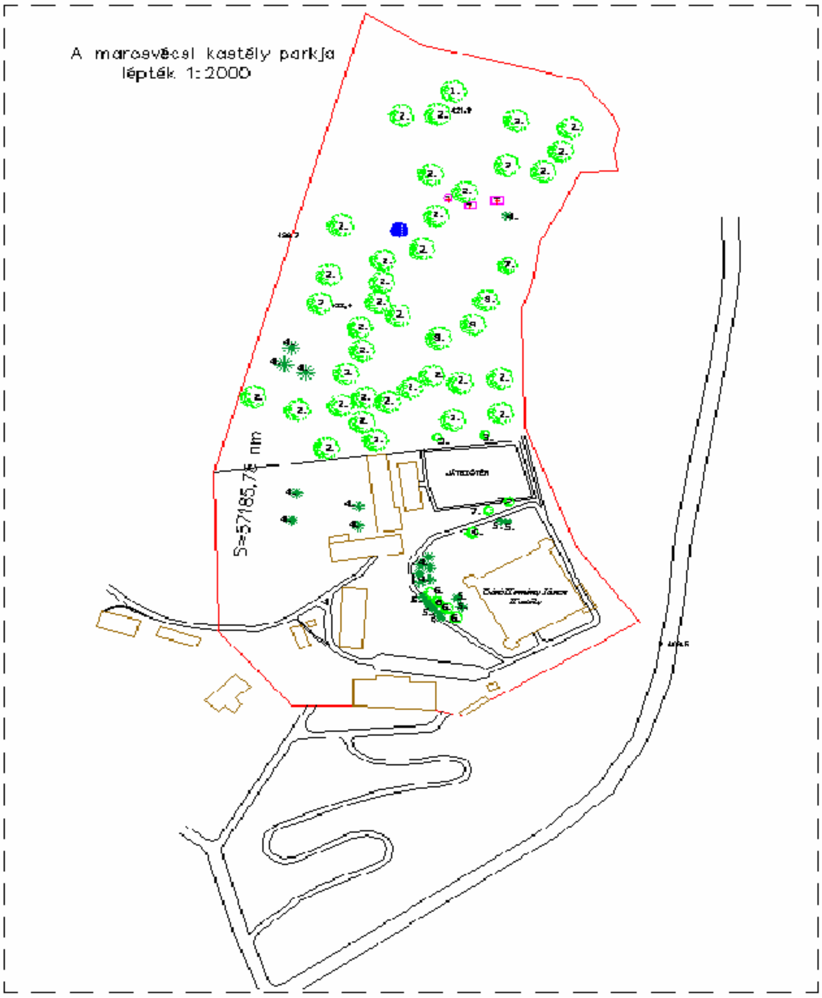

Fig. 7. Geodesic survey

The historical survey of Transylvanian (Romania) Castle Garden. An historical survey of Gorneşti Castle Garden

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Keywords: castle gardens, Gorneşti, the Teleki family, protection of monuments, landscape design science

ABSTRACT

The aim of our research is the evaluation of Gorneşti Castle Park, assessing its actual stage as well as drafting its revitalization plan. The park's dynamical changes were studied using military maps which turned out to be more precise than any other map. Topographical measurements were carried out during the survey, accompanied by a conclusion regarding the present state of the park. We also took measurements of every reference point of the studied area on the investigated site. Our geodesic assessments, together with the park's present state, contain the most important dates of the restoration and revitalization. The article also contains our conclusion and references about the investigation. Gorneşti is situated on the left bank of Mureş River, on a plain near the Bongor hillside along the road from Tg-Mureş to Reghin. The settlement has a long history; the earliest documents mention it from the beginning of the 14th century. Its name first appears in 1319 as 'Knezeg' (Bíró 1938). At this time the settlement becomes the property of the Széchényi family, and then King Sigismund's donation letter (1405) testifies that it is the property of Antal Erdélyi. The charter from 1477 mentions Gorneşti protected fortified castle as "Castellani castelli Gernyezegh". King Mátyás mentions it in his charter from 1478 as a royal castle ("Castrum Nostrum regis Gernyezegh", Keresztes 1995).

HISTORICAL BACKGROUND

The Teleki family has many illustrious members of Hungarian history. The family broke into both reformed and catholic branches in Hungary (Gyömrő) and Romania (Gorneşti, Gogan-Varolea and Şomcuta Mare, cf. Marosi 1999).

The Telekis appear in the Hungarian family history as direct descendants of the ancient Garázda family. The Garázdas belong to a pure Hungarian clan and they originate from a main estate in Mecsincze (Bulgaria), 12th century. They received their coat of arms, a wild goat rising from flames, from King Sigismund on 24th February 1409. Miklós Garázda, the castellan of Zvorn, and László Szilágyi obtained Telek plain in 1408 as exchange bestowal in Békés County (Hungary). After the Turks ravaged Dalmatia around 1414, the Garázda family moved back to Hungary. From this moment on, the Garázda family split into three branches: Zágorhíd (Hungary), Szék (Sic, Romania) and Telek (Teleac, Romania). Anna, the only daughter of Sic branch Garázda, was married to Dénes Garázda's son, Mihály of Telek branch. Mihály Teleki's (I.) son, János, castellan of Jenő (Fundătura, Romania) and lord lieutenant of Zarand (Romania) married Anna Bornemissza in 1630. Their son is Mihály Teleki (II.) (1634-1690), forefather of all later Telekis.

Mihály Teleki's descendants played a distinguished and important role in all public areas in the next 250 years of Hungarian history. They held the highest titles and offices from the king. However, the outstanding importance of the Telekis lies in their love and patronage of science and literature (Bíró 1938).

According to Transylvanian standards, the Telekis were regarded as wealthy, and they tried to enlarge their income by sensibly managing and extending their lands. Still, they inclined to represent their family status by a modern and exacting lifestyle, in which arts played a role. Nevertheless, they were also loyal to protestant-puritan family traditions in leading their social life.

BUILDING ACTIVITY OF THE TELEKI CASTLE AND GARDEN

In the 1460s István Erélyi Sombereki, voivode of Transylvania builds a medieval castle, which becomes the property of chancellor count Mihály Teleki in 1685. Between 1772 and 1782 count László Teleki (II.) and József Teleki (I.) had the castle demolished and the building of the present-day castle began. The castle's architect is presumably *András Mayerhoffer,* and the building belongs to the group of castles erected in the so-called *Grassalkovich* style. The building was erected based on a U-shaped ground plan with three axed end-façade wings facing the garden as a cour d'honneur. It is two storeyed with double rotunda, topped by a broken lined gable with a middle pavilion. The castle is roofed by a garret, and the middle pavilion and the clock-tower was finished in 1777.

One of its bells was founded in 1677, while the other in 1777 in Wien (Fig. 1).

The clockwork and its ornament were constructed by György Clockmaker Szigati from Turda in 1777 (Fig. 2).

There is an arcade on the ground floor towards the yard, and a gallery with windows joining the halls on the first floor. The main hall's stucco ornaments on the first floor and the carved stone railing of the balcony were made by Antal Schucgauer (Keresztes 1995).

The interest of the building is that it has 52 rooms and 365 windows as the weeks and days of a year.

It is the register of Gorneşti castle which first mentions the so-called "garden with lake", situated south below the manor near Mureş River. *"It has two fish ponds, a rectangular and a triangular one, both mounded with oak planks and abounding in water. There are a few apple-trees, pear-trees, and plum-trees of various kinds in this garden surrounded by braced hedgerow. Its length is 51, its width is 48 fathoms".*

The baroque castle and its park

The present-day new castle was built by László Teleki (1710-1778) and his son, József Teleki (I.) (1773-1796) between 1772 and 1782. The first building stage lasted from 1772, the demolition of the unsound walls, to 1778 when József Teleki died. During this period the greater part of the walls got roofed. Based on contemporary documents, it turned out that some walls of the old castle were re-used (Fig. 3).

We can distinguish the castle under construction with the moat on the map of the first military surveying (1769-1773), but the park is not on the map yet. (Josephinische Aufnahme 1769-1773, Military History Atlas, Sect. 113, 128) (Fig. 4).

The major events of the building date from 1777; the main wing is ready and the middle pavilion is roofed with the high rotunda (Bíró 1938).

After the building of the new baroque castle, the garden area around it changed too. The documents testifying the creation of Gorneşti baroque garden originate from József Teleki (I.) The young count while travelling in the western part of Europe visited the famous gardens of the time to which - similarly to works of art - he showed interest all his life. The new Gorneşti castle was ready in 1782, but many parts needed repairing soon; due to the after work to be carried out as well as the reconstruction of the old outbuildings turning to ruins, count József Teleki (I.) could hardly work on the garden arrangement as late as the end of 1780s. A receipt from 3rd February 1783 proves that the arrangement of the garden started in 1781 as a gardener, József Bíró was paid with 75 Hungarian forints for the previous two years. Another document from 1782 also shows that they made the first steps in creating the new garden around the castle. The evidence for the large-scale renewal of the garden is a letter from 16th September 1789 written by count József Teleki (I.) to his son in Sibiu (Romania), László Teleki (II.) (1764-1821).

The ground plan was drafted by András Mayerhoffer by order of count József Teleki. The garden was created independently from the castle, and it differs a lot from other Hungarian and Transylvanian gardens. We can conclude from the ground plan that embroidery-like parterres surrounded three sides of the castle, and there was a fish-pond in the moat (Fig. 5).

The census in 1801 mentions that the building was surrounded by a palisade built on tubby mounds on the corners inside which flowerbeds may have been planted: "*On the two sides of the stone bridge leading into the castle protecting wings (...) on the northern and eastern moat to whose outer ends connected or united plank gardens are built on oak posts with shingled roof.*"

The vegetable garden lay south from the castle, and the mill was situated west from the fish-ponds of the north-west moat, at the mill-race of Mureş river bank. The building of the *"large flower house"* (greenhouse) starts in the summer of 1790.

While building, József Teleki (I.) had the moat filled up around the castle, though not entirely; even today the building is apparently on a 3-4 m high pitch. The 1801 census mentions the *"plain place"* above the moats as the "hill of the castle". In some western parts of the moats the count and his son, József Teleki (II.) (1777-1817) got fish-ponds dug in the mounds towards Mureş river.

The count misses the elements typical of a landscape garden, which indicates his changed view of nature due to József Teleki's 'modern' style influenced by the works of Haller and Rousseau. The count met Rousseau in person, paying attention to his works until his death, and he was Haller's pen friend. He actually visited an *"anglus garden"* in Munich in 1792. This is what he wrote to his son on 8th March 1793: *"I wouldn't give my dear island for anything, the beautiful scenery from the room and the fact that I can see my fish swim..."*

The completion of Gorneşti landscape park is connected to József Teleki's (I.) younger son, József Teleki (II.) (1777-1817), who travelled all over England (Ecsedy 2003). The young aristocrat returned from abroad in 1800 showing great interest and expertise towards architecture and arts. The final look of the castle rested in good hands, but in the spirit of changed art (Bíró 1938) (Fig. 6).

The empire reminiscence of József Teleki (II.) is the only surviving plastic element of the park, which was originally created for the garden; the garland urn on a large rim pedestal was placed by his widow, Zsófia Teleki as early as his year of death in 1817, according to the Latin inscriptions on the two opposite sides of the patten (Fig. 7).

József Teleki's (II.) son, Domokos Teleki (III.) (1810-1876), withdrew to Gorneşti in 1851 after the Hungarian War of Independence, accompanied by his secretary, Pál Gyulai (1826-1909) who mentions the beauty of the 19th century castle park many times in his poems, letters and memoirs. He is a devout admirer of the tall poplars around the castle, the lime trees reaching the windows of the first floor and the winding paths of the park edged with jasmine bushes. In the 1850s the fir-trees of the park were planted.

Géza Teleki (1850-1882) inherited the castle from his father, Domokos Teleki (III.), and after his early death, his elder son, Domokos Teleki (IV.) (1880-1955) became the owner.

In this period the castle park showed its full beauty testified by the 3rd military survey map as well (Military History Picture Gallery 1869-1874) (Fig. 8).

The young count was an ardent art collector enriching the hallways of the castle and the park. This is the period when the remainings of medieval epitaphs and sepulchres appear in the garden (sentimental pieces for the sake of decoration), including count Domokos Teleki's most famous acquisitions, the pieces of Gorneşti mythological series.

There are 7 statues and pedestals of the series in the park representing Juno, Neptune, Pan, Venus, Ceres, Bacchus and Ganymedes, identified by József Bíró (Fig. 9 and 10).

Count Domokos Teleki's further acquisitions are the much damaged dwarf figurines in the park dating from the same period, which satirize the characters of the French Revolution.

These are placed around the fish-pond of the N-W moat dug in the very last years of the 18th century (Fig. 11).

So the 7 baroque statues of mythological figures and the dwarf figurines were ordered by count Dr. Domokos Teleki of Sic, which decorate Gorneşti park even today.

THE PRESENT STATE OF THE CASTLE AND PARK

The castle and its park are in the property of the Teleki family, but its right of use belongs to the Romanian state since 1947. Now a TBC preventorium functions in it. The real estate has been reclaimed by the descendant of the Teleki family of Sic, Gábor Teleki from Bucharest, taking over the building and the castle garden inside the fence. According to the law, the building can be occupied only after 5 years. The state institution will devote care to the maintenance of the building as far as possible. The building was under general repair and restoration work in 1961-1962, and unfortunately both its interior and exterior underwent changes serving the functionality of the institution. When central heating was installed in 1991 the open arcade of the left wing towards the yard on ground floor was changed into a closed room with windowed doors (Keresztes, 1995). The facades and outside walls did not change; they still preserve their 18th century looks (Fig. 12 and 13).

However, the baroque rooms suffered modification, the interior space having been turned into hospital rooms and hallways. The first-floor baroque ceremonial hall and its stucco ornaments remained intact, as well as the original chandelier and windows (Fig. 14).

The other rooms still show some traces of former pageantry, where fireplaces and some pieces of furniture tell of the glorious past (Fig. 15).

As the attached geodesic survey shows, the garden did not preserve its original structural unity lacking a unifying composition as the original layout has changed. There are no spaces left for various functions, such as promenades or one cannot find a nook suitable for rest (Fig. 16).

The changes of various ages can only be traced; one of them is the renaissance moat and mound preserved excellently and the old trees are faint reminiscences of an English park. We can identify ginkgo/maidenhair tree (Ginkgo biloba), bald cypress (Taxodium distichum), common horse chestnut rows (Aesculus hippocastanum), Catalpa (Catalpa bignonioides), century-old weeping willows (Salix alba 'Trisitis), lime trees (Tilia cordata), as well as plane trees (Platanus acerifolium) (Fig. 17. -21).

The tree plant stock can be found in the geodesic survey which contains all the trees with a trunk diameter of more than 10 cm. These can be easily identified with the help of the attached plant list at the end of this part.

Plant protection is not ensured, the tree tops of planes suffer from drying and a couple of trees have been mutilated by storms. Maintaining the garden (scything, treating trees) is very extensive; one can see several old trees cut down in the park. The shrub level is almost unexisting in the whole garden. One fish-pond with a small island from the 1790s remained intact on the S-E side of the castle, although the water and the pond-feeding Margit spring is logged, dirty and their cleaning is not solved.

Many valuable statues of the garden can still be seen. Although damaged, 7 pieces of the mythological statue group can also be found which arrived from Budapest in 1905 through Domokos Teleki. The three dwarf figurines satirizing the participants of the French Revolution came at the same time, and they are situated around the lake now. An empire sepulchre enriches the park which was erected by József Teleki's (II.) widow in 1817, and it can be found in the southern part of the garden. There used to be a well house on the pond's island, but nothing is known about it, unfortunately. The protection of the statues and other works of art in the garden is of utmost importance, as the state of these weathered items is worsening, especially those of grit (brownstone) (Fig. 22. and 23).

Several modifications have been carried out in the garden due to its new function after the nationalization. To satisfy the sporting needs, the former cour'd honneur has been concreted and a football ground and playground has got into shape in the S-E part of the garden (Fig. 24).

Several outbuildings have been built in the garden (porter's lodge, workshop, etc.) which are discrepant from the garden both aesthetically and spiritually.

The present tree plant stock of Gorneşti castle garden (the plants can be identified based on the numbers in the attached geodesic survey).

The present tree plant stock of Gorneşti castle garden (Tab.1).

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TABLE

Table 1. The present tree plant stock of Gorneşti castle garden

	English name	**Latin name**
1	Common Horse Chestnut	Aesculus hippocastanum
2	Maple tree	Acer sp.
3	European Ash	Fraxinus excelsior
4	Norway Spruce	Picea abies
6	Common (English/Pedunculate) Oak	Quercus robur
8	Black Locust	Robinia pseudoacacia
9	Small-leaved Lime	Tillia cordata
10	Weeping Willow	Salix alba 'Tristis'
11	London (Hybrid) Plane	Platanus x acerifolia
12	European Weeping Birch	Betula pendula
13	Juniper tree	Juniperus sp.
14	Bald Cypress (Swamp Cypress)	Taxodium distichum
15	Catalpa	Catalpa bignonioides
16	European Black Pine	Pinus nigra
17	Ginkgo/maidenhair tree	Ginkgo biloba
18	Eastern Arborvitae (Northern Whitecedar)	Thuja occidentalis
19	European yew	Taxus baccata
20	Common walnut	Juglans regie
21	European Larch	Larix decidua
22	Black poplar	Populus nigra
6A	'Fastigiata' English Oak	Quercus robur 'Fastigiata'

FIGURES

Fig. 1. The castle bells

Fig. 2. The clockwork

Fig. 3. The present-day new castle

Fig. 4. The map of the first military surveying

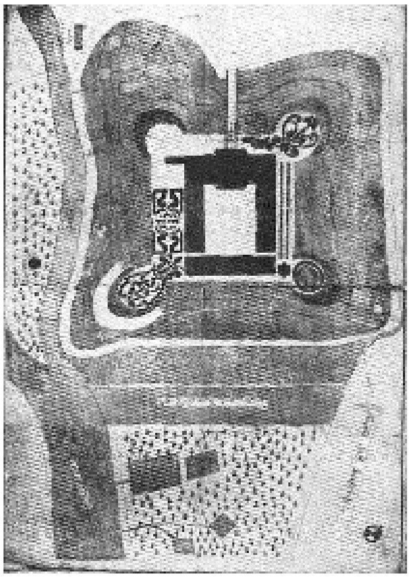

Fig. 5. The baroque garden

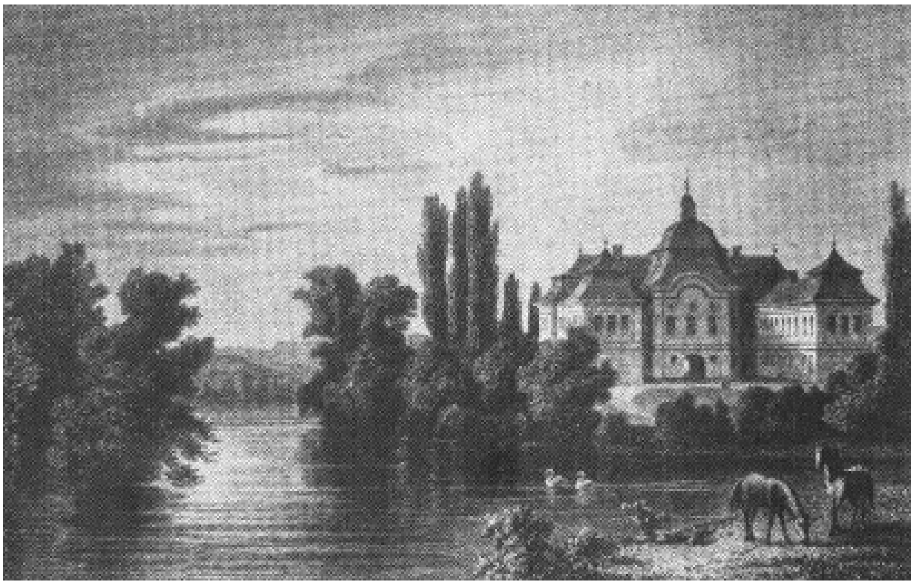

Fig. 6. The Gorneşti landscape park

Fig. 7. The empire reminiscence of József Teleki (II.)

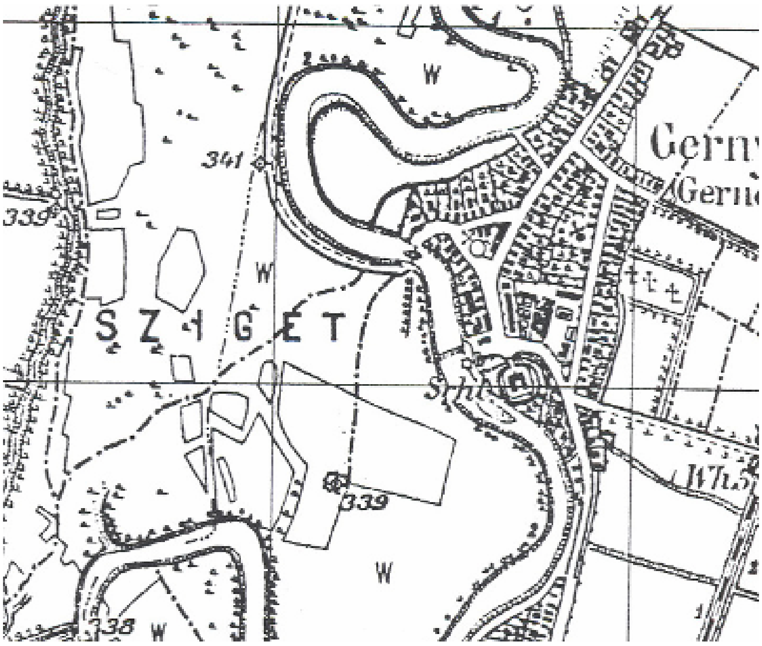

Fig. 8. The 3rd military survey map




Fig. 9-10. The pieces of Gorneşti mythological series

Fig. 11. The dwarf figurines in the park

Fig. 12-13. The facades and outside walls

Fig. 14. The first-floor baroque ceremonial hall

Fig. 15. Some pieces of furniture

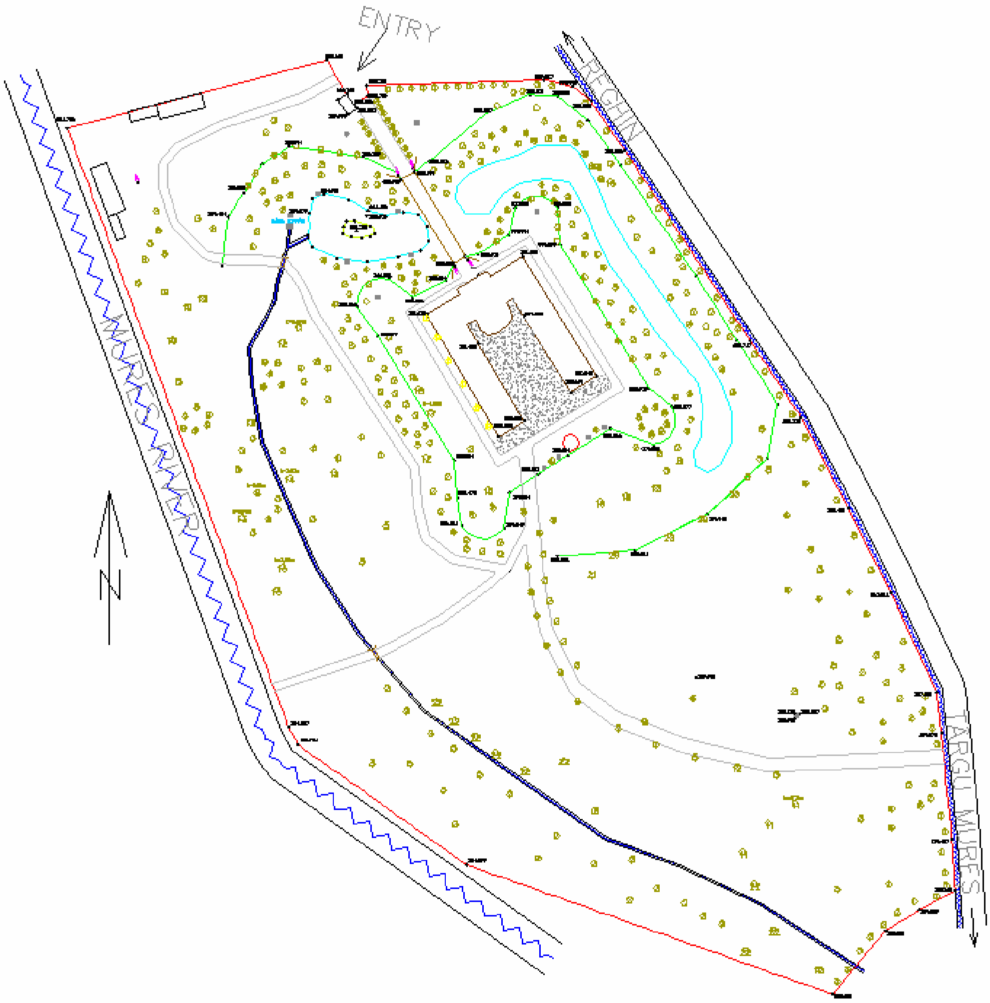

Fig. 16. The geodesic survey

Fig. 17. Maidenhair tree

Fig. 18. Bald cypress

Fig. 19. Catalpa.

Fig. 20. Century-old weeping willows

Fig. 21. Plane trees

Fig. 22-23. The statue of Gorneşti park

Fig. 24. The playground

Local community in the land of Buzău landscape

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Keywords: landscape, rural landscape, geo-park, tourism, local communities.

ABSTRACT

The landscape plays a very important role in the human life (physical and psychological), being modified continuously by their activities (conscious or unconscious) in their evolution. The landscape also represents part of the heritage of the future generations, fact that leads to a continuously monitoring need of the existing landscape and also to anticipate and to make long term scenario.

The present work presents a complex field research concerning the identification of certain existent typologies witch aims the optimum intervention principles for Buzău geo-park.

"The Land of Buzău" is situated at the intersection of three bio-geographical zones: alpine region in north, continental region in centre and the steppe region in south. All of these regions have specific elements of flora and fauna, thus results a dynamic character of the territory.

INTRODUCTION

The research presents an area that is going to be declared a Geo-park (the third one in the country). The area is located in the north of Buzău County in the Sub-Carpathian's bend (Fig. 1).

It is a case with many questions and also with lots of constraints because the territory is composed of economically disadvantaged areas but with a rich geological, biological and cultural potential, potential that it is not exploited. The combination of these elements leads to a specific local landscape. The geo-park territory presents an almost optimum balance between natural and anthropic, balance that should be maintained.

A geo-park is a protected area, but also a tool to ensure sustainable development of the communities (Andrăşanu A., 2007). This development includes also tourism (witch is a new industry in the region), which can lead to destruction of the initial values, because of uneducated tourists and uneducated local communities. Therefore this research also investigated the different effects that tourism had on the landscape.

The site we studied presents interesting diversity of geological, biological and cultural elements, meaning: landscape elements.

Geo-diversity. The region is known for the Muddy Volcanoes, the amber from Colţi, the Salt from Meledic, the Living Fires, the petroleum springs, salty springs, the spectacular relief with the "Wall of the Giants" or the stone fangs, the salt caves, fossils, or other geological structural elements less known (Fig. 2).

Bio-diversity. The north part of the geo-park territory is situated in the mountain forest area (with species like: Fagus and Picea), while in central-southern area there are steppe elements, species like: *Stipa* (herb), gopher, Carpathian Scorpio, etc. Most of the territory is occupied with a mosaic of patches of forest, bushes, pastures and arable land (result of human activity) (Fig. 3).

Cultural diversity. The territory of the geo-park is situated at the interference of three Romanian provinces loaning something from all, without denying its own identity: dominance of the countryside, village settlement along the river valleys, the existence of isolated hamlets with old traditions, the existence of powerful and ancient religious and monastic centre, traditionally clothing, vernacular architecture heritage, cultural and architectural monuments, boundary stones and religious crosses, and also customs, legends, stories, festivals (Fig. 4).

RESEARCH METHODS

"Au sens premier, commun et répandu du terme, le paysage, c'est « ce que je vois » (NEURAY, 1982), c'est-à-dire la « physionomie d'un espace qu'on embrasse du regard ou celle d'une contrée que l'on traverse, parcourt ou survole » (Noirfalise, 1988). Le plus simple et le plus banal des paysages est, comme le dit Bertrand (1978) à la fois social et naturel, subjectif et objectif, production matérielle et culturelle, réel et symbolique..." (Extrait de l'Etat de l'Environnement, 1996).

Therefore the research is based on a two year field study, in witch the main research methods were: photography analysis, plans comparisons and site analysis, plants determination, observation, sketches of observation, participative observation of the local life, interviews. Those methods led us to a specific type of approach. This approach consisted in the development of different analysis for different contexts.

Cultural and social context. The territory of the geo-park is a rural area, with tendency of population aging and migration (especially abroad). The residents of the 18 districts are unevenly distributed, Berca district being, by far, the most developed one and with the biggest economic weight (over 2900 people working in industry, especially in the extractive industry). The rest of the geo-park presents a high rate of unemployment. The main activities that provide incomes are, in order of their importance: agriculture, animal breeding, wood processing (but with irrational exploitation of forest and geological resources), industry, trade, tourism, and beekeeping. The "place" it's like an "encyclopaedia" in which you can find all the specific elements that gave the Land of Buzău a special atmosphere with remarkable views. The Land of Buzău presents some particular elements represented by the multitude of trinities (religious crosses) situated at crossroads, in households, on hills as a gratitude to God because they could climb the hill, they arrived at some point where they could rest at the shade of a tree, etc. All of these elements have a visual impact in landscape. The traditions are still respected in some parts of the territory (animal breeding, the use of carts with oxen, fishing), but some have started to be lost (drying fruits, pottery, handicraft workshops, development of tools, traditional wooden models). The historical and cultural heritage is unevenly distributed. Although traces of the old housing are frequently reported, there are no flagged archaeological sites. We noticed a deficiency in the perception of the locals over built heritage, also cultural and landscape heritage and there are no educational programs for the local communities. Thus tourism can became a very dangerous force, introducing a false desired modernity and leading at the accentuated destruction of the local heritage, already disregard by the new locals generations. Moreover, for the areas that are attended by tourists there is not any financial/economic benefit for the community, just for the private sectors from the Buzău city.

Spatial analysis of area/project/plan. Considering that the territory of the case study occupies a very large area, we tried to understand the implication of the landscape elements, elements that define the Land of Buzău, and how they give this area a distinguished aspect. These elements are*: the relief, the rivers and the lakes, the infrastructure, the villages.*

The Relief – The relief analysis give a detailed understanding and the perception of the physical structure of the site. The site has altitudes that vary from 100 meters up to 1320 meters; this variation gives the site a wide variety of relief forms. The relief is modelled by four major rivers (from east to west: Slănic river, Sărățel river, Bălăneasa river and in the south Buzău river) presented thereby, from east to west like a series of valley-hill, valley-hill. Also the site has an ascent from south to north. The landscape is varied and dynamic and the settlements are various, adapted to the relief forms.

The Hydrography – On the geo-park's territory there are four water courses with high flow at which other medium, small or temporary water courses are added. From the stage of spring to the point of confluence, the river is acting on relief shaping him. Following this actions results areas with different characteristics – various stages of the components of a river: *spring stage* – (area with the highest altitude, is characterized by thalweg, minor riverbed is not observable); *The delineation of the minor riverbed* – (the small river gains enough power erosion on side slopes); *Area with a minor riverbe*d (where the water runs frequently); *The delineation of the major riverbed* (presents land modelling by means of complex processes of meanders); *The area with major riverbed and with the beginning of the meadow* - (it's representing the balance of the river, getting out of balance and in-depth erosion lead to deployment of the meadow); *The area of the valley river with meadow* - (is the flooded portion of the land, situated along the water flowing and characterized by a specific vegetation);

Depending on the relief and geological substrate, but also on the type of the riverbed, the landscape presents different features resulting specific types of landscape (ex. landscape with rocks, waterfall - narrow landscape / tunnel; landscape with meadow - open landscape with gravel). In areas with gravel bed are often extracted aggregate (sand and gravel), changing the flow of the water and directly influencing the landscape (there is no functional program to remake the environment).

Villages typology – Considering the various forms of relief and also the land-use, in the Land of Buzău we were able to find different types of villages *(gathered villages, linear villages, spread villages, scattered villages). Gathered villages* - Characterized by well-outlined "village hearth" (in Romanian: vatră); High density of households and population are located in hearth, being proportional to their age and economic power; Appears as a consequence of the limitation of the "village hearth" from the vast property in order to save the free land for efficient use (agriculture use); Cultivated land is located entirely outside "village hearth"; Here, people have a big interest in arranging the front garden with pergolas and flowers and they show interest for the space from the main entrance; *Linear villages* - Are developed along the main transport axes, water courses and especially along the river valleys; The village has well contoured limit, while agricultural land is not necessarily located near the village; When several linear villages that are developing along the same axis tend to unite, they create a feeling/sensation of a tunnel; *Spread villages* - Represents the typical form of the Romanian village; It is the most common type of village in the site, which is specific to Sub-Carpathian regions and hills; Household's arrangement is made according to relief; The "village hearth" has irregular shape, but more specifically is that it includes a part of cultivated land; Roads have radial or tentacular arrangement. *Scattered villages* - It is frequently meet in mountain areas; The "village heart" is confused with the village boundary; Households have distances up to 2 km between them, being connected through short paths and unorganized roads; Each household has the economical land-use around it; The land use for agriculture occupies small surfaces; pastures and natural hayfields are predominate; The predominant activity of the population is the breeding; The scattered villages are situated mostly in the north of the site.

Infrastructure – The geo-parks territory is crossed by: the national road DN 18 accompanied by the railway that unites Buzău city with Nehoiu city – in the south of the site; the inter-county road that unites Buzău city with Beceni, Vintilă Vodă, Mânzăleşti, Lopătari and Gura Teghii districts; the inter-districts roads – mostly in the centre of the site. We have observed that: in the south part of the site the auto traffic is very intense, the road are asphalted and in good condition; in the centre of the site (the inter-districts roads) as the altitude is growing, the roads presents different characteristics: asphalted roads in good conditions (in south) – degraded asphalted roads – not asphalted roads; from south to north you can also see a change of the transportation mode (types of vehicles): in south - train, car, bus, maxi-taxi (a smaller bus), carts with horses; in centre: cars, maxi-taxi, carts with horses, carts with ox, bicycles; in north: cars (rare), carts with oxes and bicycles.

The vegetation – The forests vegetation is represented by three types of forest: *Coniferous forests* **(***Pinus sylvestris, Pinus nigra, Abies alba, Picea alba, Picea abies* along with moss and ferns); *Mixed forests (Pinus sylvestris, Picea abies, Abies alba*, in combination with *Fagus sylvatica, Betula pendula, Ulmus, Fraxinus*, but also ferns: *Drypteris, Pteridium*, and moss); *Deciduous forests* (*Fagus sylvatica, Quercus petrea, Qercus ceris, Populus, Ulmus, Betula, Acer, Carpinus betulus, Crataegus monogyna* and also mushrooms).

The pastures vegetation: Natural pastures (*Nardus stricta, Viola declinata, Filipendula ulmaria, Juncus sp., Angelica sylvestris, Senecio subalpinus, Rumex alpinus, Stiope sp., Agrostis canina, Agostis capilaris,* etc), Pastures (species with forage value like: *Trifolium repens, Lotus corniculatus, Juncus tenuis, Poa pratensis*, etc).

Salty soil vegetation is formed from species like: *Nitraria schoberi, Artemisia (maritima)*, Aster *trifolium, Halimione verrucifera, Carex distans, Spergularia salina, Taraxacum besarabicum, Puchinellia limosa, Festuca pseudovina, Dianthus guttatus, Achillea setacea*, etc...

Rockery vegetation is represented by: *Silene dubia, Thymus comosus, Genista janensis, Jovibarba heuffelii, Asplenium adiantum-nigrum, Veronica bachoferii, Sedum maximum, Epilobium collinum, Asplenium trichomanes, Poa nemralis, Silene nutans ssp. Dubia.*

On the geo-park's territory we found *spontaneously fruit-bearing shrub* such as*: Hippophae rhamnoides, Prunus spinea, Vaccinium myrtillus, Rubus Ideaeus, Corilius avelana*, etc...

The research site is represented by a rural area with a housing concentration especially along the rivers valleys and with different relationships of land use between the districts. Depending on the type of the villages there are different land-uses: near the gathered villages the locals are using the land for agriculture, while in the scattered villages they use it for pastures. 90% of the land it is used by locals, most of them for their own purpose; there are few investors in this area: especially in Berca, where the industry sector is very developed.

The land use is starting to change because there not many young people willing to take the old traditions further; they migrate to the big cities in order to go to school or to find something better to work so they can earn money. Therefore the landscape is changing.

The landscape anatomy. Starting from the anthropization degree of the landscape we identified five major types of landscape (landscapes with gathered villages, landscapes with linear villages, landscapes with separated villages, landscapes with scattered villages and predominantly natural landscapes) exemplified in 5 panoramic photos describing each type. The components of the views are generally represented by forests, villages, hayfields, rockery, orchards, etc... The surface and structure of these components varies from one view to another so that they give to the landscape those unique sights. (Fig. 5, 6)

During the field research, while we were trying to gather more and more information, we interacted with the local communities – fact that helped us to understand the relation between locals and the environment. Therefore we started to understand that behind all the things and all the landscapes that we saw, there was a strong cultural and social background, circumstance that led us to a big question: *"Is participation (of the locals) important?"* Another problem of the research site is tourism, (being a new industry) because some of the locals are starting to compromise the landscape and the nature in favour of the tourists (mass tourism)…a possible risk that rise another questions: "*In witch ways does tourism affect on the local identity?*" and "*Which are the mutual influences for protected areas, cultural landscapes and tourism and how can they coexist?*"

Because the research aimed as a final goal the identification of the landscape politics for the geo-park, we realized, after overlap the results of the analysis, that a good plan of landscape management is necessary. But "*What are the tasks of the landscape management?*"

RESULTS

Is participation important?

YES, because by participation of local communities we can control the influence over tourists and landscape, or involvement in the tourism infrastructure. When a tourist (outsider) crosses a landscape, all of his/her five senses are involved in the assessment of that specific landscape quality, resulting an own subjective perception of each tourist over that landscape (perceptions that can be positive, negative or neutral). There are certain aspects of the landscape in the Land of Buzău that, as tourist, you can not understand them at the first look and so you can not say it is "nice" or "ugly", they simply just raise questions. e.g.: the multitude of trinity/crosses on hills and crossroads. After an interaction with the local community (assuming active participation of the local inhabitants) this perceptions can change and evolve (the tourist's own subjective perception will combine with the subjective perception of the locals over the landscape and its elements). Therefore an active local community represents the connections between tourists and local landscape, contributing to the emotional links. Also, the local communities can promote local stories and legends about *"The Land of Buzău"* among the tourists, their traditions and customs by creating cultural activities (festivals, craftsmen workshops, etc.). Sustaining local communities to participate in the tourists accommodation programs: programs like: "Living with locals", etc. would be also helpful.

Therefore, the participation of local inhabitants in the process of conserving and adding value to *"The Land of Buzău"* landscapes is essential, also because, in our opinion, the inhabitant of a place are the first responsible in keeping alive the local identity.

In which ways does tourism effect on the local identity?

Currently, in The Land of Buzău the tourism is not very intense (taking into account the surface of the entire geo-park). (Fig. 7) But in some punctual areas, like Berca - Scorțoasa (at the muddy volcanoes), the badly managed tourism activities are starting to have a negative impact on the local identity. This negative impact is a result of the changes that occur in the behaviour of the local community: the locals begin to sell a false image/do things that in their opinion would be appreciated by tourist, to attract as many tourists as they can, earning money being their only priority. (Fig. 8) Therefore, we are dealing with uneducated local communities: they chose to build faster and cheaper, but in non-traditional ways, spoiling the whole charm of the place; they promote "kitsch", forgetting or not realizing that tourists come in *"The Land of Buzău"* for what it really represents: a rural area with incredible landscapes and stories (the "Land Story", "Life Story" and "Human Story" as A. Andrăşanu named them in his works related with the geo-park – all of these intersected giving a unique landscape); they sacrifice the local landscape in order to earn money; they change or alter the resource that could give them considerable incomes, only if well managed and promoted! From earning their existence with agriculture and handicraft they pass to a new industry which they can not master by themselves (the industry of tourism).

Which are the mutual influences for protected areas and cultural landscapes and tourism and how can they coexist?

In the case The Land of Buzău there are both negative and positive influences between the protected area (represented by the geo-park) and tourism (tourists). The most important negative influences are resulting from the changes that occur in the behaviour of the local community in the goal of earning money, and also because of uneducated tourists. Positive influences are that the tourists bring economic benefits for local communities (for now in small extent) and the site (the geo-park) offers tourists space for relaxation, meditation and new perspectives over nature and it's logic (as a responsible tourist - could be a niche tourist, like an ecotourist or a scientific/etc. one- will be pleasantly surprised by the wonders that The Land of Buzău has to reveal). So that the geo-park (with status of a protected area) and tourism can coexist it is necessary to develop an integrated plan of visitor management containing special designated areas for different categories of visitors, creating facilities and programs in some areas and promoting other area for niche tourism. It is also essential to elaborate a good strategy planning concerning promoting the Land of Buzău as a special area, supporting niche tourism and environmental education (EE).

What are the tasks of the management?

In order to ensure a good and responsible management of geological, natural, historical and cultural sites and also to value natural resources available on the Geo-park's territory, it is essential to assign areas with different type of protection, conservation and value scheme of the resources, as follows: strictly protected areas, having the a status of protection and preservation as a scientific reserve; buffer areas, having a role to ensure the protection of the above mentioned zones. (Fig. 9) In these zones certain limited activities of valuing available resources are allowed, in conformity with authorizations given by the Geo-park's administration; areas of sustainable use and development, that can develop economic incomes by traditional or modern practices, ecologically admitted and within the capacity of resources regeneration. For each of these areas it is necessary to conceive different management plans. (Fig. 10-12)

CONCLUSIONS

The geo-parks territory presents some malfunctions at the infrastructure level, in the socio-economic and cultural context and also in the environmental context. The infrastructure malfunctions are not regarding only the physical condition of the roads or of the utilities, but also the ones from the tourism infrastructure level (unmarked trails, the lack of tourism maps and informational panels, etc.) and the lack between the local communities and the local authorities. But site has a great potential regarding sights, benefiting of many geological, cultural and religious targets, and last but not least the impressive landscape potential witch is a result of superposition and intersection of all landscape types with all their elements. The combination of these elements leads to a specific local landscape. As we said in the beginning, the geo-park territory presents an almost optimum balance between natural and anthropic, balance that should be maintained. Therefore, to maintain this balance it is necessary to elaborate and to apply the landscape politics for this specific area, politics that will follow conservation, protection and to value the specific landscape from "*The Land of Buzău*" and also revitalization of the geo-park's area and value the natural, material, human and cultural potential aiming a sustainable and balanced development of the territory with ecological (environmental friendly) solutions. (Fig. 13-14)

ACKNOWLEDGEMENTS

The authors are grateful to Alexandru Andrăşanu – the geo-park's coordinator - for the information provided and the help.

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FIGURES

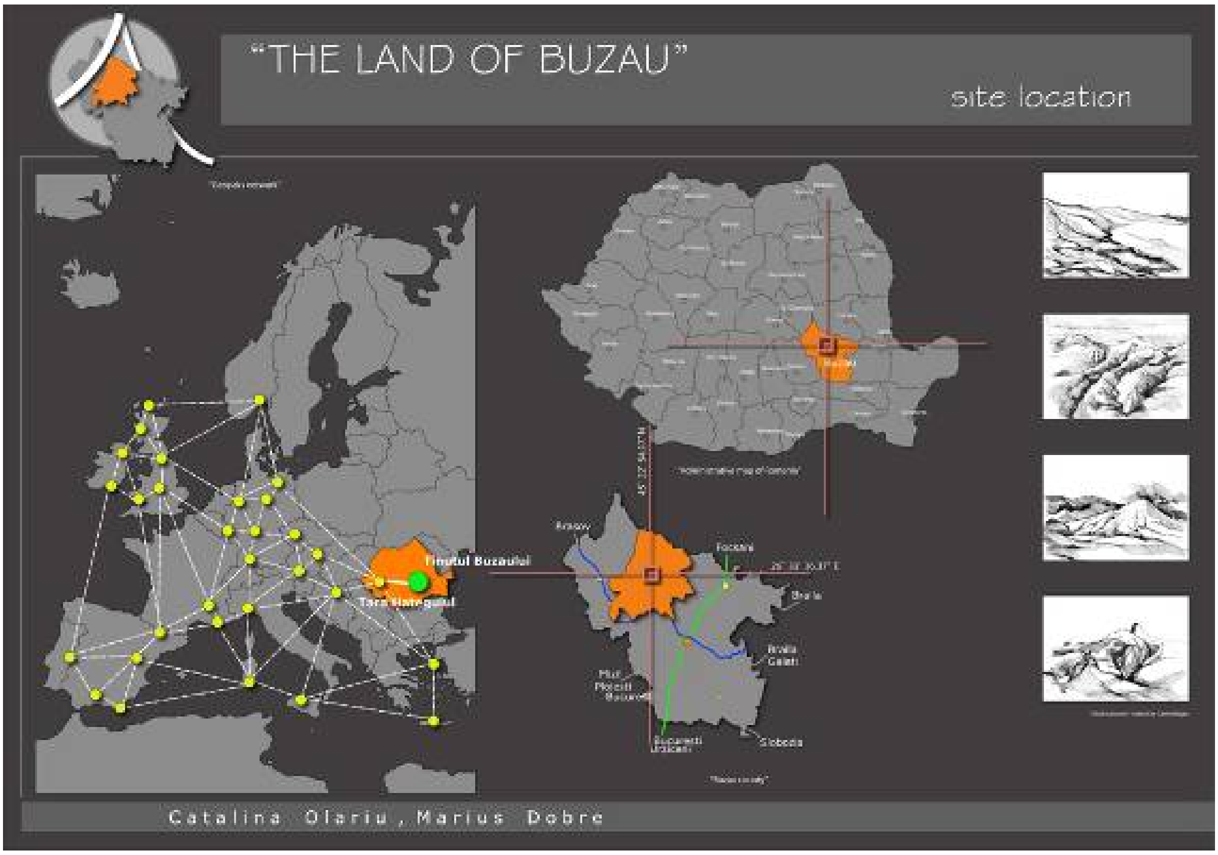

Fig. 1. Land of Buzău situation plans

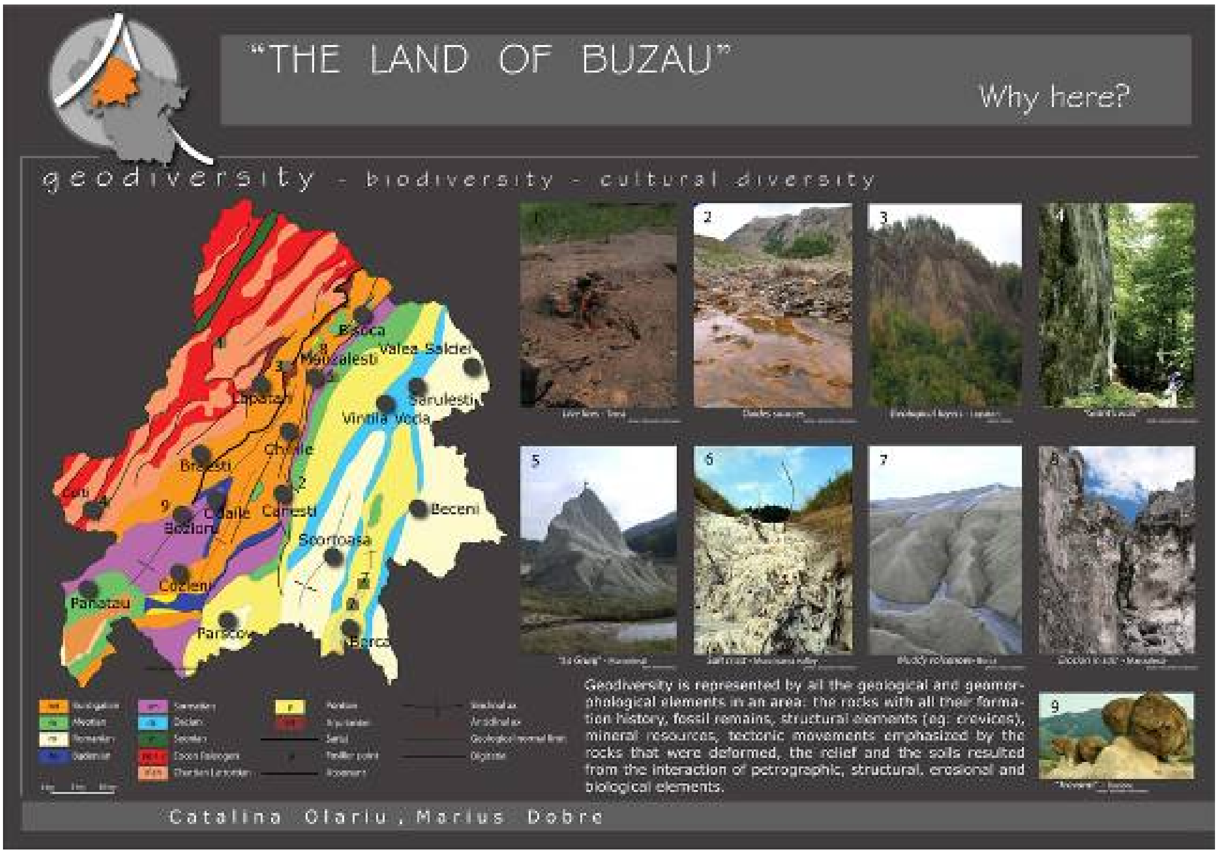

Fig. 2. Geo-diversity

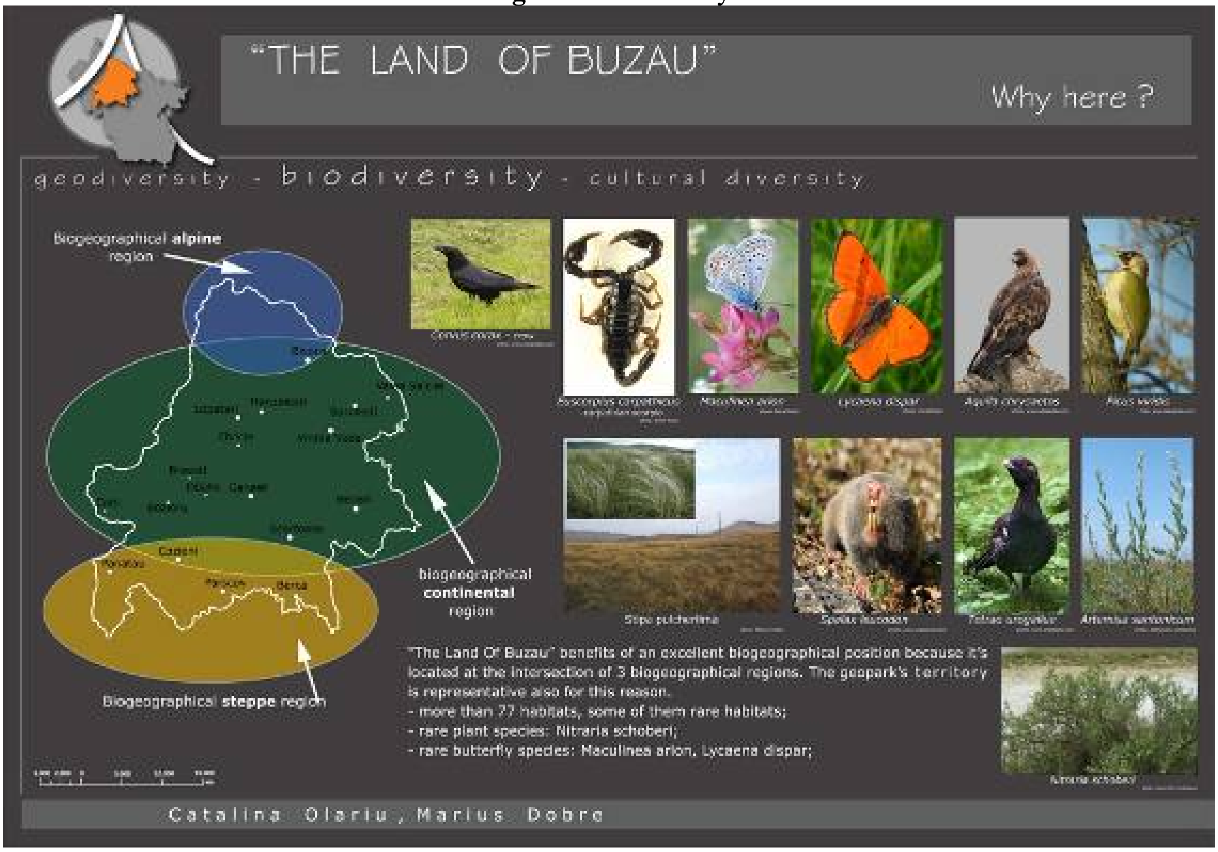

Fig. 3. Bio-diversity

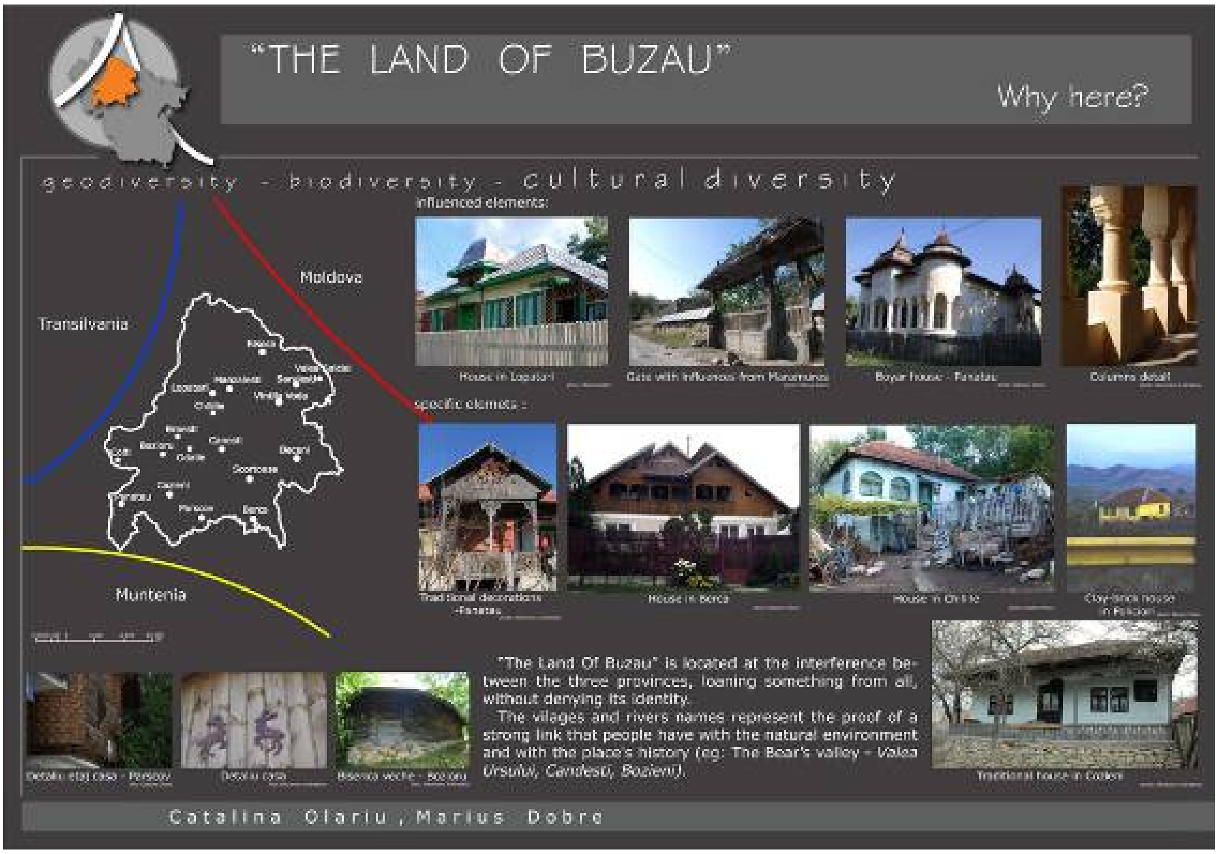

Fig. 4. Cultural diversity

Fig. 5. Landscape anatomy

Fig. 6. Landscape anatomy

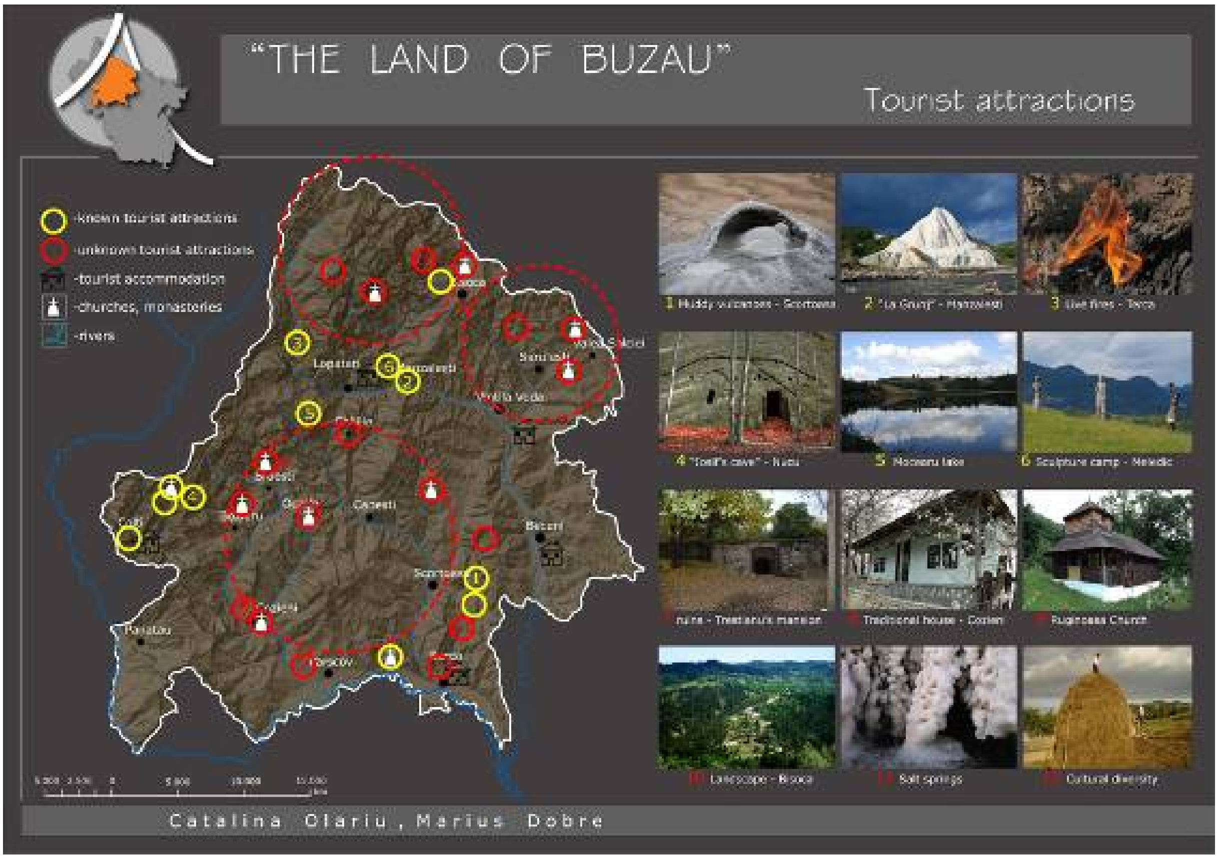

Fig. 7. Tourist attractions

Fig. 8. External influences on the cultural heritage and management proposals

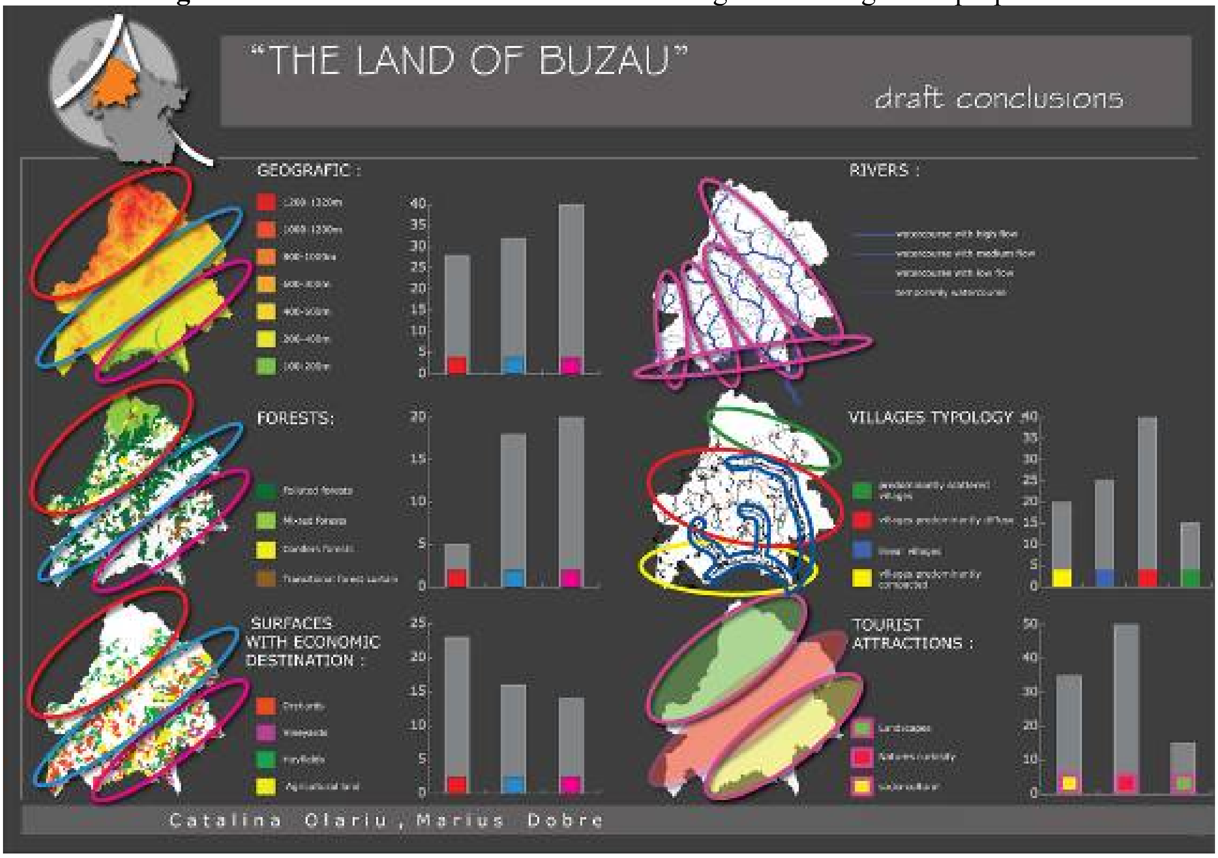

Fig. 9. Zoning of the Land of Buzău for differentiating management

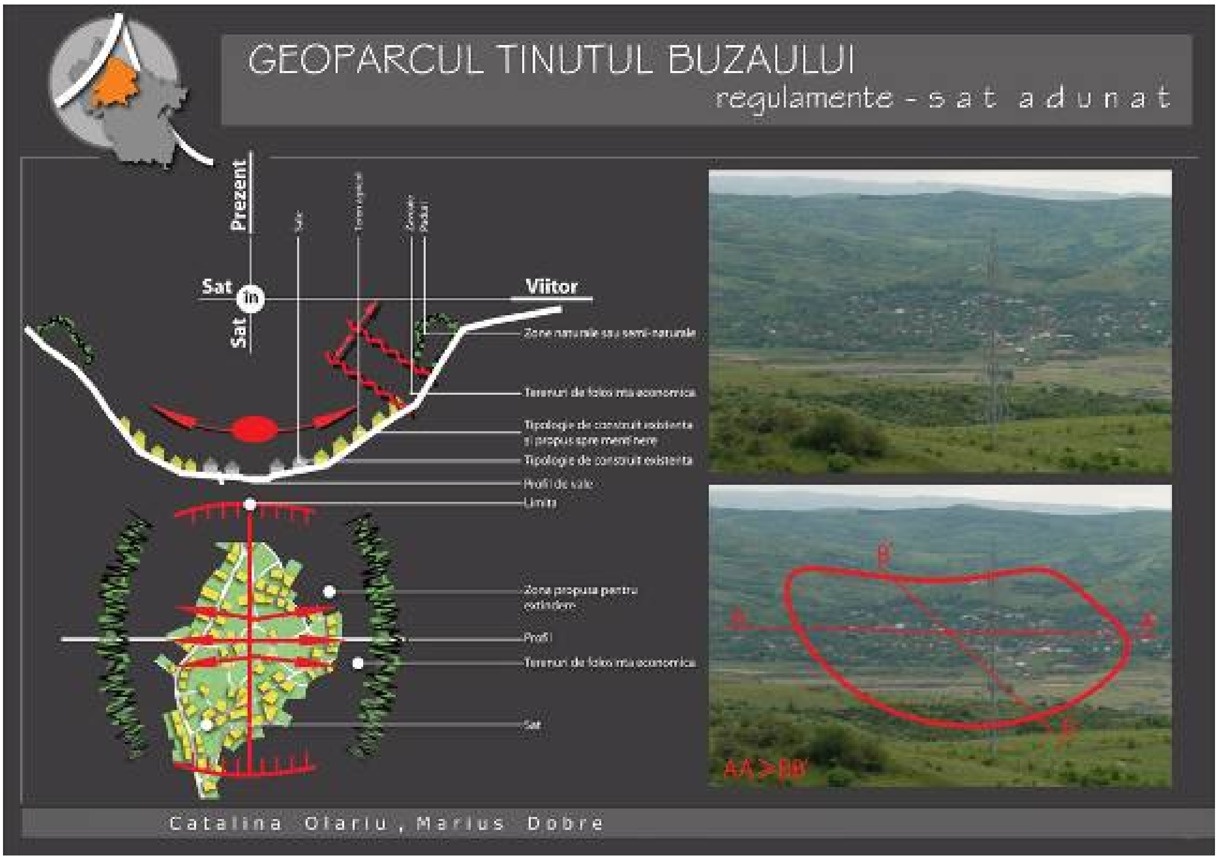

Fig. 10. Settlements for the gathered villages

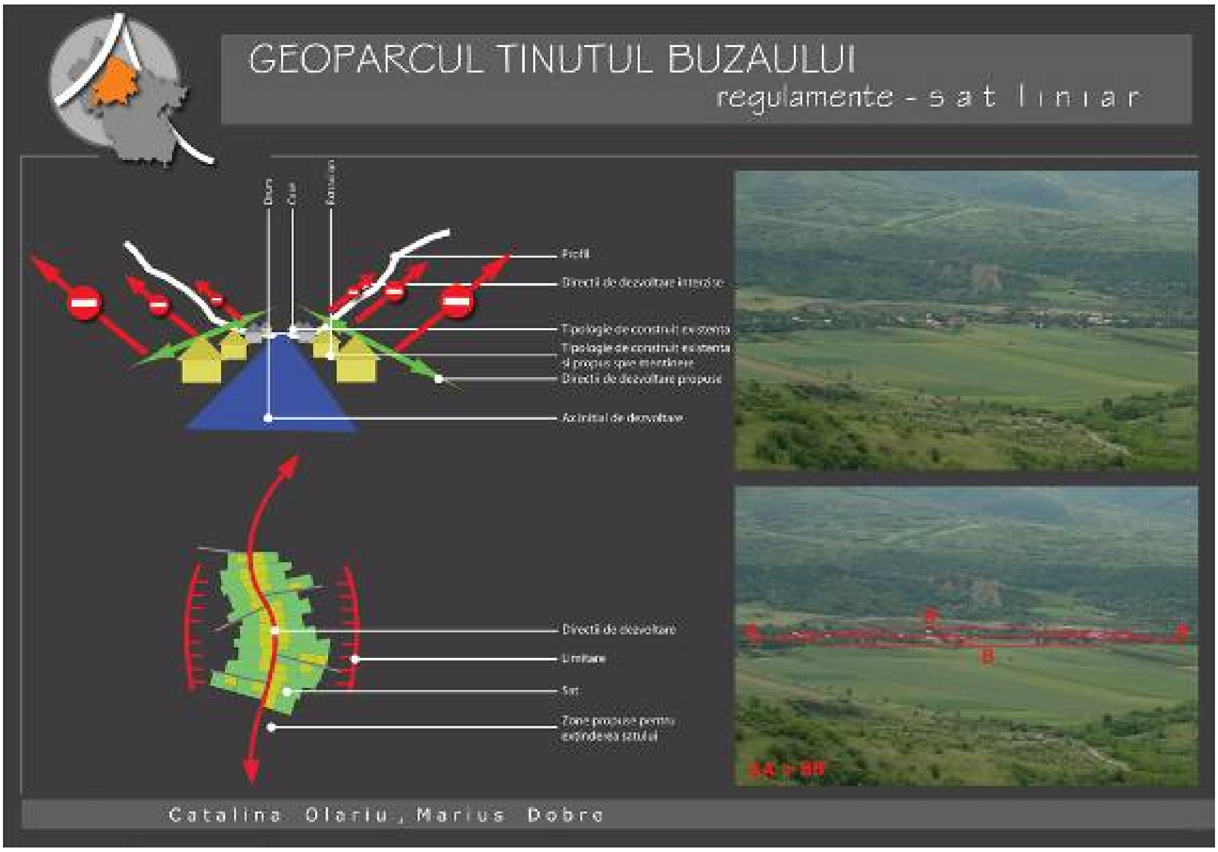

Fig. 11. Settlements for the linear villages

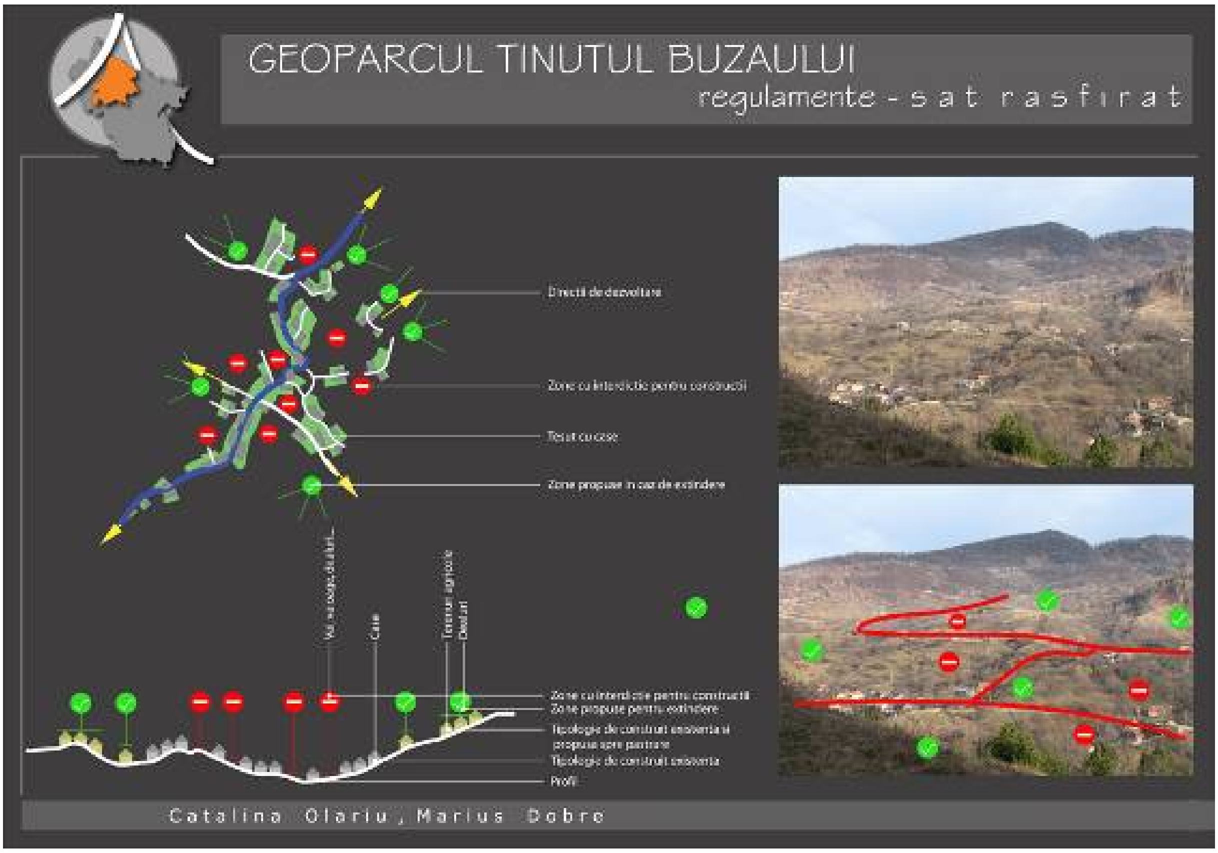

Fig. 12. Settlements for the spread villages

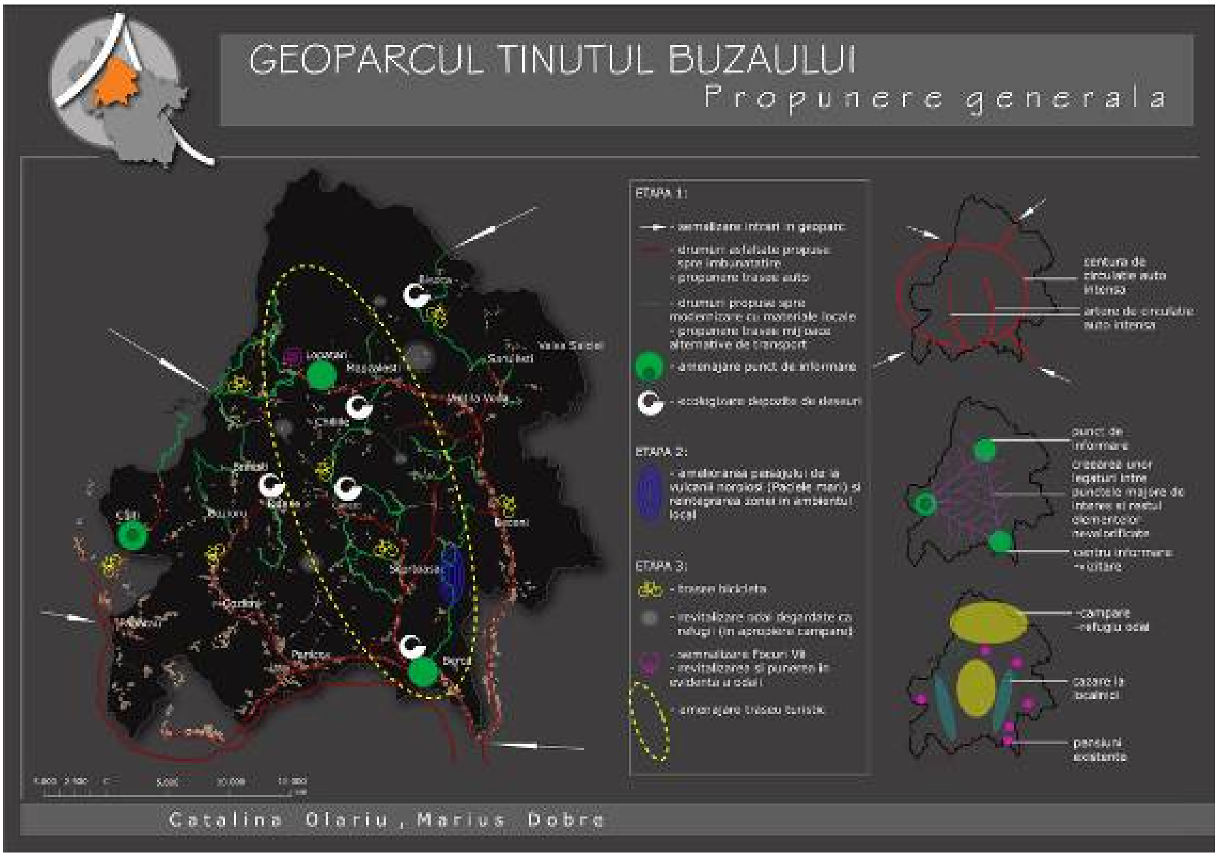

Fig. 13. General proposal for the landscape management

Fig. 14. Proposal for the village's outskirts communal spaces

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New trends in public urban parks - garden in motion theory

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Keywords: public park, garden in motion, Herăstrău Park

ABSTRACT

In this paper, I will briefly present the ecological theory developed by the French landscaper engineer Gilles Clément, called garden in motion (*jardin en movement*) and argue for the desirability of applying the above-mentioned theory to an almost derelict area of the Herăstrău Park, in Bucharest. The concept of garden in motion is inspired by waste grounds, places where plants growing spontaneously are allowed to develop freely. The garden and the landscape are always changing, they are not permanent. The plants, the seeds are always moving and thus are transforming the spaces where they end up being implanted. The landscape architect or the gardener has to choose between leaving the nature develop freely and interfering. His task is to interpret the plants' interactions and then to decide where and how much to interfere in order to maintain and to improve biodiversity (.e.g. he has to decide how to balance light and shadow, to decide on the arbitration between different species etc). The concept of garden in motion is well known and very well received all over the world. It is its ecological importance that makes me propose its application in Romania too, in Bucharest, in the northern area of the Herăstrău Park.

INTRODUCTION

The aim of this paper is twofold. I will start by briefly presenting the garden in motion theory (*jardin en movement*), also known as differentiate management. This theory was developed by a worldwide known professional and theorist, the French landscape engineer Gilles Clément, who is little-known in our country. In the second part of the paper I will go on to argue for the desirability of applying the above-mentioned theory to an almost derelict area in the northern part of the Herăstrău Park from Bucharest.

MATERIALS AND METHODS

The methods I used in studying/analysing the garden in motion theory are:
- study of documents: books, reviews, internet sites, images;
- visits and analyses of sites where the theory was applied
- systemisation of analyses.

The methods I used in finding and presenting the appropriate site for applying garden in motion theory in Bucharest:
- study of documents about Bucharest: plans, books, reviews.

RESULTS AND DISCUSSION

Garden in motion (*jardin en movement*)

Gilles Clément, landscaper, horticulturist engineer, rare plant searcher and professor at Ecole Nationale Supérieure du Paysage de la Versailles, has imposed himself during the last 3 decades in France and worldwide as a first-rank artist and theorist. Experimenting since 1977 the management of a derelict terrain that he named *jardin en movement* on his Creuse domain, France, he extracted doctrine elements that he applies to many of his works ever since, every time differently, depending on the specific site and climate.

Inspired by waste grounds, places where plants growing spontaneously are allowed to develop freely. The garden and the landscape are always changing, they are not permanent. The plants, the seeds are always moving and thus are transforming the spaces where they end up being implanted. The landscape architect or the gardener has to choose between leaving the nature develop freely and interfering. His task is to interpret the plants' interactions and then to decide where and how much to interfere in order to maintain and to improve biodiversity (.e.g. he has to decide how to balance light and shadow, to decide on the arbitration between different species etc).

This theory changes the formal concept of garden, which, here, is totally in the gardener's hands. The design of the garden, changing through time, depends on the maintainer, i.e. it does not result from a previous conception worked out on the paper.

This type of management, thus of garden conception, was first applied, with a lot of success, as I already mentioned, in Clément's Creuse domain (authentic and continuous laboratory), then in French towns and worldwide, sometimes as the generic title of differentiate management. The most famous public park where Clément applied this concept is André Citröen Park in Paris (followed by Matisse Park in Lille). Here he created a garden in motion, with exactly this name (Fig.4, 5 and 6).

Applying garden in motion theory in Bucharest

The appropriate site for applying the garden in motion theory in Bucharest is a northern area of the Herăstrău Park, between Băneasa Bridge and Nordului Avenue (Fig.7 and 8). I have chosen this area because it is almost derelict, without utilities, and because people love it and use it the way it is, and applying there garden in motion concept would minimally change it (Fig.9, 10 and 11).

The Herăstrău Park, a historical park, was first conceived by the German architect Fritz Rebhun with the purpose of organising exhibitions, only in the southern part of the lake, then, after 1950, it was transformed in a big park for culture and relaxation. As a consequence of the program established by the communist government to develop the green areas of Bucharest, it was decided to extend Herastrau Park in the northern part of the lake. The project achievement brought new types of relaxation to the inhabitants of Bucharest as restaurants, playing fields, spaces for recreation and aquatic sports, playgrounds for children, mechanical equipments for entertainment. It became the largest park in Bucharest. In the '70 Herăstrău Park was submitted to new modifications, which increased its value and interest, especially in its central zone.

At present, the park is the subject of a study initiated by the town council with the view to evaluate the general state of the park and of the vegetation, in order to plan the rehabilitation.

The area I have chosen to apply garden in motion theory in Herăstrău Park was never design, and it is almost derelict (Fig. 9, 10 and 11).

CONCLUSIONS

Garden in motion's main objective is to maintain and to improve biodiversity, and so it is very important, I would say even necessary, to apply it in Romania also, for ecological reasons.

The northern area of the Herăstrău Park is very appropriate for applying this theory in Bucharest, because of its state of dereliction, and because people use it and love it the way it is, and applying garden in motion concept here would live it almost the way it is.

The project, once realised, must be observed and managed very carefully and continuously.

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FIGURES

Fig. 1. Image from the garden in motion at The Creuse domain – pulled down trees used by men or by plants (after Hucliez Marielle 1999)

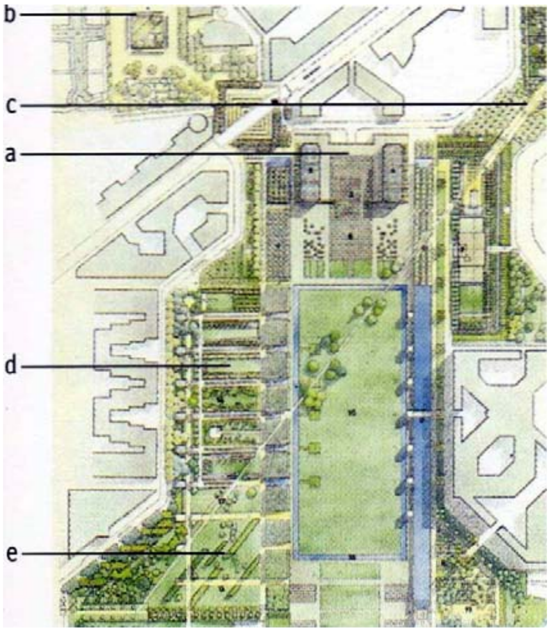

Fig. 2. Citröen Park plan: e- The Garden in Motion (after Hucliez Marielle 1999)

Fig. 3. Citröen Park plan: The Garden in Motion (after Google Earth)

Fig. 4. Image of The Garden in Motion, Citröen Park – Rosa sericeea (after Hucliez Marielle 1999)

Fig. 5. Image of The Garden in Motion, Citröen Park (after Hucliez Marielle 1999)

Fig. 6. Image of The Garden in Motion, Citröen Park, 2000

Fig. 7. Herăstrău Park plan (after Iliescu Ana-Felicia 2003)

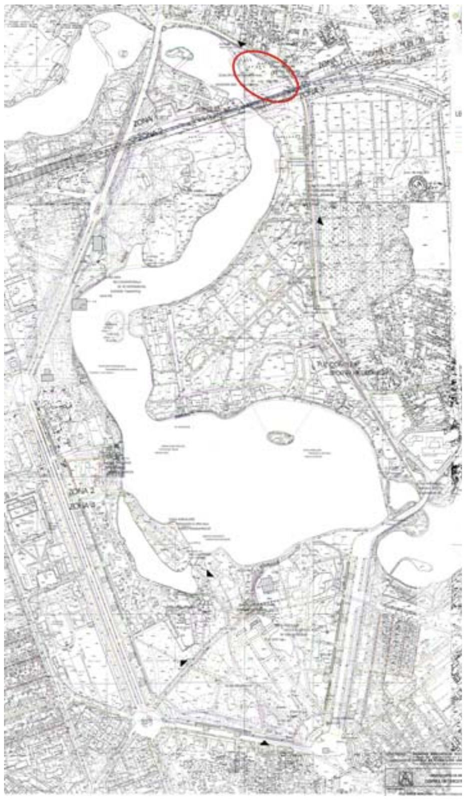

Fig. 8. Plan of Herăstrău Park (survey)

Fig. 9. Northern Herăstrău Park

Fig. 10. Northern Herăstrău Park

Fig. 11. Northern Herăstrău Park

Cişmigiu Public Garden in Bucharest urban context and the role of horticultural maintenance in preservation of historic gardens

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Keywords: preservation, conservation, restoration, legislation, national heritage

ABSTRACT

Cişmigiu Public Garden has evolved a long way, from a hunting and fishing public place into a central public garden, the place for one of the most important cultural, political, civil society activities, the place of various happenings, protest meetings linked to the evolution of the city, in other words to urbanism, preservation and conservation of historic public spaces and green spaces too. The cultural landscape has to be preserved and historic gardens are one of the most important components of it. This garden was designed in three stages starting in the middle of the 19^{th} century. For the first stage, landscape architect Wilhelm Friedrich Carl Meyer (1814-1852) was helped by the gardener Franz Hörer. Wilhelm Knechtel, for the end of the 19^{th} century, and Friedrich Rebhuhn, for the first half the 20^{th} century, was other great creators of this Garden. Their work completed and improved Meyer's design. They opened the garden to the city. Cişmigiu Public Garden became an important part of the city, linked with it along all its sides. The mixed character of the Garden composition was preserved along its whole evolution. In our days, the historic character of the Garden is in a great danger to be lost or seriously damaged, as a result of incomplete legislation, of lack of specialists in preservation and conservation of Historic Gardens and mostly, as a result of the fact that the landscape architects are not represented in the decisional structures of the municipalities and of the Romanian Ministry of Culture, Cults and National Patrimony (MCCPN). Horticultural techniques have to support preservation and conservation of the historic vegetal compositions, which are an important part of historic character of this Garden and of any Historic Garden.

INTRODUCTION

In the west side of Bucharest there was a place with a public character, named "Dura's marsh". It was not a public garden, but a public space. In 1830, General Kiseleff demanded a project for a public garden on this site and in 1837 the first works were started. In 1845, this place was administrated by Bucharest Mayoralty.

This Garden was designed in three stages starting with the middle of the 19^{th} century. In 1843, landscape architect Wilhelm Friedrich Carl Meyer, ex-director of Imperial Gardens in Vienna, was invited to design this public garden. It was a romantic garden with a geometrical axis. It was no innovation, but this was the moment of synchronization with European landscape architecture principles. It was a closed Public Garden, surrounded by the backyards of the houses situated around it. In 1870, King Carol I of Romania invited Wilhelm Knechtel to Romania. Knechtel has worked in Prague and then in Italy and Mexico (for Archduke Maximilian) and then he became Director of Bucharest Gardens and Professor of Botany at the Bucharest School of Agriculture. In 1882, Knechtel redesigned the garden, opening it to the city. Starting with 1910, Friedrich Rebhuhn redesigned many parts of the garden to their present-day appearance. The places of interest are: the lake, the Grotto with a waterfall, "Eminescu" spring, other water features, the main axis, the "Citadel", the "Writers Rotonda", the two bridges, the "Trunk", pergolas and terraces on the east side, wooden pergolas on the west side, the ancient balances, monuments, kiosks, sculptures and vegetal compositions.

Starting with the middle of the 20^{th} century, a lot of features were added, affecting the appearance and the consistence of the historic character of Cişmigiu Public Garden. Now, this Historic Garden is in a great danger to become an ordinary garden, as a result of these unfortunate interventions and lack of skill in horticultural maintenance.

MATERIALS AND METHODS

Successive historical plans and maps, old photos and drawings were studied in order to find the most important changes in city development (Răducan 2007).

Plans and maps, developed in different stages of evolution of the city, have been implemented on the same scale. These were put in parallel, to be compared and to highlight the most important traces and changes. Also, a lot of testimonies of some foreign travelers and some Romanian writers have been studied for a better understanding of social, cultural and political climate.

RESULTS AND DISCUSSION

In 1831, the Organic Statute (Regulamentul Organic), a law with constitutional character, was adopted in Walachia. (Cheşcă 2009) This law had a major impact on development in urban areas and green spaces in Romanian cities. The evolution of Bucharest was reflected by Cişmigiu Public Garden itself.

For the first stage in the development of Cişmigiu Public Garden, landscape architect Wilhelm Friedrich Carl Meyer was helped by the gardener Franz Hörer. Wilhelm Knechtel, for the end of the 19th century, and Friedrich Rebhuhn, for the first half the 20th century, were others great creators of this Garden. Their work completed and improved Meyer's design. They opened the Garden to the city. The Garden became an important part of the city. The old closed garden became opened to the city on all its sides. The project was partially implemented, but the main features are still present.

The three stages are:

I - middle of the 19th century - Wilhelm F. Carl Meyer

It was a boggy site (14 ha.), around the "Dura's marsh", behind the back courtyards of the properties surrounding it. The shape of the lake was almost like nowdays. The island and the restaurant were already present and also the formal axis.

II - end of the 19th century - Wilhelm Knechtel

The south and west limits of the garden were extended to the new Queen Elisabeta Avenue and to Schitu Măgureanu Street. The garden of Kretzulescu Palace was the north limit of Cişmigiu Garden. Meyer's project was modified but its character was preserved. Better links with the city were created in this stage. On the east side were several entrances, linking the garden with the city. The lighting of the garden and of Queen Elisabeta Avenue became electric.

III - beginning of the 20th century - Friedrich Rebhuhn

After 1927, when Bucharest Mayoralty became the owner of Kretzulescu Palace, 2 ha were added to Cişmigiu Garden. This was a good moment for linking the garden with Ştirbei Vodă Street. Rebhuhn added and configured some new features. Current appearance is almost like in those times.

The most important decision for the evolution of Cişmigiu Public Garden was to create Queen Elisabeta Avenue in the end of the 19th century and to create the link with Ştirbei Vodă Street in the beginning of the 20th century (Lascu 2006).

We have to stress the importance of some remarkable cultural and political personalities of Walachia in the evolution of the city, such as Prince Bibescu, Baron Kiseleff, King Carol I of Romania, Friedrich Rebhuhn … (Giurescu 1979, Lascu 2006).

After 1910, Friedrich Rebhuhn redesigned parts of the garden as they look today (Lascu 2006). In 1912, Rebhuhn designed a pergola and terraces for roses (in the north area of the garden). The main formal axis is opened to the church and Queen Elisabeta Avenue. The appearance of this axis has become the appearance of our days.

Parallel with Schitu Măgureanu Street, he designed an alley with pergolas and roses. In 1927, Bucharest Mayoralty became the owner of Kretzulescu Palace. An important part of its gardens with a little lake and some water features (2 ha in total) became part of Cişmigiu Garden. In 1929, Rebhuhn designed a new entrance to Schitu Măgureanu Street. The project was not realized at the time but after a few years (with smaller amplitude). Between the two World Wars, Rebhuhn added sculptures, representing some Romanian generals. In 1942, for the west side of the garden, between the main axis and Schitu Măgureanu Street, Rebhuhn designed "Roman Rotonda" (a circular ensemble consisting in 16 statues representing Romanian writers and formal vegetation: lime trees, *Taxus baccata* cones, *Buxus sempervirens* hedges). In 1943, "Roman Rotonda" or "Writers' Rotonda" was inaugurated. After the Second World War, near the "Writers' Rotonda", a rectangular place for chess players and for political debates was created. Stone benches and tables are surrounded by a beautiful fence in *fer forgé* and by dense vegetal features.

After the Second World War, starting with 1960, a lot of features were added to Cişmigiu Garden, affecting its historic appearance and consistence. This situation is still evolving and destroying step by step the historic character of this Garden (Neo-Romanian "Monte Carlo" restaurant was replaced by a modern concrete building and its terraces cover the whole island). The process is developing by adding some kitsch features (a flower clock, new benches, "ornamental" flower pots, new monuments...). Now, the original composition is affected by new plantations and unqualified horticultural maintenance too. The management, the current maintenance and the horticultural maintenance were made by horticulturists and unqualified workers. Landscape architects, architects and historians were not involved in these activities.

We have to save the historic character of this Garden. The laws and the literature we have written are not enough to save it. Academic and professional reviewers have accomplished studies on Cişmigiu Historic Garden but these studies have a limited impact because they are part in professional publications (El Shamali 2005, El Shamali 2008, Ionescu 2007, Lascu 1998, Lascu 2006, Răducan 2006, Răducan 2007, Răducan 2008, Răducan 2009, Toma 2001).

We have important difficulties in preservation, conservation and restoration of Historic Gardens because Romanian Cultural Legislation is not completed in this field and landscape architects are not represented in local and central administration structures and in Historic Monuments Department, part of The Romanian Ministry of Culture, Cults and National Patrimony (MCCPN).

CONCLUSIONS

The legal framework creates the premises of urban development. This framework can be a positive or a destructive one, by absence or by incorrect or incomplete formulation. It is necessary to create a national legislation in accordance with the international legislation concerning protection, preservation, conservation and restoration of historic gardens (The Florence Charter, International Charter for the Conservation and Restoration of Monuments and Sites and The Florence Charter of Historic Gardens and Landscapes) and to create a control and supervision framework, to make sure this legislation will be respected (***1964 and ***1981).

The process of assessing and of valorization of the national heritage is just in the beginning in our country. To prevent abuse and damage caused by ignorance or any other grounds, severe penalties must be established in this area.

Relating to the legal framework and the jurisdiction of Historic Gardens, in Romania, we have lack of:

- A law for listing Historic Gardens.
- Official criteria for listing Historic Gardens.
- A system of scheduling "urbanization adjustment zones" and "scenic beauty preservation zones" by the City Planning Law.
- Special measures for the preservation and conservation of "Historically Important Zones" and "Special Preservation Zones".
- A relationship between Historic Gardens and their surroundings.
- The reconciliation between development and conservation.
- A scheduling of Historic Gardens.
- The interest in protection, preservation and conservation of Historic Gardens of central and local administrative organs.
- Administrative machinery for preservation and conservation of Historic Gardens.
- Non-governmental organizations support in this field.
- Surveys of vegetation and all features of historic, artistic and environmental interest for Historic Gardens.
- An inventory of relevant features, including relevant vegetal compositions.
- Specialized companies in preservation, conservation and restoration of Historic Gardens.
- A body of workers specialized in preservation, conservation and restoration of Historic Gardens.

The activity of academic circles regarding Historic Gardens is relevant but the professional publications are barely known. The horticultural maintenance of Historic Gardens and the maintenance of their surroundings in the most desirable state possible is one of the most important factors in their protection.

In our days, the historic character of Cişmigiu Public Garden is in a great danger of being lost or seriously damaged, as a result of incomplete legislation, of lack of specialists in preservation and conservation of Historic Gardens and mostly, as a result of the fact that the landscape architects are not represented in the decision structures of the municipalities and of the Romanian Ministry of Culture, Cults and National Patrimony (MCCPN) (Răducan 2009). Horticultural techniques have to support preservation and conservation of the historic vegetal compositions, which are a very important part of historic character of this Garden and of any Historic Garden (Răducan 2008).

It is absolute necessary to bring sensitive ideas and facts to civil community, to media, to local and central administration and other authorities to get a positive result: to take care of our national patrimony, and of Historic Gardens as a part of it.

ACKNOWLEDGEMENT

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***1964, The Venice Charter - International Charter for the Conservation and Restoration of Monuments and Sites

***1981, The Florence Charter of Historic Gardens and Landscapes

FIGURES

First stage
Wilhelm Friedrich Carl Meyer
(1814-1852)

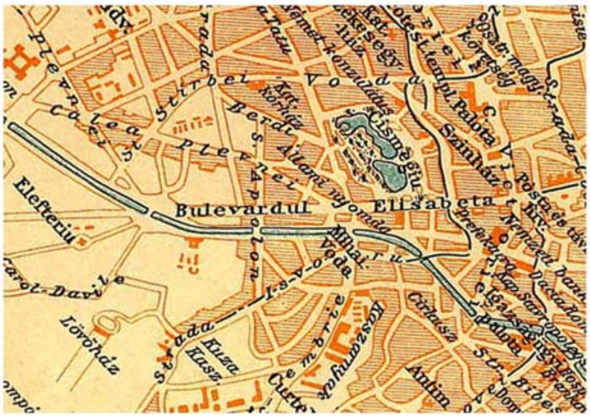
Map by Baron Borroczyn
1846-1852

Closed space
behind the backyards of the houses

Second stage
Wilhelm Knechtel
(1837-1924)
starting with 1882
map of Bucharest 1886

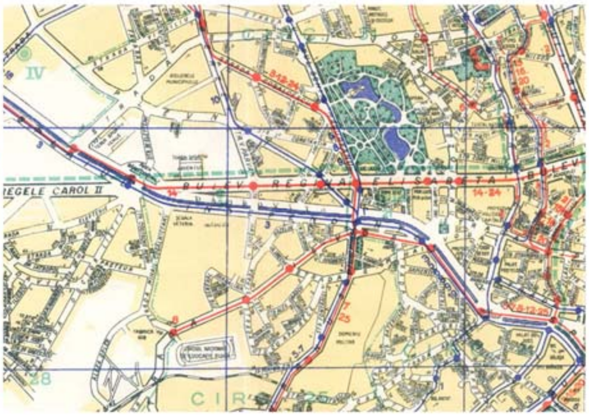
1882 – link with new Queen Elisabeta Avenue
1883 – extension of the formal axis onto the Schitu Măgureanu Church
1885 – creation of Schitu Măgureanu Street
1896 – reconfiguration of the Walter Mărăcineanu entrance (on the east side)

Fig. 1. The first and the second stage in the evolution of Cişmigiu Public Garden



Second stage
Wilhelm Knechtel
(1837-1924)
map of Bucharest 1897

1896 – reconfiguration of the Walter Mărăcineanu entrance (on the east side)
1895-1899 – actual links of the garden: Ştirbei Vodă Street, Schitu Măgureanu Street and Queen Elisabeta Avenue
1902 – Kretzulescu Palace was restructured (Arch. Petre Antonescu)

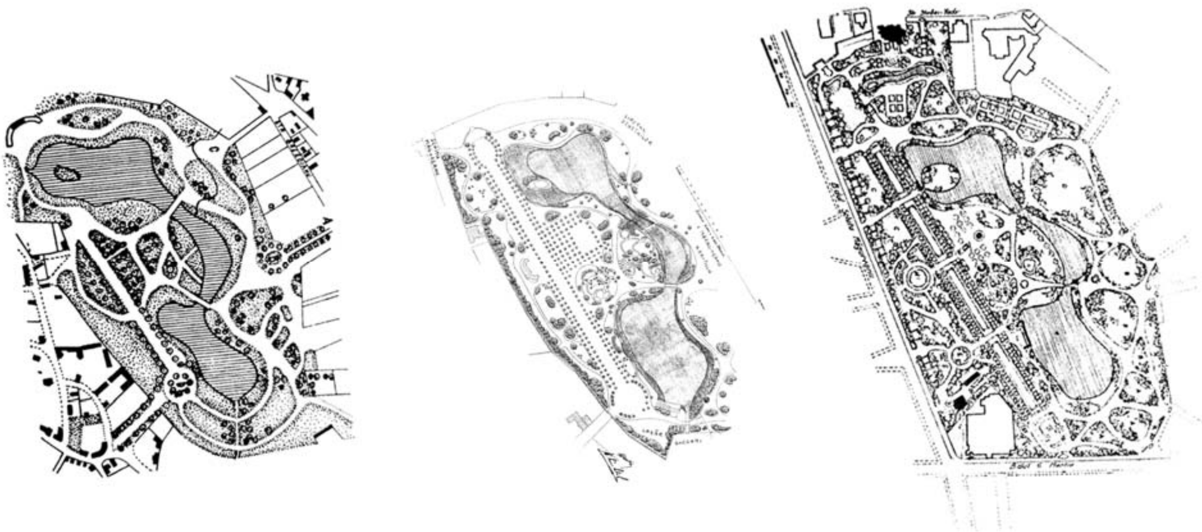


Third stage
Friedrich Rebhuhn

map of Bucharest 1934

1912 – the formal axis was opened onto the Schitu Măgureanu Church and the Queen Elisabeta Avenue
1929 – Rebhuhn designed an entrance to Ştirbei Vodă Street

Fig. 2. The second and the third stage in the evolution of Cişmigiu Public Garden



First stage
Wilhelm Friedrich Carl Meyer
1846-1852
map by Baron Borroczyn
after Rica Marcus (Marcus1958)

Second stage
Wilhelm Knechtel
starting with 1882
layout signed by W. Knechtel in 1883
after Dolores Toma (Toma 2001)

Third stage
Friedrich Rebhuhn
1910-1943
after Rica Marcus (Marcus1958)

Fig. 3. The three stages in the evolution of Cişmigiu Public Garden

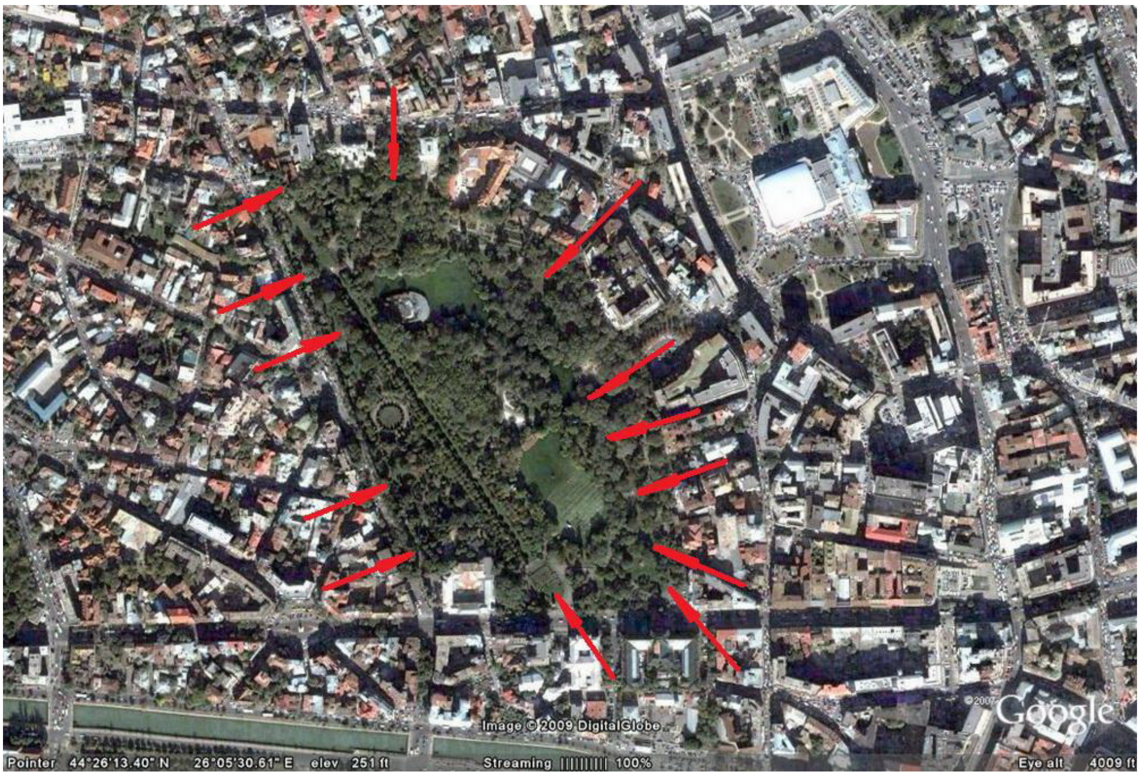


Fig. 4. Actual stage of Cişmigiu Public Garden and its links with the city

Fig. 5. The main axis in the first half of the 20th century

Fig. 6. The vegetation maintenance was not accomplished and the historic composition was deteriorated (2008)

Fig. 7 **Fig. 8.**

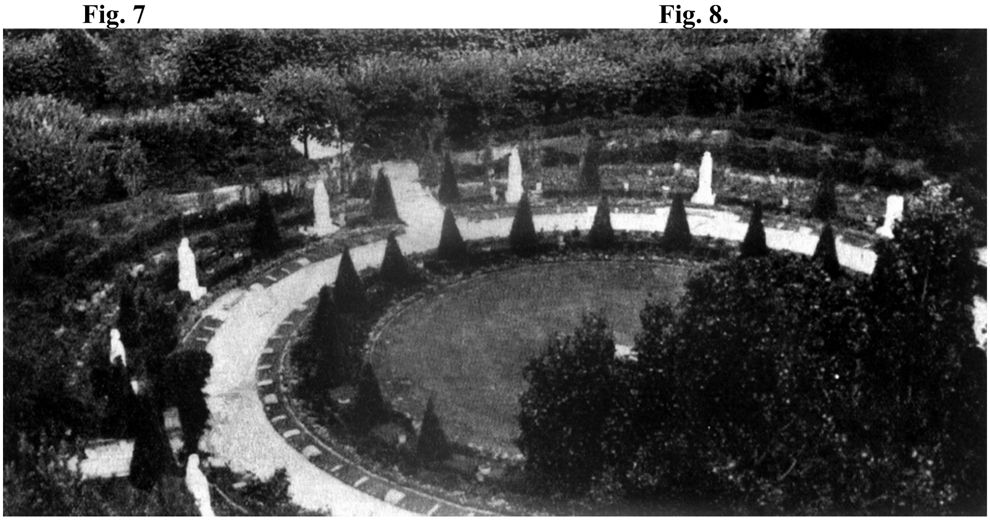


Fig. 9.

Fig. 7., 8. and 9. “Writers Rotunda” inaugurated in 1943 before 1958 (Fig. 9.), after 1960 (Fig. 7.) and actual view (Fig. 8.) *Buxus sempervirens* hedges and the *Taxus baccata* cones were not clipped in the proper shape, as Friedrich Rebhuhn designed it in 1942. The entire composition was affected by changing the proportions of vegetal elements and the central bowline bridle and the central potflower are difficult to be seen.

Fig. 10. *La grande pelouse verte* was copiously planted in the last three years
The historic composition was damaged again.

Fig. 11. In the spring flowers area, another *pelouse verte* was invaded by an unaesthetic floral clock and some young trees. The historic composition was damaged again and again.

Fig. 12. The main axis - the alley with *Tilia tomentosa*
The linden trees have to be clipped in a geometrical shape

Fig. 13. The alley with pergolas initially planted with roses now it is planted with *Wisteria sinensis*

Fig. 14. “Monte Carlo” Restaurant (build in 1886) – Postcard

Fig. 15. "Monte Carlo" Restaurant (build in 1941) – Postcard

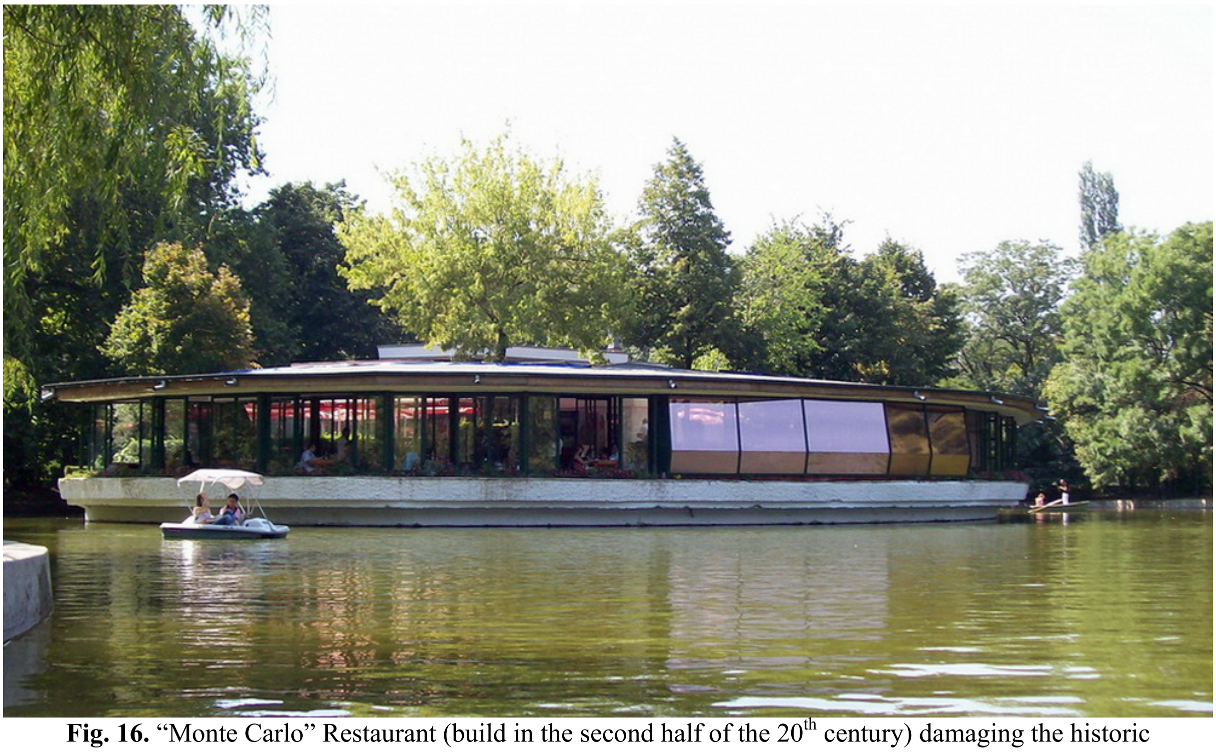


Fig. 16. "Monte Carlo" Restaurant (build in the second half of the 20^{th} century) damaging the historic appearance of Cişmigiu Historic Garden – actual view

Lucrări ştiinţifice USAMVB, Seria B, vol. LIII, 2009

Cişmigiu Historic Garden - a manifest

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Keywords: patrimony, protection, preservation, conservation, restoration, ephemeral installation

ABSTRACT

The interest in protection, preservation, conservation and restoration of Historic Gardens is not a priority in Romania, partially as a consequence of the political and economical context and partially as a consequence of lack of legislation in this field. As a result, all the Romanian Historic Gardens are in a poor condition and in a great danger to loose their historical character. Cişmigiu Public Garden, one of the most loved and well-known Historic Gardens in Bucharest is an exemplar case for the importance of protection, preservation, conservation and restoration of the national patrimony. Cişmigiu Public Garden, one of the oldest public gardens in Bucharest, is part of the Romanian List of Historic Monuments (LMI: B-II-a-A-19655). However, it is in danger of becoming an ordinary garden, because of the multitudinous of unfortunate interventions which damaged its historical character. The garden was established in the first half of the 19th century and it was modified several times. Starting with 1960, a lot of features were added, affecting the appearance and the consistence of this Historic Garden, even if it is placed just in front of Bucharest City Hall. We have already completed the inventory of all artifacts and features of historic and artistic interest, which are still alive in Cişmigiu Public Garden, including vegetal compositions and a list of urgent interventions to save them. On Saturday the 18th of July 2009, on the alleys of Cişmigiu Public Garden, we exhibited three hundred sketches, analyses and proposals. These activities were accomplished by the students of Landscape Architecture Department, Bucharest Faculty of Horticulture, as practical activity in Restoration of Historic Gardens. That was the day when the mayor of Bucharest invited us to collaborate with the Mayoralty in the field of Historic Gardens.

INTRODUCTION

Cişmigiu Garden was established in the first half of the 19th century and it was modified several times. (Răducan 2008, Răducan 2009) Starting with 1960, a lot of features were added, affecting the appearance and the consistence of this Historic Garden even if this garden is placed just in front of Bucharest City Hall. (Răducan 2009) This situation is still evolving, destroying step by step the Historic character of this Garden. Cişmigiu Public Garden is part of the Romanian List of Historic Monuments (1971 B-II-a-A-19655). However, it is in danger of becoming an ordinary garden. (Răducan 2009)

The media is interested in sports, politics and publicity, not in national patrimony. The professional publications regarding Historic Gardens are barely known. As a result, academics' efforts in spreading information, reviews and critics are never-ending. (El Shamali 2005, El Shamali 2008, Ionescu 2007, Lascu 1998, Lascu 2006, Răducan 2006, Răducan 2007, Răducan 2008, Răducan 2009, Toma 2001)

MATERIALS AND METHODS

1. Detecting the causes for the poor state of Historic Gardens is very important for solving it. The most important causes of this situation are:

- Romanian legislation concerning Historic Gardens is not updated and synchronized with international legislation.
- Existent Romanian legislation in the field of protection, preservation, conservation and restoration of Historic Gardens is not respected.
- In Romania, there are no specific criteria for listing Historic Gardens.
- Decisional organs are not reacting to abuses in the field of protection, preservation, conservation and restoration of Historic Gardens.
- The Romanian Ministry of Culture, Cults and National Patrimony (MCCPN) is not reacting to the poor condition of Historic Gardens, maybe because of their poor funds.

- The municipality is not interested in conservation/restoration of Historic Gardens.
- Non-Governmental Organizations have a minimal activity in this field and their support is weak.
- Academics and professionals have made studies on Historic Gardens, but professional publications are barely known.
- Landscape architects are not represented in the decision structures of the municipalities and of the Romanian Ministry of Culture, Cults and National Patrimony (MCCPN) (Răducan 2009). There is no legal frame for that.
- Landscape architects are not involved in the management, the current maintenance and the plant maintenance of this Historic Gardens. There is no legal frame for that.
- Media is not involved in spreading cultural information in the field of protection, preservation, conservation and restoration of Historic Gardens.
- An inventory and surveys of relevant features, including relevant vegetal compositions do not exist. Abuses have a free way. The features unlisted can be sold or demolished.
- All the interventions are made by the municipality and its department Administrația Parcuri, Lacuri şi Agrement - APLA (Administration of Parks, Lakes and Leisure), which has no employees specialized Historic Gardens and in national patrimony. There is no legal frame for that. These interventions were made without a conservation/restoration project or without any project. There is no legal frame for that. The companies involved in works on Historic Gardens are not specialized in preservation, conservation and restoration. There is no legal frame for that.

2. Identifying necessary actions

It is necessary to make decisive actions, strong motions to solve this situation. We have to get out in the public space for making well known these problems, to the citizens, to Non-Governmental Organizations and media.

Cişmigiu Public Garden was chosen for this manifest. Being in the historic center of Bucharest, in the heart of the city and in front of the City Hall, Cişmigiu Garden is visited by the citizens and tourists in the same time. This is a place for walking, reading, dancing (there are tango contests), skating … This is a meeting place from the very begining. The main use of this garden is promenade. (Filip 1999, Potra 1990)

Every Saturday, we see just married couples accompanied by their families who are the protagonists of lots of photos and movies.

This is the place where Santa Claus comes to meet children. This is the place where we celebrate the national days of Romania, France, USA... with fireworks and shows. This is the place where people, citizens of Bucharest, organize protest meetings for ecologist reasons, for urban reasons, for saving gardens and parks and the cultural landscape of Bucharest … As a result, this is a place for manifesting our interest in saving the Historic Character of Historic Gardens. The impact of such an action has to be maximum.

3. The manifest

I have decided to emphasize the poor condition of Cişmigiu Public Garden and to lay emphasis on the possible measures to repair the incorrect measures and decisions that were already done. During Restoration of Historic Gardens classes, the students of Landscape Architecture Department (Bucharest Faculty of Horticulture) have studied Cişmigiu Garden and they have completed the inventory of all artifacts and features of historic and artistic interest, which are still alive, a list of urgent interventions and they have proposed solutions for the damaged features and vegetal compositions.

The key for the poor condition of Cişmigiu Public Garden was to expose their works along the alleys of this Historic Garden and to mark the most damaged features with kinetic white vanes. The entries in the Garden should also be marked with white vanes, in order to show that something unusual is happening there. The vanes have to be white for a good contrast with the dark green of the vegetation.

Every detail have to be perfect for demonstrate professionalism and involvement. I have elaborated a set of images and a text presentation to support this idea. My proposal was approved by the director of APLA and we have started working.

The vanes have been hand made in white drawing-paper. They had to be plenty and big enough to be seen from the distance, from a moving car or from a bus and to be kinetic, not to be ignored and to bring the visitors' attention. The vanes had to be really kinetic. Their movement had an important role in our demarche. The places to implant them were chosen in order to be visible and to stress the damaged features and vegetal compositions. We had made three types of vanes: 50x50 cm, 35x35 cm, and the smallest 20x20 cm to be our gifts to the visitors and especially to the children.

About three hundred prints were sorted by content and I have chosen their positioning. White ribbons were spread between the trees, along the alleys and on the fences of the Garden, in order to suspend the students' projects. We have used stainless clips for a professional image. These installations are in a continuous movement because of the gentle wind. The students have accompanied these vanes and projects, for explaining their content, for watching the visitors' reaction and for offering the small vanes as souvenirs.

At the end of the day (Saturday the 18th of July 2009), the students have collected all these installations, not to pollute Garden vistas. These activities were accomplished by the students of Landscape Architecture Department as practical activity in Restoration of Historic Gardens. Even if it was a hot day, a lot of people have visited the Garden. Children, young people and old people were interested in our work and in our demarche. It was a success.

RESULTS AND DISCUSSION

1. Concrete results

The students were involved in an activity which can be profitable for their future occupation.

Students' responsibility on Historic Gardens, as future professionals, is increasing.

The public interest in Historic Gardens is awakening.

Young people and children were conquered for our goal: protection, preservation, conservation and restoration of Historic Gardens.

Our demarche had a large publicity: news journals of the most important televisions have informed the public about it; in the "România Liberă" journal an article about our work was published; more information about our activity can be found on the internet.

As a result of this exhibition, the mayor of Bucharest invited us to collaborate with the Mayoralty. This is for the first time when we will be consulted in the field of Historic Gardens.

Now, we have also a good link with the Non-governmental Organizations and Foundations interested in protection, preservation, conservation and restoration of the national patrimony including Historic Gardens.

2. Expected results

Romanian legislation concerning Historic Gardens will be updated and synchronized with international legislation. It is necessary to create a national legislation in accordance with the international legislation concerning protection, preservation, conservation and restoration of Historic Gardens (The Venice Charter - International Charter for the Conservation and Restoration of Monuments and Sites (***, 1964) and The Florence Charter of Historic Gardens and Landscapes) and to create a control and supervision framework, to make sure this legislation will be respected (***, 1981).

A law for listing Historic Gardens with specific criteria will be adopted.

The Green Spaces Register and a Scheduling of Historic Gardens will be accomplished.

The List of Historic Monuments - 2004 will be revised and completed.

Special measures for the preservation and conservation of "Historically Important Zones" and "Special Preservation Zones" will be taken and respected.

Abuses will be stopped by creating an inventory and surveys of relevant features, including relevant vegetal compositions. All these features will be listed.

The preservation, conservation and restoration projects will be accomplished by interdisciplinary teams of specialists (landscape architects, architects, historians, archeologists, horticulturists, ecologists …).

Landscape architects will be represented in the decision structures of the municipalities and of the Romanian Ministry of Culture, Cults and National Patrimony (MCCPN) (Răducan 2009).

Landscape architects will be involved in the management, the current maintenance and the plant maintenance of this Historic Gardens.

A body of professional companies with specialized workers in preservation, conservation and restoration of Historic Gardens will be created.

Schools for Gardeners will be created for the maintenance of Historic Gardens.

Media will be involved more and more in spreading cultural information in the field of protection, preservation, conservation and restoration of Historic Gardens.

CONCLUSIONS

It will be a long way in trying to change the legal framework in the field of Historic Gardens. It will take some time until we make sure the legislation will be respected. In Romania, despite of all these problems, young generations have to be confident in the future of Historic Gardens.

It is necessary to wake up the public conscience.

I have worked with the students of Landscape Architecture Department, Bucharest Faculty of Horticulture, on this project implemented in the real field of Historic Gardens. In the future, we will apply this strategy to other Romanian Historic Gardens, hoping to change the dramatic actual situation.

ACKNOWLEDGEMENT

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***1964, The Venice Charter - International Charter for the Conservation and Restoration of Monuments and Sites

***1981, The Florence Charter of Historic Gardens and Landscapes

FIGURES

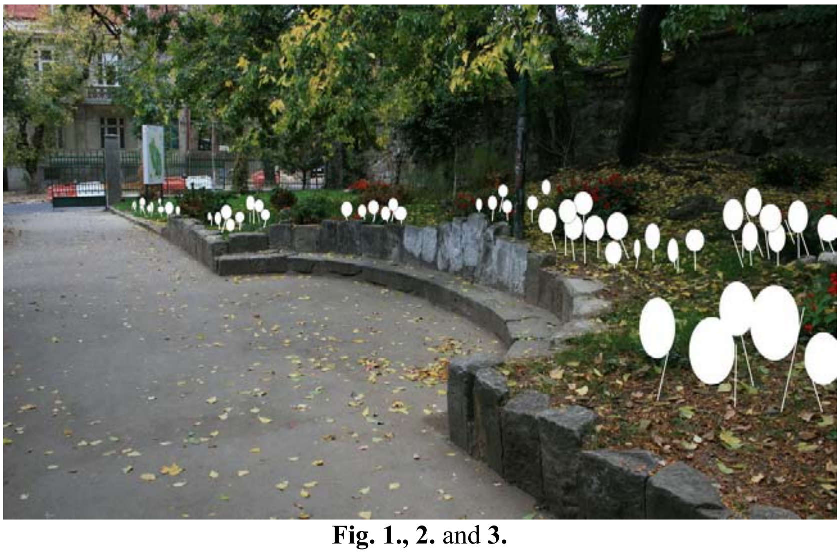

Fig. 1., 2. and **3.**
Set of images presenting and supporting our proposal
The two entrances to Queen Elisabeta Avenue and the entrance to “The Citadel”

Fig. 4., 5. and **6.**

The entrance to Queen Elisabeta Avenue and the main axis of Cişmigiu Public Garden

Fig. 7., 8. and **9.**
Sketches, analyses and proposals along the alleys of Cişmigiu Public Garden

Fig. 10., 11. and **12.**
Other sketches, analyses and proposals

Fig. 13., 14. and **15.**
The vanes and their impact on the people

Fig. 16. and **17.** The students near “The Citadel”

Fig. 18. and **19.**
The flower clock, a new feature that doesn't fit in Cişmigiu Historic Garden, surrounded by the white vanes

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Case study of a rural area in South-Western Dobrogea

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Keywords: rural landscape, sustainable development,

ABSTRACT

Romania starts on the road of reaching a free market with a considerable disadvantage. We are 20 to 50 years behind the Western Europe countries in numerous ways. None the less, this handicap must bring some advantages: traditions, customs, occupations, values that constitute the way of life of the Romanian country-side dweller. In search of progress and of a superior life standard, we need to combine new technology and E.U. Politics and strategies with the lessons that these advantages can still offer to the future generation.

The case study refers to a rural area in the South-Western Dobrogea (the historical territory of the country, situated in the vicinity of the Black Sea).

The study, divided in two parts tried to accomplish the following:

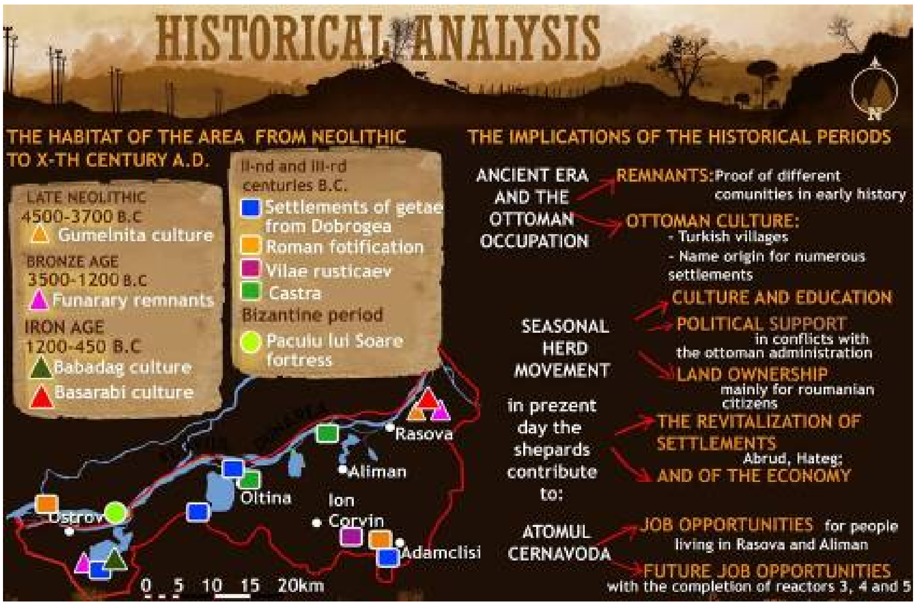
-the first part was dedicated to an interdisciplinary assessment of the physical, social, cultural and economical territory, and to the formulation of the conceptual guide lines of intervention and of the general strategy.

-in the second part of the study four targeted solutions were formulated addressing the landscape potential usages: as a base for touristic activities, as means of increasing the public appreciation of landscape and environmental issues, as base for sustainable rural development; the case study also offered a general draft of the management methodology.

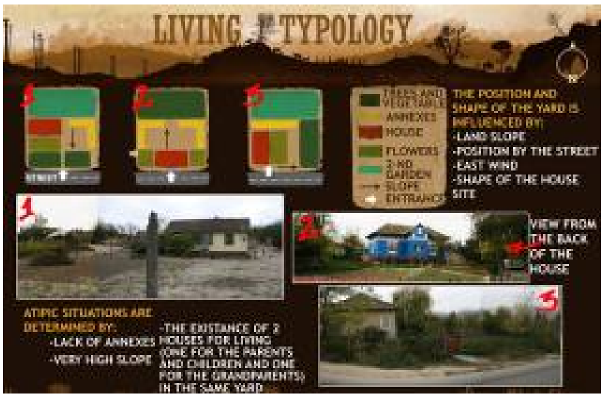
PREZENTATION OF THE CASE STUDY, METHODS USED AND CONCLUSIONS

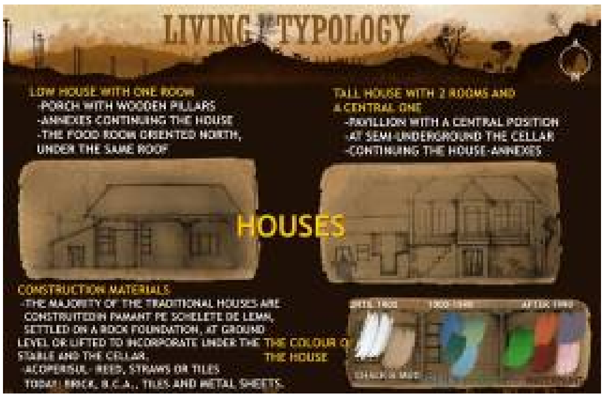
The area that makes the subject of the case study contains 6 regional units, each containing 3-6 villages.

The historical analysis was based on research of the early Romanian history, of settlements history and published studies of changes in names of people and places. For the contemporary period we used internet and newspaper information (Fig. 1).

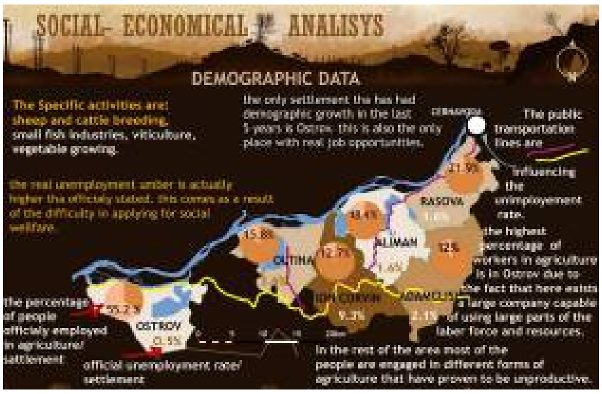


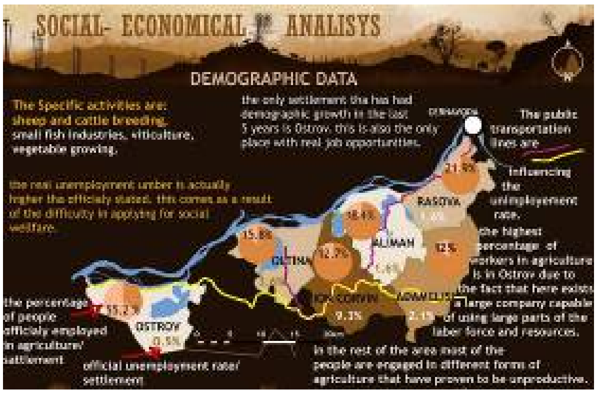
The next analysis showed us the manner in which housing has developed throughout the decades and also the heritage characteristics that can still be found in the area. Most of the information came from field research but also from other architectural and ethnographical studies made on the historical region of Dobrogea (eg. DOBROCULT, a project that has the objective of protecting, developing and promoting of cultural products of European importance, as a mean for durable development of the rural Dobrogea; the leading authority of the Project is The National Institute of Ethnography and Folklore I. Brailoiu) (Fig. 2, 3).





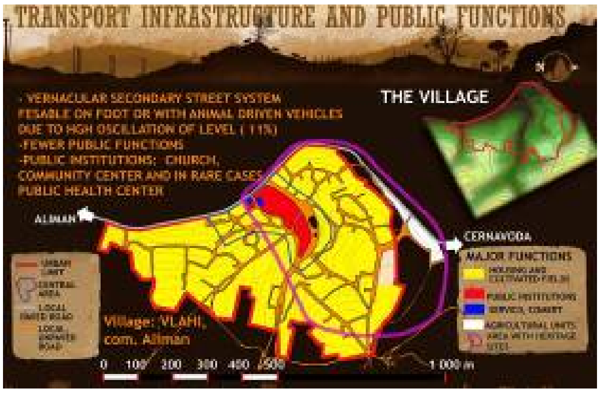
The most significant source of information for the social-economical analysis was the data provided by surveys of the national institute of statistics. The correlation of these data with the reality from the field shows a slight discrepancy. Also, in the social analysis we used an inquiry of our own to determine how profound are the local population's knowledge of the heritage resources of the site, which are the problems that are viewed as most pending by them, how they spend their free time, what are the preferred social activities and leisure places, etc. (Fig. 4, 5).



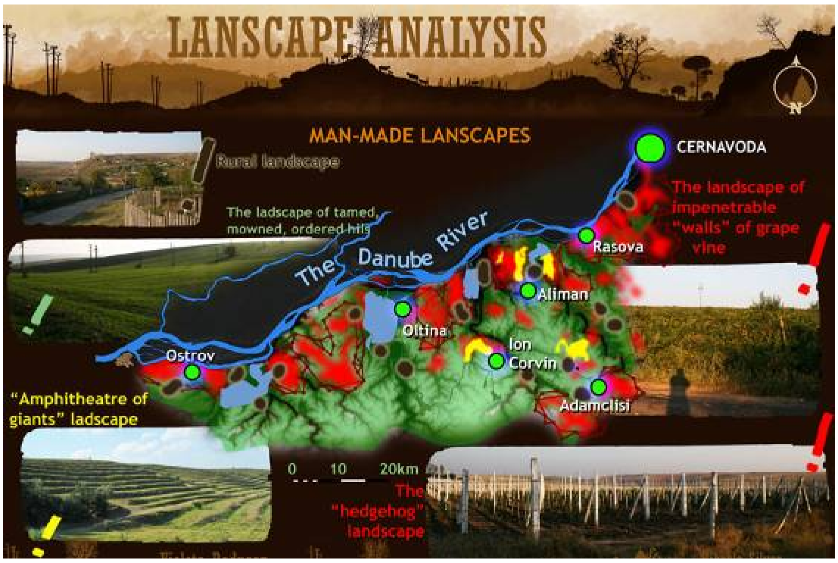


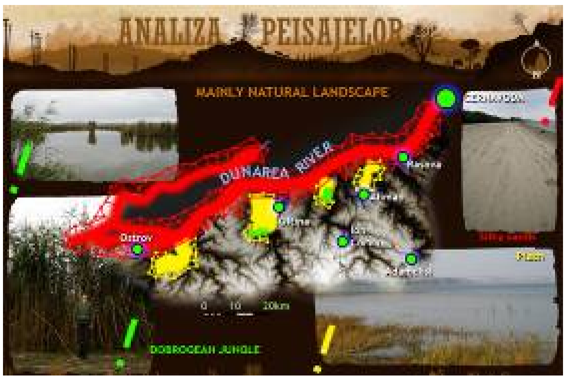
The rural-urban relationship illustrates which of the near-by towns is the chosen destination for commerce, leisure, job and school opportunities (Fig. 6).

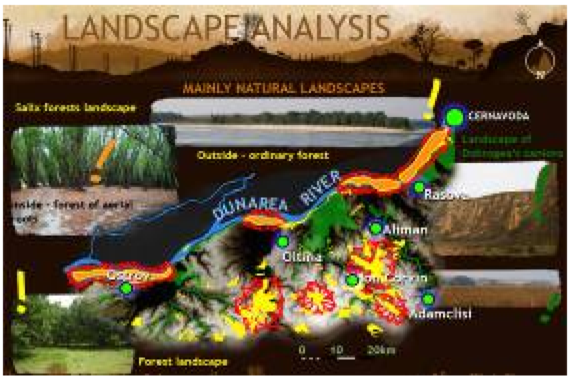
The analysis of the infrastructure and of the social services available in each of the villages has led us to the conclusion that there are necessary improvements to be made in each of them, but especially in those farther from towns, regional roads or those who aren't regional centers (Fig. 7, 8).



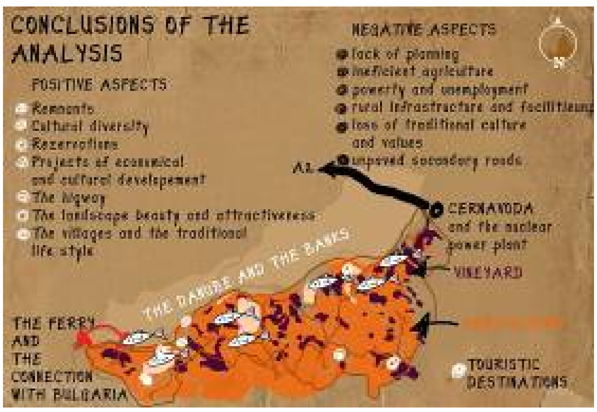
The landscape analysis shows a great diversity of landscapes in the region due to the variation of the terrain and the presence of water. Also, the human activity has determined the existence of specific landscapes. All this leads to the conclusion that there is a great potential to be exploited from a touristic point of view but also to the necessity to protect and conserve their diversity (Fig. 9-14).







The first stage of the case study leads us to understand that, although the region is confronted with numerous problems and difficulties, it also shows numerous resources and a great potential for an economical and social rehabilitation that will most likely be based on a graduate development of local agriculture, industries and tourism. As landscape architects, we have the mission to support this process with strategies for the conservation and valorification of the landscapes and also with local interventions to support the touristic activities (Fig. 15-16).

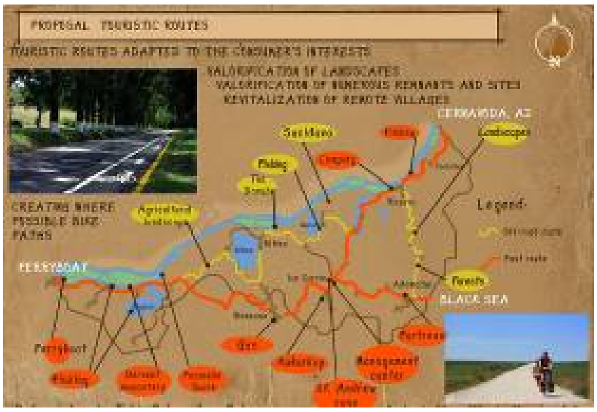


In order to achieve that goal we created a strategy that emphasizes the landscaper involvement in the process of durable development (Fig. 17).

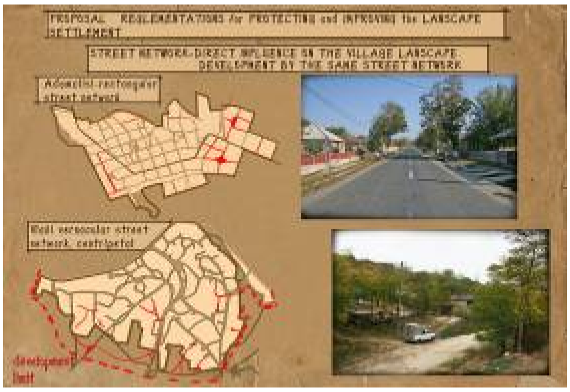
THE SOLUTION

The general solution details the general and the local interventions.

The first step in the elaboration of the solution was to determine the touristic routes that make use of the landscape and the different sceneries of the site. It is based on the premises that travelling through the area may constitute a rich and unique experience (Fig. 18-19).

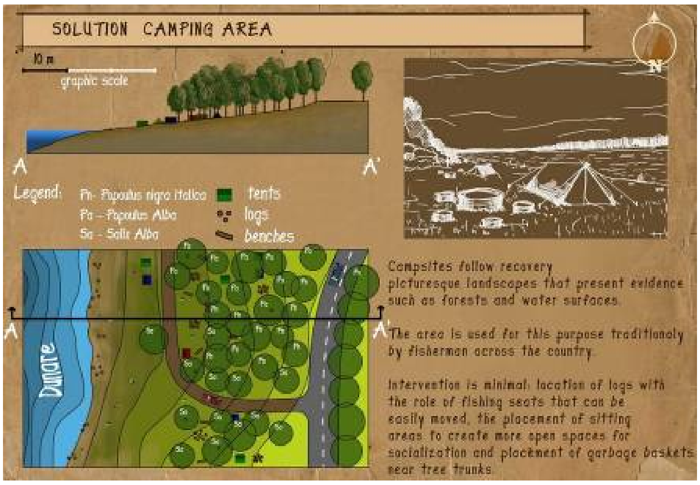


In order to conserve the specific feeling of the site rules must be compiled to conserve its physical characteristics. Some reglemantation concerning the rural architecture but also the infrastructure use and construction were proposed. (Fig. 20-22)

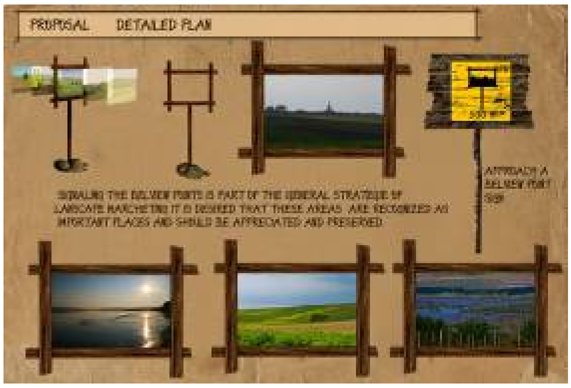


Through out the area a unitary signalling system will give it an identity of it's own, beside the obvious benefits. The elements are meant to blend in the scenery and use local materials (Fig. 23).

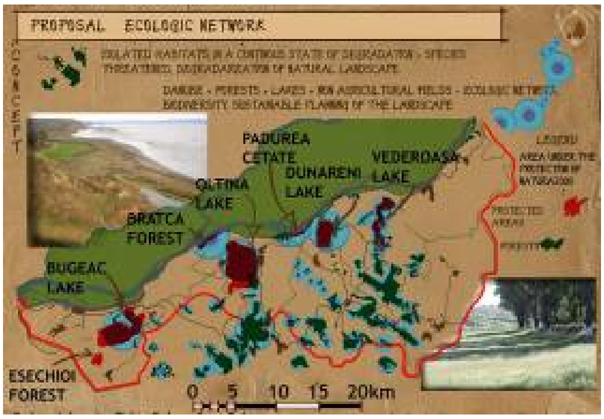
The camping areas are using the spectacular sites offered by the Danube and the lakes. They are also based on the leisure possibilities offered by fishing, hiking, and berry gathering, historical site seeing, etc opportunities. The "rural furniture" also uses local materials and is designed to integrate into the landscapes, to be functional and durable (Fig. 24-26).



The solution that refers to the sceneries is based on the principle that these are common good that everyone has the right to enjoy, regardless whether they are constituted by private or public properties and that the public can be educated towards a better appreciation of the landscape. We propose a series of frames that attract the visitor attention toward a certain landscape and a retreat on the side of the road that gives them the opportunity to enjoy it for a few moments. We are also proposing a series of measures and actions at a regional level, which, with help from the local population can lead to an improvement and enhancement of the scenery. (Fig. 27-30)



The ecological network is based on the following principles:
-the conservation of natural habitats is a necessity;
-the natural habitats are efficient only if they are linked and overlapped;
-there are a multitude of fields that remain uncultivated due to lack of resources or of demand for products in U.E. (Fig. 31, 32).



We propose to interconnect the natural areas like forests, river banks, lakes, and fields and create traffic zones for wild life.

The management method is based on the creation of a vast data base, with detailed information of the physical, economical, historical, cultural, social landscape of the area. This data base will indicate the time and place of specific actions that will lead to a complete valorification and conservation of landscapes.

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Landscape revival towards the intergration of the Magheru-Bălcescu boulevards in the N-S green axis of Bucharest

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Keywords: urban landscape, public space, axis, diversity, alternative, environment

ABSTRACT

The present article proposes to present an alternative vision regarding the public spaces in Bucharest, beginning with the specific case of the city centre and its main axis: the Magheru-Balcescu boulevards. The town's historic development led to a peculiar urban landscape, whose particularities tend to dull, becoming almost imperceptible in the last couple of years. This situation is merely determined by the urban environment being dominated by the more and more aggressive presence of the car and, simultaneously, by continuous loss of public space, the only one to refresh the sense of collectiveness and communal life. On the other hand, even though the issues concerning urban ecology increase their harshness, the revival policies of Bucharest remain stuck in a decorative approach, that ignores the problems of urban environment and ecology. Given all this, the project that is being discussed in this article is set to offer an alternative approach on the recovery of urban public space.

INTRODUCTION

Urban landscape revival projects, and particularly city centre revival, play a greater role as part of the policies concerning big cities rehabilitation. From the complex aspects that they deal with, we will resume on the issues concerning the urban plantings in general, and the socio-cultural issues.

In this context, an important accent is being put on the usage of plants that are adapted to the urban climate, constantly strike by pollution, heat and drought. Regarding social issues, a crucial role is being given to the public space and its capacity to generate civic and urbanity, social mix and cultural diversity.

GENERAL ANALYSIS

The North-South axis of Bucharest was structured beginning with the end of the 19th century, work starting in 1894, but was to be finished only after Second World War. The axis is composed from north to south by the following boulevards: Lascăr Catragiu, General Magheru, Nicolae Bălcescu, I.C. Brătianu and Dimitrie Cantemir. These boulevards are extensions to the Aviatorilor and Kiseleff roads, linking nowadays three major parks in Bucharest: Herăstrău, Kiseleff and Tineretului. Carving these boulevards in the urban tissue was achieved through different methods, judging from (depending on) the period they've been structured. The Kiseleff road, as a historic extension of the Mogosoaia Bridge (Calea Victoriei) is one of the oldest radial axes of the city, occurring in the earliest plans of Bucharest.

Unirii Square was built in successive steps that follow the same guidelines: those of the Parisian „carvings" (*percées*) attributed to Haussmann. These carvings double the historic axis of the city; represented by Calea Victoriei, as in Paris the Sebastopol Boulevard doubles the rue Saint-Denis. The doubling of existing paths allows linkage between important points of the city, without needing to demolish dense urban tissues. Although Bucharest is in its beginnings a city with an extremely poor density, the doubling of the axes allows the big interventions, carvings being made only on gardens (properties) and agricultural land.

The Kiseleff road is the rebuilding of the Băneasa avenue (named after the forest it drove into),established in 1833, when only the trees had to be planted, the Kiseleff park was built by Meyer during 1845-1848 (Olteanu, p. 142, 155), becoming the favourite promenade of the city inhabitants.

After completing the Est-West axis, begins the establishment of the North-South one that was to generate a new structural and symbolic centre: Universităţii Square.

The decision to build the Colţei Boulevard consisting of several sections, took place on 2 May 1894 at the City Hall. These sections are: between the intersection of Colţei street with Lipscani and Doamnei Street, from Doamnei Street to Romană Street and the end of Calea Victoriei (Victoriei Square). If the first sections will have a wideness of 30 meters, the last unit will be 40 meters wide, having a central drive for horses (Fezi, 247-248). The Mayor Nicolae Filipescu states during the council meeting held on the 28th of May 1894 that the project should be continued towards the south, reaching the market halls (Unirii Square) and even the barrier of Calea Rahova (Fezi, 249).

The whole establishment of the axis was done in sections, which led to an extremely diverse atmosphere. The variety of urban landscapes that resulted was analyzed in detail in the study done by Diana Culescu, Florin Teodosiu and Ioana Tudora in 2003, entitled: *The North-South Axis- green axis from north to south,* presented at two symposiums: *The axes of Bucharest,* organised by The Order of Architects in partnership with UAIUM in 2003, and a more detailed study at the Scientific Symposium held by the Faculty of Horticulture in Bucharest in 2004.

These studies underlined the discrepancies between the image of the green axis and the reality of the ground, where, excepting the north sections, the vegetation is very scarce and absent from the perception of the urban landscape. Another conclusion pointed out the indirect proportionality between the presence of the vegetation and the social usage of the urban space. Given all this the most populated sections are also the less green, scarcer in vegetation, while the northern part is much greener, but unused (except for the usage of parks) (Fig. 1).

In fact, the main promenade of the city inhabitants moved sometimes between the 19th century and the post-war period from the Kiseleff road to the Magheru, Bălcescu and Brătianu boulevards.

Part of this axis, the section between Universităţii Square and Romană Square has become a symbol of the modernity of Bucharest, a manifesto of modern architecture. The buildings erected mainly between the two world wars can easily be seen as part of the European modernist avant-garde: the ARO block (Horia Creangă and Haralamb Georgescu), the Burileanu-Malaxa block (Horia Creangă), the Carlton block (G.M. Cantacuzino), the Scala block (Rudolf Fraenkel) the Ambasador hotel and the Ferechide block (Jean Monda), the Magistrates block (Duiliu Marcu) along with the buildings done by Arghir Culina, State Balotin, Emil Nădejde and other well known architects transform the Brătianu, Bălcescu and Magheru boulevards into a virtual museum of European modernism. (Machedon & Scoffham, 166-189).

Even if the general surroundings and the character of these boulevards is induced by the volumetric simplicity of modernist architecture, seeming to determine a perception of this section as being a tunnel with continuous walls, in reality, things are extremely different. A few cells and impressive retreats mark the boulevard, like for example those in front of the Leonida, Eva and Malaxa blocks... some buildings of the traditional old Bucharest remain also, the Sturdza house (nowadays the Cărtureşti library) and the Italian Church are just two of them...

The study proposes to offer a revival of the axis that represents the social centre of the city. In the adopted solutions an important stress is laid on valuing the architectural urban and cultural heritage, in order to abolish the apparent monotony of the boulevards, praising and cherishing formal and social diversity instead (Fig. 2).

RESULTS AND DISCUSSION

Being the centre of the social and cultural life in Bucharest, Magheru-Balcescu Boulevard lacks proper planning of public space which seems to be perceived rather as a residue of the built area. It is surfeit with improvised parking; it lacks street furniture and visual identity.

The project seeks an aesthetic and cultural rehabilitation of the public space so that it becomes itself an attraction establishing a boost to the public urban life. The project aims the (re)establishment of the human scale, finding solutions consistent with the needs of interaction between pedestrian and public space, in our case the boulevard, the need for shade, coolness, to shorten the path (shortcut) and for an unhindered walk (indirectly goal-oriented movement). Interventions will not be a 'face-lift' for the notorious boulevards in Bucharest, but rather a functional, aesthetic and environmental arch of connections and a reconsideration of the identity of places. The understanding of the character and the reading of the context of each site separately is crucial in the process of planning.

The studied perimeter exceeds Universității Square - Romană Square section, including urban tissue adjacent to the great boulevard. On one hand there is the area adjacent to Calea Victoriei, clearly influenced by the plotting of the two axes and on the other hand the area adjacent to Ioanid Garden, less dense.

One of the first concerns in order to elaborate the strategy was to establish an alternative route to scroll the boulevard, a cultural route that brings together urban areas with high potential for landscape design: Universității Square, Colțea, TNB esplanade, the areas adjacent to Eva and Leonida blocks. Also this approach seeks to show a new perspective over the dull space that is now Magheru-Bălcescu Boulevard by reopening the courtyards and gangways, restoring connections with adjacent areas and by regaining the public space for the pedestrian, increasingly neglected lately in front of the automobile.

A prime focus of the route and starting point is Universității Square. The project aims to reinvent the place so that it would reflect the acquired character more, symbol of the city and landmark by converting it into a pedestrian area and eliminating the parking. Universității Square could be a starting point for both a cultural and urban route toward the boulevard and for a historic one toward "Lipscani".

TNB esplanade - the project seeks the remodelling of the place in order to answer the way it is commonly used: as a socializing place, meeting point and location for outdoor events. To serve this purpose the improvement and enrichment of the plantations is needed; also the place should be equipped with street furniture, outdoor exhibition areas and an amphitheatre for outdoor performances.

Colțea area is where we propose a memorial place dedicated to the victims of the tragic events of "December '89 Revolution". Along with the events occurring at that time Universității Square and Nicolae Bălcescu Square became a symbol, yet this has not been marked so far, the only elements that recall the events are a few crosses.

"Fântâna de la Universitate" (University fountain) at the Edgar Quinet Street and Biserica Enei Street cross is an important meeting point, socializing place and landmark. Converting it into a pedestrian area by eliminating the parking and restricting the car access, improving and enriching the plantations, equipping the place with street furniture can enhance the public space quality in this area. Also a similar project, as "Strada Cărții" (Book Street fair) that takes place in front of the Faculty of History, could be implemented here by equipping the area with "urban style" designed book stalls.

An entire series of green pocket will be conceived:

The inner courts of Dalles Hall and the Faculty of Pharmacy will be connected, the space thus result and the terrace being opened to social use as lecture and study space.

The Bălcescu parking area (in front of the Wilson and Burileanu-Malaxa blocks) is where we propose to improve the plantings, laying out 'green pockets' where it is possible, point wise introduction of water into the site and fitting the area with urban furniture.

For the surrounding area of the Eva blocks we propose a conversion of the site into a pedestrian area, equipping it with urban furniture, introducing water to the site, in form of soaring water jets, aerating and showcasing at the same time, improving the microclimate, especially during summer periods, ameliorating the existing plantings and enriching them with new plants, establishing a 'garden of shadow'.

At Romană metro station we propose eliminating the existing parking in order to support pedestrian trespassing, introducing proper designed stalls for selling flowers, media and bus tickets all designed according to the specific character of the boulevard. Romană Square will be given a visual coherence by fitting out the sidewalks with the same pavement.

In order to achieve a new perception of the boulevard and to show an unseen and maybe ignored face of the city, we propose opening up the alleyways, passages and the narrow streets full of Bucharest's inter-war charm, linking them in an alternative route. Most of them represent real shortcuts for those who use them 'on their way to work', but can become alternative for the 'unhindered Sunday walk'. Thus, we propose dualistic approach in reception and usage of these spaces, and invest them with great value as public space. The walk on Magheru should not be limited to the plane movement on one of its sidewalks. Instead we propose a 'drift' behind the continuous front of monumental facades, to spaces seen as story tellers of the carving of the great boulevard. Opening an alternative pedestrian route will also lead to a decongestion of the overcrowded sidewalks. The route consists of: entrance through an alleyway in Dunărea block – linkage to Biserica Enei Street, Nicolae Bălcescu boulevard, Câmpineanu Street; Ministerului Street – linkage path to Câmpineanu Street, Dobrescu Street; Boteanu Street – establishing a pedestrian friendly area by laying out outdoor furniture, enriching plantings and ameliorating the existent ones. The project also aims the remodelling of the area surrounding the Boteanu church, making it proper for religious celebrations; Pictor Arthur Verona Street (permanently pedestrian) (Fig. 3).

An important point of the project is the restoring of nowadays broken linkages, thus (re)considering connections concerning the whole centre of Bucharest.

Proposed in the strategy is the implementation of a pedestrian route to link Magheru Boulevard (Romană metro station node) to Lahovari Square, through the Tache Ionescu Street, nowadays partially used by cars. The project has a cultural potential through the transformation of the house in which Tache Ionescu lived into an inter-war politicians museum, and with the possibility to open a part of the A.C.R. headquarters for broad public. Changes in the surface texture and pattern of the pavement are meant to 'announce' and 'guide' the pedestrian to the points of interest. The placement of a statue of the personality on the green triangle nearby enriches identity and establishes the green patch as garden of the T.Ionescu house (Fig. 4).

'The Garden of shadow' Eva block area is a peculiar site that offers the ideal premises for the establishment of a small urban garden. Its placement between high-rise buildings (Eva-block) and the presence of lush vegetation will make this place dry-shaded for most of the day. The shadow articulates and gives a certain unity and depth to the site. The intervention is minimal, consisting in the articulation of a pedestrian short rest, interaction place, without excluding the transit function that it has to have, as a part of the alternative route. An avenue is being build where a sidetrack used to be. A paved square platform is being inserted, that acts like a stopping-place, but without giving a sense of being excluded from the flow of the path. The platform is a distinctive place, marked by a mineral oversized border that allows sitting. Opening up the corners offers the possibility to create certain connections of the square as ‘inside’ and the rest of the garden as ‘outside’. Being a dry-shaded place most of the time, choosing the plants that can thrive in such conditions becomes crucial. Shrubs include: Mahonia aquifolium, Cornus Alba and Lonicera pileata. As ground cover, will be planted Vinca minor and Pachysandra terminalis, both evergreen species. One of the tall vertical walls will be covered with Parthenocissus quinquefolia, offering a colourful background in autumn (Fig. 5).

The project also aims to provide an alternative vision to the way the vegetation is inserted in an urban environment, with extremely harsh conditions for plants. Vegetation comes to 'support' the pedestrian. Trees provide precious shade. Shrubs provide fresh green stripes, guidelines or a simple separation of pedestrian circulation from parking. Perennial flowers enrich with colour and scent. In order to naturalize the studied perimeter in light of its inclusion in the green axis of Bucharest we suggest a 'green geometry' as adapted and adaptable complex structure.

The vegetal composition will be conceived in points (perennial flowers), rows (linear plantation of shrubs), planes (horizontal surfaces and green vertical walls, creepers) and volumes (trees and groups of trees). The ’green geometry’ is about planting the proper type of plants on a specific site, taking in account not only detailed biological requirements, but also cultural, economical and maybe historical criteria. The plantings done on public space in Bucharest in the last couple of years seem to ignore all of the enumerated criteria. Plants are inserted in places they can not survive, not even minimal planting distances are taken in account. The tendency in Bucharest is to plant large amounts of exotic plants or expensive and pretentious conducted forms, that look good in nurseries, but obviously are not suited for every ‘green patch’. This is the case of the plane tree (Platanus hybrida) that is being planted excessively. The species, well known for its monumental broad crown has recently been planted in sidewalk alignment along some parts of the Magheru-Balcescu boulevards. We firmly affirm that: ’a tree is a long term investment’ (Richard Rosenfeld) (Fig. 6).

Trees are not intended to support visually the auto lane, therefore the proposed plantation will not consist of a continuous street alignment, symmetrically ordered, monotonous consisting of a single species. As an alternative to what is being planted on the Magheru-Balcescu boulevards we recommend species that have proven that they can fit the harsh conditions of Bucharest’s urban environment, these are: Quercus rubra, Fraxinus excelsior, Ulmus carpinifolia, planted alternatively in the extended sidewalk or green stripes. The insertion of trees on sidewalks should take place after insuring a proper draining, the trees being protected by a metal grill (Fig. 7).

CONCLUSIONS

Urban public space, mostly ignored by Bucharest’s politics, represents an essential resource for the social revival and urban rehabilitation. A simultaneous taking in account of all the aspects that configure and determine the urban environment can insure the long time success of a project this type. What we propose in this study is a change in the paradigm of urban design projects. Therefore, a concomitant approach of the issues regarding social life, architectural heritage and conservation, contemporarily and cultural life is doubled by a new way of studying space in a project of urbanism. Thus, the Magheru and Bălcescu boulevards aren’t tackled intra-muros, but are taking in account their connections with the surrounding urban tissue. Urban revival is not about abstract lines drawn on a master plan, it’s about dealing with the city as a system of interpenetrating networks. The boulevard’s public space should not be limited to the sidewalk; instead it should reach out to the whole urban space that is available. Such an approach insures not only the achieving of a broad variety of spaces, capable of generating particular and diverse surroundings, but also the 'opening' of the city to its inhabitants, that nowadays tend to ignore its structure and…charm.

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FIGURES

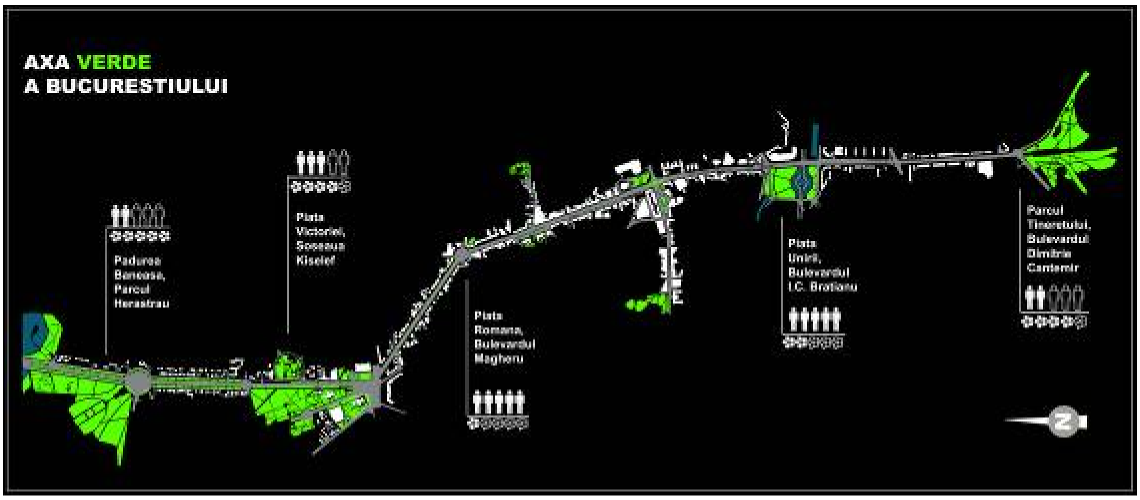

Fig. 1 – The presence of vegetation and the usage of space along the N-S axis.

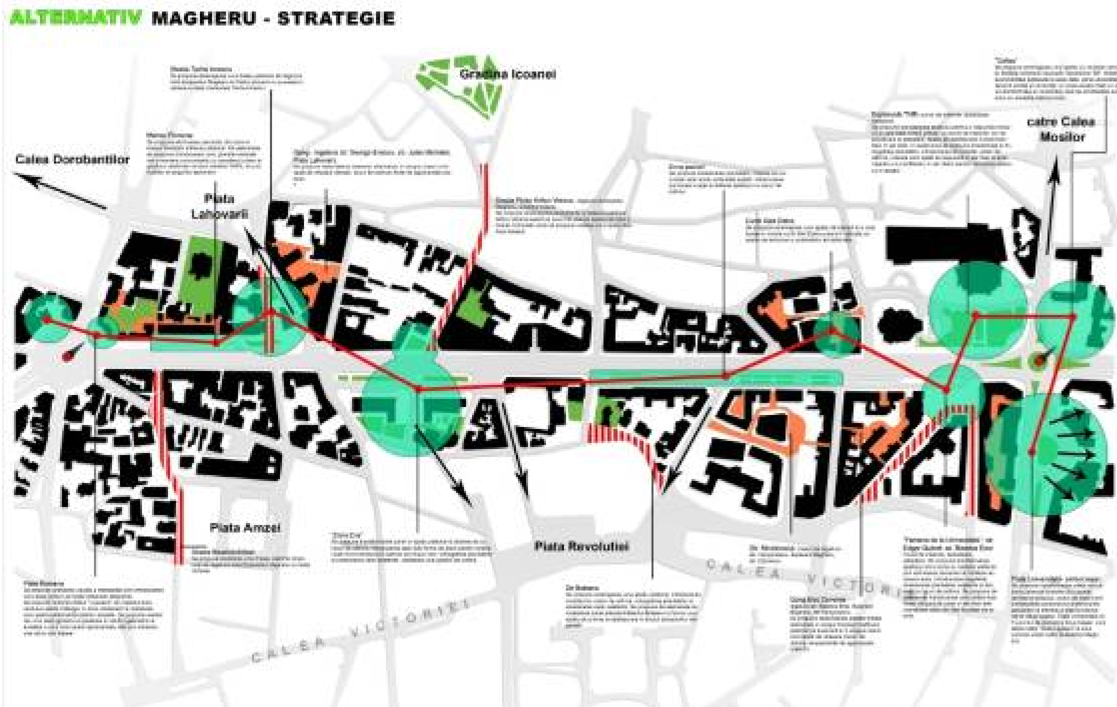

Fig. 2 – Cells and retreats of the boulevard as main point of intervention in order to value the architectural, urban and social diversity

Fig. 3 – The opening up of the alleyways, passages and the narrow streets full of Bucharest's inter-war charm, linking them in an alternative route

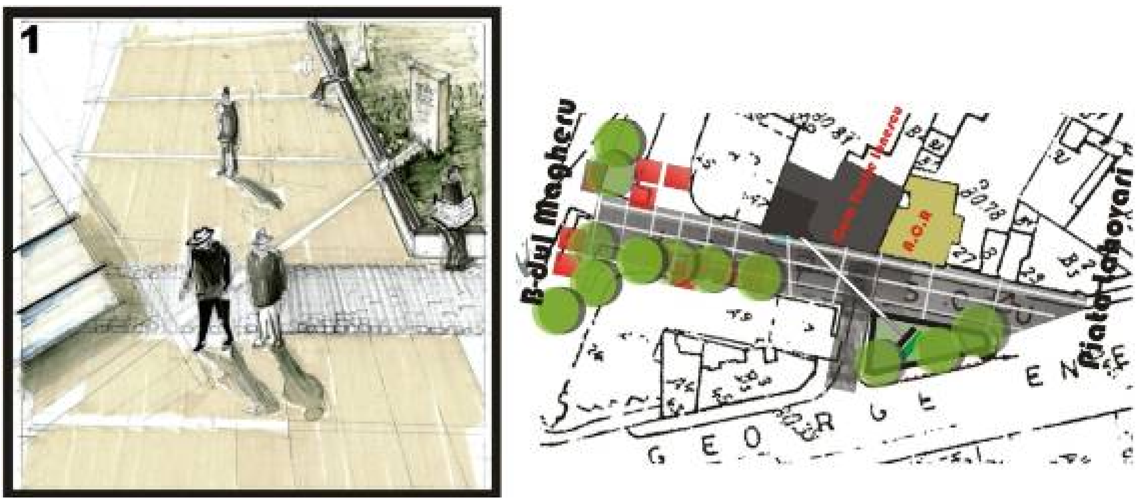

Fig. 4 – Tache Ionescu Street

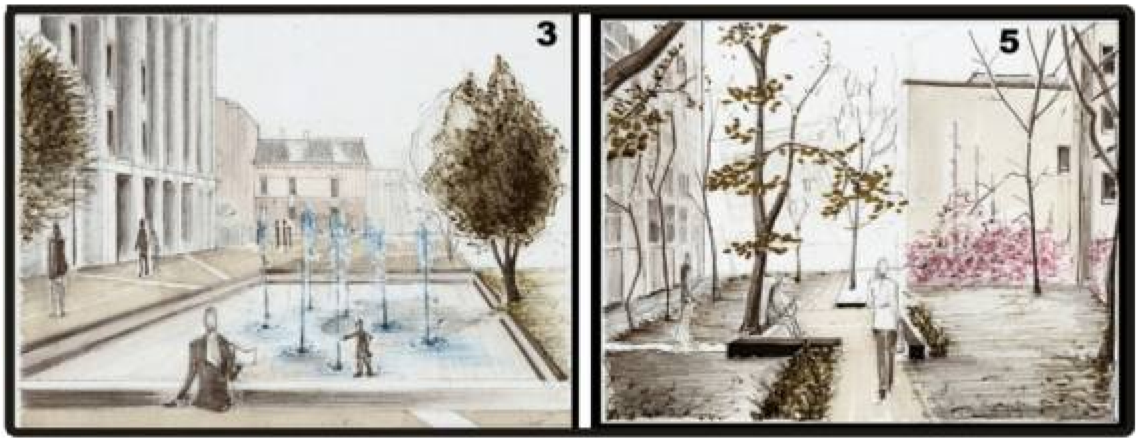

Fig. 5 – 'The Garden of shadow' at Eva block area, the establishment of a small urban garden

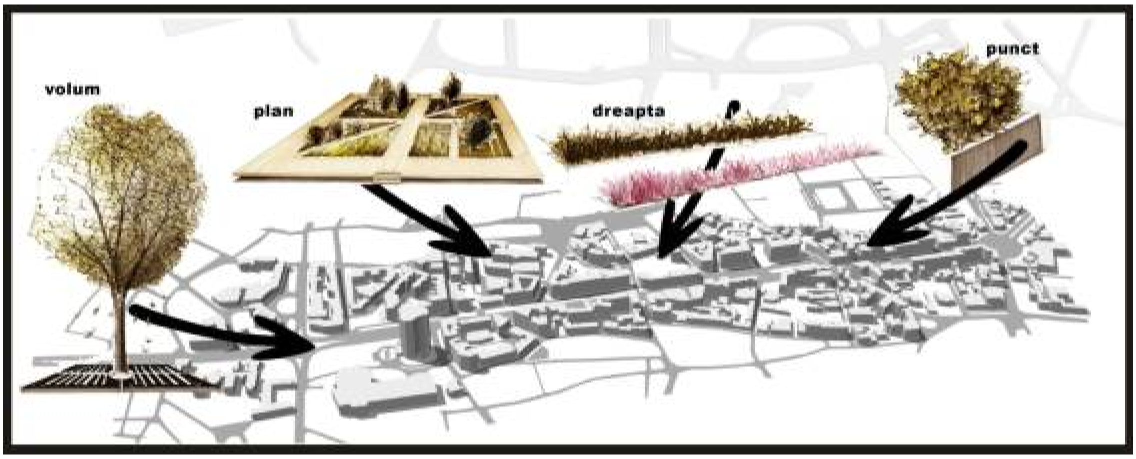

Fig. 6 – Implementing the 'green geometry'

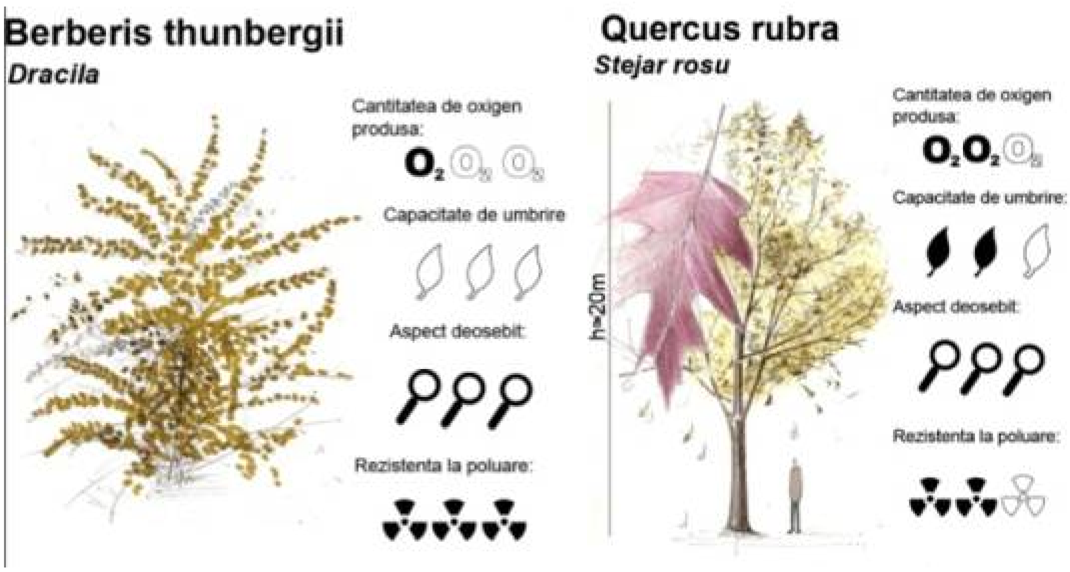

Fig. 7 – Alternative species that are proposed

Les effets des politiques urbaines du XIX^{-e} siècle sur les jardins bucarestois comme éléments du paysage urbain

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Motsclef: Paysage urbain, jardin, politiques urbaines

RESUME

Cet article se propose d'étudier le rôle des cours et des jardins bucarestois dans la création du paysage urbain de la deuxième moitié du XIXe siècle. Il suivra le fil de leur évolution, guidé par les législations et les réglementations urbaines modernes, et analysera leur structure, image et usage en tant qu'espaces d'habitation. Notre étude prend en compte les jardins des faubourgs (*mahalale)* bucarestois, devenus désormais des quartiers centraux. Quant à la chronologie choisie, la période est marquée par une série de transformations radicales de la structure urbaine opérées dans un contexte d'influences culturelles multiples, ayant aussi touchée le mode d'habitation.

1. LE ROLE DES JARDINS DANS LE PAYSAGE URBAIN AVANT LE XIXE SIECLE

Ne possédant pas de fortifications (interdites par la Sublime Porte), Bucarest n'a pas été contrainte à une densification dans un espace strictement délimité comme dans le cas des villes occidentales. Cela favorise une extension libre et permet le maintien des terres agricoles à l'intérieur de l'agglomération. Dans ce contexte, le jardin joue un rôle déterminant dans la structuration de l'espace urbain bucarestois à travers une double action en devenant un élément dominant du territoire et de la vie socio-économique.

Par ses dimensions, configurations, végétations et utilisations, le jardin bucarestois est un élément essentiel dans le paysage urbain. Maintes descriptions faisant référence à la présence des cours et des jardins nous permettent de visualiser la ville au début du XIXe siècle. Ainsi Ion Ghica[1] parle de Bucarest au XVIIIe siècle et le décrit comme des espaces vides occupés par des vergers, des vignes et des terrains vagues, clairsemés par des huttes, des cabanes et des maisons en torchis séparées par des carrières de sable et des marécages, au milieu desquelles se dressent les tas de fumier des écuries des boïars. Vers le milieu du XIXe siècle François Recordon[2] découvre des bâtiments éparpillés dans un grand bois. Il est alors surpris de savoir que c'est en fait Bucarest. Les plans, les gravures ou les photographies illustrant la cité bucarestoise nous montre, jusque vers la fin du XIXe siècle, une ville dominée par de la végétation plutôt que par des édifices.

En 1886, Le Cler[3] remarque cet espace urbain atypique où à l'exception de deux ou trois rues où les maisons sont jointives, les habitations sont clairsemées, isolées et positionnées entre la cour et le jardin. Le terrain perdu occupe neuf dixièmes de la superficie totale. Chaque famille, même les plus pauvres, possèdent une maison individuelle. Selon la description de Le Cler: les maisons, même les plus petites, sont accompagnées par la cour et le jardin. Cette spécificité de l'habitat traditionnelle bucarestoise d'avant le XIXe siècle est l'unité maison-jardin dans laquelle la maison, qu'elle soit grande ou petite, se situe au milieu d'un grand espace couvert par un système de cours, jardins et bâtiments annexes. La cour est formée par une succession de jardin: le jardin fleuri en face; *bătătura* (cour ouverte où se groupent la maison et ses annexes); le potager; le verger; la cour des animaux; le terrain agricole, etc. La maison, perdue entre ces espaces végétaux, ne regarde presque jamais sur la

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[1] Ion Ghica – *Convorbiri Economice*, repris en Frédéric Damé, *Bucureştiul în 1906,* Bucarest, 2007
[2] François Recordon – *Lettres sur la Valachie*, Lecointe et Durey, Paris, 1821
[3] G. Le Cler, *La Moldo-Valachie*, Dentu, Paris, 1866

rue. Les familles plus aisées peuvent aussi avoir d'autres terrains agricoles éparpillés dans la ville, loin de leur propre demeure.

A la fin du XIXe siècle « la superficie occupée par des maisons est de 423 hectares, celle des places publiques et des rues de 251 hectares, les vergers et les cultures maraîchères couvrent quant à eux 717 hectares»[4]. Les terrains considérés agricoles occupent donc plus de la moitié de la superficie totale de la ville. Cette mesure est calculée en incluant aussi les cours et les jardins, ce qui nous donne une immense étendue végétale.

Le grand périmètre de la ville et son extension insensée ont toujours préoccupé les princes régnants, et plus tard les édiles. Le plus souvent les tentatives de limitation de la croissance urbaine ont toujours échoué. La modernisation de la ville est surtout liée au contrôle de cette expansion perpétuelle, et de façon inhérente à sa densification.

Evidemment, les premières terres sacrifiées au processus de condensation de l'agglomération ont été les terres arables, les vignes et les vergers. Par la suite ce sont les grands jardins des maisons qui disparaissent. La transformation de Bucarest en une capitale européenne moderne a provoqué la disparition successive et rapide des grands espaces plantés. Comme le remarque Frédéric Damé, la diminution en nombre et en surface des jardins a profondément changé la vie quotidienne, la façon d'habiter la ville et les habitudes des Bucarestois[5]. La modernisation de Bucarest au fil du XXe siècle a radicalement modifié le rôle de jardins perdent alors leur importance dans la structuration de la ville. Le changement des pratiques spécifiques des habitants dans le cadre de l'utilisation des jardins est induit simultanément par la diminution de leur superficie et par la modernisation de la société bucarestoise. Ce double renouvellement de la ville et de la société est réalisé grâce à deux outils: d'une part les politiques urbaines; et d'une autre part le désir des habitants d'adopter un nouveau modèle culturel venu de l'occident.

2. LES REGLEMENTATIONS MODERNES (1831-1939) ET LES JARDINS BUCARESTOIS

La volonté de moderniser la ville se reflète dans une longue série de lois et de réglementations urbaines censées transformer la structure urbaine. Une première loi vise l'établissement de limites pour le périmètre urbain et l'installation de barrières par Alexandru Ipsilanti (1774–1782). Il s'agit de prémices législatives. C'est la première fois qu'une mesure est intégrée dans un système de règles concernant l'administration de la cité. A l'instar des autres tentatives, l'initiative d'Ipsilanti n'a pas eu un grand succès[6].

Le Règlement pour l'état de la santé et pour la surveillance de la politique de Bucarest[7], précédant de quelques jours le *Règlement organique* (1831), reprend le problème de la limitation de la croissance de Bucarest, toujours sans succès. Parmi ses prescriptions on peut dénombrer des travaux d'embellissement: des espaces publics, des alignements de rues, le drainage des étangs et l'assainissement des marécages, le traçage de nouvelles rues et l'alignement des maisons par rapport à la rue. Ces idées ont un impact important sur les cours et jardins des bucarestois, mais aussi sur les *maidane*. Les cours fleuris devant les maisons disparaissent en partie avec l'alignement des maisons. L'analyse des intentions de

[4] *Enciclopedia română* de Jannescu citée en Dolores Toma, *Despre grădini şi modurile lor de folosire*, Iaşi, 2001, p. 25

[5] Frédéric Damé, *Bucureştiul în 1906*, Bucarest, 2007p.92

[6] Constantin Giurescu, op. cit. p. 106

[7] *Regulamentul pentru starea sănătăţii şi paza bunei orînduieli în politia Bucureştilor* a été approuvé le 14 avril 1831 et intégré ultérieurement dans le Règlement organique en tant qu'annexe. Dans son préambule est énoncé son but: l'embellissement, la salubrité et la régularisation de la ville (Nicolae Lascu, *Legislaţie şi dezvoltare urbană. Bucureşti 1831-1952,* p. 40)

l'administration reflète le désir de densification de la ville, vue comme principal moteur de la modernisation urbaine.

Une loi essentielle pour la densification est *Le Règlement pour l'ouverture de nouvelles rues dans la capitale* de 1856[8] qui donne la possibilité de réaliser de nouvelles voies privées, et qui prévoit la construction de trottoirs, la mise en place de l'éclairage public et du système assurant l'hygiène urbaine. La promulgation du règlement est accompagnée par l'arrivée d'un nouvel instrument de travail, essentiel pour la planification urbaine: le premier plan topographique et cadastral de la ville réalisé par le Baron Rudolf Von Boroczyn. Le plan dont la réalisation a débuté en 1846, est publié en 1852 avec toutes les mises à jour disponibles et rendues nécessaire par le grand incendié de 1847. On peut affirmer que ce dernier règlement détermine une série de transformations radicales du tissu urbain, permettant le re lotissement des grandes surfaces, leur passage de statut «agricole» à celui «d'urbain» (l'utilisation des terres pour l'agriculture a été déclarée anti urbaine). C'est ainsi qu'une grande partie des jardins est transformée dans les petits quartiers.

L'étude des recensements de 1831, 1838 et 1860 démontre les effets de ces lois, surtout pendant cette période où les limites de la ville restent relativement immobiles. Ainsi, en 1831 la ville a « 80 *mahalales*, avec 9342 maisons pour 53 888 personnes (28 419 hommes et 25 469 femmes) »; en 1838 on retrouve 81 *mahalales*, avec 10601 maisons pour 63644 habitants. Durant ces années, la ville évolue peu. Elle se développera spectaculairement plus tard, ainsi que la montre le recensement de 1860. La nouvelle capitale des Principautés (1859) compte alors « 16263 maisons en dur, 2184 en bois et 4992 de bâtiments mixtes pour une population de 121734 habitants dont environ 9000 sont des Tsiganes. Notons que 67482 sont encore des agriculteurs ou travaillent dans des professions libérales, 30399 sont des artisans, 769 des *fabricants* et 23089 des *commerçants* (dans ces catégories sont inclus aussi les 13940 de *servants*) »[9]. Cette dynamique est aussi accompagnée par une modification radicale des techniques de construction et de la façon d'habiter, fait révélé par le grand nombre – quasiment toutes les nouvelles habitations – de constructions en dur (briques, pierre), conformément à la loi.

Les règlements et les lois promulguées et appliquées en 1831 et 1847 offre une certaine continuité et une stabilité, à la politique urbaine et de la ville en général. A l'opposé, la société bucarestoise subit d'importantes mutations. La bourgeoisie, les commerçants et les fonctionnaires jouent un rôle de plus en plus conséquent. Bucarest devient à tour de rôle la capitale des Principautés Unies (1859) puis du nouveau Royaume de Roumanie (1881). Toutefois, les intérêts politiques multiples ne semblent influer sur la cohérence et la continuité de la législation urbaine. On peut alors dire que pour le contexte historique décrit, les premières interventions concertées dans le tissu d'une ville pleine de poussière et de montagnes de boue, en fonction de saison, sont imposées par un projet politique visant une modernisation générale.

Un autre moment important dans la modernisation de la ville est la sécularisation des avoirs des églises et des monastères datant du13 décembre 1863. Elle fait suite à une loi adoptée malgré les oppositions internationales (notamment des Grecs qui contrôlent les avoirs provenus des Principautés)[10]. La sécularisation a permis l'acquisition de nombreux terrains

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[8] *Regulamentul pentru deschiderea din nou de ulițe în capitală* a été publié en 13 septembre 1856 pour répondre à la densification de la ville par les nouveaux lotissements. Les rues plus longues de 100 mètres devraient avoir une largeur de 12 mètres en conformité avec le Règlement organique. (Nicolae Lascu, op. cit. p. 53)

[9] Olteanu, *Bucureşti în date şi întâmplări*, Bucarest, 2002, p. 180-181

[10] La loi du gouvernement de Mihail Kogălniceanu pour la sécularisation des avoir des églises et monastères a touché notamment les monastères bâtis par les princes roumains et appartenant au mont Athos. Les protestes du métropolite Sofronie Miclescu de Moldavie ont provoqué ensuite la chute du gouvernement.

bucarestois. La ville moderne est alors bâtie en grande partie sur des anciens terrains vagues des monastères. «Entre 1866 et 1877 la population connaît une croissance de 15 302 personnes (de 162 000 à 177 302 habitants), c'est-à-dire avec en moyenne 1 391 personnes par an; c'est très peu en comparaison avec les suivantes décennies(…). Parallèlement à l'augmentation du nombre de bucarestois, le nombre de maisons croît aussi. Selon les statistiques, en 1878 il y a dans la capitale 31 037 maisons, les plus nombreuse dans la couleur Noir[11]: 5.681, vient ensuite la couleur Bleu, avec 5.175, puis le Jaune avec 4.857, le Vert avec 3.891 et le Rouge pour le centre commercial avec seulement 1.430. Entre 1850 et 1860 on construit 3.673 immeubles, entre 1860 et 1870, 3.730, et entre 1870 et 1880, seulement 1.889»[12].

Le *Règlement sur la salubrité de constructions et des logements* (élaboré en 1876 par le docteur Iacob Félix et promulgué en 1878), détaille la méthodologie d'implémentation de la *Loi pour l'organisation du service sanitaire* de 1874. Il contient une série de normes hygiéniques sans précédent dans la législation bucarestoise et a un impacte très important sur les futurs cours et jardins[13]. Parmi ces règles, la plus importante concerne l'obligation de paver les cours. Ainsi « la cour sera nivelée et couverte systématiquement avec du pavé en pierre, en gravier, en asphalte ou en bois… ». Cela interdit donc, non seulement l'usage agricole des cours urbaines, mais aussi la plantation de fleurs dans les jardins devant les fenêtres. En regardant le plan de l'Institut Géographique de l'Armée de 1899 ou celui de la ville de 1911, ainsi que les jardins actuels, il est évident que cette réglementation n'a jamais été appliquée ou respectée. L'obligation à paver les cours est pour l'époque, un signe très clair de volonté de définir un espace urbain moderne.

D'autres éléments du règlement de 1876 prévoient l'obligation des clôtures délimitant les propriétés, celle d'équipements sanitaires pour les logements (un cabinet toilette par étage pour les maisons unifamiliales et un par appartement pour les habitations collectives) et pour les bâtiments d'utilité publique (des théâtres et des musées jusqu'aux bistrots de quartier)[14]. Cette dernière norme a aussi un impact non négligeable sur la configuration des cours et leur utilisation. Une grande partie des bâtiments connaissent des extensions avec «des corps

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[11] La ville de Bucarest était divisé en plusieurs unités administratives, les secteurs, chacun ayant une couleur (le centre rouge, puis le noir, jaune, bleu et vert autour)

[12] Constantin Giurescu, op. cit. p. 154

[13] Nicolae Lascu, op. cit. p. 91-92

[14] « Chaque étage des maisons aura au moins une latrine (privée). Dans les maisons avec plusieurs ainsi que les modalités de branchement au réseau de canalisation de la ville. (Nicolae Lascu, op. cit. p. 93)

[14] Cette loi sera modifiée en 1891 pour agrandir les arrondissements de la ville, confirmant ainsi la croissance de la ville. (AN-DMB, le fond Technique de la Mairie, dossier 6/1891)

[14] La première variante de la loi prévoit des hauteurs très grandes pour les bâtiments par rapport a la largeur de la rue, allant jusqu'au 17,55 m. fait qui détermine Alexandru Orăscu d'envoyer une adresse (no. 1260/29 décembre 1875) dans laquelle il remarqua que ces hauteurs sont reprises au décret d'Haussmann du 27 juillet 1859 (AN-DMB, le fond Technique de la Mairie, dossier 3/1874)

[14] ibidem

[14] Voir Bogdan Andrei Fezi, p. 142-147, Nicolae Lascu, p. 84-87

[14] *Règlement pour les constructions et les alignements*

[14] Voir Eugène Pittard, *La Roumanie*, en Bogdan Andrei Fezi, p. 217-218

[14] Nicolae Lascu, p. 144-148

[14] Nicolae Lascu, p. 154-181

[14] Liviu Chelcea, p. 69 familles, chaque appartement familial va avoir une latrine. Dans les hôtels le nombre de latrines va être de minimum une pour quinze chambres. Les restaurants, bistrots, bars, cafés et confiseries-cafés vont avoir des latrines et urinoirs. » L'article 9 de la loi prévoit aussi les premières normes dans le domaine ainsi que les modalités de branchement au réseau de canalisation de la ville. (Nicolae Lascu, op. cit. p. 93)

d'eau» destinées aux groupes sanitaires; les latrines de fond de cours sont amenées à disparaitre lentement.

Le même règlement prévoit un pourcentage d'occupation du terrain de 66% des surfaces, le reste étant réservé pour les cours. Il est évident que cette norme s'adresse plutôt au centre ville, le reste du territoire se caractérisant par une très faible densité. Une grande partie des cours de *mahala* sont ainsi partagées et possèdent alors une superficie plus faible qu'auparavant. L'obligation de paver les cours est reprise par le maire Pache Protopopescu dans son *Règlement pour les constructions et les alignements* de 1890, qui pour le secteur central, réduit encore l'espace destiné aux cours de 33 à 20%[15].

Promulgué en 25 août 1878, le *Règlement pour les constructions et les alignements* est visiblement inspiré, pour ne pas dire plagié, des décrets haussmanniens[16]. Néanmoins l'imitation est tempérée par l'ingénieur en chef de la ville, Alexandru Orăscu. Les débats autour du règlement montrent le rapport existant entre le modèle désiré pour Bucarest, à savoir Paris, et les réalités de la vie locale. Si l'idée d'ouvrir de grands boulevards et de nouveaux axes urbains survit aux débats critiquant le modèle français, ce n'est pas le cas du rapport entre l'hauteur des bâtiments et la largeur des boulevards. Ainsi, suivant les normes parisiennes, le règlement souhaite imposer des régimes variables d'hauteur en fonction de la largeur des rues, ce qui en principe aurait forgé une autre silhouette de la ville.

Ainsi les grands boulevards, larges de plus de 20 mètres, auraient dû entrainer l'apparition de bâtiments hauts de 6 étages. Plusieurs observations critiquant le modèle des villes occidentales rejettent cette vision en faveur d'une autre plus patriarcale. Les considérations portent sur « les intérêts financiers privés » et sur la spéculation immobilière, facteurs puissants de l'évolution verticale de la métropole parisienne. Elles insistent sur l'absence de cette problématique – pour le moment - à Bucarest. Une autre critique, formulée par le médecin en chef de la vile, se focalise sur les problèmes d'hygiène posés par des édifices d'une telle hauteur[17]. L'observation la plus intéressante reste celle qui porte sur l'inadaptabilité de tels bâtiments au mode de vie des Bucarestois, pour lesquels l'habitation collective est impensable, même pour des raisons sociales. En effet, l'habitation unifamiliale est pratiquement la seule forme d'habitation bucarestoise (à l'exception de la situation où la pauvreté extrême oblige la cohabitation de plusieurs familles). La hauteur imposée pour la plupart des rues est finalement de 6 mètres. Elle peut toutefois être portée à 17 mètres (4 étages) sur les rues principales. Pourtant les 6 mètres (permettant seulement des maisons sur terre) s'avèrent insuffisants pour ceux qui désirent des maisons à étage. Les dépassements des normes officielles sont alors systématiques [18].

Toutes ces normes sont reprises presque à l'identique en 1890 lorsque sont complétés l'ensemble des règlements avec: des détails concernant la construction de passages; des directives menant à une plus forte densification (pouvant aller jusqu'à 80% du terrain) et à la construction de front continu sur les grandes artères, nouveauté pour la politique urbaine bucarestoise qui jusque là contrôle seulement l'édification des maisons isolées et non celle des ensembles[19]. Un an plus tard, l'obligation de construire en alignant tous les bâtiments est

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[15] Cette loi sera modifiée en 1891 pour agrandir les arrondissements de la ville, confirmant ainsi la croissance de la ville. (AN-DMB, le fond Technique de la Mairie, dossier 6/1891)

[16] La première variante de la loi prévoit des hauteurs très grands pour les bâtiments par rapport a la largeur de la rue, allant jusqu'au 17,55 m. fait qui détermine Alexandru Orăscu d'envoyer une adresse (no. 1260/29 décembre 1875) dans laquelle il remarqua que ces hauteurs sont reprises du décret d'Haussmann de 27 juillet 1859 (AN-DMB, le fond Technique de la Mairie, dossier 3/1874)

[17] ibidem

[18] Voir Bogdan Andrei Fezi, p. 142-147, Nicolae Lascu, p. 84-87

[19] Règlement pour les constructions et les alignements

décrétée pour tout le centre ville, mais pas nécessairement en front continu, d'où la conservation d'une certaine configuration des rues et le maintien de jardins dans le cadre du paysage urbain.

Paradoxalement, au pavage des cours, commence le développement des lotissements conçus sur les principes de la *cité-jardin* d'origine britannique. Les cours et les jardins y jouent un rôle emblématique pour le nouveau Bucarest en cours d'industrialisation. Cela nous mène à considérer le fait que la norme concernant le pavage des cours est surtout adressée aux cours des anciennes *mahalale* qui gardent encore un caractère semi agricole. On peut donc parler de plusieurs modèles qui, dans le même temps, influencent la modernisation de Bucarest. On embrasse alors l'idée que la modernité n'est une forme unique de cela. Le jardin devient un élément à double rôle dans ce paradigme urbain: emblème du style traditionnel d'habiter qu'on peut classer comme « préurbain » il est en même temps, mais pas de la même forme, le symbole de l'habitation moderne et civilisée avec un air « post-urbain ».

3. CONCLUSIONS SUR L'IMPACT DE REGLEMENTS URBAINS SUR LES JARDINS

On peut remarquer une «volonté d'ordonner» les jardins au fil du temps passant du jardin sauvage à celui d'asphalte à travers d'autres formes intermédiaires. Au-delà de leur nettoyage et de la création de réglementation, on remarque la disparition de l'utilisation intensive du jardin qui peut être étudiée sur plusieurs plans. Ainsi on constate un important changement du point de vue de la végétation rencontrée dans les jardins bucarestois. Initialement dominée par des plantes «utilitaires» (légumes, arbres fruitiers, plantes aromatiques…) le jardin devient de plus en plus « horticole ». Passant par le jardin de fleurs rural avec des plantes «vulgaires» appartenant au biotope local, il s'épure doucement et perd sa dimension utilitaire-gastronomique, devenant alors de plus en plus abstrait et détaché de l'esprit du lieu, tant du point de vue esthétique, qu'écologique, jusqu'à se transformer en un carré d'asphalte. La configuration spatiale change aussi sous l'influence de règlements urbains qui déterminent dans le temps une nouvelle conformation du jardin. De la multitude d'espaces complexes qui abritent des fonctions les plus diverses liées au mode de vie et à l'économie de la famille, le jardin se rétrécit peu à peu. Il se transforme en un espace avec pour rôle prépondérant l'esthétisme et le loisir au moment où les dimensions deviennent tellement petites qu'elles altèrent le sens de l'intimité de l'espace.

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Fig. 1. Le centre de Bucarest en 1911 avec les nouveaux jardins modernes en gris foncé (y compris le plan original de Cişmigiu) et les jardins traditionnels en gris éclairé

Ornamental species used for landscape design in South Korea

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ABSTRACT

In South Korea, woodlands are considered to be the most important biotope type for biodiversity conservation. However, they are suffering loss and degradation under strong pressure from urbanization and agricultural expansion. In a period of 30 years it was modified the spatial characteristics of the woodlands at the landscape level. The famous Maisan (Horse Ears) Mountains provide a dramatic backdrop for nearby dwellings and temples. Many hillsides and mountains in South Korea have been replanted with trees to reverse the effects of past deforestation, such as severe erosion. Farmers cultivate the lands in the river valleys and on the hillsides within this predominantly mountainous country. Scattered residential developments and roads were the main causes of woodland loss and fragmentation in the urban and urban fringe landscapes, while the expansion of agricultural activities reduced the average size of woodland patches in the agricultural landscape, like in our country. Traditionally an agricultural nation, South Korea has invested heavily in landscaping and mining to diversify its economy. So, they found the potential and specific needs for landscape planning in a rapidly developing urban region in South Korea. In this paper we observed the ornamental species which they used in their landscaping plans for using them in our own country, Romania.

INTRODUCTION

Garden makers in history have been intent on creating earthly paradise. In addition, the garden has been a place of symbolism and representation of major philosophical questions. The first record of Korean gardens appeared in 391 CE at *Samkuksaki*. The palace building was heavily repaired, and a pond was dug for mounding to raise rare birds and exotic plants. Afterwards the ultimate goal of Korean traditional gardens was to transform the symbolic immortal world to an earthly paradise. Some representative remains exist such as *Kungnamji* in 634 at Buye City, *Anapji* in 674 at Kyungju City, *Kyungbokgoong Palace* in 1393, *Changdukgoong* Palace in 1401 at Seoul City and *Kwanghaloo* in 1420 at Namwon City. The idea of a fairyland was a main theme of gardens and for those purpose replicas of legendary immortal islets was constructed in ponds or symbolic patterns of longevity were decorated on the garden furniture such as stone basins chimneys and walls. Part of the East Asian monsoonal region, South Korea has a temperate climate with four distinct seasons. The movement of air masses from the Asian continent exerts greater influence on South Korea's weather than does air movement from the Pacific Ocean. Winters are usually long, cold, and dry, whereas summers are short, hot, and humid. Spring and autumn are pleasant but short in duration. Seoul's mean temperature in January is -5°C to - 2.5°C; in July the mean temperature is about 22.5°C to 25°C. Because of its southern and seagirt location, Cheju Island has warmer and milder weather than other parts of South Korea. Mean temperatures on Cheju range from 2.5°C in January to 25°C in July. The country generally has sufficient rainfall to sustain its agriculture. Rarely does less than 75 centimeters of rain fall in any given year; for the most part, rainfall is over 100 centimeters. Amounts of precipitation, however, can vary from year to year. Serious droughts occur about once every eight years, especially in the rice-producing southwestern part of the country. About two-thirds of the annual precipitation occurs between June and September.

Because of its position on the southeastern portion of the European continent, Romania has a climate which ranges from temperate to continental. Climatic conditions are somewhat modified by the country's varied topography. The Carpathians serve as a barrier to Atlantic air masses, limiting their oceanic influences to the west and center of the country (Transylvania, Banat and Maramureş), which have milder winters and heavier rainfalls as a result. The mountains also block the continental influences of the vast plain to the north in the Ukraine, which results in frosty winters and less rain to the south and southeast. The average annual temperature is 11 °C (51.8 °F) in the south and middle-south and 8 °C (46.4 °F) in northeast. Rainfall, although adequate throughout the country, decreases from west to east and from mountains to plains. Some mountainous areas receive more than 1,010 mm (39.8 in) of precipitation each year. Annual precipitation averages about 635 mm (25 in) in central Transylvania, 521 mm (20.5 in) at Iaşi in Moldavia, and only 381 mm (15 in) at Constanța on the Black Sea. So, the climate of Romania and South Korea are quite the same, except of the air humidity which is about 70-80% in South Korea and about 30-40 % in Romania during the summer. Instead of this, we are sure that most of the ornamental plants used in landscaping in Asia will have the possibility to acclimate in our country.

MATERIALS AND METHODS

We have started our studies in 2008 when we first visited South Korea for eight days and it was continued in this summer, 2009, when we had the second visit for 17 days. We took in our observations places from different parts from South Korea: North, West, North-East and South-East. We had observations in botanical gardens, forests, green area of the temples and urban area landscape. We founded a lot of plants which we already use also in our country like *Acer palmatum, Acer pictum, Cornus kousa, Magnolia denudata, Magnolia kobus*, *Magnolia siebolidii* and so on, but there are many, many species and cultivars that we don't have and it will be very interesting to acclimate them and use in our own landscape designs.

Pinus densiflora* for. *Multicaulis is a straight to contorted (particularly in coastal settings) tree up to 36m tall, with an open, irregular or umbrella-shaped crown. Lower branches shed early even in open settings. Bark red-brown, in large plates (on old trees) or flaky and papery. Branches grey-green, rapidly becoming smooth with age, developing papery reddish bark. Leaves green, pliable, 2 per fascicle, sheaths retained, 8-12 cm long, 0.7-1.2 mm wide, acute, with minute marginal teeth, stomata in lines on all surfaces; retained in bunches at ends of twigs. Pollen cones small, ellipsoidal, pale yellow or yellow-brown, at end of shoots. Seed cones conic-ovoid, tan to golden brown, 4-7 cm long, in whorls of 2-5 at branch nodes, remaining closed and attached for several years, on a 1-3 mm long somewhat flexible peduncle. Cone scales: about 50 scales may contain fertile seed; cuneate, the exposed part flattened, rhomboidal with a central, short-mucronate umbo; the concealed part a dark red-brown. Seeds are with attached wing 10-17 mm long. This was the tree that we've met in all parts of South Korea, even near by the sea. More than that, in some places it was the only tree that resist because of the acid soils full of salt and a very high atmosfere hummidity.

Tilia kiusiana - the species name is a latinised form of Kyushu, southern most of the main islands of Japan, where this species is native. *Tilia kiusiana* has the distinction of being the most un-lime looking member of the genus. As a rarely cultivated species its presence reminds us that botanic gardens display a broad selection of plant diversity. It's a slow-growing plant which provides shade and autumn splendor.

Acer buergerianum It is a small to medium-sized deciduous tree reaching a height of 5-20 m with a trunk up to 50 cm diameter. The leaves are in opposite pairs, 2.5-8 cm long (excluding the 2-5 cm petiole) and 3.5–6.5 cm broad, hard, glossy dark green above, paler below, usually with three lobes; on mature trees the lobes forward-pointing and with smooth margins, on young trees with more spreading lobes and serrated margins. The flowers are produced in spring, yellow-green, in pendulous corymbs; they are small, with five greenish sepals and five yellow-white petals about 2 mm long, and eight stamens. The fruit is a samara with two winged seeds, each seed 4-7 mm diameter, with a 15 mm wing; the wings are forward-pointing and often overlapping each other.

It is widely grown in temperate regions as an ornamental tree. It was introduced very early to Japan, where its name translates as "China maple". More recently, it was introduced to Europe and North America in 1896, and is now occasionally grown in parks and large gardens there. Mature examples may be seen at Westonbirt Arboretum in England, the Esveld Aceretum in Boskoop, Netherlands, Arnold Arboretum in Boston, Massachusetts.

Forsythia koreana Kumson This forsythia will get up to 2,5 m tall and has typical forsythia flowers. But the flowers are the least of F. 'Kumson's' attributes. The foliage is dark green and has a creamy white netting in the spring to fall. Forsythias usually do their brilliant display in early spring then are boring. Forsythia 'Kumson' has something happening nine months a year.

Zelkova serrata (**Keyaki** or **Japanese Zelkova** is a species of *Zelkova* native to Japan, Korea, eastern China, and Taiwan. It is a medium sized deciduous tree usually growing to 30 meters tall. This tree is characterized by a short trunk dividing into many upright and erect spreading stems forming a broad, round topped head. The tree grows rapidly when young though the growth rate slows to medium upon middle age and maturity. In the summer this tree has alternately arranged deciduous leaves. The leaves themselves are simple and ovate to oblong-ovate with serrated or crenate margins, to which the tree owes its species name “Serrata”. The leaves are acuminate or aciculate, rounded or subcordate at the base and contain about 8-14 pairs of veins. The leaves are rough on top and glabrous or nearly glabrous on the underside. They are green to dark green in spring and throughout the summer, though they change color in the autumn to a various assortment of yellows, oranges and reds. Leaves are 3-5cm long and 2-5cm inches wide, on shoots that are approximately 12-13cm long. Petioles are 2-5mm long. Zelkova Serrata develops monoecious flowers in spring with the leaves. Buds are ovoid, acutish, with many imbricate, dark brown scales. They diverge at a 45 degree angle from the stem. The staminate flowers are shortly pedicellate and approximately 3mm in diameter, clustered in the axils of the lowers leaves. The pistillate flowers are solitary or few in axils of the upper leaves, sessile and usually about 1.5mm in diameter. The flowers are yellow-green, not showy, and occur in tight groups along new stems. They give rise to small, ovate, wingless drupes that ripen in late summer to autumn. The drupe is green though matures to a brown color, subsessile and 2.5 to 3.5mm in diameter. To identify Zelkova Serrata one would look for a short main trunk, low branching and a vase shaped habit. Its twigs are slender with small, dark conical buds in a zigzag pattern. The branches are usually glabrous. The bark is grayish white to grayish brown and either smooth with lenticels or exfoliating in patches to reveal orange inner bark. Branchlets are brownish purple to brown.

Juglans mandshurica The **Manchurian walnut** (*Juglans mandshurica* Maxim.) is a deciduous tree of the genus *Juglans* (section *Cardiocaryon*), native to the Eastern Asiatic Region (China, Russian Far East, North Korea and South Korea). It grows to about 25 m. The leaves are alternate, 40–90 cm long, odd-pinnate, with 7–19 leaflets, 6–17 cm long and 2–7.5 cm broad (margin serrate or serrulate, apex acuminate). The male flowers are in drooping catkins 9–40 cm long, the wind-pollinated female flowers (April-May) are terminal, in spikes of 4 to 10, ripening in August-October into nuts, 3-7.5 × 3-5 cm, with densely glandular pubescent green husk and very thick shell. The tree is exceptionally hardy (down to at least -45°C), has a relatively short vegetation period compared to other walnuts, grows rapidly and is cultivated as an ornamental in colder temperate regions. The kernels of the nuts are edible, but small and difficult to extract. The timber is in use, but less valuable than that of English walnut or black walnut.

Spiraea fritschiana is a compact, upright, mounded, deciduous shrub that is native to forests, forest margins, cliffs, slopes and rocky areas (see Flora of China) in China and Korea. It is noted for producing quality dark green foliage, attractive white flowers in May-June and good fall color. It is sometimes commonly called fritsch spirea. "Pink Parasols' is pink-flowered cultivar that primarily differs from species plants by having (a) more red tinting on young leaves, (b) pink flowers and (c) larger and more floriferous inflorescences. It is an upright, mounded, bushy, deciduous shrub that typically matures to a compact 2-3' tall and 3-4' wide. Ovate leaves (to 2" long) emerge with red tinting, mature to blue-green in summer and turn attractive shades of yellow-orange-red in fall. Numerous tiny, pink flowers in flat-topped, parasol-like clusters (corymbs to 3-5" diameter) bloom above the foliage from late spring to early summer. The Royal Horticultural Society currently lists Spiraea fritschiana 'Pink Parasols' as an accepted name. However, some nurseries currently list 'Pink Parasols' or PINK PARASOLS as being synonymous with Spiraea fritschiana 'Wilma' (U. S. Plant Patent PP15, 397).

Acer triflorum (**Three-flowered Maple**) is a species of maple native to hills of northern China and Korea. It is a deciduous tree that reaches a height of about 25 m but is usually smaller. It is a trifoliate maple related to such other species as Manchurian Maple (*Acer mandshuricum*) and Paperbark Maple (*Acer griseum*). It has yellowish-brown exfoliating bark that peels in woody scales rather than papery pieces like *Acer griseum*. The leaves have a 2.5-6 cm petiole and three leaflets; the leaflets are 4-9 cm long and 2-3.5 cm broad, with serrated margins, the central leaflet the same size as or slightly larger than the two side leaflets. The flowers are yellow, produced in small corymbs of three small flowers each, hence the name. The samaras are 3.5-4.5 cm long and 1.3-2 cm broad, hairy, the nutlet with a woody shell. Even more than its relatives, three-flower maple has spectacular fall colour that may include brilliant orange, scarlet, purple and gold. It is one of the few trees to develop good fall colour in shade.

Lonicera vesicaria is a deciduous shrub lives in north of central part of South Korea, especially limestone area, 2m in height. Branch has rigid hair and glandular hair and a lot of hair exists on both side of leaf. Yellow flower blossoms in May. It is usually used in park areas and private gardens.

Aesculus turbinata is a species native from Korea and Japan. We can found it in mountains, especially in ravines, all over South Korea and in deciduous forests, especially in moist slopes along stream. It is in flower in June, and the seeds ripen in September. The flowers are hermaphrodite. The plant prefers light (sandy), medium (loamy) and heavy (clay) soils and requires well-drained soil. The plant prefers acid, neutral and basic (alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It requires moistsoil.

Also, we studied much more plants like *Carpinus tschonoskii, Maackia amurensis, Corylopsis gotoana Var. Coreana, Acer palmatum Asahizuru, Rhododendron schlippenbachii, Crataegus pinnatifida, Abies koreana Wilson, Cerylopsis coreana Uyeki, Lindera obtusileba Blume, Tsuga sieboldii Carierre, Acer palmatum Atrolineare* and so on.

RESULTS AND DISCUSSION

Carefully matching the types of plants you'll be growing with the space where they'll be growing is essential to sound landscaping. Light and soil requirements should always be considered before deciding which types of plants to use for your yard or a public space. Also, some of the plants can be used in different types of groups like a hedge, row, protection curtain, geometric group, or even like individual plant. Because of it's resistance in all soil and humidity conditions we recommend to use *Pinus densiflora* for. *Multicaulis* in all parts of our country, even at the seaside, because of its beautiful shape it can be used on our beaches instead of Washingtonia spp which is very sensitive to the frost. *Tilia kiusiana* and *Acer* *triflorum* areas tree that we recommend to be used in urban landscaping in public spaces and private gardens in rows or individual plant. *Acer buergerianum* beeing a small to medium-sized deciduous tree fits in geometrical groups made from three plants or in rows along a fence, as well. *Forsythia koreana Kumson, Lonicera vesicaria* and *Spiraea fritschiana* are great shrubs which are proper to be plant in cuted or uncuted hedges along an alley or like individual and neregular grouped plants. *Juglans mandshurica* and *Aesculus turbinata* are trees that we recommend to be used in public parks in regular rows or individual plants for shadow in private gardens.

CONCLUSIONS

After studding all this plants we realized that we can improve our flora with a lot of beautiful plants native from Asia, especially from South Korea. These plants are not very hard to multiply them and the effort worth a lot.

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FIGURES

Pinus densiflora* for. *Multicaulis

Tilia kiusiana

Zelkova serrata

Aesculus turbinata

Acer buergerianum

Juglans mandshurica

Acer triflorum Kom.

FRUIT GROWING&TECHNOLOGY

The behaviour of some local walnut biotypes from Voiteg, Timiş county

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Keywords: biometrical features, physico-mecanical composition, kernel

ABSTRACT

The long time culture of walnut and its wide spread in different climatic and soil conditions in the world made up the conclusion that the walnut is a very plastic species, easy adaptable. Because of its heterosexual pollination, within the species *Juglans regia* L. there are some trees resistant to frost and others very sensitive, some with late flowering and others with early flowering, resistant to diseases in different ways, productive or less productive. This variability has an advantage because it is possible to choose the most representative biotypes proper for the soil, climatic and economical conditions of each region.

INTRODUCTION

In Romania the walnut is the most valuable species belonging to the nuts group. The walnuts have the highest energetic and feeding value by having large fats content (52-77%), protean substances (12-25%), high sugars content (5-24%), vitamins, mineral substances and others. The nut kernel is a concentrated nourishment with a complex chemical composition.

Spread all over Romania, the walnut represented a serious concern for researchers so that there were many programs and projects developed in selecting the most valuable biotypes and doing the artificial hybridizing.

As a result of the researches done by different authors [1, 2, 3] there were obtained and recommended for culture many walnut varieties.

MATERIALS AND METHODS

In the present article we present some walnut biotypes that we have studied, biotypes that were cultivated in Voiteg locality, an area which provided the biological material.

The trees are being cultivated in the village, close to people's homes and Geoagiu 65 variety was considered the control of the experiment. This variety is being cultivated in the conditions of the Didactic Station Timisoara.

The walnuts were brought in the Fruit Culture Laboratory of our Department, where there were done biometrical and gravimetrical determinations.

RESULTS AND DISCUSSION

The values of the main biometrical elements of fruits are being presented in table 1.

The large diameter of walnuts (D) had values of 30.01 mm for biotype V108 and 42.22 mm for biotype V101.

The small diameter of walnuts (d) had the lowest value of 27.12 mm for biotype V108 and the highest value of 36.40 mm for V101.

Walnuts' height (H) was of 32.72 mm for biotype V105 and 51.50 mm for biotype V102, all the other biotypes having values between these limits.

The form index of walnuts (If) was calculated in order to determine accurately the form of fruits. It had values of 150.00 for biotype V109 and 100,90 for biotype V101.

By analysing this index we can conclude that three biotypes have ellipsoidal fruits, including the control Geoagiu 65 (V102, V109), five biotypes have ovoid fruits (V103, V104, V106, V107 and V108) and two biotypes have spheroid fruits (V101, V105).

The physical-mechanical composition of fruits is an essential feature in determining the quality of walnuts.

The international standards concerning the chemical-mechanical composition of walnuts consider the existence of 42-50% kernel in the fruit, thin nutshell and a good taste.

In table 2 we present the chemical composition of walnuts.

The average weight of walnuts varies from 9.4 grams for biotype V 109 to 30.60 grams for biotype V102.

The kernel percent varies from 33.33% for biotype V102 to 53.00% for biotype V107. This percent is very different for the studied biotypes so that: seven of the biotypes have a good kernel percent of over 40%, including the control Geoagiu 65, while three of the studied biotypes have a satisfactory kernel percent, which varies between 33-40%.

CONCLUSIONS

The most valuable biotypes were those with nice and appropriate walnuts and also with a high kernel percent. These varieties are also recommended for multiplication and they are: V107, V108 and V109, with over 50.00% of kernel, being followed by biotypes V103, V104, V106 and the control Geoagiu 65 with over 44.86% kernel.

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TABLES

Table 1. Biometrical elements of walnuts (average 2006-2008)

No.	Genotype	Size (mm)			If	Walnuts' form
		D	d	H		
1	V 101	42,22	36,40	38,99	100,90	spheroid
2	V 102	38,07	36,70	51,50	129,28	ellipsoidal
3	V103	35,44	32,82	40,03	115,69	ovoid
4	V 104	32,68	29,84	39,07	123,80	ovoid
5	V 105	34,41	28,82	32,72	103,58	spheroid
6	V 106	31,94	30,803	36,62	115,63	ovoid
7	V 107	37,00	35,35	42,26	118,78	ovoid
8	V 108	30,01	27,12	37,46	111,00	ovoid
9	V 109	33,21	30,45	35,19	150,00	ellipsoidal
10	Geoagiu 65 (control)	36,62	35,03	47,13	132,63	ellipsoidal

Table 2. Physical-mechanical composition of walnuts (average 2006-2008)

No.	Genotype	Average weight (grams)	Kernel%
1	V 101	17,30	36,41
2	V 102	30,60	33,33
3	V103	14,80	47,97
4	V 104	12,70	46,45
5	V 105	9,80	36,00
6	V 106	10,00	46,00
7	V 107	11,20	53,57
8	V 108	12,00	50,00
9	V 109	9,40	53,19
10	Geoagiu 65 (martor)	20,06	44,89

The behaviour of some insecticide products in the control of the afides (*Aphis pomi)* in the conditions of the Dâmbovița tree growing region

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Keywords: species**,** apple tree, *Aphis pomi*, new insecticides, attack degree

ABSTRACT

The green apple tree louse (*Aphis pomi De Geer*.) represents a dangerous pest for the orchards in Dâmbovița. The researches performed at the Tree Growing Research & Development Station Voineşti in the period of the years 2007-2008, present results regarding the efficiency of some new products, besides the classical insecticides with a known biological efficiency in the combat of the green apple tree louse. A good efficiency was noted at the product CALYPSO 480 SC conc. 0.02%, with a mortality of 92.9% for the year 2007 – and the substances THIACLOPRID + TRIFLUMURON SC conc. 0.05% and DECIS 50 EW conc. 0.015% presented a mortalitaty of 94.5% and 91.4% respectively, in the year 2008.

INTRODUCTION

In the period of the years 2007-2008, in the majority of the orchards in the Tree Growing Region Voineşti, a strong attack of the green apple tree louse (*Aphis pomi De Geer*) was registered. The main reason was the lack of winter treatments and the accumulation of an important biological reserve. At the trees without treataments or treated inadequately (not respecting the warnings), the attack frequency raised to values comprised between 35-60%.

So, the adoption of an efficient strategy became important, which - together with the correct treatments warning – has led to the significant limitation of the attack. The results obtained at the Tree Growing Research & Development Station Voineşti in the conditions of the years 2007-2008, point out the efficiency of some new insecticides, as compared with the „Chemical Standard" variant.

MATERIAL AND METHODS

The researcches were organized in the period of the years 2007-2008 in an experimental lot in the Tree Growing Farm Nr. 1 of the Tree Growing Research & Development Station Voineşti, at the Ionathan breed.

The trees are grafted on the graft bearer MM106. The crown form is free palmeta, with planting distances of 4x 3.5 m, the intervals between the tree rows beeing maintained with grass; herbicides were used on the row, to combat the weeds. The tree age was 15 years.

The experience was organised in the year 2007, with 4 variants, respectively 4 variants in the year 2008.

2007: V_1 = Calypso 480 SC conc. 0.02%
V_2 = Decis 2,5EC conc.0.03%
V_3 = Decis 25 WG conc. 0.003%
V_4 = Untreated witness

2008: V_1 = Thiacloprid + Triflumuron SC conc.0.05%
V_2 = Decis 50 EW conc. 0.0125%
V_3 = Decis 50 EW conc. 0.015%
V_4 = Untreated witness

The prognosis of the afid's appearance was established based on the resistant eggs reserve, deposed on the branches and on the offshoots of the trees, in regions found out with atack hearths, year after year.

In spring and in summer, the treatments warning was done at the signaling of the first afides colonies on the leaves, depending on the economical damage treshold, which is at 4-10 eggs/10 cm of the branch (until debuding) or 8-10 colonies/offshoot.

The treatmant application data at warning:

- the efficiency evaluation was performed at 5 days after the application of each treatment on 19 yearly offshoots, with 25 leaves/offshoot.

The treatments were applied at warning with the sprinkling pump Atomoizor STHIL 400. The solution quantity per Ha: 1500 l (5 l/tree). The trees number/variant = 5 (a tree = a repetition).

RESULTS AND DISCUSSIONS

The apple tree green louse (*Aphis pomi De Geer*.) sin. *Aphis mali F., Doralis pomi De Geer.,* belongs to the Ord. Homoptera Fam. Aphididae.

The biology and the ecology of the pest.

The pest multiplies itself all the time duringn the year, only on wooden plants. It hybernates in the resistant egg stage on the offshoots. The amfigone females depose the eggs in autumn, usually on the buds bases. In spring, in April, the founders appear, which give birth to several generations of aptere and winged females. The appeared females, after copulation, depose a resistant egg each, which hybernates. During a vegetation period, 8-12 generations may develop. In May, June, July - the period corresponding to the intensive growth of the offshoots, the highest densities of the green apple tree louse are registred. The medium air temperatures of 18-24^{0}C and the reduced rainfalls favor the multiplying of the pest. The development duration of the grubs is of about 10-12 days at temperatures of 15-17^0 C and of 7-8 days at temperature of 20-22^0 C.

At the biological treshold of 6^0 C, the sum of the effective temperatures coresponding to the development of the grubs is of about 110^0 C (Lefter, 1990).

In the conditions of the Tree Growing Research & Development Station Voineşti, the appearance dates of the pest were the following:

2007 - G_1 - 05.05.2007
- G_2 - 27.05.2007
- G_3 - 18.06.2007

2008 - G_1 - 19.05.2008
- G_2 - 01.06.2008
- G_3 - 12.06.2008

Attack Mode and Produced Damages

The green apple tree louse (*Aphis pomi De Geer*) is a dangerous pest for the orchards in Dâmboviţa. At the beginning, the pest colonizes the flower and leaf buds, then the free leaves and fruits. Following the stings, the offshoots do not develop normally, they twist, the young leaves deform themselves, remain small, with an cu clorotic aspect. He flowe buttons avort and dry – and their pedunculi remain long time suspended on the branches. The attacked branches are covered with sugar-like dejections which fungi of the Capnodium kind develop. Therefore, on different attacked organs, a black colored stratum (fumagine) is formed, impeding the breathing, the perspiration, etc.

The species appearing possibly until autumn on the young offshoots, it causes important damages if it spreads in the nurseries.

The tables 1 and 2 present the results obtained regarding the biological efficiency of some new standard products for the combat of the afide in the period of the years 2007-2008.

The products were applied mixed with fungicides, recommended for the combat of the main foliar diseases: scurf, mildew, etc.

After applying the treatments at warning, the performed observations on the offshoots have shown the following:

- in the year 2007, with a good efficiency was remarked the product Calypso 480 SC conc. 0.02%, with a mortality of 92.2%, as compared with the "untreated witness" variant, which registered a mortality of 30.1%.

- In the year 2008, a very good action presented the products: THIACLOPRID + TRIFLUMURON SC conc. 0.05% and DECIS 50 EW conc. 0.015%, with a mortality of 94.5% and 91.4% respectively, as compared with the "untreated witness" variant, which registered a at mortality of de 34.7%.

Based on the results obtained in the 2 experiment years, it was noted that for the combat of the afides *Aphis pomi De Geer,* at least 8-10 treataments, applied at warning, are needed with the presented products, assuring a suitable phyto-sanitary status.

CONCLUSIONS

1. The green apple tree louse (*Aphis pomi De Geer.*) represents in the Dâmbovița Valley, for the apple tree plantations in the tree growing region Voineşti, one of the injurious species, with a major incidence on the fruits quality and on their commercial value.

2. The fruit bearing cuttings, applied in the apple tree culture technology, may move away the greatest part of the branches, on which the resistant eggs are deposed.

3. From the products studied at the SCDP Voineşti in the period of the years 2007 – 2008, were remarked with the best attack limitation efficiency the products: CALYPSO 480 SC conc. 0.02%, with a mortality of 92.9% for the year 2007 – and the substances THIACLOPRID + TRIFLUMURON SC conc. 0.05% and DECIS 50 EW conc. 0.015% presented a mortality of 94.5% - and 91.4% respectively in the year 2008.

4. Breeds resistant or tolerant to the afides attack are not known.

5. Some predator species (*Chrysoperla carnea, Coccinella septempunctat, Anthocoris nemoralis*) are known, which feed on afides.

6. In order to avoid the phenomenon of resistance appearing against the action of the products – and for a high protection of the useful insect species, an alternation/equilibration of the insecticides is recommended.

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TABLES

Table 1. The Biological Efficiency of Some New Products in the Combat of the Green Apple Tree Louse *Aphis pomi De Geer* in the year 2008

The Biological Efficiency of Some New Products in the Combat of the Green Apple Tree Louse *Aphis pomi De Geer* in the year 2008 Variant (product)	Conc. %	Generation I			Generation II + III		
		Total obs.	Attacked d.c.		Total obs.	Attacked d.c.	
			Nr.	%		Nr.	%
Calypso 480 SC	0.02	288	263	91.3	595	553	92.9
Decis 2.5 EC	0.03	194	165	85.0	487	430	88.2
Decis 25 WG	0.003	303	263	86.7	526	470	89,3
Untreated witness	-	765	205	26.7	850	256	30.1

Table 2. The Biological Efficiency of Some New Products in the Combat of the Green Apple Tree Louse *Aphis pomi De Geer* in the year 2008

Variant (product)	Conc. %	Generation I			Generation II + III		
		Total obs.	Attacked d.c.		Total obs.	Attacked d.c.	
			Nr.	%		Nr.	%
Thiacloprid + Triflumuron SC	0.05	278	255	91.7	589	557	94.5
Decis 2,5 EC	0.0125	197	170	8,2	533	475	89.1
Decis 25 WG	0.015	310	277	89.3	611	559	91.4
Untreated witness	-	489	133	27.1	759	264	34.7

Mathematical models, tables and nomograms to settle the technically optimal rates (TOR) of N, P_2O_5 and K_2O in fruiting apple tree and pear tree on flat and terraced terrains

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ABSTRACT

For the first time it is published the series of mathematical models and agrochemical tables and nomograms to settle the technically optimal rates (TOR) of N, P_2O_5 and K_2O in fruiting apple tree and pear tree, as function of maximum expected yield, Y_m, and the specific soil agrochemical indexes (IN, P_{ALc}, K_{AL}). FERTEXPERT software version 3 has been used for TOR calculations. When operative settle of TOR are needed and the farmer does not have enough time for calculations, the practical agrochemical tables and nomograms can be used; when exact values of TOR are desired, the presented mathematical models have to be used.

INTRODUCTION

This paper is a tribute brought to Z. Borlan, the greatest and most original Romanian agrochemist ever. The technically optimal rates (TOR) of N, P_2O_5 or K_2O are those rates that allow to obtain the maximum yield in given conditions concerning the soil supply with the regarded nutrient on the optimum soil supply with the others, meanwhile the economically optimal rates of fertilizers (EOR) allow to obtain the maximum net revenue/ha (Budoi, 2007).

The research results concerning the advantages and disadvantages of TOR versus EOR have been recently published (Budoi, 2007). TOR can be assured form manure, compost, chemical fertilizers and other sources.

Some authors elaborated over the years agrochemical tables and nomograms for apple tree and pear tree, but for experimentally optimal rates, ExpOR (Borlan et al., 1982), and EOR (Budoi et al., 1988, 2003; Budoi, 2001), and nobody for TOR.

MATERIAL AND METHODS

FERTEXPERT software version 3 (Budoi, 2007, 2009) has been used for TOR calculations. This software use the mathematical models presented bellow for TOR, nutrient action coefficients, c_a, and soil nutrient supply, S_n.

The equations used to calculate c_a and S_n have the same coefficients as those used for the economic optimal rates of N, P, K (settled by Budoi et al., 1988).

Based on calculated TOR, specific agrochemical tables and nomograms (specific graphs) have been built.

RESULTS AND DISCUSSIONS

The logical deduction of the mathematical model, derived from the Mitscherlich-Bray-Black-Borlan response function (Borlan et al., 1984), used to calculate the Technically Optimal Rates (TOR) as function of the maximum expected yield level (Y_m) and soil agrochemical indexes (AI) has been demonstrated (Budoi, 2007), and the model is:

$$\text{TOR, kg N, } P_2O_5\text{, } K_2O\text{/ha} = [\log(2.3 \cdot c_a \cdot Y_m)]/c_a - S_n$$

where: Y_m = maximum expected yield, kg/ha, established on the basis of the site evaluation studies; the level of Y_m depend on the variety and on the levels of all vegetation factors (temperature, water etc.);

c_a = action coefficient of N, P, K, unique for both the soil potentially available form, as well as for that from fertilizer, calculated with specific models (see below);

S_n = soil nutrient supply, potentially available form, kg N, P_2O_5 or K_2O/ha, calculated based on the specific agrochemical analyses (IN, P_{ALc}, K_{AL}) and Y_m (see the computing models below).

For TOR, the same models as those for optimal economic rates are using in order to compute c_a and S_n; these models are (Budoi et al., 1988, 2003):

- For apple tree:
  - for nitrogen:
    $c_a = 0.011 + 100/Y_m$; $S_n = 65(1\text{-}10^{-0.4IN}) + 0.0003Y_m$
  - for phosphorous:
    $c_a = 0.012 + 40/Y_m$; $S_n = 126(1\text{-}10^{-0.01P_{ALc}}) + 0.0015Y_m$
  - for potassium:
    $c_a = 0.007 + 35/Y_m$; $S_n = 134(1\text{-}10^{-0.0028K_{AL}}) + 0.0022Y_m$
- For pear tree:
  - for nitrogen:
    $c_a = 0.011 + 100/Y_m$; $S_n = 65(1\text{-}10^{-0.4IN})+0.00015Y_m$
  - for phosphorous:
    $c_a = 0.012 + 40/Y_m$; $S_n =125(1\text{-}10^{-0.01P_{ALc}}) + 0.00145Y_m$
  - for potassium:
    $c_a = 0.007 + 35/Y_m$; $S_n = 134(1\text{-}10^{-0.0028K_{AL}}) + 0.0022Y_m$

where: IN = soil nitrogen index, calculated with this model: IN = $H \cdot V_{Ah}/100$ (Borlan, 1982), where H = humus content (%) and V_{Ah} = degree of base saturation (%);

P_{ALc} = soil mobile P content (extracted by Egner-Riehm-Domingo method, with ammonium acetate lactate solution, AL), ppm P, corrected with a pH depending factor;

K_{AL} = soil mobile K content, ppm K (extracted by Egner-Riehm-Domingo method). IN, P_{ALc} and K_{AL} are the average values for the 0-40 cm soil layer.

In order to built the agrochemical tables and nomograms for apple trees and pear trees, TOR have been calculated with FERTEXPERT software, 3-rd version (Budoi, 2007, 2009); the 1-st version of this software was elaborated in the framework of author's PHD thesis (Budoi, 1997); a paper related to the 2-nd version was published (Budoi et al., 1998). The 3-rd version was specially developed in order to include the recent research results and to compute TOR as function of Y_m and soil agrochemical indexes (AI); this last version uses the above mathematical models.

Variation of TOR depending on Y_m and AI are presented in tables 1-6 and nomograms from figures 1–6. TOR increase with AI decrease and with Y_m increase. These tables and the nomograms allow to operative settle TOR. The advantage of TOR tables and nomograms, as compared with those for EOR, is that TOR are independent of the changing unitary fertilizer price and yield price on the market, meanwhile DOE strongly depend on these prices.

The use of such tables and nomograms have been explained in detail in other paper (Budoi, 2007). In the estimations of TOR, interpolations have to be done, if necessary; in such cases, the results are approximates. The above mathematical models have to be used to calculate TOR when exact results are desired and Y_m, IN, P_{ALc}, K_{AL} are not exactly those from tables or nomograms.

The elaborated tables and the nomograms have been used to build Web pages, which will be accessible through an online Decision Support System (DSS). The above mathematical models will be used to develop the DSS in order to online calculate TOR.

CONCLUSIONS

For the first time it is published the series of mathematical models and agrochemical tables and nomograms to settle the technically optimal rates (TOR) of N, P_2O_5 and K_2O in fruiting apple tree and pear tree, as function of maximum expected yield, Y_m, and the specific soil agrochemical indexes (IN, P_{ALc}, K_{AL}).

When operative settle of TOR are needed and the farmer does not have enough time for calculations, the practical agrochemical tables and nomograms can be used; when exact values of TOR are desired, the above mathematical models have to be used.

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TABLES

Table 1.Technically optimal rates of N (kg/ha) in fruiting apple tree on flat and terraced terrains as function of the maximum expected yield (Y_m) and soil nitrogen index (IN) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m	IN									
kg/ha	*0.5*	*1.0*	*1.5*	*2.0*	*2.5*	*3.0*	*3.5*	*4.0*	*4.5*	*5.0*
5000	56	41	32	26	22	19	18	17	16	16
10000	100	85	76	70	66	63	62	61	60	60
15000	129	114	104	98	94	92	90	89	89	89
20000	149	134	124	118	114	112	110	109	109	108
25000	164	149	139	133	129	127	125	124	124	123
30000	176	161	151	145	141	139	137	136	136	135
35000	185	170	160	154	150	148	147	146	146	145
40000	193	178	168	162	158	156	154	153	153	152

Table 2. Technically optimal rates of P_2O_5 (kg/ha) in fruiting apple tree on flat and terraced terrainsas function of the maximum expected yield (Y_m) and soil mobile P content (P_{ALc}) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m	ppm P												
kg/ha	*5*	*10*	*15*	*20*	*25*	*30*	*40*	*50*	*60*	*70*	*80*	*120*	*160*
5000	96	84	73	64	55	47	34	24	16	9	4		
10000	131	119	108	98	90	82	69	59	51	44	39	27	22
15000	148	135	125	115	106	99	86	76	67	61	55	43	38
20000	157	144	134	124	115	107	95	84	76	69	64	52	47
25000	161	149	138	128	120	112	99	89	80	74	69	57	52
30000	163	151	140	130	122	114	101	91	82	76	71	59	54
≥ 35000	163	151	140	131	122	114	101	91	83	76	71	59	54

Table 3.Technically optimal rates of K_2O (kg/ha) in fruiting apple tree on flat and terraced terrains as function of the maximum expected yield (Y_m) and soil mobile K content (K_{AL}) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m	ppm K										
kg/ha	*40*	*80*	*120*	*160*	*200*	*240*	*280*	*320*	*360*	*400*	*440*
5000	116	92	74	60	49	41	34	29	25	22	20
10000	174	151	132	118	107	99	93	88	84	81	78
15000	205	181	163	149	138	130	123	118	114	111	109
20000	223	199	181	167	156	148	141	136	132	129	127
25000	234	210	192	178	167	159	152	147	143	140	138
30000	240	217	198	184	173	165	158	153	150	147	144
35000	243	220	201	187	177	168	162	157	153	150	148
40000	244	221	203	189	178	169	163	158	154	151	149

Table 4. Technically optimal rates of N (kg/ha) in fruiting pear tree on flat and terraced terrains as function of the maximum expected yield (Y_m) and soil nitrogen index (IN) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m	IN									
kg/ha	***0.5***	***1.0***	***1.5***	***2.0***	***2.5***	***3.0***	***3.5***	***4.0***	***4.5***	***5.0***
5000	57	42	32	26	23	20	19	18	17	17
10000	102	87	77	71	67	65	63	62	62	61
15000	131	116	106	100	96	94	93	92	91	91
20000	152	137	127	121	117	115	113	112	112	111
25000	168	152	143	137	133	131	129	128	128	127
30000	180	165	155	149	146	143	142	141	140	140
35000	190	175	166	160	156	153	152	151	150	150
40000	199	184	174	168	164	162	160	159	159	158

Table 5. Technically optimal rates of P_2O_5 (kg/ha) in fruiting pear tree on flat and terraced terrains as function of the maximum expected yield (Y_m) and soil mobile P content (P_{ALc}) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m	ppm P												
kg/ha	***5***	***10***	***15***	***20***	***25***	***30***	***40***	***50***	***60***	***70***	***80***	***120***	***160***
5000	97	85	74	64	56	48	35	25	17	10	5		
10000	132	120	109	99	91	83	70	60	52	45	40	28	24
15000	149	136	126	116	107	100	87	77	69	62	57	45	40
20000	158	145	135	125	116	109	96	86	78	71	66	54	49
25000	163	150	140	130	121	114	101	91	82	76	71	59	54
30000	165	153	142	132	123	116	103	93	85	78	73	61	56
≥ 35000	165	153	142	133	124	117	104	93	85	79	74	62	57

Table 6. Technically optimal rates of K_2O (kg/ha) in fruiting pear tree on flat and terraced terrains as function of the maximum expected yield (Y_m) and soil mobile K content (K_{AL}) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m	ppm K										
kg/ha	***40***	***80***	***120***	***160***	***200***	***240***	***280***	***320***	***360***	***400***	***440***
5000	116	92	74	60	49	41	34	29	25	22	20
10000	174	151	132	118	107	99	93	88	84	81	78
15000	205	181	163	149	138	130	123	118	114	111	109
20000	223	199	181	167	156	148	141	136	132	129	127
25000	234	210	192	178	167	159	152	147	143	140	138
30000	240	216	198	184	173	165	158	153	150	147	144
35000	243	220	201	187	177	168	162	157	153	150	148
40000	244	221	203	189	178	169	163	158	154	151	149

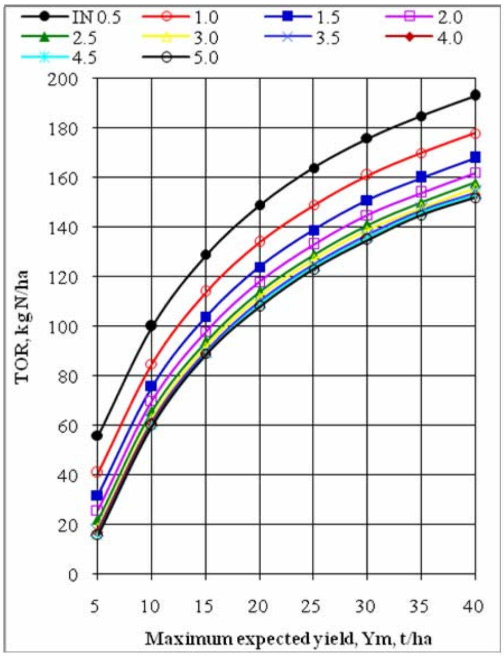

Fig. 1 – Technically optimal rates (TOR) of N in fruiting apple tree as function of the maximum expected yield (Y_m) and soil nitrogen index (IN)

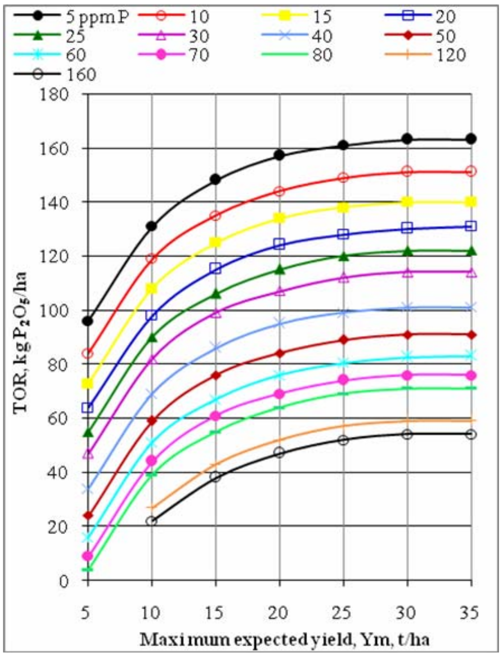

Fig. 2 – Technically optimal rates (TOR) of P_2O_5 in fruiting apple tree as function of the maximum expected yield (Y_m) and soil mobile P content (P_{ALc}, ppm P)

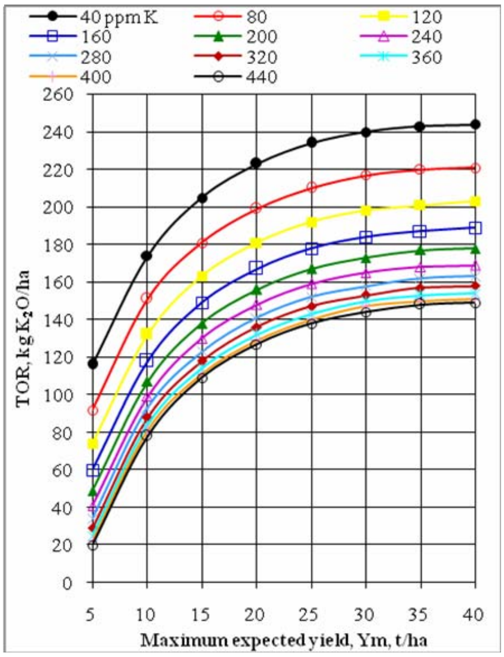

Fig. 3 – Technically optimal rates (TOR) of K_2O in fruiting apple tree as function of the maximum expected yield (Y_m) and soil mobile K content (K_{AL}, ppm K)

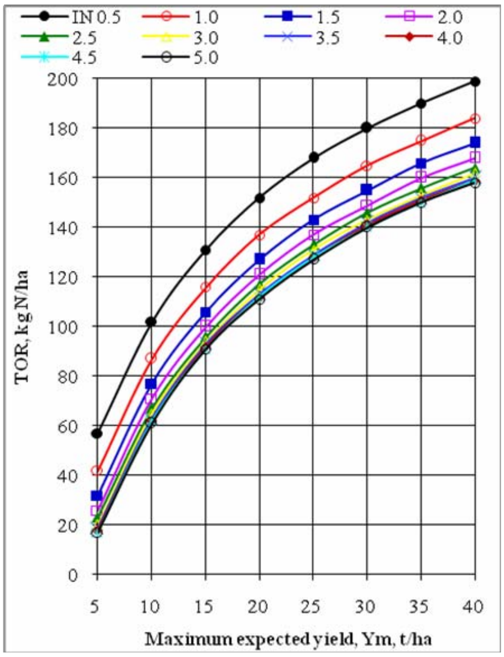

Fig. 4 – Technically optimal rates (TOR) of N in fruiting pear tree as function of the maximum expected yield (Y_m) and soil nitrogen index (IN)

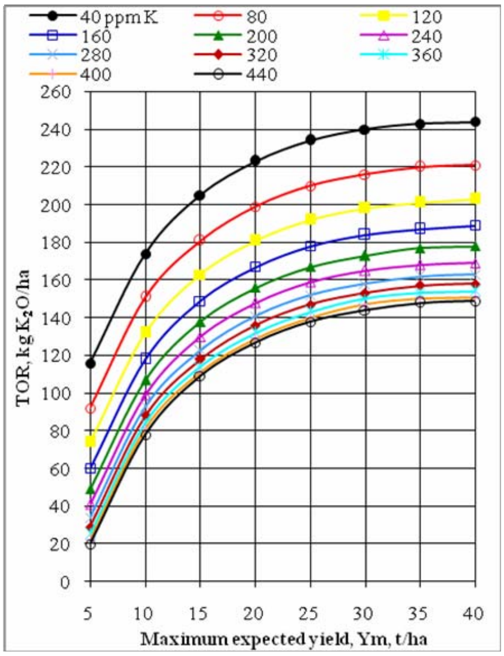

Fig. 6 – Technically optimal rates (TOR) of K_2O in fruiting pear tree as function of the maximum expected yield (Y_m) and soil mobile K content (K_{AL}, ppm K)

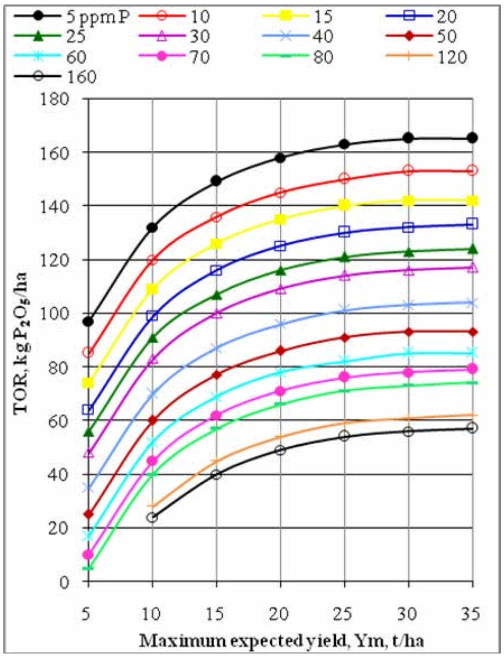

Fig. 5 – Technically optimal rates (TOR) of P_2O_5 in fruiting pear tree as function of the maximum expected yield (Y_m) and soil mobile P content (P_{ALc}, ppm P)

Mathematical models, tables and nomograms to settle the technically optimal rates (TOR) of N, P_2O_5 and K_2O in fruiting peach tree and apricot tree on flat and terraced terrains

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Keywords: soil nutrients, maximum yield, Fertexpert

ABSTRACT

For the first time it is published the series of mathematical models and agrochemical tables and nomograms to settle the technically optimal rates (TOR) of N, P_2O_5 and K_2O in fruiting peach tree and apricot tree, as function of maximum expected yield, Y_m, and soil chemical analyses: IN, P_{ALc}, K_{AL}. In order to compute TOR values, FERTEXPERT software version 3 has been used. The practical agrochemical tables and nomograms allow the farmer to operatively settle TOR when he does not have enough time for calculations. When exact TOR values are needed, the mathematical models have to be used.

INTRODUCTION

This paper is another tribute brought to Z. Borlan, the greatest and most original Romanian agrochemist of all times. Some authors elaborated over the years agrochemical tables and nomograms for peach tree and apricot tree, but for experimentally optimal rates, ExpOR (Borlan et al., 1982), and for economically optimal rates, EOR (Budoi et al., 1988, 2003; Budoi, 2001), and nobody for TOR.

MATERIAL AND METHODS

The mathematical model for TOR has been derived (Budoi, 2007) from the Mitscherlich-Bray-Black-Borlan response function (Borlan et al., 1984).

FERTEXPERT software version 3 (Budoi, 2007, 2009) has been used for TOR calculations. This software use the mathematical models presented bellow for TOR, nutrient action coefficients, c_a, and soil nutrient supply, S_n.

The equations used to calculate c_a and S_n have the same coefficients as those used for the economic optimal rates of N, P, K (settled by Budoi et al., 1988).

Based on calculated TOR, specific agrochemical tables and nomograms have been built.

RESULTS AND DISCUSSIONS

The mathematical model used to calculate TOR is (Budoi, 2007):

$$\text{TOR, kg N, } P_2O_5\text{, } K_2O\text{/ha} = [\log(2.3 \cdot c_a \cdot Y_m)]/c_a - S_n$$

where:

Y_m = maximum expected yield, kg/ha;

c_a = action coefficient of N, P, K;

S_n = soil nutrient supply, potentially available form, kg N, P_2O_5 or K_2O/ha.

For TOR, the following models have to be used in order to compute c_a and S_n, the same as those for optimal economic rates (Budoi et al., 1988, 2003):

- For peach tree:
  - for nitrogen:

    $c_a = 0.0075 + 60/Y_m$; $S_n = 65(1-10^{-0.55IN}) + 0.0016Y_m$
  - for phosphorous:

    $c_a = 0.01 + 90/Y_m$; $S_n = 125(1-10^{-0.01P_{ALc}}) + 0.002Y_m$
  - for potassium:

$c_a = 0.0072 + 35/Y_m$; $S_n = 180(1\text{-}10^{-0.006K_{AL}}) + 0.002Y_m$

- For apricot tree:
  - for nitrogen:

    $c_a = 0.0075 + 60/Y_m$; $S_n = 65(1\text{-}10^{-0.55IN}) + 0.0014Y_m$
  - for phosphorous:

    $c_a = 0.01 + 90/Y_m$; $S_n = 123(1\text{-}10^{-0.01P_{ALc}}) + 0.002Y_m$
  - for potassium:

    $c_a = 0.0072 + 35/Y_m$; $S_n = 175(1\text{-}10^{-0.0066K_{AL}}) + 0.002Y_m$

where:

IN = soil nitrogen index, calculated with this model: $IN = H \cdot V_{Ah}/100$ (Borlan, 1982), where H = humus content (%) and V_{Ah} = degree of base saturation (%);

P_{ALc} = soil mobile P content (extracted by Egner-Riehm-Domingo method, with ammonium acetate lactate solution, AL), ppm P, corrected with a pH depending factor;

K_{AL} = soil mobile K content, ppm K (extracted by Egner-Riehm-Domingo method). IN, P_{ALc} and K_{AL} are the average values for the 0-40 cm soil layer.

In order to built the agrochemical tables and nomograms for peach trees and apricot trees, TOR have been calculated with FERTEXPERT software, 3-rd version, specially developed by Budoi, 2007, 2009, with the aim to calculate TOR; the 1-st version of this software was elaborated in the framework of author's PHD thesis (Budoi, 1997).

The calculated TOR of N, P_2O_5 and K_2O for different values of Y_m and soil agrochemical indexes (IN, P_{ALc} and K_{AL}) are presented in the tables 1-6 and in the nomograms from figures 1–6.

These tables and the nomograms allow to easily estimate TOR; interpolations have to be done if Y_m, IN, P_{ALc}, K_{AL} are not exactly those from tables or nomograms; in such cases, the results are approximates. The above mathematical models have to be used to calculate TOR when exact rates are desired and Y_m, IN, P_{ALc}, K_{AL} are not exactly those from these tables and nomograms.

The elaborated tables and nomograms have been used to build Web pages, which will be accessible through an online Decision Support System (DSS). The above mathematical models will be used to develop the DSS in order to online calculate TOR.

CONCLUSIONS

For the first time it is published the series of mathematical models and agrochemical tables and nomograms to settle the technically optimal rates (TOR) of N, P_2O_5 and K_2O in fruiting pech tree and apricot tree, as function of maximum expected yield, Y_m, and soil chemical analyses: IN, P_{ALc}, K_{AL}.

The practical agrochemical tables and nomograms allow the farmer to operatively settle TOR when he does not have enough time for calculations. When exact TOR values are needed, the mathematical models have to be used.

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TABLES

Table 1.Technically optimal rates of N (kg/ha) in fruiting peach tree on flat and terraced terrains as function of the maximum expected yield (Y_m) and soil nitrogen index (IN) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m kg/ha	IN									
	0.5	***1.0***	***1.5***	***2.0***	***2.5***	***3.0***	***3.5***	***4.0***	***4.5***	***5.0***
5000	82	65	57	52	50	49	48	47	47	47
10000	138	121	113	108	106	105	104	104	103	103
15000	171	155	146	142	139	138	137	137	137	137
20000	193	176	168	163	161	160	159	159	158	158
25000	207	191	183	178	176	174	174	173	173	173
30000	218	201	193	188	186	184	184	183	183	183
35000	225	208	200	195	193	192	191	190	190	190
40000	229	213	205	200	198	196	196	195	195	195

Table 2.Technically optimal rates of P_2O_5 (kg/ha) in fruiting peach tree on flat and terraced terrainsas function of the maximum expected yield (Y_m) and soil mobile P content (P_{ALc}) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m kg/ha	ppm P												
	5	***10***	***15***	***20***	***25***	***30***	***40***	***50***	***60***	***70***	***80***	***120***	***160***
5000	65	53	43	33	24	17	4						
10000	105	93	81	72	64	56	43	33	25	18	13	1	
15000	127	115	104	95	86	79	66	55	47	41	36	24	19
20000	141	129	118	108	100	92	79	69	61	54	49	37	32
25000	149	137	126	116	108	100	87	77	69	62	57	45	40
30000	153	141	130	121	112	104	91	81	73	67	61	50	45
35000	155	143	132	122	114	106	93	83	75	69	63	51	47
40000	155	143	132	123	114	106	93	83	75	69	63	52	47

Table 3.Technically optimal rates of K_2O (kg/ha) in fruiting peach tree on flat and terraced terrainsas function of the maximum expected yield (Y_m) and soil mobile K content (K_{AL}) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m kg/ha	ppm K										
	40	***80***	***120***	***160***	***200***	***240***	***280***	***320***	***360***	***400***	***440***
5000	69	25									
10000	127	83	57	43	34	30	27	25	24	24	23
15000	157	113	88	73	65	60	57	56	55	54	54
20000	175	131	106	91	83	78	75	74	73	72	72
25000	186	142	117	103	94	89	87	85	84	84	83
30000	193	149	124	109	101	96	93	92	91	90	90
35000	197	153	128	113	105	100	97	96	95	94	94
40000	199	155	129	115	106	102	99	97	96	96	96

Table 4.Technically optimal rates of N (kg/ha) in fruiting apricot tree on flat and terraced terrains as function of the maximum expected yield (Y_m) and soil nitrogen index (IN) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m kg/ha	IN									
	0.5	***1.0***	***1.5***	***2.0***	***2.5***	***3.0***	***3.5***	***4.0***	***4.5***	***5.0***
5000	83	66	58	53	51	50	49	48	48	48
10000	140	123	115	110	108	107	106	106	105	105
15000	174	158	149	145	142	141	140	140	140	140
20000	197	180	172	167	165	164	163	163	162	162
25000	213	196	188	183	181	179	179	178	178	178
30000	224	207	199	194	192	190	190	189	189	189
35000	232	215	207	202	200	199	198	197	197	197
40000	237	221	213	208	206	204	204	203	203	203

Table 5.Technically optimal rates of P_2O_5 (kg/ha) in fruiting apricot tree on flat and terraced terrainsas function of the maximum expected yield (Y_m) and soil mobile P content (P_{ALc}) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m kg/ha	ppm P												
	5	***10***	***15***	***20***	***25***	***30***	***40***	***50***	***60***	***70***	***80***	***120***	***160***
5000	66	54	43	34	25	18	5						
10000	105	93	83	73	65	57	44	34	26	20	15	3	
15000	128	116	105	96	87	80	67	57	49	42	37	26	21
20000	141	129	118	109	100	93	80	70	62	56	51	39	34
25000	149	137	126	117	108	101	88	78	70	64	59	47	42
30000	153	141	131	121	113	105	93	83	75	68	63	51	47
35000	155	143	133	123	115	107	95	84	76	70	65	53	49
40000	155	143	133	123	115	107	95	85	77	70	65	53	49

Table 6. Technically optimal rates of K_2O (kg/ha) in fruiting apricot tree on flat and terraced terrainsas function of the maximum expected yield (Y_m) and soil mobile K content (K_{AL}) in 0–40 cm soil layer (Computerized with FERTEXPERT v. 3, Budoi, 2007, 2009)

Y_m kg/ha	ppm K										
	40	***80***	***120***	***160***	***200***	***240***	***280***	***320***	***360***	***400***	***440***
5000	71	28	4								
10000	129	86	61	47	39	34	32	30	29	29	28
15000	159	117	92	78	70	65	62	61	60	59	59
20000	177	135	110	96	88	83	80	79	78	77	77
25000	189	146	121	107	99	94	91	90	89	89	88
30000	195	153	128	114	106	101	98	97	96	95	95
35000	199	156	132	118	109	105	102	101	100	99	99
40000	201	158	133	119	111	106	104	102	101	101	100

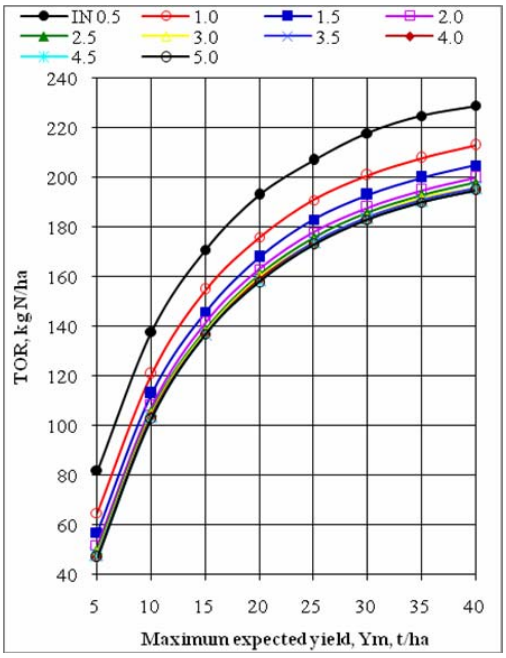

Fig. 1 – Technically optimal rates (TOR) of N in fruiting peach tree as function of the maximum expected yield (Y_m) and soil nitrogen index (IN)

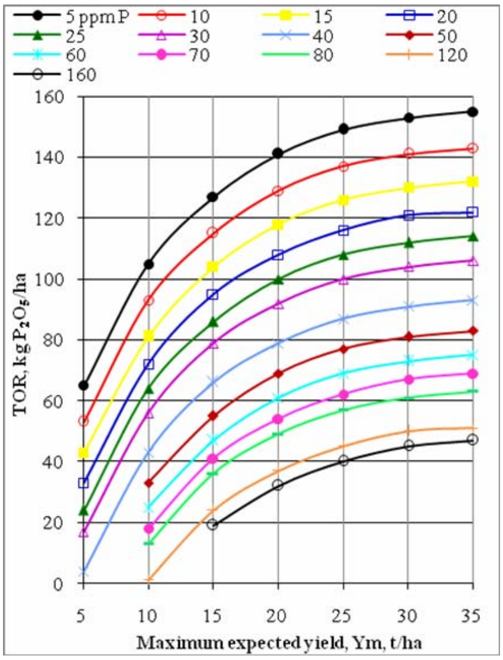

Fig. 2 – Technically optimal rates (TOR) of P_2O_5 in fruiting peach tree as function of the maximum expected yield (Y_m) and soil mobile P content (P_{ALc}, ppm P)

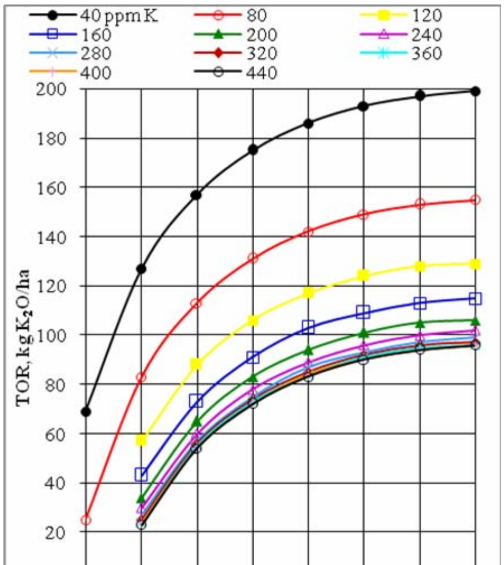

Fig. 3 – Technically optimal rates (TOR) of K_2O in fruiting peach tree as function of the maximum expected yield (Y_m) and soil mobile K content (K_{AL}, ppm K)

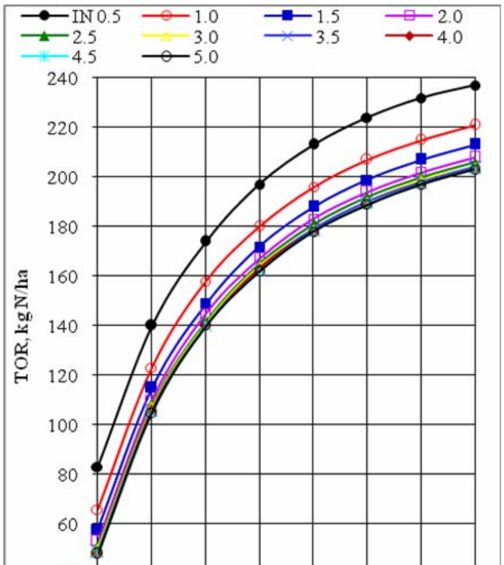

Fig. 4 – Technically optimal rates (TOR) of N in fruiting apricot tree as function of the maximum expected yield (Y_m) and soil nitrogen index (IN)

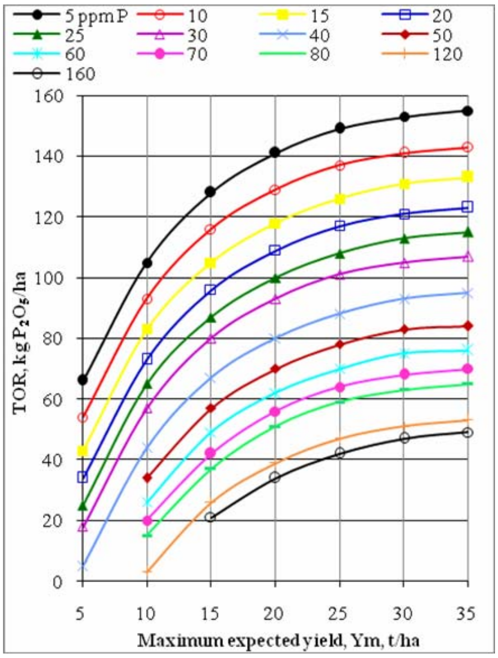

Fig. 5 – Technically optimal rates (TOR) of P_2O_5 in fruiting apricot tree as function of the maximum expected yield (Y_m) and soil mobile P content (P_{ALc}, ppm P)

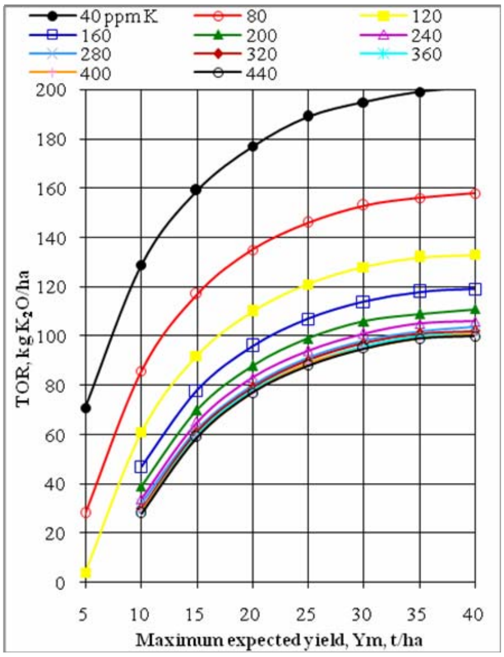

Fig. 6 – Technically optimal rates (TOR) of K_2O in fruiting apricot tree as function of the maximum expected yield (Y_m) and soil mobile K content (K_{AL}, ppm K)

Research concerning sensorial characterization of seven apple types stored in refrigeration and controlled atmosphere conditions, respectively for 7 months

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Keywords: sensorial analysis, volatiles, electronic nose, quality of apples

ABSTRACT

Freshness represents one of the main characteristics of consumer choice of fruits and vegetables. Freshness will be presented to relate the attributes associated with like crispiness, hardness and juiciness, chewiness, after taste, flavours, odour. The apple storage by refrigeration and controlled atmosphere is a technique for quality fruit preservation involving careful control of temperature, oxygen, carbon dioxide and humidity. During storage in controlled atmosphere storing rooms for a long period fruits lose their freshness and some of their characteristics depreciate but market differences appears in refrigeration conditions. In this article we characterized seven types of apples stored in these conditions concerning carbohydrate content and their sensorial attributes. The objective evaluation of the quality of fruits is a difficult task, mainly due to the fact that every single person is not necessarily influenced by the same attributes and that the quality scale may vary strongly from one person to another. The perception of volatile compounds by the human nose is of great importance in evaluating quality of foods; therefore, similar principle as the human nose, the electronic nose, was used.

INTRODUCTION

The quality of fruits is an extremely complex matter, difficult to describe objectively. The consumer does not judge the nutritional quality of a certain fruit but he can make statements about sensory aspects such as shape, color, texture, juiciness, firmness, taste and aroma. (Azodanlou, 2001) Apples are the most widely consumed fruits in Romania. After the apples are harvested, they are commercialized. Today, the extended availability of seasonal fruit in the market place is common due to both post-harvest technologies and fruit varieties that allow for longer periods of storage. (Defilippi, et al, 2009) The apples which are not sold yet are stored in cold storage warehouses, consisting of large refrigerated rooms where the temperature and air humidity are maintained at optimal conditions. During storage**,** fruits lose their properties, although low temperatures slow the ripening process. In the controlled atmosphere storage**,** temperatures are kept constant according to apple variety, fruits chemical composition and fruit ripening level. Long time cooling may lead to losses in fruits quality caused by differential or inexistent activity of some enzymes. (Harsan., 2006, Berceanu, 2003) Refrigeration warehouses with controlled atmosphere, although need supplementary costs, are widely used for fruit storage because of possibility to store the fruits for longer periods of time. Using these storage conditions, the fruit quality loses are lower and fruits have a better quality as it will be observed in this paper. (Jamba and Carabulea, 2005) In this article, we followed the variation of carbohydrate content, sensorial characteristics for apples stored under controlled atmosphere and, respectively, under refrigeration conditions, because of the importance of these analysis for apples quality and perception of the volatile compounds.

MATERIALS AND METHODS

Four varieties of apples: Jonathan, Starkimson, Gala and Golden were harvested from Reghin territory and three varieties of apples: Golden, Pinova and Fuji were harvested from Insuratei. They were stored in four different cells of the storehouse placed in Reghin and in warehouses placed in Insuratei and they were used in the following experiments. The temperature and air humidity in the storage room were continuously recorded during storage and they were specific for each apple variety. The apples were tested using sensorial analysis every month. The sensory panel was formed by students from The Food Science and Engineering Faculty,,,Dunarea de Jos'' University, Galati, Romania. The students panelists were selected for food sensorial analysis using specific methods for panel selection. The subjects were asked to rate the following sensory attributes: odor, aroma, sweetness, acidity, firmness, juiciness and to give marks for the overall appreciation. The panel rated the different parameters on a 1 to 15 scale (eg. 1 – very weak aroma intensity and 15 – very strong aroma intensity). Panelists received water and bread as neutralizing agents between samples testing. The sensory analysis was carried out in the standard sensory laboratory under well controlled conditions.

Volatile compounds of the apples harvested and stored at Reghin territory (Jonathan, Starkimson and Golden) were analyzed with electronic nose, α-Prometheus (Fox 4000, Alpha.Mos, France), to The Institute of Food Bioresources, Bucharest. Three types of samples of apples were analyzed: pare of apples, pulp and pare of apples which were homogenized and diluted homogenates to 25%. 2 grams of each sample were weighted into 10 ml vials. The samples were heated to 50° C and shaken for 3 min just before headspace sampling. Headspace (500μL) was injected at 2000 μL/s and signal acquisition lasted 2 min, followed by 8 min for baseline recovery. Each injection was repeated four times per sample. The resulting e-nose signal intensities (changes in resistance across the metal oxide sensor due to non-selective interactions with volatile compounds in the headspace) were analyzed by PCA (principal component analysis) and DFA (discriminant factor analysis).

The carbohydrate content of the apples was determined using HPLC method to USAMV Bucharest. Analysis of glucose, fructose and sucrose using the liquid chromatography (LC) Agilent 1200 Series equipped with refractive index detector (RID) were done. The carbohydrates were extracted from 50 g fresh cutted samples and boiled in 250 ml distilled water. The solution was filtered by 0, 22 μm filter before HPLC analysis. The chromatography parameters were: column 250 x 4.6 mm Zorbax NH_2, 5 μm (Part No. 880952-708), mobile phase acetonitril 80%, flow rate 1, 5 ml/min, injection volume 10 μl; detector: Refractive Index Detector (RID). Fructose eluted between 7.5 – 7.8 min, glucose eluted between 8.00-8.3 min and sucrose eluted between 13.3-13.5 min. The results were analyzed using statistical control methods. The carbohydrate content of the apples was also studied after 7 months of storage.

RESULTS AND DISCUSSION

The glucose, fructose and sucrose contents of the apples are presented in following figures1. As it can be observed in figure 1, the glucose content is higher for the apples stored under refrigeration conditions than for those stored under controlled atmosphere conditions. This may be due to the lower content of the Reghin apples in glucose. The fructose content of the apples is higher when the fruits are stored controlled atmosphere conditions. This may be due to the lower respiration rate of the fruits kept in controlled atmosphere conditions. Known as CA in the industry, controlled atmosphere storage involves careful control of temperature, oxygen, carbon dioxide and humidity. The accurate conditions in the storage room are set according to species, varieties, the fruit chemical composition and the ripening level. (Harsan, 2006) Without careful temperature control, the fruit will rapidly over-ripen and senesce leading to internal tissue breakdown and the production of volatiles characteristic of the over-ripe fruit.

The sensorial characteristics of the apples were determinate using ten panelists, monthly, at the same data, from December until May. The evaluated characteristics were: smell intensity, acid smell, grass smell, honey smell, fruit smell, chemical smell, almond smell, aroma intensity, fresh acid aroma, grass aroma, honey aroma, fruit aroma, acid aroma, sweet aroma, bitter aroma, chemical aroma, almond aroma, firmness, masticability, hardness, mealiness, juiciness, aftertaste. Applying ANOVA analysis method to the obtained results, we can conclude that the differences between panelists are low concerning the grades given for each characteristic of every apple variety, so average of the grades given by panelists can be used for apples sensorial characterization. Spider sensorial profiles were realized for each variety of apples, but in this article, the varieties of apples stored in CA are representative for analyzing the aroma intensity until May month (figures 1 to 4). So it can be seen that during storage, apples loose their quality characteristics. Smell and aroma intensity, aftertaste, juiciness, mealiness, hardness, masticability and firmness are, generally, better expressed in December than in February. Also, acid aroma, fruity aroma and sweet aroma had higher scores in December than in February. The aroma profile can change dramatically during the post-harvest life of fresh produce, particularly in climacteric fruits in which the dominant volatile may be quite different in the unripe fruit, the ripe fruit and the over-ripe or senescing fruit. Refrigeration also tends to limit the development of aroma volatiles in ripening fruits. (Gherghi, et al. 2001) The storage of apples under low temperature and controlled atmosphere conditions inhibited the synthesis of volatiles compounds (apples aroma had a lower level) but in inadequate conditions of gaseous composition, grain alcohol and formaldehyde will be accumulated. Volatiles accumulation will be accelerated by the ripen process. (Jongen, 2002) The apples type storage in atmosphere with normal composition (Pinova, Fuji and Golden) synthesized ethylene and other volatiles faster that why these types of apples were analyzed concerning sensorial until March. Sensorial analysis indicated that the attributes of Golden and Starkimson apples maintained in time, but Jonathan less and Gala more less identical figure 5. Aroma can be an important factor in the storage and shelf-life of fresh products. Jonathan, Starkimson and Golden, due to their physiology~~,~~ are compatible for storage under controlled atmosphere as it can be seen in figure 5. Concerning aroma, Golden apples are highly aromatic products because the volatile compounds were synthesized more lately. These apples were harvested immature with higher content of starch, so the intensity of aroma increased in March.

Discriminate odors have been tested with "electronic nose". The obtained diagrams, which represent the answer of the sensors in analyzing the volatiles compounds from the samples, are presented below (fig7: left –apple sample from Starkimson; right: apple sample from Golden). Analyzing the two diagrams it seems that no concrete differentiation is visible between the two varieties of apples. The answer of the sensors is similar, which means that no important differences are between the headspace of the Starkimson samples and the headspace of the Golden samples. Statistical methods PCA (Principal Component Analysis) and DFA (Discriminant Factor Analyis) were used further in order to differentiate the results between the three analyzed varieties. The figure 8 presents the graphic of PCA analysis. PCA method is the best method of visualizing a complex, multivariate data set. The aim of this method is to find a "structure" or proximities within the samples - and not to identify samples. It gives a representative map of the different areas (olfactive, concentration area...). On the PCA graph, the percentage reported on each axis (C1, C2 …Cn) gives the amount of information given by sensors on each axis (also called components). This percentage is also called the% of variance. The sum of the percentage of variance on all the axes (C1, C2 …Cn) is 100%. A PCA is valid if: the discrimination index is as closest to 100. If the discrimination index is negative the analysis is not valid. As we have obtained a low discriminant index, the samples couldn't be clearly differentiated, probably because the samples suffered damages in their quality during the preservation. If the discrimination through PCA is valid, we can then perform the DFA to classify the samples in distinct groups. The DFA method represents a qualitative analysis for discrimination and identification (prediction of belonging to a group of an unknown sample). DFA allows the user to construct a model which enables to identify a new sample. A DFA is valid if: there are enough samples per group and if the percentage of recognition > 90%. Figure 9 presents the DFA diagram; DFA analysis proved to be successful in performing overall correct classification (86%) of the nine samples of apples used in these experiments. The pares samples and homogenate samples are located in the right part of the graphic and the diluted samples are more oriented on the left part. With sensor and mass optimization we have a better discrimination -The second series of measurements gave a very astonishing result. It is very surprising that the kind of sample for same apple can also be discriminated.

CONCLUSIONS

Growth and ripeness are complex processes for carbohydrates accumulation. Apples are living commodities and their rate of respiration is of key importance to mainten the quality. Respiration is the metabolic process by which cells convert energy from one type of chemical structure into another form, more useful to the cell for driving metabolic reactions (fresh product undergoes aerobic respiration). The polycarbohydrates were hidrolizated to monocarbohydrates. These were used in the oxidative process when oxygen and glucose are consumed while carbon dioxide, water and heat are formed. The storage of apples increases the carbohydrate content due to the content of starch at harvest. These data depend on the species, varieties, the fruit chemical composition, the ripening level and the preservation type, also. Fruit storage under controlled atmosphere store rooms is one of the most known storage solutions due to the good quality maintenance of fruits quality for a longer period of time. Maintenance content of sugar at special level, maintain the acid balance which will induce at the fruit flavour balance that why demonstred sensorial analyze. The perception of volatile compounds by the human nose is of great importance in evaluating quality of foods. The electronic nose, as an instrument which comprises an array of electronic chemical sensors with partial specificity and an appropriate pattern-recognition system, is capable of recognizing simple or complex odors. These sensorial data can be correlated with the answer gave by the electronic nose. Results of the PCA have shown that the use of sensor arrays applied for the refrigerated samples of apples couldn't lead to a very good discrimination. The DFA gave a better discrimination between all the samples. Further experiments will be done in order to establish a proper methodology to use this rapid method as a toll in the quality analysis of fruits.

ACKNOWLEDGEMENT

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FIGURES

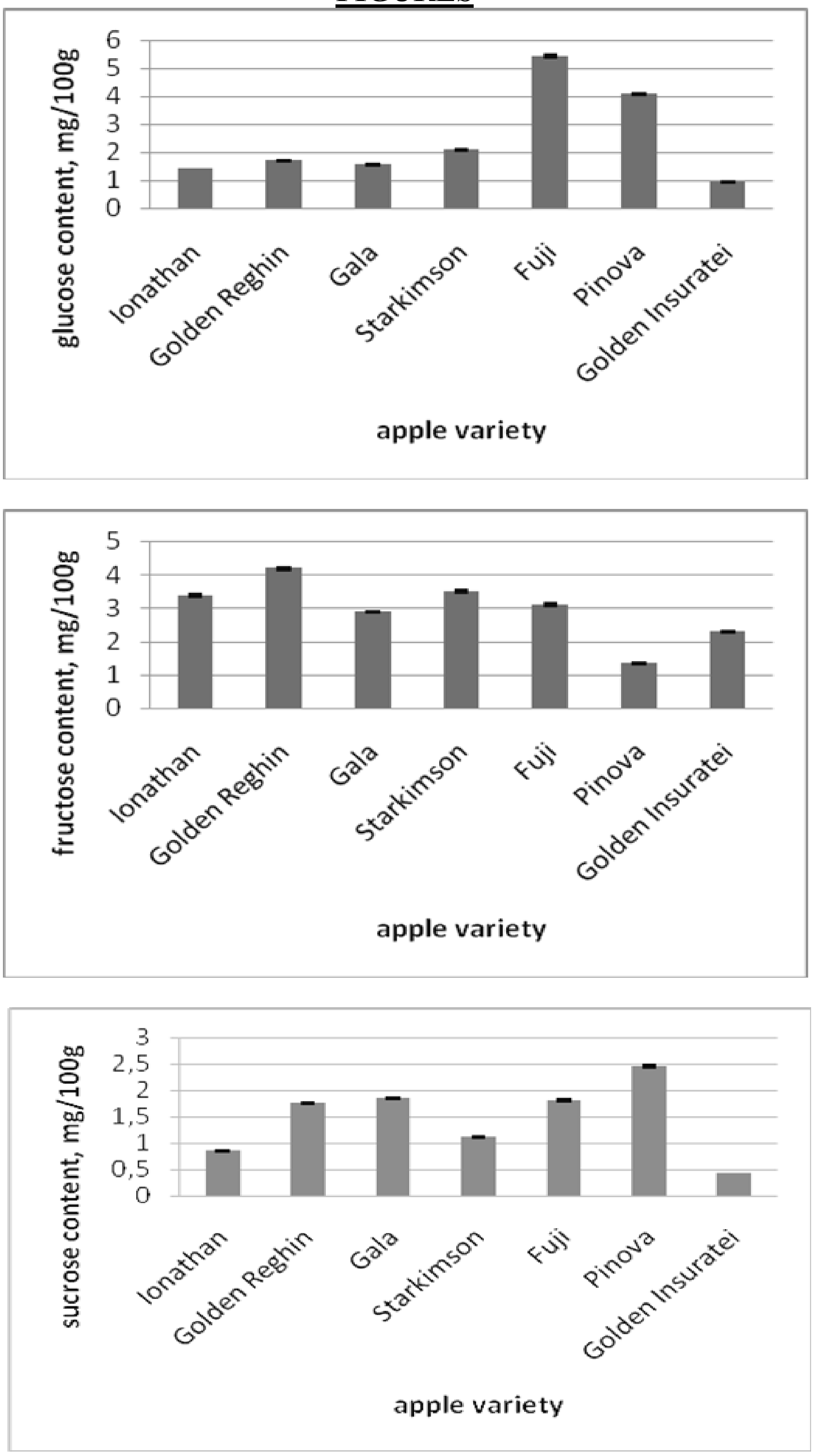

Fig. 1. The glucose, fructose and sucrose content of the apples after 7 months of storage under refrigeration conditions (Fuji, Pinova, Golden Insuratei) and controlled atmosphere conditions respectively (Ionathan, Golden Gala, Starkimson)

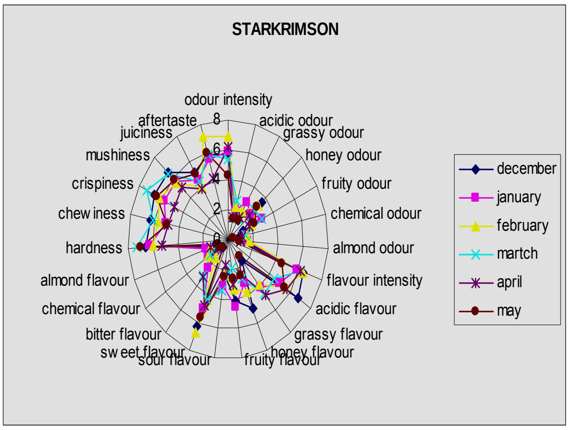

Fig. 2. The sensorial profile of Starkrimson type

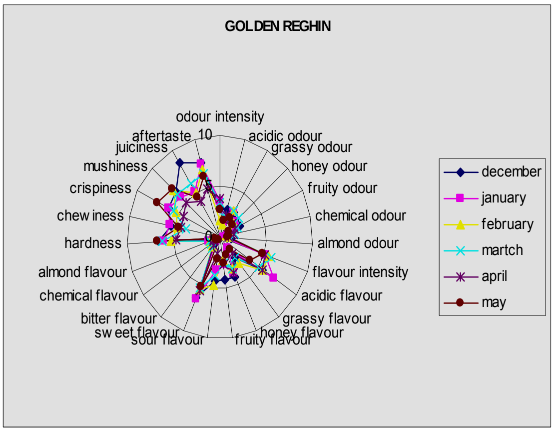

Fig. 3. The sensorial profile of Golden type

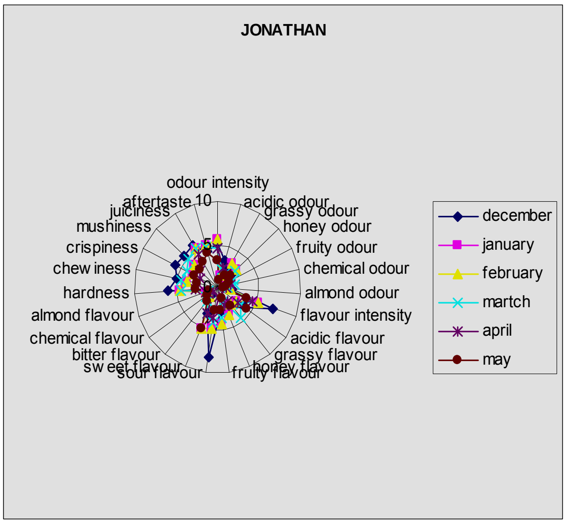

Fig. 4. The sensorial profile of Jonathan type

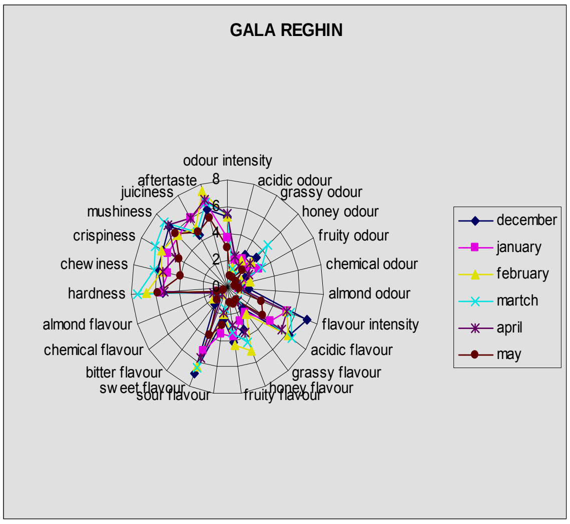

Fig. 5. The sensorial profile of Gala type

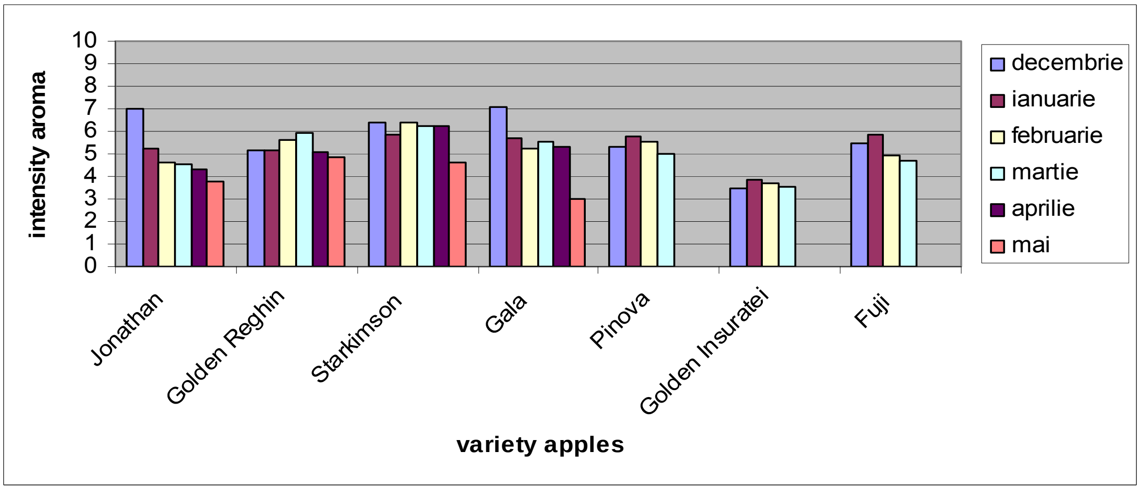

Fig. 6. Variation of the aroma for 4 types of apples under CA and 3 types of apples at refrigeration

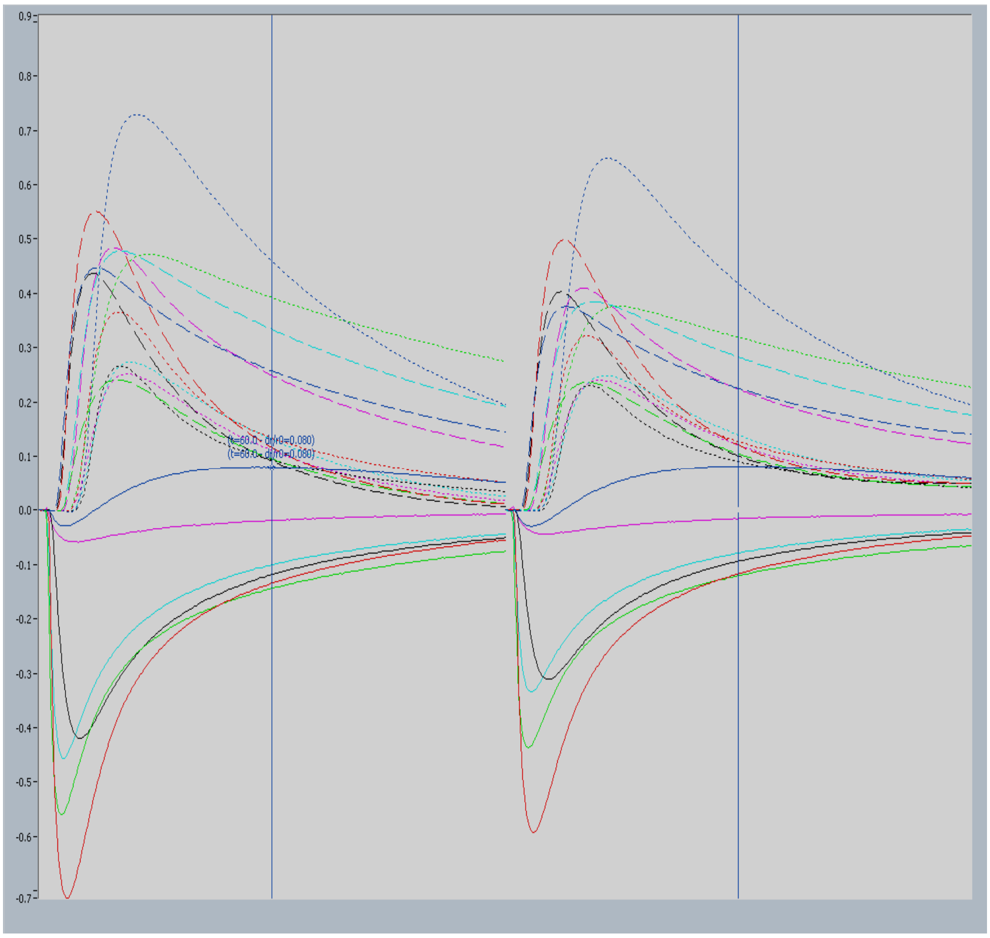

Fig. 7. The response of the sensors (left: apple sample from Starkimson right: apple sample from Golden)

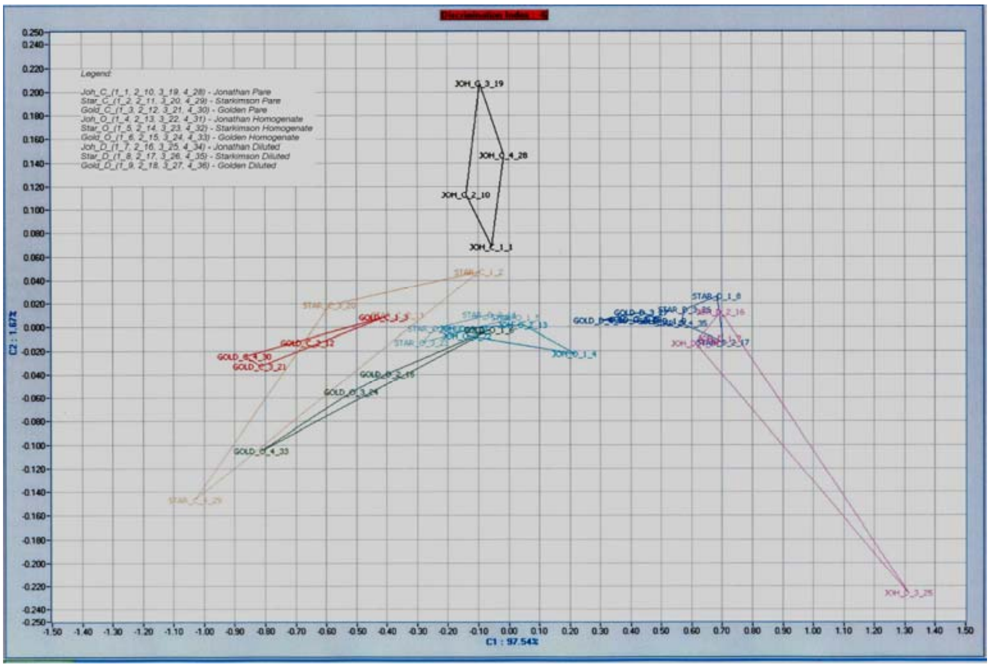

Fig. 8. PCA analysis of all the apple samples (legend attached)

Studies regarding the influence of some pre and postharvest treatments upon the quality of peach and nectarine fruits

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Keywords: quality, storage, perishable, pre and postharvest

ABSTRACT

The most important link in the postharvest technology is constituted by the physical treatment during the storage period.In the present paper we want to demonstrate the influence of the post-harvest storage conditions on the quality and shelf life of the peach and nectarine fruits. The experiment has been organized at the Research Institute of Fruit Growing-Constanta and at the Faculty of Horticulture Science of Bucharest with four peach and nectarin varieties: Cora, Delta,Southland and Cardinal. The lower moisture percent and loss weight, for all varieties has been registered at variant were the fruits are stored under modified and refrigerated atmosphere.In the case of fruits stored at 2 C and 85-90% relative humidity under modified atmosphere, the fruit storage capacity was better and the qualitative characteristics were higher as compared with the untreated control (stored in room conditions).

INTRODUCTION

One of the most important aspects of produce is its quality both during trading and on reaching the consumer or final buyer. For non – perishable products, only the influence of production on quality is of any importance. During trade and distribution this quality will hardly change. If no calamities occur, these products remain in the same quality state during distribution. For perishable produce this picture changes compatibility. During trading and distribution up to the moment the produce arrives at the final consumer, the quality may change quite rapidly, depending on the circumstances during storage and transport, thereby affecting both the possibilities of selling the produce and the price that can be obtained. For both types of produce, perishable and non – perishable, the quality is of almost importance. In addition to the quality resulting from production, for the second type, sufficient care should be taken to conserve quality during trade. Starting from this aspects, in the present paper will be presented few aspects regarding the influence of some post-harvest physical treatments upon the quality of peach and nectarine fruits.

1. THE INFLUENCE OF FERTILISATION SYSTEM ON FRUITS QUALITY

MATERIALS AND METHODS

Our experiment was done on a field of Valul lui Traian Fruit Growing Research Institute, in a ten years old peach and nectarine plantation. Four peach and nectarine varieties were used: Cardinal and Southland (peach) - Cora and Delta (nectarine).

The main goal was to establish the influence of different fertilization system upon the production and quality of the harvest. For this reason we had four experimental variants: V1 – control, without treatment, V2 – organic manure, V3 – complex mineral fertilizers, V4 – foliar fertilizers

The main physic - chemical characteristics of the fruits were determined at the moment of harvest and at the end of storage. Also the fruit yield for all experimental variants was determined.

RESULTS

Table 1 shows the mean fruit weight for all variants and varieties. The greatest values were found at variant number 4 (foliar fertilizers): 120 g for Cora, 110 g for Delta, 126 g for Cardinal and 154 g for Southland.

Regarding the soluble dry matter content all varieties registered the greatest values for this parameter at variant number 4 (11,6% – Cora, 10,8% - Delta, 11,0% – Cardinal and 10,2% - Southland) while at control their values were lower (10,3% - Cora, 8,8% - Southland). This parameter had also great values at the variant with the greatest fruits sizes (variant number 4), suggesting that this fertilization treatment is really necessary for a superior quality of fruits.

The total titerable acidity had the lowest values at variant number 4 that had the greatest content of soluble dry weight (1,16% malic acid at Cora and 0,92% malic acid at Cardinal). At control the greatest values were registered: 1,54% malic acid at Cora and 1,44% at Southland.

2. THE INFLUENCE OF FRUIT STORAGE CONDITIONS ON PEACH AND NECTARINE QUALITY STORAGE CAPACITY

MATERIAL AND METHOD

The peach and nectarine fruits were harvested at the harvesting ripeness. At this moment, the main quality physic-chemical properties were analyzed, afterwards, the fruits were stored in different storage conditions, which represent the experimental variants:

V1 = normal environmental storage conditions; (T=20 C; RH= 68%)

V2 = refrigerating storage and micro perforated bag pre-package; (T=1,5ºC;RH=85%)

V3 = refrigerating storage under modified atmosphere; (T=1,5 º C;RH=92%)

The fruits have been weight both when they were stored and the end of storage period, the depreciation due to rottenness, the origin main pathogen agents and the main fruit physic-chemical proprieties of the best variant were evaluated.

RESULTS

As we can see in table 2, the storage period in normal environmental conditions is shorter. The lowest period was for V1 (5-6 days) for all varieties. The fruit was stored in a refrigerating storage under modified atmosphere. In this way, it was ensured a higher relative air humidity, a modified gaseous composition, enriched with CO_2 (5-6%) and rarefied of O_2 (4-5%). These conditions preserved the fruit very good, during 22 to 40 days (Cora fruits from foliar fertilization trees).

The losses of weight were grater at the fruit stored in normal environmental condition. This happened due to the higher temperature and the lower relative air humidity. The least losses were registered at V3 as the fruit transpiration has been diminished. We can point out rather similar values after loss of weigh at the four varieties, but the best results were registered for Cora. The problem is the dropping is more significant that at the other varieties, because of the thin epidermal.

The depreciation due to rottenness and physiological disturbs presented higher values in V1 case, while in V3 we can find the lowest values. Different varieties registered different reactions. Thus for Cora, the percentage of rotten fruits was of 14,3%, after a 5 days storage period (V1) in comparison with 4% after a 40 days storage period (V3). In Cardinal varieties case, the presence of the pathogen agents that caused fruit depreciation has been influenced by the storage as follows: the *Monilinia laxa* has developed better in low temperature conditions and high relative humidity (V2, V3,) in comparison with V1. *Botrytis* *cinerea* has manifested itself stronger at a high temperature (V1).

The quality of the fruits had tested both during their harvesting and at the end of the storage period.

Regarding the average weight of the fruits at harvesting the Cardinal V4 (foliar fertilizers) was the biggest (126 grams). During the storage, these values diminished because of the transpiration water loss.

The Effegi penetrometer determined immediately after harvesting the following values: V1- Cora –1,4 kgf/0,5 cm^2, V 2- Cora – 2 kgf/0,5cm^2, V 3- Cora- 1,6 kgf/0,5 cm^2 and V 4 Cardinal- 2,2 kgf/0,5 cm^2.

These values decreased during the storage period due to pectin substance transformation into soluble pectines because of the pectinmetilesterase enzyme. The values (at the end of storage period) are between 0,8 kgf/0,5cm^2at V1 Cora and 1,6 kgf/0,5cm^2 to V4-Cora.

The soluble dry substance content and the titerable total acidity were two biochemical indicators of great interest. The soluble dry substance content had the following harvesting values: V1- Southland– 8,8% and 11,6% for Cora-V4.

At the end of the period, the values increased. The titerable total acidity expressed in malic acid values is as follows: Cora V4 – 1,16% (at harvesting) and 0,90% (end of storage period), Cora V1 – 1,54% (at harvesting) – 1,16% (end of storage period).

The order analyzed biochemical components are also shown in table 3.

This show us the advantage of storing peach and nectarine fruits in refrigerating storage under modified atmosphere,that can assure the best humidity conditions and a modified gaseous composition, favorable for fruits storage.

CONCLUSION

1. The fruit storage period ranges from 5 days (Cora of control-without fertilization, in normal environmental conditions) to 40 days (for Cora- V4 with foliar fertilization, in conditions of refrigerating storage under modified atmosphere).
2. The weight losses during the storage period were greater in natural ventilation conditions. The least losses of weight (9,4%) were registered in refrigerating storage conditions under modified atmosphere, at the fruits from foliar fertilization trees.
3. The main fruit pathogen was *Monilinia laxa* for the fruits stored under modified atmosphere and *Botrytis cinerea* in normal environmental conditions.

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TABLES

Table 1. The influence of fertilization system on quality of peach and nectarine fruits

Variety	Variant	Average weight - g -	Soluble dry matter -% -	Titerable acidity %- malic acid	Firmness - kgf/0,5cm²	Watter content -%-	Total dry matter -%-
CORA	V1	75	10,30	1,54	1,4	86,2	13,8
	V2	98	11,20	1,22	2,0	87,2	12,8
	V3	92	10,60	1,24	1,6	86,9	13,1
	V4	120	11,60	1,16	2,2	87,8	12,2
DELTA	V1	82	9,50	1,25	1,8	85,6	14,4
	V2	102	10,20	1,34	2,4	86,4	13,6
	V3	96	9,80	1,12	2,0	86,0	14,0
	V4	110	10,80	1,10	2,8	86,8	13,2
CARDINAL	V1	105	10,00	1,06	2,4	86,8	13,2
	V2	111	10,60	1,15	3,4	87,6	12,4
	V3	118	10,40	1,76	3,2	87,2	12,8
	V4	126	11,00	0,92	3,8	88,0	12,0
SOUTHLAND	V1	114	8,80	1,44	2,8	85,8	14,2
	V2	152	9,40	1,20	3,7	86,8	13,2
	V3	144	10,00	1,06	3,4	86,2	13,8
	V4	154	10,20	0,98	4,0	87,2	12,8

V1 = without treatment (control)
V2 = organic manure
V3 = complex mineral fertilizers foliar fertilizers
V4 = foliar fertilizers

Table 2. The storage capacity of the peach and nectarine fruits

Variety/ Variant of fertilization	Storage condi-tions	Storage duration (days)	Weight losses (%)	Rot losses (%)	Total losses (%)
Cora V1	V1	5	12,7	14,3	27,0
	V2	12	1,3	9,8	11,1
	V3	22	10,6	6,3	16,9
Cora V2	V1	6	9,6	10,8	20,4
	V2	18	1,1	5,4	6,5
	V3	32	8,0	4,5	12,5
Cora V3	V1	5	10,7	12,4	23,1
	V2	16	1,9	6,5	8,4
	V3	28	8,7	4,9	13,6
Cora V4	V1	6	9,0	11,2	20,2
	V2	21	1,2	5,2	6,4
	V3	40	5,5	4,0	9,4

Table 3. The evolution of mainly quality characteristics during storage

Variety/ Treatment	Analysis time	Fruit weight (g)	Firm ness (kgf/ cm^2	Water content (%)	Total dry matter (%)	Soluble dry matter (%)	Titrable acidity (malic acid)%	Mineral subst. (%)
CORA V1	At harvest	75	1,4	86,2	13,8	10,3	1,54	0,32
	After storage V3	67	0,8	77,1	19,3	13,8	1,16	0,23
CORA V2	At harvest	98	2,0	87,2	12,8	11,2	1,22	0,38
	After storage V3	90	1,4	80,2	18,5	14,4	0,98	0,28
CORA V3	At harvest	92	1,6	86,9	13,1	10,6	1,24	0,35
	After storage V3	84	1,0	79,3	20,7	14,3	1,07	0,25
CORA V4	At harvest	120	2,2	87,8	12,2	11,6	1,16	0,43
	After storage V3	113	1,6	80,9	19,1	15,0	0,90	0,30

FIGURES

Fruits from Cora variety (V4-foliar fertilization)

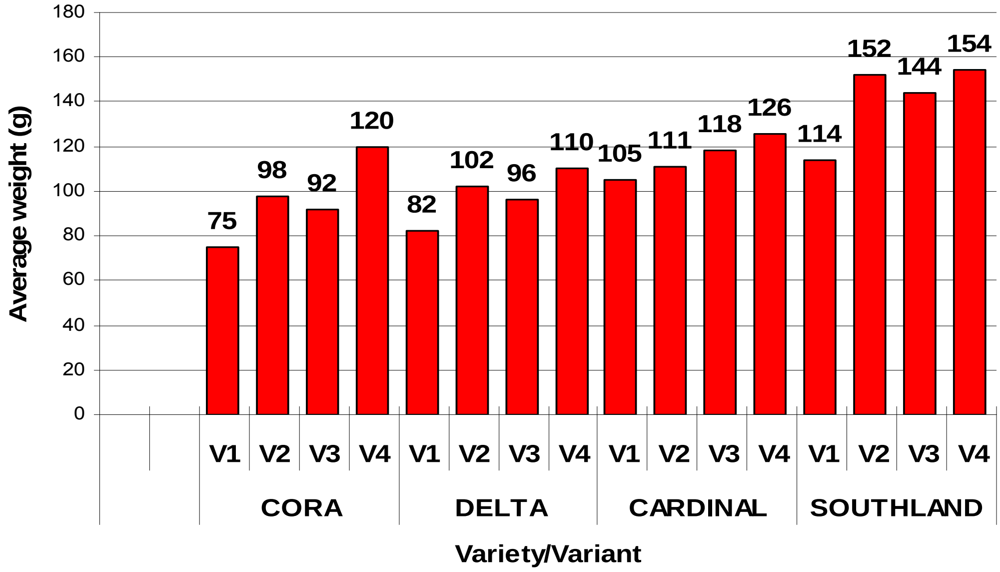
Delta variety stored under refrigerated modified atmosphere

Delta variety stored in normal environmental conditions

Aspect from refrigerated fruit storage

Cardinal variety stored in normal environmental conditions

Fruits attacked by *Monilinia laxa* mould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140
120
100
80
60
40
20
0
75
98
92
120
82
102
96
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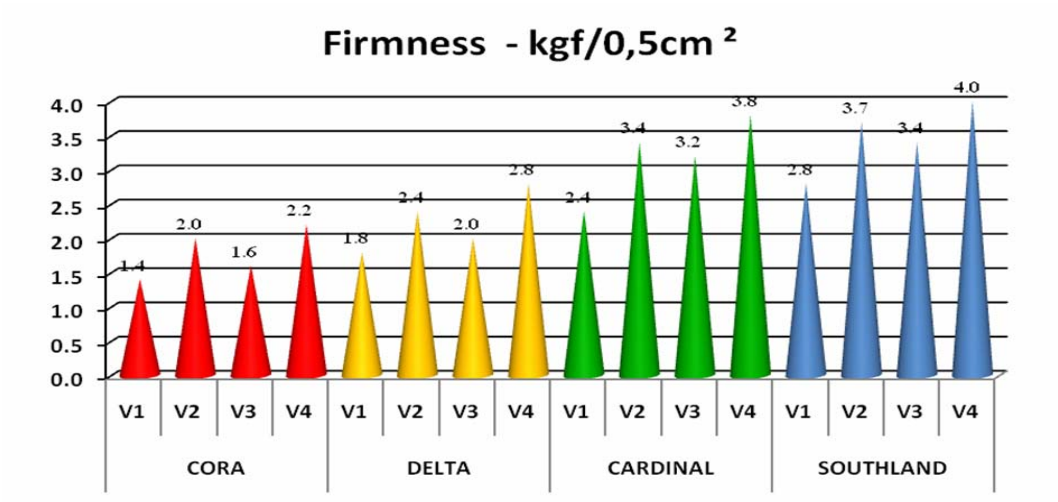
105
111
118
126
114
152
144
154
V1 V2 V3 V4 V1 V2 V3 V4 V1 V2 V3 V4 V1 V2 V3 V4
CORA
DELTA
CARDINAL
SOUTHLAND
Variety/Variant


Firmness - kgf/0,5cm ²
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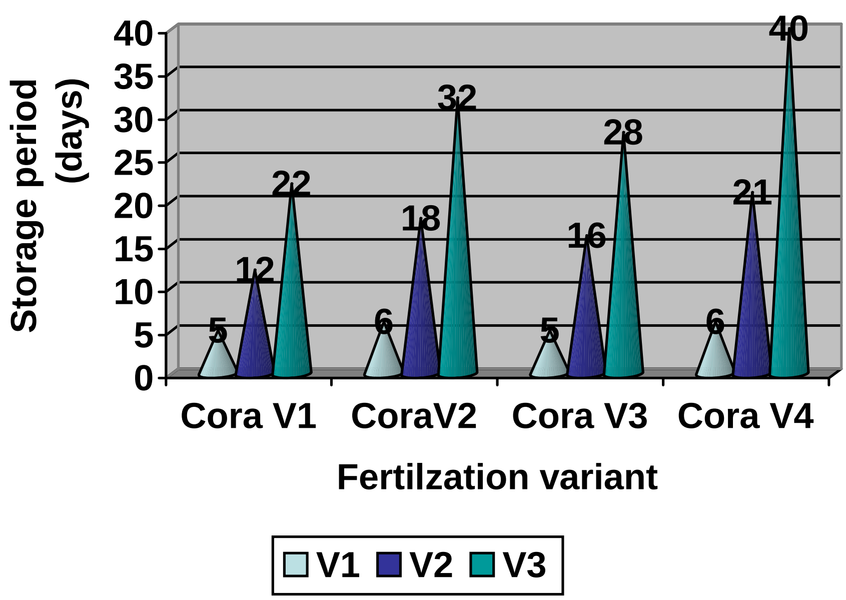
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1.4
2.0
1.6
2.2
1.8
2.4
2.0
2.8
2.4
3.4
3.2
3.8
2.8
3.7
3.4
4.0
V1 V2 V3 V4 V1 V2 V3 V4 V1 V2 V3 V4 V1 V2 V3 V4
CORA
DELTA
CARDINAL
SOUTHLAND


Storage period (days)
40
35
30
25
20
15
10
5
0
5
12
22
6
18
32
5
16
28
6
21
40
Cora V1
CoraV2
Cora V3
Cora V4
Fertilzation variant
V1
V2
V3

Lucrări ştiinţifice USAMVB, Seria B, vol. LIII, 2009

Effect of growth retardants treatment on plums yield and fruit quality

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Keywords: growth retardants, yield, fruit quality

ABSTRACT

The experiment was conducted to investigate the effect of some biorregulator applied to improve plums yield and fruit quality. The field experiment was designed in 4 treatments, disposed linearly and 4 replications with the plum trees cv. As factor A, biorregulator products application as factor B and the moment of application as factor C. Foliar application of bioregulators has induced a increased of plum yield with 25% at '*Stanley*' cv. (treatment with Paclobutrazol) and 15% at '*Tuleu gras*' cv. (Treatment with prohexadione calcium) versus control.

INTRODUCTION

If we regard the fruit plum tree, as a community within a system, then one can ascertain that the trees like the communities will need space, water and food to reach their purpose, to produce fruit. It is well known that in the first years after planting, the trees bear evenly and give better quality fruit but after few years due to various reasons, the balance between the trees and fruiting is disturbed, occurring to the bear alternance. This paper present the results recorded following biorregulators application on plum trees. We are chouse the plum species because in Romania this holds about 118000ha (Cociu, 1997).

MATERIAL AND METHODS

Field experiment has been set up, in a plum orchard at the Research Institute for Fruit Growing Piteşti –Mărăcineni, between 2001-2003. There were organized two experiments which involved one group of biorregulators (growth regulators). The first experiment had 4 variants (10 trees for each treatment, in 3 replications), with the following experimental design T1-treated with prohexadione Ca 1.25 kg/ha, T2- treated with prodexadione Ca 2.5 kg/ha, T3- treated with paclobutrazol (Cultar) 0.2%, T4- control, treated plot with aqueous solution. The products were applied at two moments: when the shoot length was 8-10 cm and the second one, after 3 weeks. The readings and measurements regarding the growth retardants were the shoot length, fruit yield, fruit mean weight, and flower buds.

The quality of fruit was determined visually for color (100 fruits/trial), resistance handling (300 fruits/trial), dry matter by gravimetric method and sugar by Feling method. The average weight was recorded in a plot for 100 fruits. All the treatments were done manually with a sprayer, using the solution amount: 1000 l/ha, for growth retardants. The phytotoxicity induced by all products was visually determined. The experiments data were statistically processed, using ANOVA- method (Duncan test).

RESULTS AND DISCUTION

The effect of prohexadione –Ca, was studied by some researchers (Buban 2002, Greene 2002, Costa 2004), which show that the treatment with prohexadione –Ca reduced growth and induced disease resistance too. The data obtained in this study show that there is significant differences between treated plots and control (Duncan test).

Figure 1 presents the results obtained after products application. One can see that foliar sprays with paclobutrazol (Cultar), have had a good effect on vegetative growth, the shoot length decreased with both cultivars (10.8 cm at Tuleu gras, 16.6 cm at Stanley versus 28.4 cm at control)

The data from figure 2, confirm with the Duncan test the good effect of growth retardants application on yield. The best results were involved in the plot treated with paclobutrazol 0.2% at both cultivars (37.1 kg at Tuleu gras and 46.1 at Stanley versus control 20.7 kg/tree at Tuleu gras cv. and 19.8 at Stanley cv).

Analyzing, the data presented in figure 3, one finds that prohexadione – Ca, applied in two doses has a good effect on fruit quality. The Duncan test shows that there were statistical differences between plots treated with prohexadione –Ca, paclobutrazol and control, the best results being obtained with 1.25 kg/ha at Tuleu gras cv. and with both doses of prohexadione – Ca) application at Stanley cv.(40 g)

Regarding the effect of growth retardants on flower buds for the next year, one can see in figure 4 that in plot treated with paclobutrazol, are statistical differences between all the treatments and control. The best results obtained by paclobutrazol application at Tuleu gras cv. at Stanley cv. The data (fig. 4) show that it was not a statistical difference between plot treated with prohexadione –Ca (2.5 kg./ha.) and paclobutrazol 0.2%, but it was a difference between plots treated with 1.25 kg/ha. We must notice that products application induced more flower buds for the next year compared with control.

CONCLUSIONS

The treatments with paclobutrazol had a good effect on reducing the shoot lengths, increased yield and induced more flower buds for both cultivars.

The treatment with prohexadione Ca has a good effect on mean weight for both cultivars.

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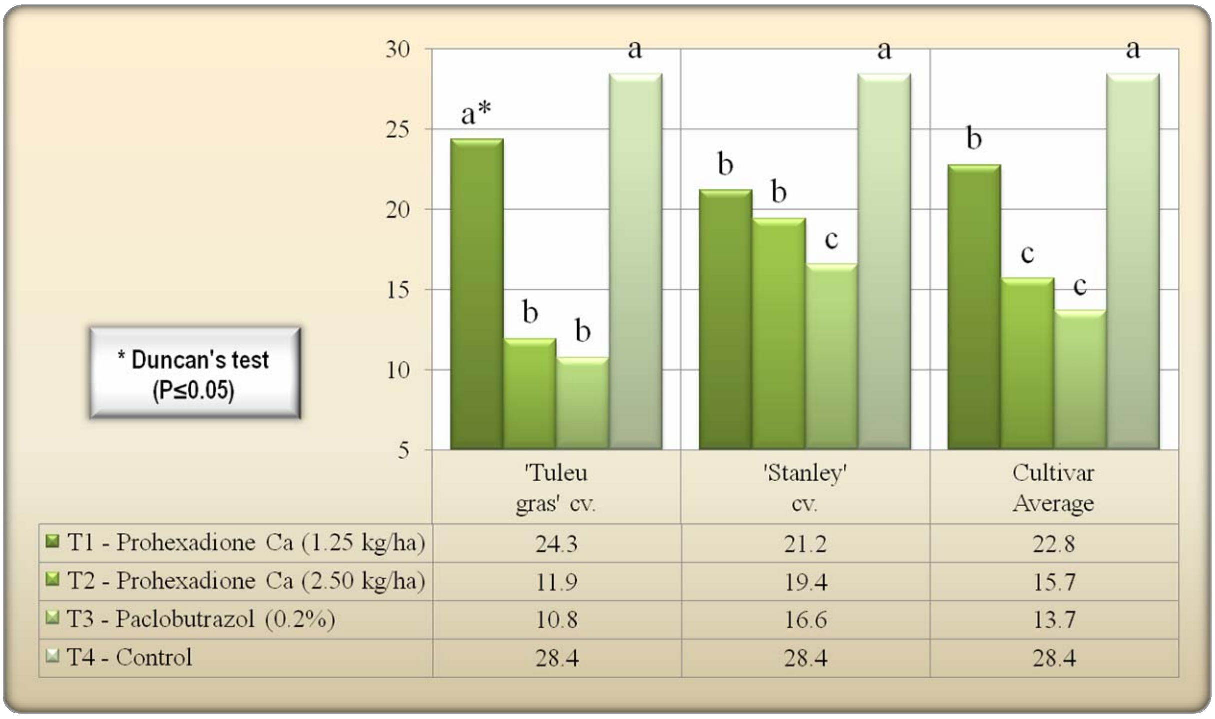
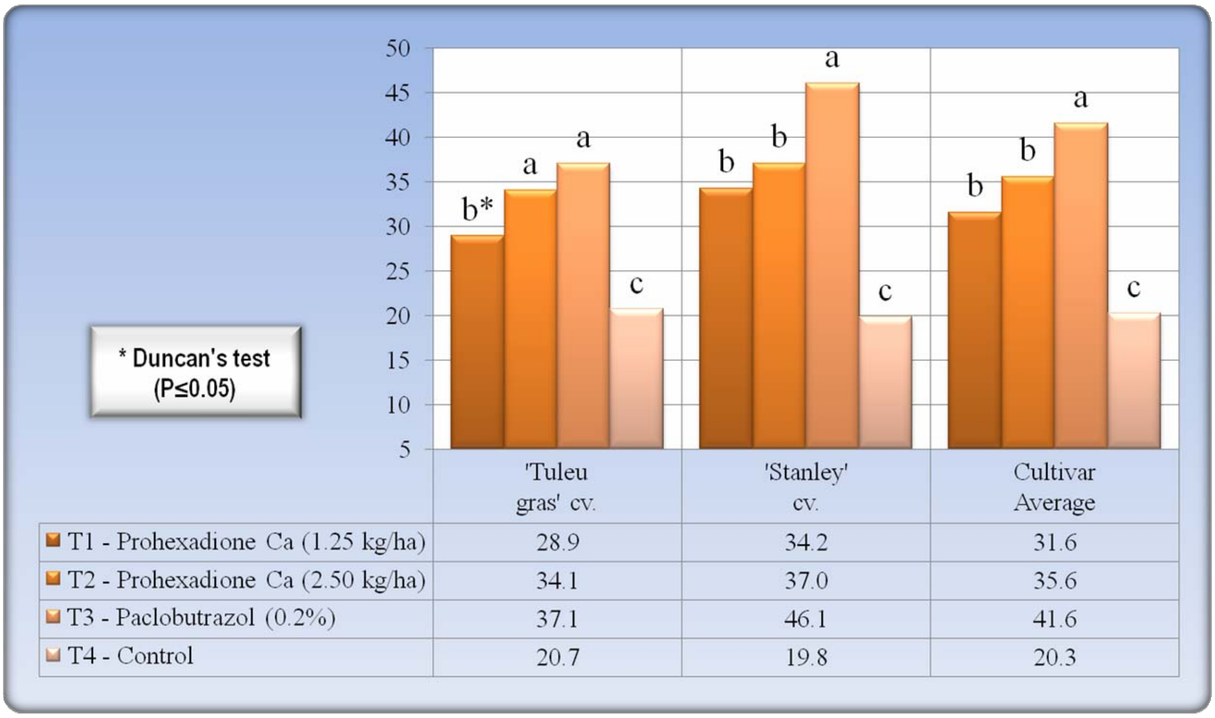
FIGURES



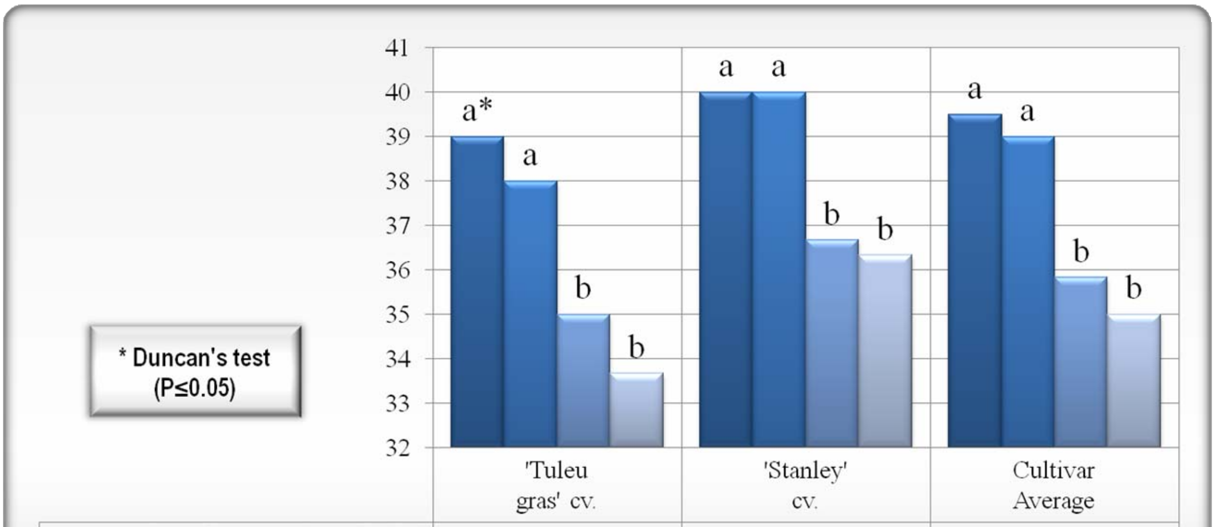
	'Tuleu gras' cv.	'Stanley' cv.	Cultivar Average
T1 - Prohexadione Ca (1.25 kg/ha)	24.3	21.2	22.8
T2 - Prohexadione Ca (2.50 kg/ha)	11.9	19.4	15.7
T3 - Paclobutrazol (0.2%)	10.8	16.6	13.7
T4 - Control	28.4	28.4	28.4

Fig.1. Effect of growth retardants on shoots length
(Tuleu gras and Stanley cvs.)



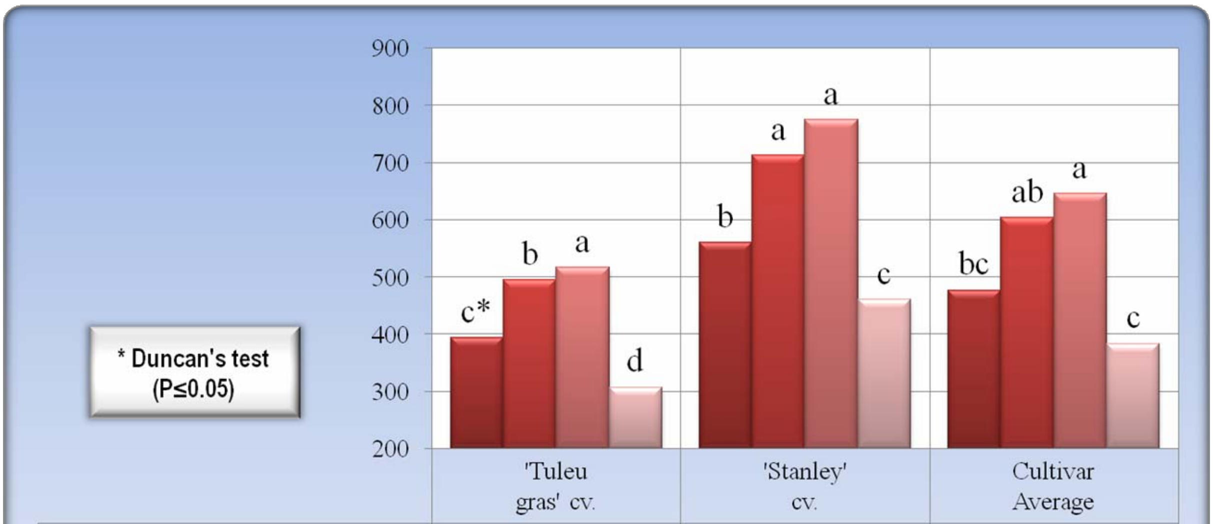
	'Tuleu gras' cv.	'Stanley' cv.	Cultivar Average
T1 - Prohexadione Ca (1.25 kg/ha)	28.9	34.2	31.6
T2 - Prohexadione Ca (2.50 kg/ha)	34.1	37.0	35.6
T3 - Paclobutrazol (0.2%)	37.1	46.1	41.6
T4 - Control	20.7	19.8	20.3

Fig. 2. Effect of growth retardants on yeld (kg/tree)
(Tuleu gras and Stanley cvs.)



	'Tuleu gras' cv.	'Stanley' cv.	Cultivar Average
T1 - Prohexadione Ca (1.25 kg/ha)	39.0	40.0	39.5
T2 - Prohexadione Ca (2.50 kg/ha)	38.0	40.0	39.0
T3 - Paclobutrazol (0.2%)	35.0	36.7	35.8
T4 - Control	33.7	36.3	35.0

Fig.3. Effect of growth retardants on mean weight (g)
(Tuleu gras and Stanley cvs.)



	'Tuleu gras' cv.	'Stanley' cv.	Cultivar Average
T1 - Prohexadione Ca (1.25 kg/ha)	394	560	477
T2 - Prohexadione Ca (2.50 kg/ha)	495	713	604
T3 - Paclobutrazol (0.2%)	517	775	646
T4 - Control	307	461	384

Fig.4. Effect of growth retardants on flower buds in the next year
(Tuleu gras and Stanley cvs.)

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Elements of the specific investment for the promotion in culture of the high density apple tree system

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Keywords: the highdensity apple tree system, specific investment, genetic disease resistant breeds.

ABSTRACT

The researches performed at the Tree Growing Research & Development Station Voineşti, by the creation in the year 2007 of an apple tree plantation in the the high density system, with an disease resistant assortment, open new perspectives for the extension of modern orchards in the private farms of our country's dedicated tree growing zones, which will reach the remarkable performances of the countries with a developped tree growing. The investment at the setting up of an apple tree hectar in the the high density system, wich raises to 135.000 lei (without the anti-hail system), can be recovered in a relative short time, respectively until the year 6 after plantation, having in view that the maitaining expenses are partially covered from the year 3 – and totally from the year 4 after plantation, due to the remarkable producţtions registred at the cultivatated assortment. The results obtained at the Tree Growing Research & Development Station Voineşti, recommend the extension in culture of the the high density apple tree system, due to the the high economical efficiency and also for the fact, that it permits the rapid adaptation of the assortments and of the technologies, in accordance with the requirements of the consumption and with the steady increasing general technical level.

INTRODUCTION

As everywhere in the agricultural production, also in the tree growing the most suitable solutions are searched for the increaase of the economical outputs per surface unit, by adopting new modern culture systems, wich shall assure quantitative and qualitative superior productions.

The modern apple tree culture systems, with a rapid fruit bearing start and with a short exploitation duration, represent a periodical and rapid replacement modality of the assortment, by which the introduction of modern technics and ideas in obaining productions adaptated to the exigences of the European quality standards is encouraged.

On the European level, the use of the midget graft bearer M9, of reduced vigour, has been generalized - with trees sustaining and irigation system, with the orchards covered with an anti-hail net. In the the high density tree growing exploitations in France, Italy, Germany, Spain, Swiss, etc., with densenesses of 2500-3000 trees/Ha, they obtain, year after yeear, remarkable performances, concretized in productions of 40-60 t/Ha.

The researches performed at the Tree Growing Research & Development Station Voineşti, by creating in the year 2007 an apple tree plantation in the high density system, with disease resistant assortments, will represent a model for the extension in the private farms of our country's dedicated tree growing zones, with the possibility to rapidly recover tyhe investments used at the creation.

MATERIAL AND METHODS

The reseasrches were organized at the Tree Growing Research & Development Station Voineşti in spring of the year 2007, following up the promotion of a the high density apple tree system, based on disease resistant breeds – and the adopting of some specific technological solutions, which have as an effect the early fruit bearing start and the permanent fructification on young wood.

The genetic disease resistant aple tree assortment proposed for experimentation: Redix, Iris, Real, Remar, Inedit, Luca, Rebra, Entreprise, Saturn, Golden Lasa, Goldrush, Ariwa, grafted on M9.

Thet trees were planted at a distance of 4x1 m (2500 trees/Ha), the crown form: Slender Sprindle.

The studies refer to the costs levels for the specific investmment at the creation of an the high density apple tree orchard, determined by registring the materials and labour consumtion on works groups, both at the creation - and annualy, during the tree vegetation, until the fruit bearing.

Also, at the apple tree assortment used for the orchard creation, there were followed up: the fruit bearing precocity, the productions level, the fruits quality in the years 2-3 after planting and other culture aspects, which represent factors which must be taken into account at the promotion in culture of the the high density system apple tree orchards.

The soil in the experimental lot was laid fallow on the interval and clean of weeds on the trees row; it is brown eumezobasic weakly pseudogleized, with a clayish texture, with a weak acid pH (5.7-5.9). The humus content is medium at the surface (2.0-2.9%), medium supplied with nitrogen and weakly supplied with phosphorus anf potassium.

The climatical conditions were favourable for the growth and for the fruit bearing of the trees, characterized by a medium annual temperature greater by 0.6^0 C, as compared to the zone's normal (8.8^0 C), with an annual rainfall sum of 693 mm.

For the pest combat, 6-8 treatments - only with insecticides - were applied. The other works were performed according to the technology specific for the the high density apple tree orchards.

RESULTS AND DISCUSSIONS

In Romania, after the year 1990, by applying the land fond laws, a part of the intensive apple tree orchards returned to the private producers. Presently, these orchards have grown old, they have an age of over 40 years, the trees have a low production potential, an inferior fruits quality – in limits that cannot be trespassed, indifferently of the level of the applied technologies.

The apple producers will be obliged in the next years to replace the old plantations with modern culture systems, with rapid trees fruit bearing, with breeds demanded by the consumers, those with a the high productivity, with fruits of superior quality, competitive both on the internal market and at export.

The high density apple tree system offers a greater easiness regarding the exchange of the assortment (due to the more reduced exploitation period of these orchards), the increased output at works performing (totally performed on the soil) and also quantitative and qualitative superior productions.

The promotion of the high density apple tree system, where disease resistant breeds are provided for, grafted on weak vigour graft bearers (M9), lead to the identification of new tree growing technologies, which have a positive impact in short time on the productivity increase in the new created plantations, with an immediate profitability in the agro-food chain: production, storage, sorting-packing, marketing. It is also born in mind to realize apple lots with reduced pesticide residues, more and more necessary in the consumers' diet.

The realization on European level regarding the apple tree culture, have reached nowadays remarkable performances in the great cultivating countries, both regarding the assortment and the culture technology.

By promoting the high density apple tree system in our country's consecrated tree growing regions, it is born in mind to rapidly replace the existing plantations, in decline, with the high performance plantations, which shall bear fruits from the second and the thirs year after plantation - and which reach the maximum potential in the years 5-6 after planting, with the obligation to clear the trees at the age of 15-16 years in view of the assortment's exchange, according to the requirements of the fruits market.

The results obained at the Voineşti Station in the period 2007-2009 are promising and mandatory to be followed up for establishing the level of the specific investment at the creation of the plantation - and the promotion in culture of the earlist and most productive breeds, which are suitable for the high density apple tree system.

The soil preparation for the planting consisted of clearing the the existenting orchard, filling up of the resulted unevenesses, the basic fertilization with complex NPK fertilizers, the ground broaching by ploughing at 40cm, performed with a couple of 2 tractors in november 2006, followed by levelling the surface, performed by 2 passes with the discs harrow in spring of the year 2007, before planting the trees.

The proper creation of the plantation was performed by picketing the ground at the planting distance of the trees, respectively at 4x1 m (2500 trees/Ha) and by the mechanized execution of the pits with a 40 cm diameter drill. At planting, seddling material from the field II of the nursery, rods shortened to 65 cm from the soil level, in order to realize the Slender Sprindlecrown form - were used. The trees planting was performed manually, the planting operations being exactly respected.

The installation of the sustaining system was realized in the year 2 after planting. The 3 m long frontal sustaining poles were burried 80 cm into the soil, being anchored – and the middle pols were planted at a distance of 20 m one from the other. Three wires were installed, the first disposed at 60 cm – and the others at a distance of 70cm one from the other.

Afterwards follows the technological roads and the irrigation system laying out for 1 Ha of orchard, the estimated values being provided for.

In the investment, the maintaining works in the year I and II after planting were also provided for, which were performed under the corresponding conditions.

The total specific investment for the creation of one hectar of the high density apple tree system, presented in the table 1, raises to 135.000 lei, where the anti-hail system may be added to, which is estimatedat at over 40.000 lei/Ha.

The presented data demonstrsted that the specific investment for the creation of the high density apple tree system on one Hektar is hitgh enough, but this can be returned in a relatively shor time, respectively until the year 6 after planting, the maintaining expenses being partially covered from the year 3 – and totally, from the year 4 after planting, through the obtained productions.

The productions obtained in the year 3 after planting demonstrate the excelent performances of the high density apple tree system, which can be extended in the consacrated tree growing zones, with the most productive breeds and with fruits with a quality corresponding to the requirements of the market.

From the apple tree breeds cultivated in the high density system, the Iris breed grafted on the graft bearer M9, has the tendency to bear fruit already from the year 2 after planting.

From the year 3 after planting, the 12 aple tree breeds with genetic disease resistance, grafted on the graft bearer M9, realized satisfactory produtions, having in view that at the planting, seedling material from the field II of the nursery, rods, without anticipated offshoots were used as support of the fruit bearing buds differentiation, already from the planting year.

From the data presented in the table 2, results that from the studied apple tree assortment, the earliest and most productive Romanian breeds are: Real (7.5 t/Ha), Inedit (6.5 t/Ha), Iris (6.3 t/Ha), Remar (3.8 t/Ha).

From the foreign breeds, are remarked, with productions in the year 3 after planting: Saturn (5.8 t/Ha), Ariwa (5.5 t/Ha), Golden Lasa (5.5 t/Ha), Goldrush (5.0 t/Ha).

In the conditions of the year (2009), with normal rainfalls, the fruits weight (g) was variable, comprised between 160 g at the Goldrush breed and 230 g at the Rebra breed. The trees being young, they realised fruits surpassing 170g, with a size corresponding to the trading standard. At the majority of the breeds, the fruits had a diameter of over 70 mm. The Goldrush and Inedit breeds present themselves with smaller fruits..

In the period of the experimentation, the studied apple tree breeds presented a very good resistance against scurf (*Venturia inaequalis*) and a reduced attack degree of mildew (*Podosphaera leucotricha*), in the conditions where only insecticides were used at performing the phyto-sanitary treatments. In the year 3 after planting (the first fruit bearing year), a contact product was used at the last treatment, in order to prevent the attack of *Gleosporium*.

After the crown volume and the appreciation of the fruit bearing buds differentiation degree, it is foreseen that in the year 4 after planting, at least 6-8 kg/tree are obtained, with 15-20 t/Ha, a production that will cover the maintaining expenses and will obtain a profit, which will be allocated for a part of the specific investment.

The introduction and the generalization of the the high density apple tree system, with disease resistant breeds, in the consacrated tree growing regions, creates the premises for obtaining of apple lots with reduced pesticide residues, benefical to the consumers.

By promoting the genetic disease resistant apple tree breeds, the treatments number in the orchards is substantially reduced, simultaneously with the lowering of the production costs.

The reults obtained at the Tree Growing Research & Development Station Voineşt*i*, recommend the extension in culture of the the high density apple tree system, due to the high economical efficiency – and also for the fact that it allows the rapid adaptation of the assortementand of the of technologies, in accordasnce with the requirements of the consumption and with the general, steadily increasing, technical level.

CONCLUSIONS

1. The specific investment at the financing of one Hectare of apple tree in the high density system, raising to 135.000 lei (without the anti-hail system), may be recovered in a relatively short time, respectively until the year 6 after planting, having in view that the maintaining expenses are partially covered from the year 3 – and totally from the year 4 after planting, due to the remarkable production registered at the cultivated assortment.

2. At the promotion in culture of the high density apple tree system it is mandatory to use weak vigour graft bearers (M9), a sustaining system and the dripping or the micro-jet irrigation.

3. From the studied genetic disease resistant apple tree assortment, the earliest and the most productive breeds, suitable for the promotion in the high density system are: Real, Inedit, Iris, Remar of the Romanian breeds and Saturn, Ariwa, Golden Lasa, Goldrush, from the foreign breeds, which realized productions of 3.8 – 7.5 t/Ha in the year 3 after planting and fruits with a quality, corresponding to the requirements of the market.

4. The high density apple tree system, where genetic disease resistant apple tree breeds are previewed, grafted on weak vigour graft-bearers (M9), with a density of 2500 trees/Ha (the distance of 4x1m), is recommended for the extension in our country's consecrated tree growing zones, due to the high economical efficiency, the modality of periodical and rapid assortment replacement and obtaining of apple lots with reduced pesticide residues, beneficial to the consumers.

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TABLES

Table 1.The specific investment for the creation of one plantation Hectare in the high density apple tree system (2500 trees/Ha)

Specification	Expenses (lei)			Total
	Materials	Manpower	Mechanical	
A. Financial investments - total	73335	10192	4989	88516
1. Ground preparation (including the basic fertilization)	2734	227	835	3796
2. Technological roads laying out (100 m)	3500	400	250	4150
3. Ground setting up for irrigation	12000	2500	1450	15950
4. Trees planting (including the seedling material)	38951	3345	1984	44280
5. Sustaining means	16150	3720	470	20340
B. Investments for maintaining – total	7970	5720	1640	15330
Year I	2570	2480	700	5750
Year II	5400	3240	940	9580
Investments A + B	81350	15912	6629	103846
Indirect expenses (30%)	x	x	x	31154
Total specific investment	x	x	x	135000

Table 2. The fruit production realized on the year l3 after planting at the genetic disease resistant apple tree breeds, cultivated in the high density system
= 2500 trees/Ha =

Nr.	Breed/graft-bearer	Production		Medium fruits weight -g -	Consumption period
		kg/tree	t/Ha		
1	Ariwa/M9	2,2	5,5	180	Winter
2	Golden Lasa/M9	2,2	5,5	178	Winter
3	Golsrush/M9	2,0	5,0	160	Winter
4	Enteprise/M9	0,5	1,3	195	Winter
5	Inedit/M9	2,6	6,5	170	Winter
6	Iris/M9	2,5	6,3	175	Autumn
7	Luca/M9	1,1	2,8	180	Winter
8	Real/M9	3,0	7,5	185	Summer
9	Rebra/M9	1,2	3,0	230	Winter
10	Redix/M9	1,1	2,8	185	Winter
11	Remar/M9	1,5	3,8	200	Autumn
12	Saturn/M9	2,3	5,8	188	Autumn
A V E R A G E			**4,5 t/Ha**		

The influence of the way of field fertilization and way of storage upon nectarines and peaches quality

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Keywords: peaches, nectarines, quality, storage

ABSTRACT

The market studies underline the more increased consumer exigency for the products that they buy. On the other hand, the most efficient factories and farms are situating the quality in the middle of their strategy, that one becoming a main aspect in the concurrence context, and sometimes, even a surviving condition. In the agro-food domain, the investment in quality is one of the best that a company can do, being a privileged way for dropping the production price, for maintaining their clients, for winning new positions on the market. The final aim is to make the company more competitive. But the resulted costs from non-quality can represent even to 5- to 30% from the business number, so an inefficacy activity (that determines the non-quality) costs as much as a good one (the one that determines quality), but the last one reduces the cost price while the first one it increases.

INTRODUCTION

The agro-food products quality in the nowadays context from Romania suppose an intense and long process, oriented to individual and collective mentality change regarding nutrition.

But nowhere in the world has the quality had no success, because of the mentalities change, being a very hard stuff, and nobody began with this one. But, through the day by day quality realization, from the obtained success was achieved close to close mentality changing.

Must be very well understood by all the participants on the agro-food chain, that first the quality is projected (e.g.: the correct culture placing and varieties choosing, defining the culture technology), after that is realized (respecting the culture technology) and at the end is appreciated (organoleptic and physical-chemical analyses).

The agro-food quality management system implementation is consisted today by a surviving in a concurrencies economical plan strategy, and “surviving is not compulsory”.

The realization of a quality production to correspond to retailers requests, imposes the respecting some standards, that on the European level were put in EUREPGAP norms, that in perspective will be adapted and known at world level as GLOBALGAP norms.

Fr the vegetable crops and fruit appreciation are used different specific criteria for each product that underline the most important characteristics depending on which is established its quality, according the present normative documents. According to these, the quality differentiates on categories or classes of quality. So, for example for the most horticultural crops as quality groups are considered: extra, I quality and II quality, and in some cases only I and II quality. Foreign writers (Ryall, A.L. and co, 1978; Ryall, A.L. and co., 1979; Kader, A.A. and co., 1985; Salunkhe, D.K., 1992) are synthesizing the following quality indicators, according to the maturity stage:

Technological indicators: the number of days from flowering to harvest, the sum of daily temperature degrees, endogenous ethylene, the production and capitalization technology differentiated on scope of use.

The visual aspect: the dimensions and weight, volume, form, exterior color, pulp color, compactness, external and internal defects, surface morphology and structure.

Texture: firmness, elasticity, freshness, crispiness, juiciness, hardness/fibers.

Aroma (taste, smell): astringency, phenolic substances content, acidity, sweetness, bitterness, aroma, the lack of taste and smell.

The nutritive value: starch content, hydro-soluble carbohydrates, other carbohydrates content, carbohydrates/acidity rapport, lipid-oil content, proteins, vitamins, mineral substances.

The ecological value: natural toxic substances, toxic substances contamination, mycotoxins, microbiological contamination.

MATERIALS AND METHODS

The experience was placed at Research and Development for Trees Culture Institute Constanta, from Valu lui Traian, at 12 km from Constanța, on Bucharest-Constanta national road. The geographical coordinates are: north latitude 44°10', east longitude 28°40' and with an altitude varying from 40-80 m altitude.

The experience took place in an intensive peach and nectarine orchard of 10 years old. Were studied 4 varieties: Cora and Delta for nectarines and Cardinal and Southland for peaches.

The fruit quality was determined not only at harvest time but also at the end of storage period.

The determination of the experience supposed: fruit average weight, fruit firmness and total titrable acidity. All the observations were done not only at the beginning of the storage period (at harvest) but also at the end of the storage period.

RESULTS AND DISCUSSIONS

Regarding the fruit average weight at harvest for Cardinal variety for foliar fertilization variant registered the highest values (126 g). The same was also for the other varieties, respectively Cora (155 g), Delta (141 g) and Southland (154 g). During the storage period, these values decreased due to water loss through transpiration.

Fruit firmness determination was realized with the penetrometer. Immediately after harvest, the Effegi penetrometer determined the following values: Cardinal variety, witness variant – 2,4 kgf/cm^2, V1- 3,4 kgf/cm^2, V2- 3,8 kgf/cm^2 and V3- 3,2 kgf/cm^2. higher values had the fruits of Southland variety (late maturity variety): 3,4 kgf/cm^2 for witness variant, and a little bit more higher were those for V3 (4,6 kgf/cm^2); V1 and V2 had the same value 4,7 kgf/cm^2.

Regarding the pulp firmness for the two nectarine varieties, the situation was as follows: the lower values - (1,15 kgf/cm^2 and 1,7 kgf/cm^2) were measured for Cora witness variant and V3 variant for Delta variety. While Cora variety reached values of 4,28 kgf/cm^2 at V3 and 3,37 kgf/cm^2 at V2, Delta variety had the highest value 2,7 kgf/cm^2 for V1.

These values decreased during storage period due to pectic substances solubilization and their transformation in soluble pectines under PME enzyme action. The values (at the end of the storage period) vary for Cardinal variety between 1,4 kgf/cm^2 for witness variant and 2,4 kgf/cm2 for V3. Southland variety registered a pulp firmness decrease varying between 2,7 kgf/cm^2 for witness variant and 2,9 kgf/cm^2 for V3. as was expected also for nectarine varieties, the pulp firmness decreased at the end of storage period, varying between 0,63 kgf/cm^2 for witness and 2,35 kgf/cm^2 for V3, for Cora variety and 0,93 kgf/cm^2 for V3 and 1,48 kgf/cm^2 for V1 variant.

The total titrable acidity, measured in malic acid was as follows: Cardinal V2 – 0,92% (at harvest) and 0,70% (at the end of storage period), Cardinal V3 – 1,26% (at harvest) – 1,07% (at the end of storage period); Southland V2 – 0,98% (at harvest) and 0,81% (at the end of storage period); Cora V2 – 0,99% (at harvest) and 0,80% (at the end of storage period) and V3 1,05% (at harvest) and 0,85% (at the end of storage period); Delta V2- 0,81% (at harvest) and 0,60% (at the end of storage period) and V3 -1,15% (at harvest) and 0,97% (at the and of storage period).

CONCLUSIONS

These results are showing the advantages of nectarine and peaces storage under refrigeration using micro perforated and semi-permeable plastic folium conditions that can assure the best humidity conditions and a gas modified atmosphere, favorable for fruit storage.

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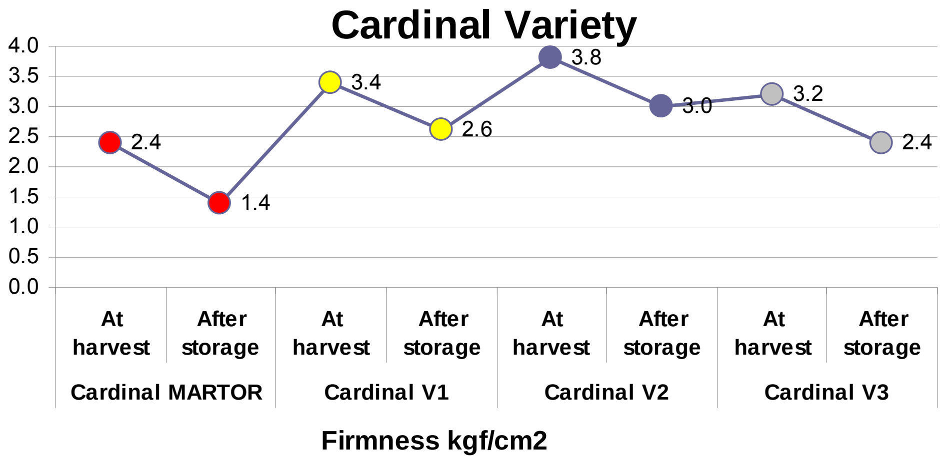
FIGURES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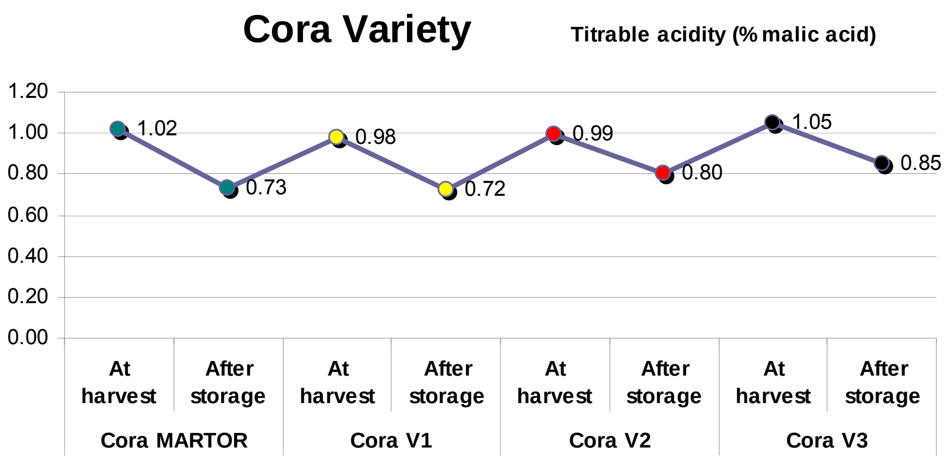
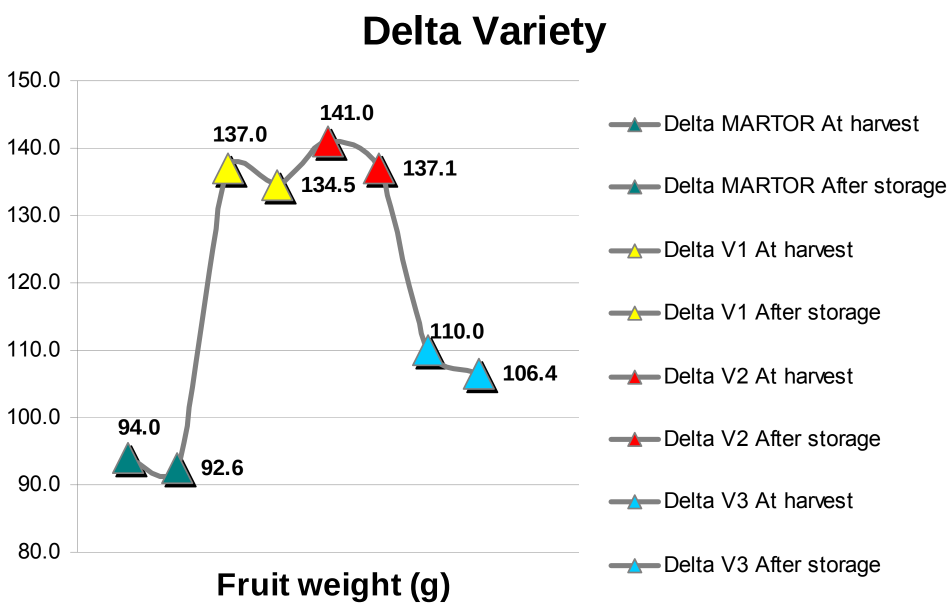
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2.4
1.4
3.4
2.6
3.8
3.0
3.2
2.4
At harvest
After storage
At harvest
After storage
At harvest
After storage
At harvest
After storage
Cardinal MARTOR
Cardinal V1
Cardinal V2
Cardinal V3
Firmness kgf/cm2


Cora Variety
Titrable acidity (% malic acid)
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1.02
0.73
0.98
0.72
0.99
0.80
1.05
0.85
At harvest
After storage
At harvest
After storage
At harvest
After storage
At harvest
After storage
Cora MARTOR
Cora V1
Cora V2
Cora V3


Delta Variety
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
94.0
92.6
137.0
134.5
141.0
137.1
110.0
106.4
Delta MARTOR At harvest
Delta MARTOR After storage
Delta V1 At harvest
Delta V1 After storage
Delta V2 At harvest
Delta V2 After storage
Delta V3 At harvest
Delta V3 After storage
Fruit weight (g)

Researches regarding the influence of some pre and post harvest technologies upon the quality and storage capacity of some peaches and nectarines fruits varieties

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Keywords: peaches, nectarines, quality, storage

ABSTRACT

Analyzing the content of the notion "quality" for horticultural crops, we have in aur minds, first of all, the value of use which expresses the possibility of use of a product that make it capable of satisfying a social need. In fact, the value of use differentiates the products from the same specie and even from the same variety before being used in a technological process, before being raw material, good and even final product.

Taking in consideration the dynamic aspect, the quality represents the entire characteristics that a product have them for satisfying a specific time, very well established, the buyer requests, facilitating the purchase of that product in spite of other similar product. Must be added the fact that about quality can't be spoken without reminding the complex and dynamic characteristic of it. As much the product is more perishable the time increases the transformation speed of its characteristics.

The dynamic characteristic of products quality expresses also on the human evolution, so its content evolutes step by step with the practical needs.

A main component in real matter of quality is the time, not only as period of product use, but also as product life cycle. So, the values of product use have also a dynamic characteristic that manifests multiple according to entropy law, the use values are in movement under transformations (usual degradable – A. Gherghi, 1999).

For the agricultural crops and in special for horticultural crops, the processes are only in a temporary equilibrium, conditioned. In this equilibrium ongoing interferes its passing from one system – the one of obtaining, of products, in the other system – of capitalization. (A. Gherghi, 1979, I. Burzo, 1983).

The products quality and especially for final products, prepared as goods through direct rapport to requests, is expressed by characteristics. On these is founded the differentiation of products quality, their classification in classes and quality categories.

In the products and services quality law, the characteristics are grouped in: technical, economical, psycho-sensory, social and esthetical. Some authors (I. M. Juran, F. M. Gryna) differentiate the quality characteristics after the following groups: technical characteristics, psycho-sensory characteristics, of reliability grouping them after their destination, in media work and individual consume objects characteristics.

TRENDS IN PRODUCTION DOMAIN

Peaches and nectarines are cultivated in over 70 countries on over all the continents. During the last 10 years, the world production increased with 53%, reaching the 18.3 mil tones level. The first four producers – China, Italy, USA and Spain – own over 60% from the entire surfaces cultivated and approximately 70% from the peach and nectarine global production. This increase is due to China (+150% during 10 years), while the production in the rest of the world increased only with 15%. In almost all the countries is attested a dynamic of increase of the harvest per hectare (+29% al world level).

China is the world leader for peach and nectarine production (8.6 mil tones or 46% of world production), followed by Italy, Spain and USA. Nowadays these countries are maintaining or are increasing the produced volumes, while ex big producers as France and Greece are reducing considerable the produced volumes. (Table 1). This fact is an indicator of specialization intensification, especially between the EU member states. Spain is the only European producer that enlarges constantly the surfaces of peach and nectarine orchards.

At world level, about 55% from peach and nectarine production is for industrialization and 45% is consumed as fresh.

Even if from botanical point of view, nectarines are only a subspecies of peaches, are considered a separate product in the international commerce with fresh fruits practice.

Additionally peaches are divided in 2 groups: with adherent essence and with essence free. Only European Union monitors systematically the production evolution on sub-categories. So, in 2008 in EU the production level for essence free peaches was 1536 thousands tones, for adherent essence peaches was 1094 thousands tones and for nectarines 1455 thousands tones. (Figure 1)

In Romania, in the same time with communist system disappearance in 1989, the total surface of peaches orchards was reduced drastically from 8.3 to 2.1 thousands hectares, and the volumes decreased continuously, from 81 thousands tones to only 12 thousands tones in 2008. Nowadays, the nectarine production volume is insignificant. (Figure 2)

TRENDS IN INTERNATIONAL COMMERCE DOMAIN

A big quantity of world production of peaches and nectarines reaches international market. So, in 2008 in international commerce were included 1.5 mil tones (18% from world production for fresh consume), which is with 25% more than in 2004.

In the same period, the peaches and nectarines exports values increased with a more advanced rhythm (+48%), being in 2008 over 1.8 billions USD. The average world price at which the export operations were made (FOB conditions) increased from 960 USD/tone in 2004 to 1200 USD/tone in 2008. The biggest peaches and nectarines exporter is Spain (547 thousands tones), followed by Italy, USA, Chile, France and Greece.

The main peaches and nectarines importers are developed countries from Europe and North America. During the entire period, Germany was the biggest world importer, but the imported quantity was about 275 thousands tones. In contrast, the second biggest importer, Russia, increases continuously the imported volumes (the imports doubled during 5 years). (Table 2 and Table 3)

Romania occupies the 12th place in the world fresh peaches and nectarines importers top. During the last 4 years, the annual imports oscillated around 30 thousands tone (60% from consume). In the imports structure is observed the continuously increase of nectarines share: from 17% in 2003 to 47% in 2008. Also, must be remarked the growth of the average price at import not only for peaches, but also for nectarines. (Table 4)

Greece is the main peaches furnisher (exclusively nectarines) for Romanian market – 57%, being followed by Serbia – 23%. Turkey is still a main furnisher yet, but the delivered volume is in continuously decrease. From prices point of view, Italy is in the upper part (1610 USD/tone), Greece and Turkey – in middle part – (750-100 USD/tone), and Serbia – in the lower part (350 USD/tone). (Table 5)

Greece is the main nectarines furnisher for Romanian market – 57%, being followed by Italy – 23%. From prices point of view, Spain is in the upper part (1600 USD/tone), Greece and Italy – in middle part – (1150-1300 USD/tone), and Turkey – in the lower part (800 USD/tone).

The seasonal imports analysis shows that peaches imports are especially in June-August period, and nectarines imports are in June-September period. (Figure 3 and Figure 4)

REQUESTS FOR PRODUCT AND PREFFERENCES

In general, peaches and nectarines imported from Greece, Italy or Spain are in the top market segment. The Turkish fruits are considered of medium quality, while Romanian products are in the last places. An important aspect not only for importers, but also for consumers is the price, motif by which nectarines and peaches cheaper from Greece dominate the market compared with the same products from Italy or Spain. From the same motif peaches and nectarines from Italy and Spain were replaced in short time by cheaper products from Serbia. Other determinant factors in consumers' choice are the color, dimensions, shape and the taste of fruit. Romanians prefer better red-yellow peaches and nectarines, the pale ones giving the impression of un-ripened.

The dimensions. All the respondents consider the fruits with big dimensions as elite fruits. There exists a positive correlation between the dimension and the price of peaches and nectarines. The commercialized imported fruits in the distribution network aren't smaller than 60 mm, always well calibrated (homogenous dimensions for fruits from the same box) being imported from Greece and Italy.

The packaging. The importers majority affirmed that the packaging doesn't matter so much; it must only to protect the fruit, to prevent its alteration. Although, trying to enter the top market segment, the products must be adequately packed. Usually, the imported peaches and nectarines are in the market in wood cases arranged in 2 layers and separated in cells. So the fruits aren't pressed and can't touch between them. The standard dimension for the case is 500x300x160 mm, with 11/12 kg weight, depending on fruit dimensions. Another case type has the same dimensions 500x300 mm, but 300 mm height containing 4 layers of peaches weighting about 20-21 kg.

The Logo/Brand. For Romanian consumers, the fruit producers don't matter. There is no preference for a brand or producer company. The consumers prefer not to loose time with logos and labels.

The origin country. For the consumers doesn't matter the origin country when they choose nectarines and peaches. Importers and distributors are making the selection only on the basis of quality and price criteria, although, nectarines from Greece, Italy and Spain are considered, usually, of a very good quality. The Turkish fruits are of a medium quality, while Romanian products are of a lower quality.

Quality requests. All the respondents mentioned about quality importance. Peaches and nectarines commercialized in big networks are usually of superior quality (1st or extra category, according to European standards). The 1st category is characterized by:

- Specific fruit dimensions and shapes
- Specific variety color
- Lack of exterior defects, the quality, the storage period and the packaging
- Specific storage conditions before and during distribution

Varieties and trends. The first 2 varieties in the biggest importers from Romania preferences top are Redhaven (peach), cultivated in the hole world, and Stark RedGold (nectarine). Other mentioned varieties were: Spring Crest, Sun Crest and Fayette.

All peaches and nectarines are classified according to 2 main parameters:

- Pulp color – white or yellow and
- Pulp and essence cohesion – strong, medium and free

Peaches and nectarines with yellow pulp have surface color red or orange; peaches and nectarines ripened with white pulp have different red nuances skin, on a yellow-green surface.

The varieties with white pulp are more delicate, and an inappropriate treatment can damage the skin and pulp. The varieties with yellow pulp dominate peaches and nectarines imports from Romania because they are more attractive and less sensitive compared with the pale varieties considered by the consumers being un-ripened.

Prices. The prices vary considerably depending on season and climacteric conditions registered in a specific year. Usually, nectarines are with 20-40% more expensive than peaches. The lowest prices are registered usually at the beginning of September when on the market can be found early and autumn varieties. The difference between early and autumn varieties can reach 300% (1.5 USD for 1 kilo of early variety fruits compared with 0.5 USD for 1 kilo of autumn variety fruits). In November the prices increase reaching about 1.5 USD/kg, after which increase rapidly before Christmas and New Year, reaching 10-15

USD/kg in the period of 20 December-end of January. At the end of January, the prices begin to decrease at 1-1.5 USD/kg.

Note. The numbers reflect the prices from 2008 from open markets from Bucharest; the prices from en-details vendors are usually bigger in June-October period, being at the same level or decreasing during the rest of year months.

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*** EUROSTAT ComExt http://epp.eurostat.ec.europa.eu/newxtweb

*** EU Export Helpdesk http://exporthelp.europa.eu

TABLES

Table 1 – Peaches and Nectarines Global production (thousands tones)

Nr.	Country	2004	2005	2006	2007	2008
1	China	7.040	7.649	7.829	8.032	8.600
2	Italy	1.710	1.693	1.665	1.719	1.680
3	Spain	988	1.231	1.256	1.150	1.200
4	USA	1.430	1.302	1.133	1.009	1.171
5	Greece	876	817	712	700	704
6	Turkey	372	510	553	558	562
7	France	397	400	401	401	405
8	Iran	390	390	390	390	415
9	Egypt	361	360	360	365	375
10	Chile	311	315	320	330	345
	Other	2.821	2.932	2.885	2.803	2.873
Total World		**16.595**	**17.600**	**17.502**	**17.457**	**18.330**

Source: FAOSTAT and FAS USDA

Table 2 – The main peaches and nectarines exporters (thousands tones)

Nr.	Country	2004	2005	2006	2007	2008
1	Spain	276	424	545	521	547
2	Italy	407	426	360	373	327
3	USA	112	117	97	117	129
4	Chile	114	110	97	98	106
5	Greece	98	103	81	83	102
6	France	66	69	71	60	53
7	China	16	17	20	24	28
8	Turkey	20	39	39	19	22
9	Holland	18	22	21	19	21
10	Argentine	9	11	17	16	19
11	Jordanian	4	6	10	13	19
12	Belgium	12	18	19	21	17
	Other	53	78	92	107	112
Total World		**1206**	**1441**	**1470**	**1470**	**1501**

Source: UN Comtrade

Table 3 – The main peaches and nectarines importers (thousands tones)

Nr.	Country	2004	2005	2006	2007	2008
1	Germany	262	305	297	249	263
2	Russia	77	101	132	133	160
3	France	89	115	139	108	132
4	Holland	38	50	42	84	92
5	Poland	65	79	61	97	81
6	Great Britain	90	97	93	87	72
7	Italy	46	61	80	56	67
8	USA	75	72	60	60	63
9	Canada	63	65	56	60	62
10	Belgium	42	50	55	51	51
11	Portugal	31	31	31	35	28
12	Romania	15	33	29	30	25
	Other	312	384	394	419	405
Total World		**1206**	**1441**	**1470**	**1470**	**1501**

Source: UN Comtrade

Table 4 – Peaches and nectarines imports evolution in Romania

	2003	2004	2005	2006	2007	2008
PIERSICI						
Volumul importurilor (tone)	1,947	11,241	20,833	19,375	16,296	13,559
Valoarea importurilor (mii USD)	439	2,475	5,616	4,920	11,002	11,444
Preţul mediu de import (USD/tonă)	225	220	270	254	675	844
NECTARINE						
Volumul importurilor (tone)	431	4,219	11,672	9,298	14,035	11,892
Valoarea importurilor (mii USD)	115	1,144	3,578	3,453	12,969	14,424
Preţul mediu de import (USD/tonă)	267	271	307	371	924	1,213
TOTAL PIERSICI + NECTARINE						
Volumul importurilor (tone)	2,378	15,460	32,505	28,672	30,331	25,451
Valoarea importurilor (mii USD)	554	3,619	9,194	8,373	23,971	25,868

Sursa: EUROSTAT ComExt

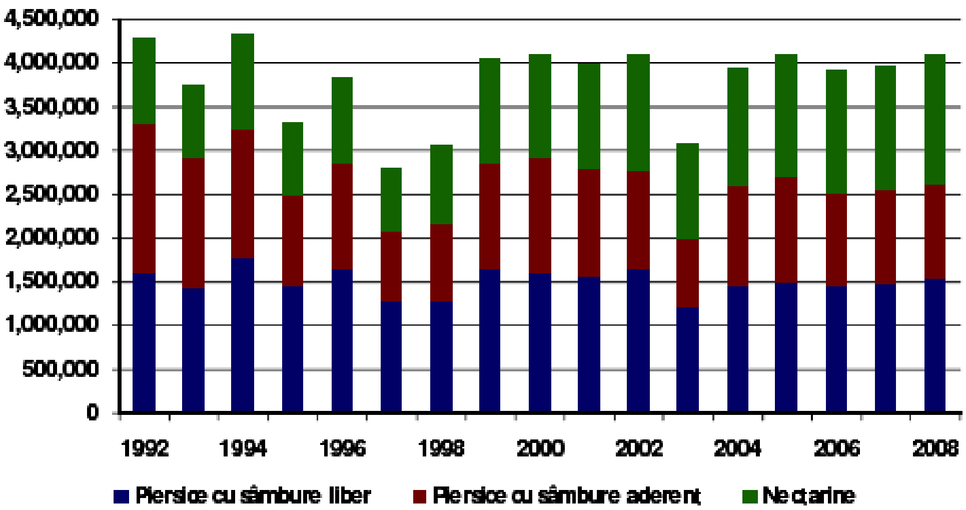
Table 5 – Peaches and nectarines imports evolution in Romania (tones)

	2003	2004	2005	2006	2007	2008
PIERSICI						
1. Grecia	280	7,714	13,964	8,518	10,671	7,902
2. Serbia			2,810	5,815	3,120	3,132
3. Italia	22	262	351	936	790	865
4. Turcia	1,224	207	3,208	2,448	785	674
NECTARINE						
1. Grecia	24	3,755	8,545	5,451	7,470	6,734
2. Italia	75	333	1,740	1,730	3,148	2,721
3. Spania	22	19	617	899	2,306	1,307
4. Turcia	271	50	689	962	471	655

Sursa: EUROSTAT ComExt

FIGURES

Fig. 1 – Peaches and nectarines harvest evolution in European Union (tones)



Sursa: Forumul Internaţional Europêch' (http://www.europech.com)

Fig. 2 – Peaches harvest evolution in Romania (thousands tones)

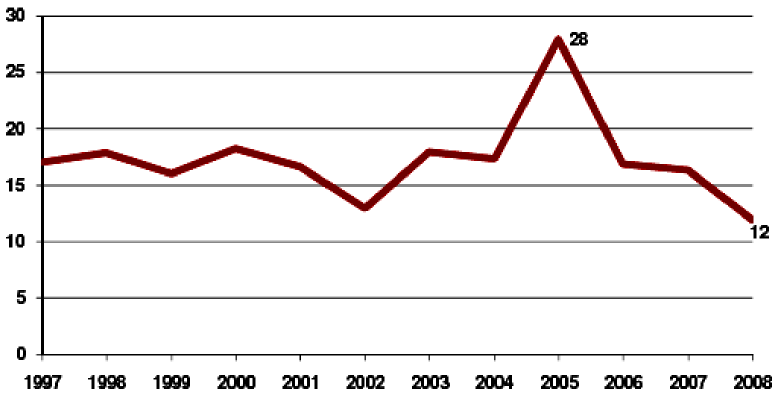


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Figure 3 – Peaches seasonal imports

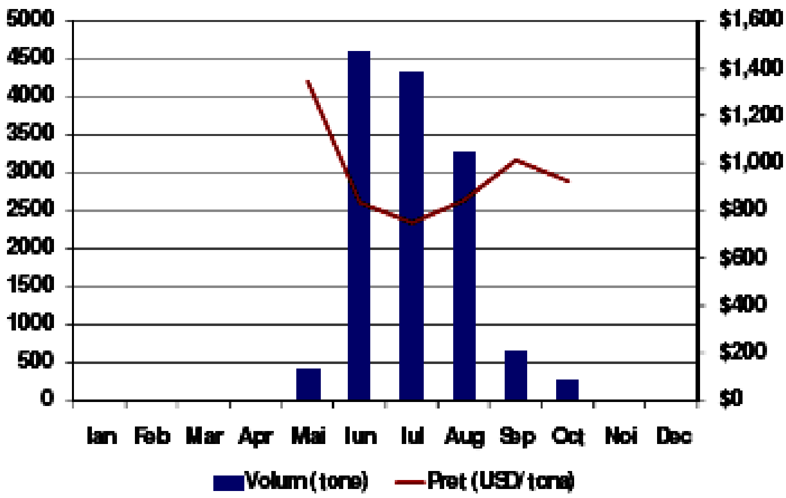

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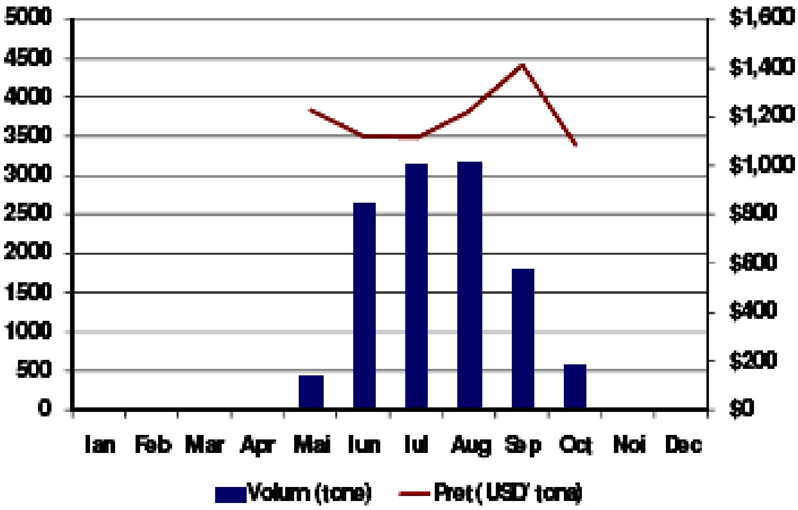
Figure 4 – Nectarines seasonal imports



Sursa: EUROSTAT ComExt

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Behaviour of new apricot selection in conditions of Băneasa Research Station

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Keywords: apricot, breeding, quality, phenology

ABSTRACT

Apricot is a species less cultivated than other Prunus species, particularly peaches and plumps. This stonefruits species is a typical temperate fruit crop which has been dispersed and has become well adapted in the countries surrounding the Mediterranean Basin. Consequently, in spite of being spread geographically, apricots have not become pomologically important except in areas with special ecological conditions.

In our country although favorable climatic conditions of apricot culture there are only in south-west and west has become a important economical species.

The Research Station for Pomiculture Baneasa have an important role both implementation and extending valuable varieties from mondial collection but through breeding of new apricot cultivars.

Cultivars studied in this work were chosen as representatives of different flowering times, ripening date and productivity. Each selection is represented by five trees, considerable differences in time and in intensity of blooming, ripening period in other characteres were observed in two seasons.

Selections studied were very productive in the years of investigation. The biggest fruit were produced by 83.7.28 BI and 84.4.41 BIV selection. The influence of the cultivar was more determinant than the seasonal effect on fruit yield.

INTRODUCTION

Apricot seems to be a species which still has plenty of scope for genetic improvement, with respect to environmental adaptability, resistance to diseases and fruit quality, and with prospects also for improving fruit quality for specific processed products, such as juice, dried fruit and canning (Krska et al., 2006).

In general, we refer to breeding of the apricot species, in reality we are referring to the new genotypes produced to satisfy human requirements and thus they should possess those characteristics currently in demand. (Balan et al., 1999).

Such characteristic include greater size, more colour and greater yield, which are often of little relevance to the survival of the species, and which sometimes, are in conflict with it since the achievement of many of this a objectives inevitable requires human involvement (Egea &Burgos,2001)

Thus, it is important to realise new apricot selection with quality characteristics to satisfy consumer demands and also to contribute to extansion of consumption period through introduction of cultivar with mid season and late maturity

The aim of this study are to evaluate the behaviour of new apricot selections in field of Research Station Baneasa from south region of the country, from point of view of productivity and quality of fruits.

MATERIAL AND METHOD

Apricot selection studied in this work were evaluated in a experimental field of the Research Station for Pomiculture Baneasa, region with a temperate climate

The three selections and two cultivars studied have different periods of ripening: with mid season 85.11.85 BIII and Excelsior and with tardive maturity 82.4.41 BIV; 83.7.28 BI and Litoral. Each selection is represented by five trees.

The trees of the apricot cultivars were planted at a distance de 4x4metres and the training system adopted was free crown

We observed in two season characteristics concerning trees (flowering and ripening period, productivity) and concerning fruit quality (shape, average fruit weight, soluble solids, titratable acidity).

Fruit size was measured with the help of Vernier's Caliper. Twenty fruits were measured diametrically from each variety and average size was worked out. Data on fruit weight and yield were recorded by weight 30 fruits from each variety and average fruit weight was calculated. Average fruit weight was multiplied by the number of fruits on a tree to determine the total fruit yield and it was expressed in kg per plant.

Total soluble solids (TSS%) were determine with the help of hand-refractometer and the readings corrected to 20^0C. Total titratable acidity was determined by titrating a known volume of juice extracted from randomly selected 25 fruits with 0,1N NaOH solution using phenolphthalein as a indicator and was expressed as percent of malic acid. The fruit firmness was recorded with the help of penetrometer (Fruit tester FT 327).

The performance of the introduced varieties was compared with the already recommended cultivars with the same ripening period, which are grown at Research Station for Pomiculture Baneasa

RESULTS AND DISCUSSIONS

Full bloom, fruit maturity and number of days for fruit maturity

Data in table 1 show that 85.11.85 BIII was the earliest to bloom with a mean full bloom date of April 2, alike Excelsior cultivar (check for mid season). It was followed by mean full bloom date of April 4 of Litoral (check for late ripening). The last to attain full bloom were 82.4.41 BIV and 83.7.28 BI selection. Thus, full bloom date has been in 1st week of April.

Excelsior fruits were the earliest to mature with a mean date of maturity on July 10. It was followed by 85.11.85 BIII selection with mean date of fruit maturity on July 12. 83.7.28 BI and 82.4.41 BIV were the last to mature with mean date of maturity July 18 more than three days as check Litoral cultivar.

The differences among the cultivars for maturity date are thought to be due to differences in their heat unit requirements, and their metabolism (fast or slow).

The mean number of days taken for fruit ripening among different varieties varied between 99 to Excelsior and 104 to 82.4.41 BIV.

Like full bloom and fruit maturity dates, the number of days for maturity also varied. This variation does not seem to have any relationship with the time of flowering and may be attributed to the fulfillment of heat required for fruit maturity. These results are in accordance with those of Costes, (2004) and Couranjou, (1995).

Fruit weight

The different apricot selection tested in this study showed significant variation in the average fruit weight (table 2). Fruits of 83.7.28 BI selection were significantly heavier (89 g) than those of 85.11.85 BIII (55 g), 82.4.41BIV (70 g). Differences in the genetic constitutions of varieties and the crop load effect appear to be responsible for variations in the mean fruit weight.

Index value as derived from measurements of height and two diameters led to the determination of fruit shape. Thus, the selection 85.11.85 BIII, shape index had values around 1 (1,05) round fruit characteristic. Values higher than 1 as was recorded in 82.4.41 BIV (1,13) and 83.7.28 BI (1,20) corresponds ovoid fruits.

The selection with mid season 85.11.85 BIII recorded a fruit yield of 22kg/tree was higher compared with the check Excelsior cultivar. The selection with tardive maturity fruit yield was close to the value. Thus, 82.4.41 BIV recorded 17.3 kg/tree and 83.7.28 BI recorded 17.6 kg/tree compared to the production of the check was 15 kg/tree.

Performance records over the two years (2008-2009) showed that Total Soluble solids content do not differ significantly among the varieties and selection evaluated except 85.11.85.BIII selection which has a lower content over the other varieties studied. (figure 1). However, year to year variation among varieties was quite evident. Quantitatively, the range of TSS values, varied narrow limits between 17.2- 21.5 $^{\circ}$ Brix. The highest TSS (21.5 $^{\circ}$ Brix) were recorded in 82.4.41 BIV followed by 83.7.28.BIII (20.9 $^{\circ}$Brix).

As for the acidity, a little difference have been found among the different varieties evaluated (Fig 1). Over the two years period, the highest mean fruit acidity of 2.29% was recorded in Excelsior cultivar. It was significantly higher than the fruit acidity in 83.7.28 BI (1.38%), 82.4.41 BIV (1.46), Litoral (1.50) and 85.11.85 BIII (1.67).

Like TSS, year to year variation in fruit acidity was also evident in all the varieties evaluated.

Fruit firmness

Fruit firmness data for two years period (2008-2009) in Figure 1 show that 85.11.85 BIII fruits had the highest mean value of 1.8 Kg F/cm^2 which was significantly better than the firmness values of Excelsior cultivar, 82.4.41 BIV and 83.7.28 BI selection.

Within varieties, year-to-year variations in the fruit firmness values were evident and they were evident and they were expected due to small sampling errors.

CONCLUSIONS

Data of Excelsior and Litoral cultivars with respect to various traits were compared to the selections 85.11.85.BIII, 82.4.41 BIV and 83.7.28. BI. All three selections studied has around 100 days from full bloom to fruit maturity.

Average yield of 85.11.85.BIII were recorded as 22 kg per tree whereas it was 17 kg in Excelsior.

Fruits of 82.4.41 BIV and 83.7.28. BI was larger in size, had higher TSS/acid ratio and better firmness than Litoral.

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TABLES AND FIGURE

Table 1. Phenological data of apricot selection and cultivar evaluated in this study

Cultivar	Full bloom mean date	Fruit maturity mean date	Days from full bloom to maturity
Excelsior(M)	**2.04**	**10.07**	**99**
85.11.85 BIII	**2.04**	**12.07**	**101**
Litoral (M)	**4.04**	**15.07**	**102**
82.4.41 BIV	**5.04**	**18.07**	**104**
83.7.28 BI	**5.04**	**18.07**	**103**

Table 2. Variation biometric and production atributes of selections studied

Selection	Mean fruit weight (g)	Mean fruit height (cm)	Fruit diameter (cm)		Form	Production	
			large	small		kg/tree	To/ha
Excelsior(M	70	5,0	4,5	4,4	1,12	17,0	10,62
85.11.85 BIII	55	3,5	3,3	3,2	1,05	22,0	13,75
Litoral (M)	65	4,5	3,8	3,6	1,21	15,0	9,37
82.4.41BIV	70	5,06	4,6	4,3	1,13	17,3	10,83
83.7.28 BI	89	5,46	4,76	4,26	1,20	17,6	11,04

The results presented are average of two years

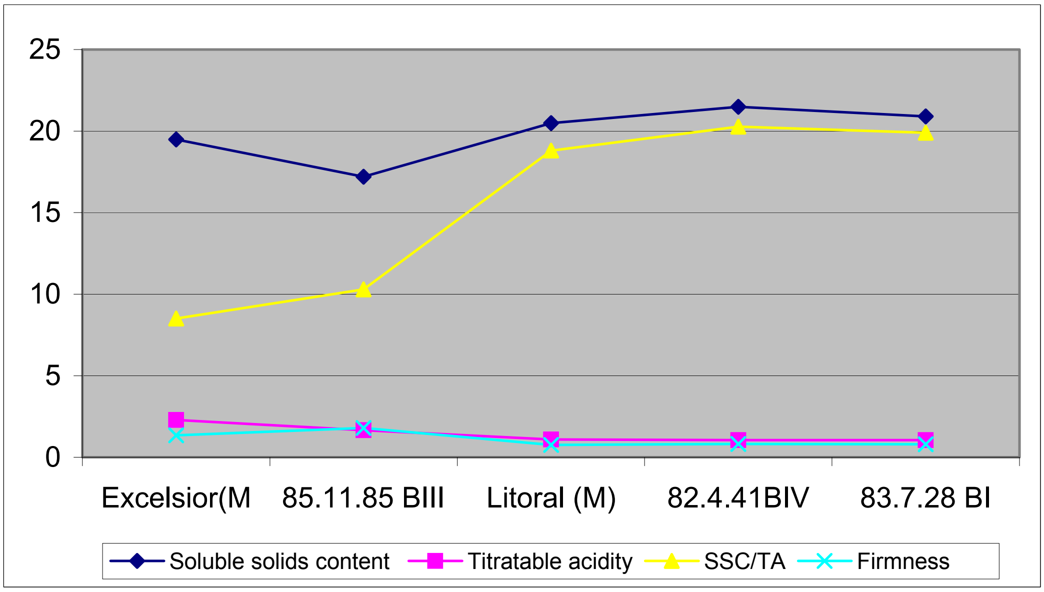

Fig. 1. Variation of physico-chemical parameters of apricot varieties evaluated.

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The rational use of the sprinkling machines in tree growing, in view of reducing the environment pollution

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Keywords: combat; pesticides; norm; diverting; parameter;

ABSTRACT

The pollution is a problem in all times, but especially in our time, because the magnitude and the gravity of the pollution processes, the scientific and technical achievements of modern man, permitted the development of the pollution risks – and consequently one forgets to take particular severe measures for the prevention and the combat of the degrading of the environment, with its three components – air, water, soil. Notwithstanding all the progresses realized in the direction of the biological pests combat, of creating diseases and pest resistant breeds and of perfecting the non-polluting combat means, until now the integrated diseases and pests combat in tree growing, without chemical treatments, is not realized satisfactory. The chemical combat continues to remain - with all the risks related to the environment pollution by using toxic pesticides with a long remanence – one of the major ways to assure and to increase the fruit production level. Due to the ease of applying, the dosage preciseness and the high productivity, applying the phyto-pharmaceutical products under the form of sprinklings continues to constitute one of the most efficient preventive and curative combat methods, used in tree growing. Applying the treatments for the diseases and pests combat with pesticides, using classical sprinkling machines with hydraulic or pneumatic spraying, leads to an efficient combat, when superior qualitative values are obtained – and it is a very precise one, regarding the distributed pesticide quantity per hectare. The paper proposes the knowledge of the main constructive and functional parameters of the sprinkling equipments in tree growing, on which it is necessary to intervene, in order to reduce the environment pollution

MATERIAL AND METHOD

To analyse the problem of the environment pollution due to the use is based on the investigation of the constructive and functional parameters of the T1200.32 sprinkling machine. In view of the determination of the constructive and functional parameters, which influence the treatments quality - and implicitly the environment pollution degree - the working qualitative indices, the solution norm, the drops size, the working height of the spraying devices were followed up. The unit formed by the tractor U445 DT and the sprinkling machine T1200.32, used for establishing the constructive and functional parameters which influence the treatments quality, is presented in the picture 1. The determination of the constructive parameters and of the qualitative working indices were performed on the trees lots of the apple tree improvement laboratory collections in the framework of the S.C.D.P. Voineşti. For the determination of the qualitative working indices, the following materials and appliances were used. The determination of the drops size, of the variation coefficient and of the treatment uniformity was performed using the CIBA-GEIGY method, by capturing the drops on hydro sensitive paper lamellas. In view of the working height determination of the spraying device, hydro sensitive paper lamellas and indicator strips were used, the fixing mode being presented in the picture.2. In order to determine the wind speed in the moment of performing the experiment, a Vento meter appliance was used.

RESULTS AND DISCUSSIONS:

For the identification of the main constructive and functional parameters of the T1200.32, which leads to obtaining some superior qualitative working indices and implicitly to the environment pollution reduction, the following parameters were determined: the solution norm, the drops size and the treatment uniformity, the working height of the spraying device. An important value, which influences the economical treatment and which leads to the environment pollution reduction, is the solution norm. The solution norm per hectare was determined depending on the machine flow rate, the nozzles type, the distance between the rows and the movement speed. The working pressure was comprised between 5 – 20 bars, the device being equipped with 14 nozzles (TIFONE). The solution norms are presented in the table 1.

The drops size was determined from the lamellas fixed in the trees crown - and also on the soil. In order to determine this parameter from the fixed lamellas, a number of 5 lamellas were chosen. The choice was made from the lamellas with a medium deposit, in order to establish how the agro technical requirement, regarding the drops number per surface unit, is fulfilled. The lamellas, fixed on the trees at performing the treatments with liquid norms of 400 and 600 l/Ha, were analyzed. The drops size was comprised between 100 and 300 μm.

The solution losses on the soil were determined by fixing eight hydro sensitive paper lamellas. Analyzing their drops deposits, it can be observed that a percentage of ca. 30% of the drops are not retained by the trees foliar apparatus and fall on the soil, leading to the environment pollution. By studying the covering of the lamellas with drops on the soil, it can be observed that their size is classified into:

- drops with a diameter below 100 μm, which have no impact energy with the leaves;
- drops with diameters comprised between 100 and 200 μm, which pass trough the foliar apparatus, without being captured;

The treatment uniformity at the spraying system of the s T1200.32 machine is of 95.31%, with a variation coefficient of 4.69%.

The working height of the spraying devices was determined in the working lot by fixing of hydro sensitive paper lamellas and indicator strips on the whole height of the trees (picture 2). The lamellas and the indicator strips were fixed on the highest trees of the working lot. The working height was established depending on the drops number existing on the lamellas and the position of the indicator strips in the air flow. Thus it resulted that the lamellas fixed at the highest height, which captured the minimum drops number, previewed in the agro technical requirement (70 drops/sq.cm.), represent the working height.

The assurance of a minimum efficiency of the treatments in tree growing can be appreciated by the recovering degree, a value that shows what proportion of the total liquid quantity (solution), administered on the surface unit, is found again on the foliar apparatus of the trees and produces the desired biological effect. The value of this value is influenced by the dispersion degree, characterized by the medium size of the drops diameter and the dispersion uniformity, which characterizes the share of the drops with the same diameter, which coexist at a certain moment in the dispersed liquid jet.

CONCLUSIONS

Following the experiments performed with the T1200.32 sprinkling machine, equipped with an axial fan and hydraulic spraying, in view of the identification of the constructive and functional parameters, which influence the treatment quality and - implicitly - the environment pollution degree, the following resulted:

- the liquid quantity, flown from the foliar apparatus on the soil, leads to the environment pollution and is so much greater as the liquid norm is greater;
- the solution norm depends on the flow rate of the sprinkling machine, the motion speed and the working width. In order to assure an as low as possible solution norm, the main parameter, where one intervenes, is the flow rate of the sprinkling machine;
- the flow rate of the sprinkling machine is influenced by the flow rate of each nozzle;

- the dispersion losses manifest themselves in two modes: losses due to the evaporation of the volatile solution components – and losses due to the carrying away of the solution outside of the foliar apparatus of the trees. The second component can be reduced by establishing the working height of the spraying devices (the inferior and the superior part of the foliar apparatus);
- In order to reduce the evaporation speed (reducing the speed relative to the atmosphere) of the drops, it is necessary to correlate the fan flow rate with the flow rate through the nozzles.

By a rational use of the sprinkling machines in tree growing, one reduces the negative effect of the pesticides on the environment, which increases with the pesticide quantity surpassing the admitted limit.

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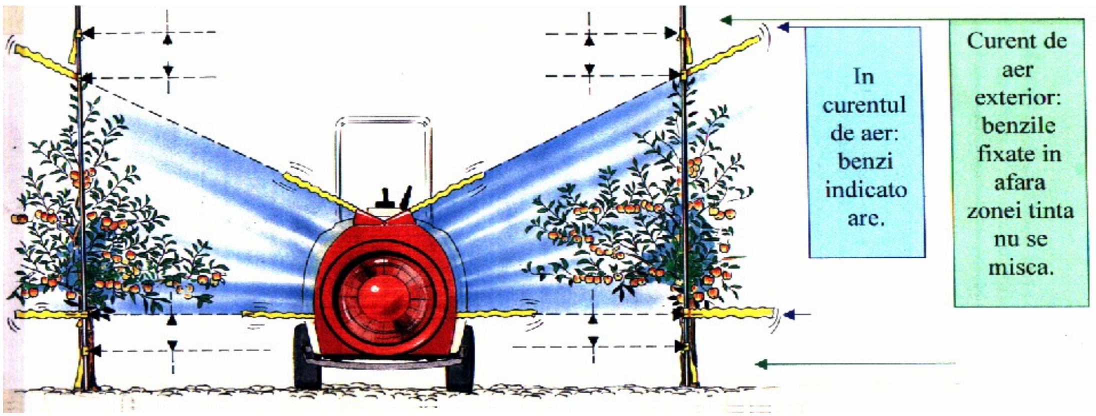
Table 1. Rules of the solution made the car equipped with nozzles spraying T1200.32 Gauze

Pressure (bar)		ϕ 0.8 mm nozzles				ϕ 1mm nozzles			
		5	**10**	**15**	**20**	**5**	**10**	**15**	**20**
Flow rate (l/min)		0.49	0.67	0.87	0.98	1.14	1.76	2.09	2.40
Working speed (km/h)	**Distance between rows (m)**	**Liquid norms (l/Ha)**							
4.14(IIi)	**4**	255	340	400	500	580	840	1000	1250
	6	170	225	270	340	480	580	640	820
	8	112	170	200	250	390	425	500	610
5.69(IIIi)	**4**	185	250	290	370	425	620	670	910
	6	123	165	195	250	285	420	500	610
	8	92	125	145	175	210	315	370	460
7.54(IVi)	**4**	140	180	220	275	320	550	560	680
	6	93	120	150	185	210	370	370	450
	8	70	90	110	140	160	240	280	340

Picture 1 –The unit tractor U445DT and sprinkling machine T1200.32



Picture 2- The fixing mode of the indicating stripes
In curentul de aer; benzi indicatoare = in the air flow; indicator stripes
Curent de aer exterior: benzile fixate in afara zonei tinta nu se miscã = exterior air flow: the strips fixed outside the target zone do not move

Evaluation of some apricot hybrids, regarding the resistence to PPV by molecular determinations

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Keywords: Plum pox virus, PCR, DNA, resistance, molecular markers.

ABSTRACT

Plum pox virus is the causal agent of Sharka disease, considered to be the most devastating disease of stone fruit trees. The estimated number of infected trees is over 100 million apricot trees. This virus belongs to the genus potyvirus (family of the Pothyviridae), which is characterized by filamentous particles containing a monocatenary RNA. Virus developes by replication in the leading vessels (phloem) of host plants. Besides plum, the disease infects other Prunus species of economic importance, including: nectarine, apricot, peach, almond, cherry and some ornamental plants (Petunia, Zinnia) or vegetables (tomatoes, peas).

Evaluation of the resistance to PPV of some apricot hybrid combinations, at SCDP Valul lui Traian, improved under natural conditions of infection in the field with PPV, is a first step to start the implementation of the molecular markers' assisted selection (MAS) in these genotypes; the next step is to test this hybrid in conditions of artificial infection in greenhouse.

MATERIAL AND METHOD

In our country Minoiu, Isac and Zagrai established for the Plum Pox virus certain biochemical correlations between the virus and the infected plant.

Thus, plants infected with PPV have a low content of dry matter. The presence of Plum-pox diminished in general the fruit content in soluble carbohydrates.

These influences have not ben studied for each strain in hand; they may create many difficulties, both in the plant improvement program and in the control of this virus, which is more common lately, because the models used until now may not be as effective for all strains.

Fruit quality is a critical component of the research programs regarding the stone fruit trees of the genus Prunus (peach, apricot, plum, cherry) where issues as "resistance to diseases and pests" have a particular importance.

In the program of interaction plant/pathogen, Sharka disease is a serious problem for Europe, the fruit production and quality being completely devastated (Roy et al., 1994). Sharka has recently been detected in Asia, South and North America (Kobber M., 2000).

PPV (Plum pox virus), the pathogen causing the disease, classified as a quarantine organism, is present everywhere in the European Union.

***Plant material*:**

1. the **parent stock** from species peach GF 305

2. F1 and F2 Hybrids, considered valuable, from species *Armeniaca vulgaris*

F1 and F2 Hybrids have beeen improved at Valul lui Traian.

1. C1 - VT 92.02.52 - NJA 17 ✕ R9 P 53 (Viceroy ✕ NjA2) – 5 trees
2. C2 - VT 92.01.05 - NJA 17 ✕ R9 P 53 (Viceroy ✕ NjA2) – 5 trees
3. C3 - VT 92.02.95 - NJA 17 ✕ R9 P 53 (Viceroy ✕ NjA2) – 3 trees
4. C4 - VT 92.02.91 - NJA 17 ✕ R9 P 53 (Viceroy ✕ NjA2) – 5 trees
5. C5 Sample 56 - R10 P79 (Viceroy ✕ NjA2) ✕ Tabriz - 1 tree
6. C6 Sample 36 - R10 P79 ✕ Traian – 5 trees
7. C7 - V5 – VT 30/40 Mari de Cenari ✕ (SEO) – 1 tree

8. C8 – V6 – VT 12/13 - MOONGOLD ✕ MJA 42 – 3 trees
9. C9 – VT 4/73 – VIVAGOLD ✕ NJA 42 - 4 trees.

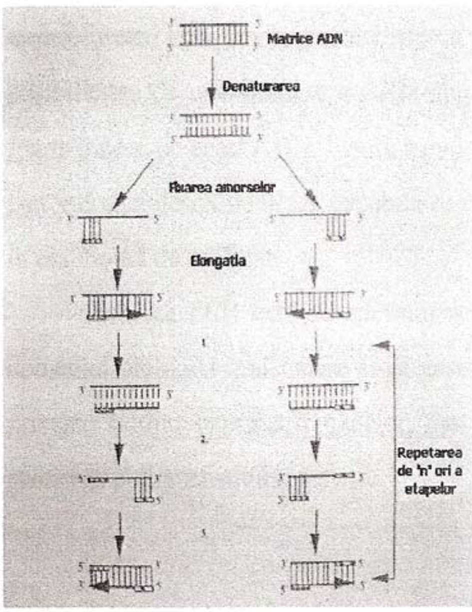
***Viral material*:**

1. Strain M (Marcus) of PPV
2. Strain D (Dideron) of PPV

Work procedure is the following: **THE PCR TEST (TECHNIQUE OF GENETIC AMPLIFICATION)**

PCR (Polymerase Chain reaction) is a technique that allows in vitro amplification of DNA sequences by repeating an elongation reaction in the presence of DNA-polymerase. The discovery of a thermophilic bacteria living at temperatures of 70˚ -75˚C in the Yellowstone National Park USA (Thermus aquaticus) and the possibility of using its polymerase (which resists to temperatures up to 100˚C) underly the development of this technique.

The principle of amplification in vitro is based on the repetition of 3 processes, namely:
- distortion of the double helix, which serve as a matrix (this operation takes place at high temperatures, around 95˚C).
- coupling of primers (primer annieling); this stage has a slightly lower temperatures, between 40˚ -65˚C.
- chain elongation reaction using thermostable DNA polymerase is performed at an optimum temperature of 72˚C.



Etapele de desfasurare ale testului RT-PCR

This stage takes place in a device called DNA Thermal Cycler, that allows the cyclical repetition of each phase. The products of the first cycle are further denaturated by heat; the cycle can be repeated up to 20-30 times. At each cycle the number of copies of the of the DNA fragment is doubled, reaching 1048576 molecules after 20 cycles and the amazing figure of 268435456 pieces after 30 repetitions.

Using the PCR technique allows obtaining conclusive results even with very small quantities of nucleic acids. Molecular hybridization and clasical technics are not precise enough in order to detect trace quantities of DNA or RNA. So, for the RNAm, which is present in cells only in very small quantities, we may experience problems in detecting it. A technique called RT-PCR has been developed to allow detection and highlighting of the accumulation of rare RNAm in tissues, organs, or even a cell.

The principle is to extract total RNA from the studied tissue and to copy it in vitro in monocatenary cDNA, using the action of reverse transcriptase.

The obtained DNA molecules then serve as a matrix for a PCR reaction, which uses a pair of primers specifical for the RNA sequence for which there is interest. The PCR fragments obtained after the development of PCR cycle are then analyzed by gel electrophoresis. One of the problems in this method is the possibility of contamination of RNA with genomic DNA; in this way, primers are set very well on this DNA too. To avoid this difficulty, it can be used a type of RNA which had been purified using a desoxinuclease, which was able to remove all traces of genomic DNA present in the analyzed sample.

PCR technique is truly revolutionary as regards researches in molecular biology and finds many applications in cloning and in the study of gene expression, but also plays an important role in studying the genetic polymorphism.

Beyond its economic interests, the pathosystem Prunus/Shark is likely to make an important contribution to understanding the mechanism of interaction plant/pathogen.

On the other hand, the "perennial" and "woody" character of host plants (fruit trees) may have an overwhelming influence on the plant/pathogen interaction and evolution; that is why such plants are less studied, in comparison with herbaceous plants (as Nicotiana ebontamiana, Arabidopsis thabana, Pisum sativum).

RESULTS AND DISCUTIONS

GF 305 used as PPV indicators have been grown in pots with a diameter of 40 cm.


On leaving the rest period before making the artificial infection, the parent stocks were subjected to serological tests and proved to be free of smallpox. Then they were double-grafted in occultation with F1 and F2 hybrids of apricot. Infection was made by a chip budding infected with PPV, strain M and D.

The grafted trees were introduced for 2 months in the cold room for entry at rest. After this period, at the exit of the first cycle of cold, the circuit of sap is accelerated, as much as the dynamics of the pressure on plant virus.

Visual phenotypic observations are made on each twig in hand for a period of one month to one month and a half, regarding the number of twigs, the number of leaves on the twig, and we observe if visual symptoms appear or not.

For the beginning, first serological tests were made in all hybrids, with or without symptoms on the plant.

Samples for Eliza and PCR were taken only from leaves without visual symptoms. Usually, in order that the symptoms appear obviously, it is neccessary to perform for the pots three passages of cold, each of them of two months.

It is important to mention that F1 and F2 hybrids have been tested initially in conditions of natural infection in the field.

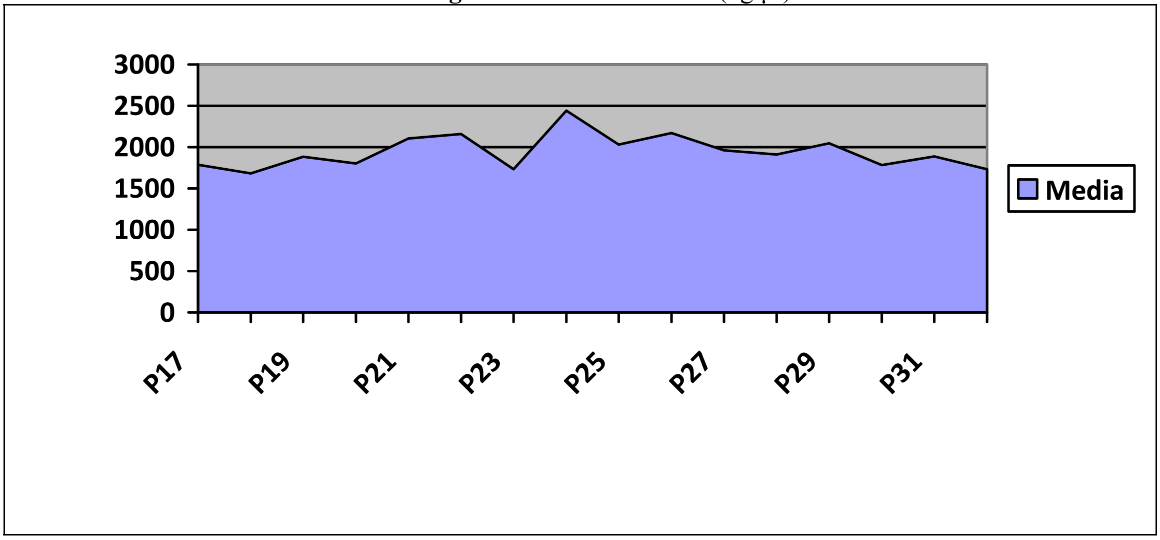
Before making the PCR using as primers P1 and P2, DNA extractions were performed on all samples using CTAB and isoamyl chloroform.

After the extraction, the DNA was quantified in nanodrop; the results are presented in the table below.

No. of Sample	Ng/µl	A260	A280	260/280	260/230	Average	Dilution PCR
1	1887.70	37.754	36.107	1.05 1.06	50.00 230	1965.47	
1	1963.03	39.261	37.505	1.05 1.06	50.00 230	1965.47	393.09
1	2045.70	40.914	39.111	1.05 1.06	50.00 230	1965.47	
2	1712.56	34.251	32.143	1.07 0.97	50.00 230	1787.77	
2	1777.18	35.544	33.329	1.07 0.97	50.00 230	1787.77	357.55
2	1873.57	37.471	35.086	1.07 0.97	50.00 230	1787.77	
3	1886.37	37.727	35.357	1.07 0.98	50.00 230	1933.16	
3	1982.24	39.645	37.148	1.07 0.98	50.00 230	1933.16	1159.89
3	1930.88	38.618	36.257	1.07 0.98	50.00 230	1933.16	
4	1864.09	37.282	35.523	1.05 1.06	50.00 230	1925.84	
4	1931.56	38.631	36.737	1.05 1.07	50.00 230	1925.84	385.16
4	1981.87	39.637	37.801	1.05 1.06	50.00 230	1925.84	
5	1887.69	37.754	35.194	1.07 1.01	50.00 230	1954.37	
5	1933.11	38.662	36.003	1.07 1.01	50.00 230	1954.37	390.87
5	2042.32	40.846	38.047	1.07 1.01	50.00 230	1954.37	
6	1925.40	38.508	35.773	1.08 0.91	50.00 230	2293.88	
6	2414.24	48.285	45.104	1.07 0.98	50.00 230	2293.88	458.77
6	2542.01	50.840	47.623	1.07 0.96	50.00 230	2293.88	
7	1989.36	39.787	37.215	1.07 0.91	50.00 230	1903.80	
7	1842.25	36.845	34.382	1.07 0.94	50.00 230	1903.80	380.76
7	1879.81	37.596	35.157	1.07 0.94	50.00 230	1903.80	
8	1779.95	35.599	33.263	1.07 0.99	50.00 230	1808.14	
8	1790.05	35.801	33.505	1.07 0.99	50.00 230	1808.14	361.62
8	1854.44	37.089	34.627	1.07 0.99	50.00 230	1808.14	
9	1776.16	35.523	32.651	1.09 1.08	50.00 230	1864.00	
9	1846.54	36.931	33.900	1.09 1.08	50.00 230	1864.00	372.8
9	1969.32	39.386	36.195	1.09 1.07	50.00 230	1864.00	
10	1884.18	37.684	35.443	1.06 0.98	50.00 230	2000.18	
10	1990.14	39.803	37.417	1.06 0.98	50.00 230	2000.18	400.36
10	2126.24	42.525	39.955	1.06 0.99	50.00 230	2000.18	
11	1893.28	37.866	35.323	1.07 0.97	50.00 230	1929.14	
11	1912.57	38.251	35.716	1.07 0.98	50.00 230	1929.14	385.82
11	1981.59	39.632	36.955	1.07 0.98	50.00 230	1929.14	
12	1830.78	36.616	33.609	1.09 0.95	50.00 230	1955.17	
12	1924.10	38.482	35.353	1.09 0.95	50.00 230	1955.17	391.03
12	2110.64	42.213	38.693	1.09 0.96	50.00 230	1955.17	
13	1888.01	37.760	34.689	1.09 0.95	50.00 230	1964.34	
13	1951.29	39.026	35.824	1.09 0.95	50.00 230	1964.34	392.86
13	2053.73	41.075	37.706	1.09 0.95	50.00 230	1964.34	
14	1719.03	34.381	32.302	1.06 0.96	50.00 230	1775.33	
14	1762.74	35.255	33.056	1.06 0.96	50.00 230	1775.33	355.06
14	1844.22	36.884	34.645	1.06 0.97	50.00 230	1775.33	
15	1706.68	34.134	32.331	1.06 1.06	50.00 230	1807.18	
15	1764.64	35.293	33.398	1.06 1.06	50.00 230	1807.18	361.43
15	1950.23	39.005	36.907	1.06 1.06	50.00 230	1807.18	
16	1838.18	36.764	34.583	1.06 1.03	50.00 230	1954.29	
16	1985.39	39.708	37.415	1.06 1.03	50.00 230	1954.29	390.85
16	2039.30	40.786	38.454	1.06 1.04	50.00 230	1954.29	
17	1737.89	34.758	32.266	1.08 0.94	50.00 230	1788.75	
17	1773.26	35.465	32.955	1.08 0.94	50.00 230	1788.75	357.75
17	1855.11	37.102	34.439	1.08 0.95	50.00 230	1788.75	
18	1494.17	29.883	28.422	1.05 0.98	50.00 230	1682.61	336.52
18	1728.78	34.576	32.807	1.05 0.99	50.00 230	1682.61	

18	1824.90	36.498	34.610	1.05 0.99	50.00 230	1682.61	
19	1827.80	36.556	33.809	1.08 1.00	50.00 230	1882.89	
19	1861.89	37.238	34.476	1.08 1.00	50.00 230	1882.89	376.57
19	1958.99	39.180	36.287	1.08 1.00	50.00 230	1882.89	
20	1756.41	35.128	33.410	1.05 1.07	50.00 230	1803.59	
20	1821.32	36.121	34.423	1.05 1.06	50.00 230	1803.59	360.71
20	1833.06	36.661	34.821	1.05 1.06	50.00 230	1803.59	
21	2179.34	43.587	40.33	1.08 0.95	50.00 230	2104.6	
21	2121.30	42.426	39.165	1.08 0.96	50.00 230	2104.6	420.92
21	2201.23	44.025	40.684	1.08 0.97	50.00 230	2104.6	
22	1991.27	39.825	36.809	1.08 0.93	50.00 230	2158.59	
22	2161.68	43.234	40.048	1.08 0.93	50.00 230	2158.59	431.71
22	2322.82	46.456	42.851	1.08 0.93	50.00 230	2158.59	
23	1652.65	33.053	30.657	1.08 0.91	50.00 230	1732.36	
23	1718.51	34.370	31.926	1.08 0.92	50.00 230	1732.36	346.47
23	1825.94	36.519	33.985	1.08 0.92	50.00 230	1732.36	
24	1765.51	35.310	32.661	1.08 1.00	50.00 230	2442.04	
24	2524.54	50.491	46.861	1.08 1.03	50.00 230	2442.04	488.40
24	3036.09	60.722	56.141	1.08 1.02	50.00 230	2442.04	
25	1968.99	39.380	36.196	1.09 0.93	50.00 230	2029.90	
25	2013.81	40.276	36.992	1.09 0.94	50.00 230	2029.90	405.98
25	2106.91	42.138	38.728	1.09 0.95	50.00 230	2029.90	
26	2058.53	41.171	37.984	1.08 0.97	50.00 230	2171.80	
26	2197.41	43.948	40.505	1.08 0.97	50.00 230	2171.80	434.36
26	2259.47	45.189	41.568	1.08 0.97	50.00 230	2171.80	
27	1892.27	37.845	36.386	1.04 1.02	50.00 230	1960.02	
27	1966.84	39.337	37.729	1.04 1.04	50.00 230	1960.02	392.00
27	2020.97	40.419	38.862	1.04 1.03	50.00 230	1960.02	
28	1816.15	36.323	33.180	1.09 0.90	50.00 230	1912.71	
28	1918.72	38.374	34.901	1.09 0.92	50.00 230	1912.71	382.54
28	2003.26	40.065	36.524	1.09 0.94	50.00 230	1912.71	
29	1995.42	39.908	37.951	1.05 1.04	50.00 230	2047.62	
29	2034.73	40.695	38.731	1.05 1.04	50.00 230	2047.62	409.52
29	2112.73	42.255	40.170	1.05 1.05	50.00 230	2047.62	
30	1717.62	34.352	32.836	1.05 1.03	50.00 230	1783.22	
30	1779.82	35.596	34.082	1.05 1.04	50.00 230	1783.22	356.64
30	1852.22	37.044	35.486	1.05 1.04	50.00 230	1783.22	
31	1802.41	36.048	32.860	1.10 0.90	50.00 230	1888.16	
31	1875.29	37.506	34.183	1.10 0.90	50.00 230	1888.16	377.63
31	1986.79	39.736	36.289	1.10 0.90	50.00 230	1888.16	
Positive sample	1706.77	34.135	32.767	1.04 1.00	50.00 230	1731.89	
Positive sample	1700.69	34.014	32.939	1.03 1.03	50.00 230	1731.89	346.37
Positive sample	1788.23	35.765	34.586	1.03 1.04	50.00 230	1731.89	

Fig. 1. DNA concentration (ng/µl)



Further, all individuals in hybrid combinations have been grafted and inoculated with PPV by chip budding, on the rootstocks GF305.

In this moment they are in the cold room in order to induce a forced rest; in two months they will be removed and the new twigs, grafted and automatically inoculated, will be tested serologically and molecularly.

The aims of these results refers to the implementation of these hybrids of the selection assisted by molecular marking (MAS).

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Researches concerning the influence of late frosts upon the production of different apricot varieties in conditions of the Banat Plain area

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Keywords: fruits, binding degree, production differences

ABSTRACT

The apricot is a species recommended to be cultivated in the plain area of Banat because of the favourable climate, but we have to mention that the appearance of late frosts in spring has a very significant negative impact upon the production. The apricot varieties in our country are diversified, including at the same time local and foreign varieties, varieties having quality fruits, very productive, some of them having a good resistance to low temperatures during pause period, but also to late spring frosts, which, in the past years, are more frequent in the western part of Romania. There were studied 12 apricot varieties: Earlyryl, Dana, Neptun, Saturn, Cea mai bună de Ungaria, Venus, Callatis, Sulina, Favorit, Selena, Silvana and Olimp cultivated in conditions of the Didactic Station of our University concerning the fruit binding degree and productivity of the varieties in 2008. The late frosts in spring affected the flowers and diminished the number of bind fruits. Correlated with the physiological fall of fruits, the percentage of harvested fruits had lower values than normal. The production obtained in 2008 was compared with the medium production obtained in 2005-2007 and the differences were pretty high. For the mentioned area we recommend for culture Favorit, Cea mai buna de Ungaria and Callatis varieties, which had a good production even though they were affected by the late frosts in spring.

INTRODUCTION

The Romanian apricot homologated collection includes a high number of varieties, both local and from abroad. These varieties have high quality fruits, they are very productive and some of them have a good resistance to low temperatures during the pause period and to late spring frosts. In the past years the late spring frosts are more and more frequent in this part of the country and this is a fact that might reduce considerably the productions obtained.

By this article we want to present how the late frosts in spring influence the production of apricot trees in conditions of Timisoara. Knowing the fact that the apricot tree is one of the most sensitive species to late frosts, because of its early development of fruiting phenophases, we tried to observe how obvious are the damages caused by the late frosts upon the productions. The motivation behind the study was to determine the most valuable varieties that can be exploited in the specific climatic conditions of Timisoara area.

MATERIALS AND METHODS

The experiment has developed during the years 2005-2008 in the fruit plantation of the Didactic Station of our University in Timisoara.

There were observed 12 apricot varieties cultivated in the orchard: Earlyryl, Dana, Neptun, Saturn, Cea mai bună de Ungaria, Venus, Callatis, Sulina, Favorit, Selena, Silvana and Olimp. The apricot trees were planted in the spring of 1997, having a distance of 5 m between the rows and 4 m between the trees on a row, with a density of 500 trees/ha.

The working method was a stationary one having two steps: the first step in the field was based on observing the fruit binding degree, counting the fruits and weighting them and the second step, in the laboratory, was based on calculating and interpreting the collected data.

RESULTS AND DISCUSSIONS

In this article we will present the development of the fruiting phenophases observed for the studied varieties in 2008 and the influence of late frosts upon the apricot production.

In 2008, the bud inflation started in 06.02 for Earlyryl variety and ended in 14.02 for the late variety Silvana.

The beginning of flowering took place in 20.02, for Earlyryl variety and continued until 28.02 for Neptun and Silvana varieties. The other varieties had a staged flowering period, which began in 22.02 and ended in 06.03. The flowering period was also unitary, between 6 days (for most of the varieties) and 9 days for Cea mai buna de Ungaria and Sulina varieties (table 1).

In 2008, the fruit binding degree was better than in the past years, but because of the late frosts that affected the bind fruits, the percentage of harvested fruits was lower than normal. The best results were observed for Selena variety with 72.40% bind fruits, while Dana variety had only 18.20% bind fruits and Saturn 25%. The other varieties had a percentage of bind fruits around the values of 30% to 40% (table 2).

In 2008, Favorit variety had the highest production of 12,16 kg/tree and had no difference to the witness, then it was followed by Cea mai buna de Ungaria witness variety, which had 11.60 kg/tree and Callatis variety with 10.9 kg/tree. The other varieties, such as: Silvana, Selena and Venus had lower productions and registered very significant negative differences to the witness. The lowest production in 2008 was given by Dana variety, which had 4.91 kg/tree (table 3).

The medium apricot production in 2008 was also very low due to the late spring frosts that damaged the production at the end of March when took place the fruit growing phenophase. Most of the fruits were affected and fell of the tree, which is why the production was so compromised.

By making a comparison between the average production obtained in 2005-2007 from the same varieties and the medium productions obtained in 2008, we observed that Neptun variety had the lowest production difference (42,40%), and Olimp variety the highest (81,43%). All of the other varieties had a production difference between 66,19% (Silvana) and 79,61% (Dana) (table 4).

CONCLUSIONS

The climatic conditions of 2008 were different than in other years, so that the fruiting phenophases started in the first decade of February, much earlier than in the past years. The bud inflation started at the beginning of February (06.02) and ended on the 14th of February, while the blooming period started at the end of February (20.02) and ended at the beginning of March (6.03).

At the end of March, when the fruits were formed and started to develop the late spring frosts came and the apricot production was considerably damaged.

The highest production was given by Favorit variety (12.16 kg/tree), followed by the control Cea mai buna de Ungaria (11.60 kg/tree) and Callatis variety (10.9 kg/tree) and the lowest was harvested from Dana variety of only 4,91 kg/tree.

Considering all these, we recommend for culture in this part of the country the following apricot varieties, which had a constant behaviour during the three studied years: Favorit, Cea mai buna de Ungaria and Callatis.

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TABLES

Table 1. The development of fruiting phenophases in 2008

Variety	Bud inflation	Bud opening	Flowering			Duration of flowering
			Beginning	In full	Ending	
Earlyryl	06.02	10.02	20.02	23.02	27.02	7
Dana	08.02	12.02	22.02	25.02	01.03	7
Neptun	11.02	15.02	28.02	02.03	06.03	7
Saturn	10.02	14.02	25.02	28.02	02.03	6
Cea mai bună de Ungaria	07.02	13.02	23.02	27.02	04.03	9
Venus	12.02	19.02	26.02	01.03	05.03	7
Callatis	12.02	19.02	26.02	01.03	06.03	8
Sulina	11.02	15.02	24.02	28.02	05.03	9
Favorit	10.02	14.02	25.02	28.02	04.03	7
Selena	13.02	17.02	26.02	01.03	05.03	7
Silvana	14.02	19.02	28.02	03.03	06.03	6
Olimp	10.02	14.02	25.02	27.02	03.03	6

Table 2. Apricot fruit binding degree in 2008

Variety	No. of flowers	No. of bind fruits	Fruit binding percentage	No. of fruits after the physiological fall	Percentage of harvested fruits
Earlyryl	1680	720	42.85	69	9.51
Dana	1915	350	18.20	14	4.00
Neptun	1658	520	31.36	72	14.00
Saturn	1518	380	25.00	55	14.50
Cea mai buna de Ungaria	1950	885	45.38	199	22.50
Venus	2810	930	33.09	260	27.90
Callatis	2325	783	33.60	49	6.33
Sulina	3110	1030	33.10	52	5.00
Favorit	2980	985	33.20	99	10.00
Selena	987	715	72.40	139	19.40
Silvana	2935	890	30.30	142	16.00
Olimp	1830	620	33.87	108	17.50

Table 3. Medium apricot production in 2008 (kg/tree)

DL 5% = 0,92 DL1% = 1,26 DL0,1% = 1,69

Variety	Medium production (kg/tree)	Relative value (%)	Difference to the witness	Significance
Earlyryl	8,22	70,86	-3,38	000
Dana	4,91	42,30	-6,69	000
Neptun	8,07	69,54	-3,53	000
Saturn	7,27	62,64	-4,33	000
CMBU	11,60	100	0	MT
Venus	9,50	81,90	-2,10	000
Callatis	10,90	93,94	-0,70	-
Sulina	9,73	83,91	-1,87	000
Favorit	12,16	104,89	0,57	-
Selena	5,76	49,71	-5,87	000
Silvana	9,33	80,46	-2,27	000
Olimp	5,00	43,10	-6,60	000

Table 4. Production difference of the apricot varieties

Variety	Average production 2005 - 2007		Production in 2008		Kg/tree	Production difference	
	Kg/tree	T/ha	Kg/tree	T/ha	%	Kg/tree	%
Earlyryl	29,85	14,92	8,22	4,11	27,53	21,63	72,47
Dana	24,07	18,03	4,91	2,45	20,39	19,16	79,61
Neptun	14,02	7,01	8,07	4,03	37,56	5,95	42,40
Saturn	31,79	15,89	7,27	13,63	32,80	24,52	77,20
CMBU	40,00	20,00	11,60	5,80	29,00	28,40	71,00
Venus	45,37	22,68	9,50	4,75	20,93	35,87	79,07
Callatis	34,83	17,41	10,90	5,45	31,29	23,93	68,71
Sulina	39,34	19,67	9,73	4,86	24,73	29,61	75,27
Favorit	43,53	21,76	12,16	6,08	27,93	31,37	72,07
Selena	21,36	10,68	5,76	2,88	26,96	15,60	73,04
Silvana	27,59	13,79	9,33	4,66	33,81	18,26	66,19
Olimp	26,92	13,46	5,00	2,50	18,57	21,32	81,43

FIGURE

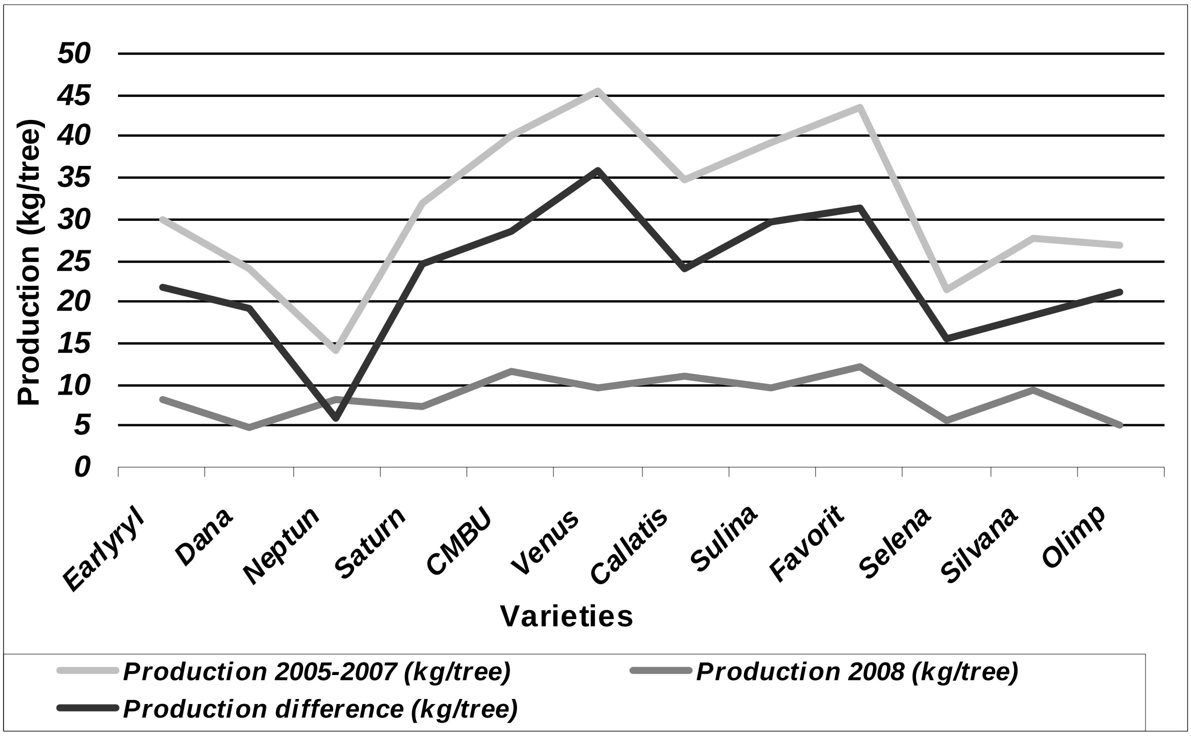

Fig. 1. Production difference of apricot varieties (kg/tree)

The influence of the culture system on the content of strawberry leaves in macronutrients

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ABSTRACT

From the pomicol species, the strawberry plant is one with a large habitat, having more modest requirements than the pedoclimatics factors and a culture technology not very complicated. It is one of the most profitable culture in case of applying a technology adequated to the biological and ecological particularities of the plant. Starting from the particularities of strawberry's growing, it is said that the first 2 or 3 runners and rosets formed in the planting's year can fructify in the the following year, when the culture has been established in spring, the runners having time enough to become vigorous plants until autumn for making possible the difference between the bud and the knot. In this paper we present part of results concerning the influence of culture system on the chemical composition of strawberry leaves. Excepting V6-band/125cm, the rhythm of accumulation in leaves, at the analyzed variants, reached higher values than the, in accordance with the average productions obtained.

INTRODUCTION

Strawberries are adapted to many growing regions and it is one of the most profitable culture in case of applying a technology adequated to the biological and ecological particularities of the plant. Strawberries are grown under many different systems throughout the world (matted rows, annual plasticulture, ribbon rows, waiting beds.). Strawberries are very labor-intensive, and establishment and operating costs can be high. In this work we estimated the two possibilities of maintaining the plants in multiannual culture (individual plant or matted row) in the conditions of planting at different distances (25cm, 75 cm, 125 cm) from the leaves' containment in macroelements point of view.

MATERIALS AND METHODS

The researches were performed during a bifactorial 2x3 experience. The experimental variants (V1 – individual plant x 25 cm; V2 - individual plant x 75 cm; V3 - individual plant x 125 cm; V4 (Mt) – matted row x 25 cm; V5 - matted row x 75 cm; V6 - matted row x 125 cm), were put in randomized blocs, in 3 repetitions, on an uniform field. One elementar parcel's surface had an area of 29 m².

The variants in which we utilised plantation distances of 75 cm, respectively of 125 cm, there were made up all the rows till normality in the first year (25-30 cm between the plants on the row) with the first 2 or 3 runners formed on the mother-plants.

The strawberry leaves' content in the main macro- and microelements as analysed in each of the three years of experimentaion, and the results of the foliar diagnosis' analysis were reported at the optimum values that were mantioned in literature. (table 1)

RESULTS AND DISCUSSION

Because of the different values of the nutrition space, the chemical composition of strawberry plants' leaves registered obvious differences.

The results of the foliar diagnosis show that:

Leaves' content in dry substance reached lower values in the first year of production – 2003, between 36,74% (V6- matted row/125 cm) and 38,88% (V1-ind. Pl./25 cm), than in 2004 (39,59%-40,95%) and 2005 (38,19%-39,68%).

Analyzing the average values from the experimental period 2003-2005, I can be seen that the accumulation rhythm of the dry substance in leaves at the analyzed variants reached higher values, between 38,62% (V5) and 39,84% (V1) than at V4-Mt (38,41%), congruent with the average productions that were obtained.V6-band/125 cm was an exception, which presents a containment in dry substance lower than at the control (38,17%) (fig. 1).

In accordance with the specialty literature, the optimum content in nitrogen of the strawberry plants' leaves is between 2,6-3,5% from SUT, and the deficiency appears at a content lower than 2% from SUT.

From the data presented in figure 2, it can be seen that in the three experimental years the average level of nitrogen in leaves exceeds the deficiency limit (<2%) at all the experimental variants, but in an optimum interval there were only V1-ind.pl./25 cm (2,79%) and V2-ind.pl./75 cm (2,71%). The control, characterized by a 2,42% leaves' containment in nitrogen, was exceeds at all the studied variants, the average values being between 2,45% (V6- matted row/125 cm) and 2,79%(V1-ind.pl./25 cm).

The optimum level of phosphorus in strawberry plant's leaves is between 0,25-0,35% from SUT, according to Langford - 1996, and respectively between 0,7 – 1,0% according to Iliescu – 2003 (tab. 1).

In these conditions, from the foliar diagnosis' analysis results made between 2003-2005, we can observe that all the obtained values were above the deficiency level (0,20%) and they have even exceeds the optimum level of supply of the strawberry plant's leaves at this element, if we refer at the optimum values established by Langford – 1996.

From figure 3, we can see that the culture system didn't considerably influence this parameter, the average values corresponding to leaves' containment in phosphorus being close between the analyzed variants, between 0,34% (V6- matted row/125 cm) and 0,4% (V2-ind.pl./75 cm), but a little higher in 2003 and 2004 at "individual plants" variants.

Potassium is one of the most important nutritive elements, having the role of the general activator of metabolism, of the enzymatic activity and of the cellular division, and also and important role in creating the resistance at drought and frost for the plants.

The foliar diagnosis' results show an optimum supply of the leaves with potassium at all the studied variants and in all the researching years, excepting V6-band/125 cm, at which in 2003 leaves content in potassium was of 0,95% towards the optimum interval taken into consideration by many authors (1,0-2,0% from SUT).

The biggest leaves' containment in potassium (fig. 4), taking into consideration the average values of the three experimental years, was registered at V1 ind.pl./25 cm (1,33%), followed by V2-ind.pl./75 cm (1,28%), which also registered the best results on the productivity aspect; the lowest values were at V6- matted row/125 cm (1,09% from SUT). Being known that potassium absorption is also influenced by the hydric and thermal regimen of the soil, it is observed that in 2003, characterized as a droughty year, there were registered the lowest values of leaves' content in potassium.

Leaves' content in calcium was situated at all the variants under the inferior limit of the optimum purveyance interval (0,5-1,5% from SUT according to Cline - 1990), especially in 2003 and 2004, without existing considerable differences determined by the culture systems that we applied. This situation can be partially justified by the acid character of the soil from the experimental parcel.

Although, it can be said that the gathered leaves at “individual plant” variants presented a higher content in calcium (0,59-0,62% from SUT) in comparison with the “matted row” variants. (0,5-0,54%). (fig. 5)

Leaves’ content in magnesium reached lower values that the optimum level (0,25%-0,50%) both in the first year of production - 2003 (droughty),between 0,16% (V3, V4, V6) and 0,20% (V1-ind.pl./25 cm),and in the second one - 2004 (0,16%-0,20%); in 2005 (excessively rainy) leaves’ containment in magnesium increased, being now situated in the optimum interval of purveyance (0,26%-0,30% from SUT), excepting V6- matted row/125 cm (0,22% from SUT). (fig. 6)

The biggest values in the three experimental years were registered at V2-ind.pl./75 cm (0,23% from SUT), followed by V1-ind.pl./25 cm and V5-matted row/75 cm (0,22% from SUT).

CONCLUSIONS

Excepting V6-band/125cm (38,17%), the rhythm of accumulation of dry substance in leaves, at the analyzed variants, reached higher values than the control (V4- 38,41%), between 38,62% (V5) and 39,84% (V1), in accordance with the average productions obtained between 2003-2005.

From the presented data it can be seen that in the three years of experimentation the average level of nitrogen in leaves bypassed the deficiency limits (<2%) at all the experimented variants, but in the optimum interval there were only V1-ind.pl./25 cm (2,79%) and V2-ind.pl./75 cm (2,71%).

Because of a high content of phosphorus in soil, all the obtained variants exceeds the optimum interval of leaves’ purveyance with this element (0,25-0,35%), without exesting too big differences between the variants.

Leaves’ content in potassium is in optimum limits (1-2%), excepting V6-band/125cm in 2003; the biggest leaves’ content in potassium was registered at V1-ind.pl./25 cm (1,33%), which also realized the best results on the productivity aspect.

Calcium was situated at all the variants towards the inferior limit of the optimum purveyance interval (0,5-1,5% from SUT), especially in 2003 and 2004; calcium accumulations in the leaves harvested from the “individual plants” variants were higher (0,59-0,62% from SUT) than from the “matted row” ones (0,5-0,54%).

Leaves’ content in magnesium descended under the optimum level (0,25%-0,50%), both in the first year of production -2003 (droughty) and in the second year - 2004, and in 2005 (excessively rainy) it increased, reaching optimum limits (0,26% - 0,30% from SUT), excepting V6-band/125 cm (0,22%).

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TABLE

Table 1. Limits of interpretation on the content of strawberry leaves macroelements (synthesis by several authors)

	Period analyzes	N%	P%	K%	Ca%	Mg%	Authors
optimum		2,6-3,5	0,25-0,35	1,0-2,0	0,7-1,5	0,25-0,40	Geoff Langford – 1996; RJ Hill Laboratories – 2002
defficiency		<2	<0.20	<1,0	<0,5	<0,10	
optimum		2,0-3,0	0,20-0,50	1,5-2,5	0,5-1,5	0,25-0,50	Cline R.A. and col.-1990
optimum	maximum flowering-protected culture (25-35 t/ha)	2,07-3,04	0,20-0,38	1,84-2,21	0,77-1,48	0,25-0,70	Almaliotis D., and col. -2002
optimum	maximum flowering	1,8-3,0	0,20-0,30	1,2-2,0	0,5-1,0	0,25-0,35	Strawberry fertilizer recommendations for the Atlantic provinces-2000
optimum	beginning vegetation period	3,0-3,5	0,2-0,4	1,5-2,5	0,4-1,5	0,25-0,5	Maynard D.N.,-2002
optimum	annual culture	3,0-4,0	0,2-0,4	1,5-2,5	0,5-1,5	0,25-0,45	Campbell C.R.-2001
optimum	maximum flowering	2,3-3,0	-	-	-	-	Diaconeasa M. şi colab.-2003
optimum	fruit maturation stage	1,6-2,3	-	-	-	-	
optimum		3,0-3,2	0,7-1,0	1,65	-	-	Mirela Iliescu-2003

FIGURES

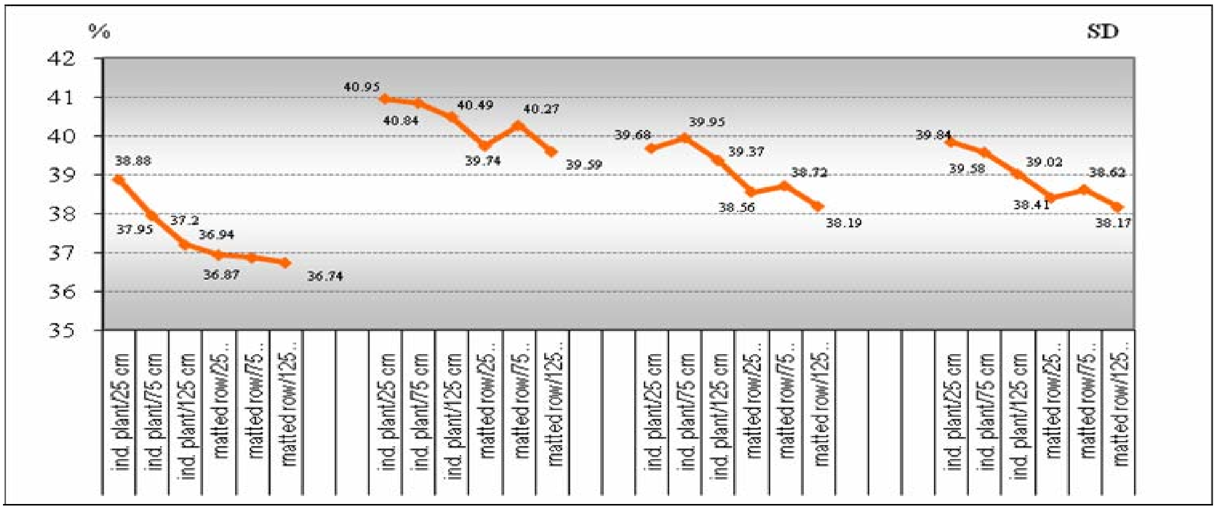

Fig. 1. The influence of the culture system on the content of strawberry leaves in DS (%)

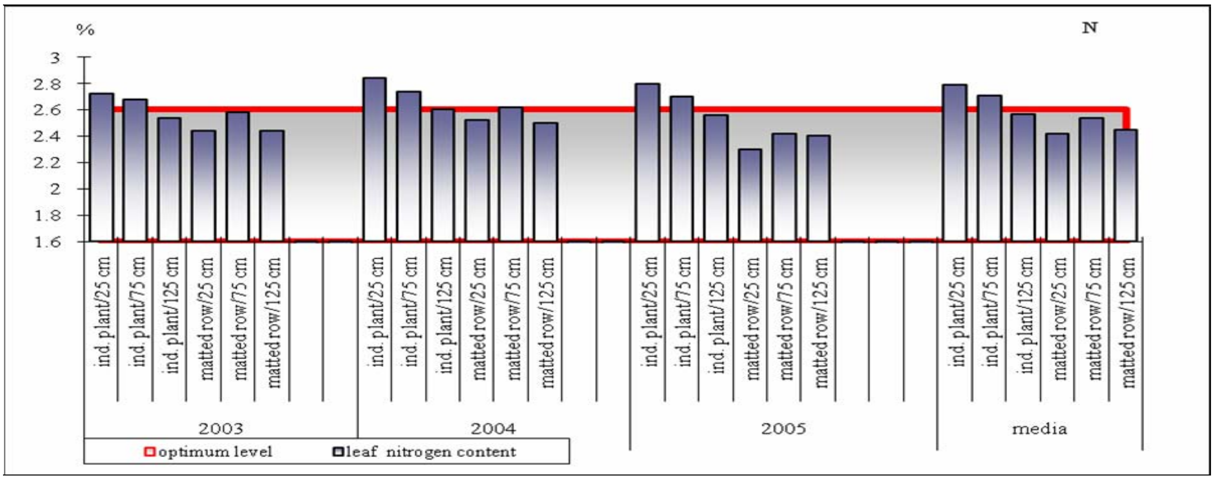

Fig. 2. The influence of the culture system on the content of strawberry leaves in N (%)

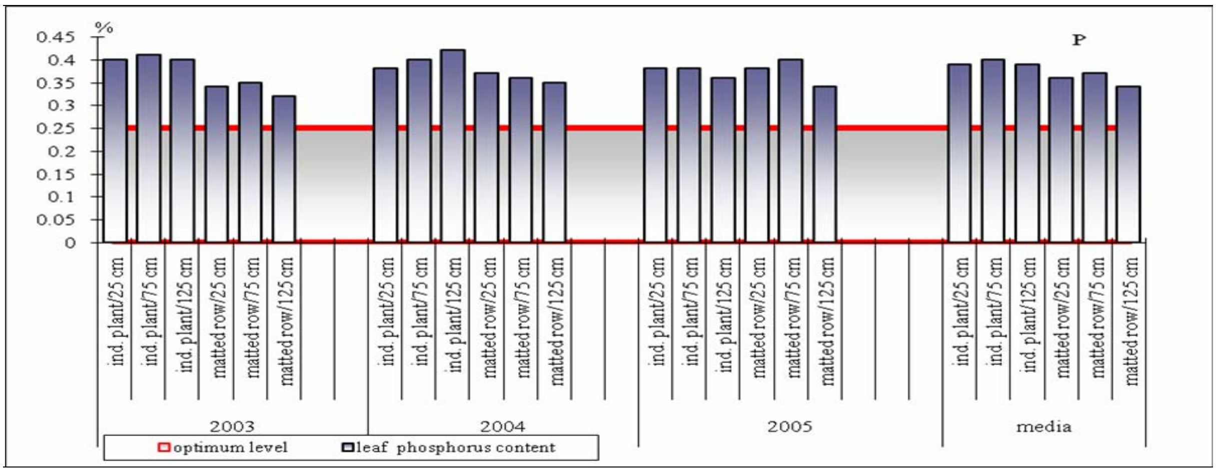

Fig. 3. The influence of the culture system on the content of strawberry leaves in P (%)

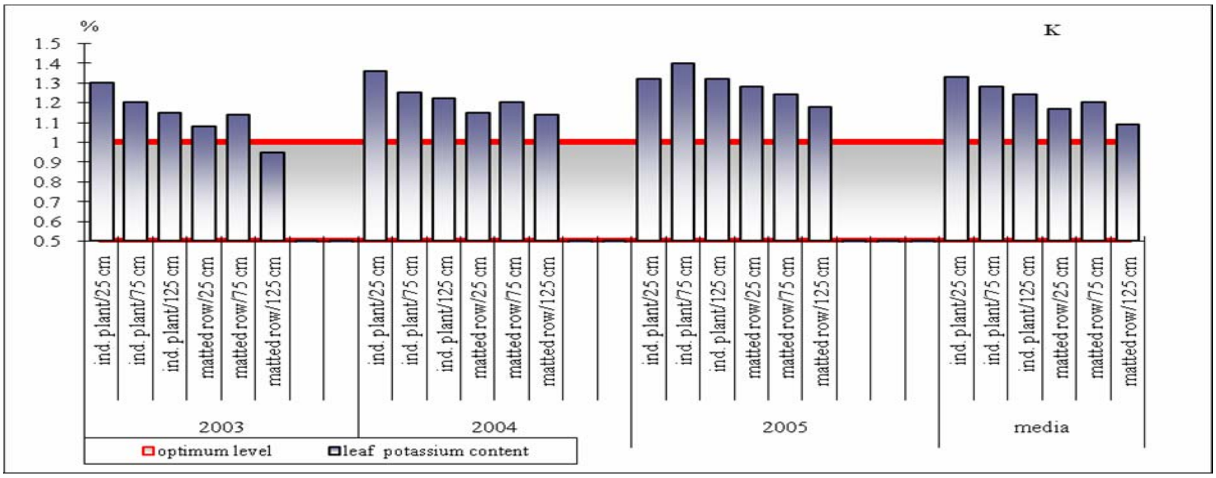

Fig. 4. The influence of the culture system on the content of strawberry leaves in K (%)

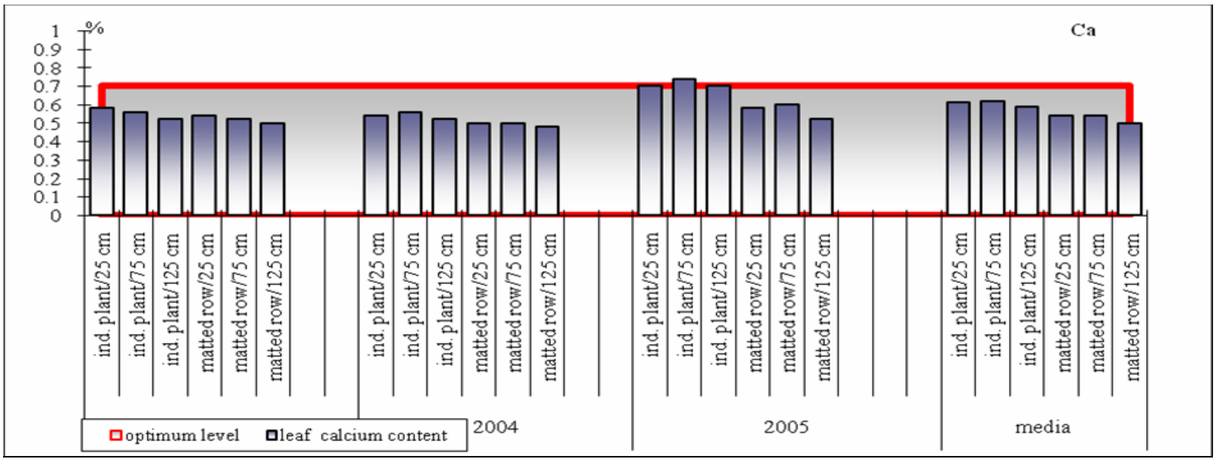

Fig. 5. The influence of the culture system on the content of strawberry leaves in Ca (%)

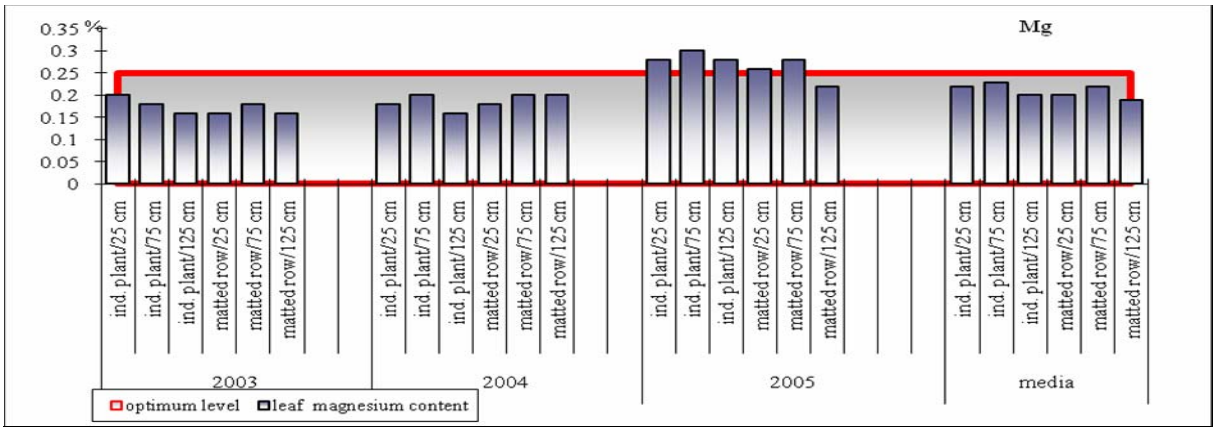

Fig. 6. The influence of the culture system on the content of strawberry leaves in Mg (%)

Preliminary results concerning the weed control in apple orchards in conditions of the Didactic Station Timişoara

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Keywords: Generos variety, final weed filing, herbicides, manual, mechanical control

ABSTRACT

Despite of the progress registered in agriculture in the past years, weeds are still remaining present on cultivated and non cultivated areas and implicitly in orchards. The weeding degree in the orchard of the Didactic Station Timisoara in 2008 was over 95%, being present both dicotyledonous and monocotyledonous annuals and perennials. In order to have a good control of them, there was first done an initial weed filing and according to that there were use the most proper control measures. After that there was done a final weed filing, which helped to determine which method of control was the best for Generos variety floristic composition. It turned out that the best results were obtained in those variants where herbicides were combined with manual hoes.

INTRODUCTION

The existence of weeds in orchards, as in any other cultures, is a very important problem for fruit growers because they can produce some damages to the trees such as: competition for water and nutrients absorption, hosts for different pests and diseases that might harm the trees or the fruits and decrease of fruit production (Lăzureanu A., 2001; Cârciu Gh., 2006).

By this article we present the preliminary results obtained in 2008 for Generos variety of the researches made for the PhD Thesis entitled *Monitorising the Influence of Some Agrotechnical Works for Maintaining the Soil in Apple Tree Orchards upon the Physical-Chemical Features of Fruits in Conditions of the Didactic Station Timisoara*.

MATERIALS AND METHODS

The experiment was placed in the orchard of the Didactic Station Timisoara being observed the weeding degree of Generos apple tree variety and the setting out of the control measures in order to reduce the number of weeds.

Generos apple tree variety is cultivated in an intensive system, planted in 1997 at the distance of 4m between the rows and 2 m between the trees on a row, being in the XII year since planting. It was grafted on M26 and the culture technology is the traditional one. The variants were placed using the method of incomplete blocks.

The weed filing was made before and after doing the herbicide treatments and the manual and mechanical works. After sprayings, the first reading was made at 12 days and the second one a month before harvesting.

Controlling weeds by manual works consisted in hoeing, which destroys the annual and biannual weeds and by repeating it there were also destroyed some perennial weeds. The mechanical control of weeds has been made by using the cultivator.

Controlling weeds by herbicides was made by spraying these directly on the weeds, for the absorption and translocation of the active substances in the weed organs, so that they are destroyed.

In order to destroy the problematic weeds there are always recommended the herbicides belonging to the IVth toxicity group, which protect the useful microorganisms in the soil that can metabolize them: Roundup 360 SL (3 l/ha), Basta 14 SL (5 l/ha), Gallant Super (1 l/ha). The spraying was done by using the vermorel.

Mulching was done by using the mowed grass on the interval, while grass sod between the rows was obtained by seeding different mixed seeds of grass.

The variants were:

V1 – no herbicides, no mechanical or manual works – control;
V2 – Roundup 360 SL (3 l/ha) on the tree row, the interval mowed;
V3 – Basta 14 SL (5 l/ha) on the tree row, the interval mowed;
V4 – Gallant Super (1 l/ha) on the tree row, the interval mowed;
V5 – mulching with mowed grass of the interval;
V6 – Roundup 360 SL (3 l/ha) + 2 manual hoes on the tree row;
V7 – Basta 14 SL (5 l/ha) + 2 manual hoes on the tree row;
V8 – Gallant Super (1 l/ha) + 2 manual hoes on the tree row;
V9 – Roundup 360 SL (3 l/ha) on the row + grass sod between the rows;
V10 – 2 manual hoes + 2 mechanical works.

RESULTS AND DISCUSSIONS

In tables 1.a. and 1.b. and in table 2 there are presented the preliminary results of control measures upon the weeds in Generos rows.

In 2008, in the control variant (V1) the total number of weeds was of 157.33 weeds/m^2, being observed 14 weed species, of which there were predominant: *Agropyron repens*, *Cynodon dactylon*, *Stellaria media* and *Convolvulus arvensis* with over 10% participation degrees.

In variant 2, Roundup 360 SL (3 l/ha) on the tree row, the interval mowed, as a result of applying the control measures, the number of weeds/m^2 was reduced from 149.33 to 26.67 weeds/m^2, which is 122,66 weeds controlled, with a proportion of 82,14% controlled weeds. There were found 7 weed species, of which 5 were dicotyledonous and 2 monocotyledonous. After using the control measures of the 7 weed species 85.71% (6 species) were perennials and 14.29% (1 species) was annual.

After applying the herbicide Basta 14 SL (5 l/ha) in variant 3, the number of weeds/m^2 was reduced to 25.33 weeds/m^2, meaning 138.67 controlled weeds. The percentage of controlled weeds in this variant is higher than in the precedent one, of 84.55%. The number of weeds found after the final weed filing was 10, of which 3 were annuals and 7 perennials, which is 70% were dicotyledonous, while 30% were monocotyledonous.

A good percent of controlled weeds was obtained in variant 4 of 83.76%, where Gallant Super (1 l/ha) was used on the Generos rows. The number of controlled weeds was 130.67 weeds/m^2, from 156.00 to 25.33 weeds/m^2. There were found finally 9 weed species, none was annual monocotyledonous, while all the other botanical class had three representatives.

Mulching didn't give great results, but the percent of controlled weeds was of 74.75%. In the initial weed filing there were found 137.33 weeds/m^2 and there were controlled 102.66 (variant 5). In this variant, after doing the final weed filing, there were found 11 weed species, of which 2 were annual dicotyledonous, 5 were perennial dicotyledonous, one was annual monocotyledonous (*Echinochloa crus-galli*) and three were perennial monocotyledonous.

The best results in controlling weeds were obtained in all of the variants where the use of herbicides was completed with manual hoes on the tree rows.

In variant 6, where there was used Roundup 360 SL (3 l/ha) + 2 manual hoes on the tree row, the percent of controlled weeds was of 95.57%, as there were 6.67 weeds/m^2 found after doing the final weed filing. Only four species of weeds were found in this variant *Agropyron repens*, *Amaranthus retroflexus, Cirsium arvense* and *Cynodon dactylon*.

In variant 7 (Basta 14 SL - 5 l/ha) + 2 manual hoes on the tree row) there were controlled a number of 134.66 weeds of the total 145.33 weeds/m^2 found in the initial weed filing. The final number of weeds in this variant was 7, of which 1 was annual dicotyledonous

(*Amaranthus retroflexus*), 3 were perennial dicotyledonous and three were perennial monocotyledonous.

Variant 8 also gave good results, because after combining the herbicide Gallant Super (1 l/ha) with 2 manual hoes on the tree row, there were controlled 140.00 weeds/m^2 of the 154.67 weeds/m^2 found in the initial weed filing. The percent of controlled weeds was of 90.51%. The number of weeds found after the final weed filing was 8, of which 2 were annuals and 6 perennials, that is 75% were dicotyledonous, while 25% were monocotyledonous.

A good percent of controlled weeds was obtained in variant 9 of 88.99%, where Roundup 360 SL (3 l/ha) was used on the Generos rows and grass sod between the rows. The number of controlled weeds was 129.33 weeds/m^2, from 145.33 to 16.00 weeds/m^2. Only five species of weeds were found in this variant: *Agropyron repens*, *Amaranthus retroflexus, Convolvulus arvensis, Cirsium arvense* and *Cynodon dactylon*.

Manual and mechanical works (variant 10) also gave good results by controlling 85.21% of the total weeds weeds/m^2, from 153.33 weeds/m^2 found in the initial weed filling to 22.67 weeds/m^2 found in the final weed filling. There were found finally 9 weed species in this variant, none was annual monocotyledonous, while all the other botanical class had representative species. There were 28.57% monocotyledonous species and 71.43% were dicotyledonous.

Comparing the results to the data obtained in the control variant (table 3) we can say that the bet results in controlling weeds were given by the combined use of herbicides with manual hoeing in variants 6 (95.76%), 7 (93.21%) and 8 (90.67%).

Good results were also obtained in variant 9 (Roundup 360 SL - 3 l/ha) on the row + grass sod between the rows) of 89.83% controlled weeds, followed by variants 10 (85.59%), 3 and 4 (both 83.90%), 2 (83.04%) and finally variant 5 – mulching (77.96%).

Out of the existent weeds, more difficult to control, in all of the variants, were *Agropyron repens, Amaranthus retroflexus, Cynodon dactylon, Cirsium arvense* and *Sonchus arvensis*. The other weeds were very good controlled, but at the final weed filing new young plants were observed.

CONCLUSIONS

In case of Generos apple tree variety, in 2008 in the climatic conditions of the Didactic Station Timisoara, it has been observed that the most problematic species were *Agropyron repens*, *Cynodon dactylon*, *Cirsium arvense, Amaranthus retroflexus*.

The best results in controlling weeds were obtained in those variants where the herbicides used (Roundup 360 SL (3 l/ha), Basta 14 SL - 5 l/ha, Gallant Super - 1 l/ha) were combined with manual hoeing because those weeds that could not be entirely destroyed by herbicides, were killed buy hoeing.

Good results were also obtained in all of the other variants, having over 80% controlled weeds. The only variant that had a lower percent of controlled weeds was the one where mulching was done and this is probably because the layer of mowed grass should have been thicker.

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TABLES

Table 1.a. Floristic composition of weeds of Generos variety, 2008 – final weed filing

No.	Species	Phenophase	Bot.class	Variant 1		Variant 2		Variant 3		Variant 4		Variant 5	
				Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)
1	*Agropyron repens*	A-C	M.p.	25,33	16,10	6,67	25	5,33	21,05	2,67	10,53	5,33	15,38
2	*Amaranthus retroflexus*	A-C	D.a.	9,33	5,93	4,00	15	2,67	10,53	4,00	15,79	4,00	11,54
3	*Capsella bursa-pastoris*	A-C	D.a.	5,33	3,39								
4	*Cardaria draba*	B-C	D.p.	6,67	4,24	1,33	5	1,33	5,26			1,33	3,85
5	*Chenopodium album*	B	D.a.	5,33	3,39								
6	*Cirsium arvense*	A-B	D.p.	12,00	7,63	4,00	15	2,67	10,53	5,33	21,05	4,00	11,54
7	*Convolvulus arvensis*	A-C	D.p.	17,33	11,02	4,00	15	2,67	10,53	2,67	10,53	2,67	7,69
8	*Cynodon dactylon*	A-C	M.p.	24,00	15,25	5,33	20	1,33	5,26	2,67	10,53	6,67	19,23
9	*Echinochloa crus-galli*	B	M.a.	4,00	2,54							1,33	3,85
10	*Polygonum aviculare*	B	D.a.									1,33	3,85
11	*Rubus caesius*	A	D.p.									4,00	11,54
12	*Sinapis arvensis*	A-C	D.a.	2,67	1,69								
13	*Sonchus arvensis*	B-C	D.p.	5,33	3,33	1,33	5	1,33	5,26	2,67	10,53	1,33	3,85
14	*Sorghum halepense*	A-B	M.p.	4,00	2,54			5,33	21,05	2,67	10,53	2,67	7,69
15	*Stellaria media*	A-C	D.a.	21,33	13,56			1,33	5,26	1,33	5,26		
16	*Veronica hederifolia*	A-C	D.a.	14,67	9,32			1,33	5,26	1,33	5,26		
	TOTAL			**157,33**	**100,00**	**26,67**	**100,00**	**25,33**	**100,00**	**25,33**	**100,00**	**34,67**	**100,00**

Table 1.b. Floristic composition of weeds of Generos variety, 2008 – final weed filing

No.	Species	Phenophase	Bot.class	Variant 6		Variant 7		Variant 8		Variant 9		Variant 10	
				Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)
1	*Agropyron repens*	A-C	M.p.	2,67	40	2,67	25	2,67	18,18	8,00	50	4,00	17,65
2	*Amaranthus retroflexus*	A-C	D.a.	1,33	20	1,33	12,5	4,00	27,27	2,67	16,67	2,67	11,76
3	*Capsella bursa-pastoris*	A-C	D.a.					1,33	9,09			1,33	5,88
4	*Cirsium arvense*	A-B	D.p.	1,33	20	1,33	12,5	1,33	9,09	1,33	8,33	4,00	17,65
5	*Convolvulus arvensis*	A-C	D.p.			1,33	12,5	1,33	9,09	2,67	16,67		
6	*Cynodon dactylon*	A-C	M.p.	1,33	20	1,33	12,5	1,33	9,09	1,33	8,33	4,00	17,65
7	*Plantago major*	B	D.a.									2,67	11,76
8	*Portulaca oleracea*	B-C	D.p.									1,33	5,88
9	*Rubus caesius*	A	D.p.			1,33	12,5	1,33	9,09			1,33	5,88
10	*Sonchus arvensis*	B-C	D.p.					1,33	9,09			1,33	5,88
11	*Sorghum halepense*	A-B	M.p.			1,33	12,5						
	TOTAL			**6,67**	**100,00**	**10,67**	**100,00**	**14,67**	**100,00**	**16,00**	**100,00**	**22,67**	**100,00**

Table 2. The influence of control measures upon the weeding degree Generos variety, 2008

Variants	Initial no. of weeds/m^2	Final no. of weeds/m^2	No. of weeds/m^2 controlled	Control percent (%)
V_1 - control	157,33	157,33	-	0,00
V_2	149,33	26,67	122,66	82,14
V_3	164,00	25,33	138,67	84,55
V_4	156,00	25,33	130,67	83,76
V_5	137,33	34,67	102,66	74,75
V_6	150,67	6,67	144,00	95,57
V_7	145,33	10,67	134,66	92,65
V_8	154,67	14,67	140,00	90,51
V_9	145,33	16,00	129,33	88,99
V_{10}	153,33	22,67	130,66	85,21

Table 3. The influence of control measures upon the weeding degree compared to the control Generos variety, 2008

Variant	Final no. of weeds/m^2	No. of weeds/m^2 controlled compared with the control	Control percent (%)
V_1 - control	157,33	-	0,00
V_2	26,67	130,66	83,04
V_3	25,33	132,00	83,90
V_4	25,33	132,00	83,90
V_5	34,67	122,66	77,96
V_6	6,67	150,66	95,76
V_7	10,67	146,66	93,21
V_8	14,67	142,66	90,67
V_9	16,00	141,33	89,83
V_{10}	22,67	134,66	85,59

Preliminary results concerning the weeding degree in apple orchards in conditions of the Didactic Station Timişoara

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Keywords: Generos variety, floral composition, weed filing

ABSTRACT

Weeds represent a permanent preoccupation in any culture as they compete with the plant culture for water and minerals' absorption. According to this, it is important to know the floristic composition of weeds in the orchard in order to apply the most efficient control measures. In the orchard of the Didactic Station Timisoara there are cultivated six varieties of apple trees, having the same culture technology, one of them being Generos variety, which gives very tasteful and good looking apples. The weeding degree in the orchard is over 95%, being present both dicotyledonous and monocotyledonous annuals and perennials. The predominant weeds, which cause severe damages, were those propagated through rhizomes *Agropyron repens, Cynodon dactylon,* or root shoots *Cirsium arvense, Convolvulus arevnsis* and *Sonchus arvensis,* as well as annuals like *Stellaria media* and *Veronica hederifolia.*

INTRODUCTION

The presence of weeds in orchards, as well as in any other culture, is a permanent reality that causes great loss of yield. The compete with the trees on different aspects, such as: more intense consume of water and minerals, more accelerated vegetation rhythm, they are hosts for a large number of pathogens, they are an obstacle in doing the maintaining works in the orchard and, finally they can determine low quantity and quality productions. (Lăzureanu A., 2001; Cârciu Gh., 2006).

The total fresh weight of weeds that can appear on one hectare of orchard can get to tens of tones annually (including the total roots weight), so weeds' consume of nutrients severely competes the fruit trees, which constantly diminish their productions (Mateescu Fl., 2002).

Weed filing is necessary in order to know the floristic compositions in orchards so that fruit growers will apply the most efficient control measures.

By this article we present the preliminary results obtained in 2008 for Generos variety of the researches made for the PhD Thesis entitled *Monitorising the Influence of Some Agrotechnical Works for Maintaining the Soil in Apple Tree Orchards upon the Physical-Chemical Features of Fruits in Conditions of the Didactic Station Timisoara*.

MATERIALS AND METHODS

According to all these, in 2008, we did the weed filing for Generos variety cultivated in conditions of the Didactic Station Timisoara in the control variant (witness) and the other variants, where there were determined the dominant weed species and there were chosen the proper control measures.

Generos apple tree variety is cultivated in an intensive system, planted in 1997 at the distance of 4m between the rows and 2 m between the trees on a row, being in the XII year since planting. It was grafted on M26 and the culture technology is the traditional one.

The weed filing was made before and after doing the herbicide treatments and the manual and mechanical works. After sprayings, the first reading was made at 12 days and the second one a month before harvesting.

The data were collected by using the quantitative-numeric method, which consists in counting the weed species on the experimental plots surface, a method which is a hustler and sufficiently accurate method. The metric framework used for weed filing has a surface of 0.25 square meters, being a square with the interior side of 0, 5 m.

Choosing the determination points was made so that they could be as representative as possible concerning the weeding status, being placed on the tree rows and marked on the filed with four pickets placed in the interior corners of the metric framework. Beside the effective number of weeds belonging to different species found inside the metric framework was marked down the phenophase of each species as it follows: the plant without reproduction organs (A); the plant having flower buds or ear (grasses) (B); flowering plant (C); the plant having fruits (D); the plant having spread its fruits and seeds (E). In order to include the weeds in the botanical class there were used the symbols: D.a. – annual dicotyledonous, D.p. – perennial dicotyledonous, M.a. – annual monocotyledonous, M.p. – perennial monocotyledonous.

The phase of data processing consisted in analyzing the primary data and writing the weed cover degree card, which needed the calculation of the analytic and synthetic data. Calculating the synthetic data consisted in expressing the above mentioned biological category according to: the number of species; the medium number of individuals; the participation of those weeds to the general weed cover degree.

The weed filing was made for each experimented variant, which are:

V1 – no herbicides, no mechanical or manual works – control;
V2 – Roundup 360 SL (3 l/ha) on the tree row, the interval mowed;
V3 – Basta 14 SL (5 l/ha) on the tree row, the interval mowed;
V4 – Gallant Super (1 l/ha) on the tree row, the interval mowed;
V5 – mulching with mowed grass of the interval;
V6 – Roundup 360 SL (3 l/ha) + 2 manual hoes on the tree row;
V7 – Basta 14 SL (5 l/ha) + 2 manual hoes on the tree row;
V8 – Gallant Super (1 l/ha) + 2 manual hoes on the tree row;
V9 – Roundup 360 SL (3 l/ha) on the row + grass sod between the rows;
V10 – 2 manual hoes + 2 mechanical works.

RESULTS AND DISCUSSIONS

In 2008, the weed extent was influenced by the climatic conditions, the rainfall quantity being moderate.

In the control variant (V1) the total number of weeds was of 157.33 weeds/m^2, being observed 14 weed species, of which there were predominant: *Agropyron repens*, *Cynodon dactylon*, *Stellaria media* and *Convolvulus arvensis* with over 10% participation degrees. Monocotyledonous weeds represent 28.57%, while dicotyledonous weeds represent 71.43%. By analysing the percent of annual and perennial weeds, we can observe that annuals represent 50% and perennials 50% of the total number of weeds (table 1.a).

Variant 2 had a total of 16 weed species, of which 12 were dicotyledonous (75%) and 4 monocotyledonous (25%). The predominant weeds were: *Agropyron repens (16.96%), Cynodon dactylon (14.29%), Convolvulus arvensis (9.82%), Amaranthus retroflexus (8.93%)* and *Stellaria media (8.93%)*. Of the total number of weeds in this variant the percentage of annuals and perennials was equal of 50%, respectively 50%.

In variant 3 the total number of weeds was of 18, being predominant the annual weeds (11), while the dicotyledonous represented 77.78%. The same as in the other variants, predominant were: *Agropyron repens (17.07%), Cynodon dactylon (13.82%), Amaranthus retroflexus (10.57%), Convolvulus arvensis (10.57%)* and *Cirsium arvense (8.94%)*. The total number of weeds in this variant was 164.00 weeds/m^2.

Variant 4 had a total of 16 weed species, of which 12 were dicotyledonous (75%) and 4 monocotyledonous (25%). The predominant weeds were: *Agropyron repens (17.95%), Cynodon dactylon (13.68%), Amaranthus retroflexus (9.40%), Convolvulus arvensis (9.40%), Cirsium arvense (8.55%)* and *Stellaria media (8.55%)*. Of the total number of weeds in this variant the percentage of annuals and perennials was equal of 50%, respectively 50%.

In variant 5 the total number of weeds was of 137.33 weeds/m^2, being observed 18 weed species, of which there were predominant: *Agropyron repens*, *Cirsium arvense, Cynodon dactylon*, *Amaranthus retroflexus* and *Convolvulus arvensis* with over 9% participation degrees. Monocotyledonous weeds represent 22.22%, while dicotyledonous weeds represent 77.78%. By analysing the percent of annual and perennial weeds, we can observe that annuals represent 50% and perennials 50% of the total number of weeds (table 1.a).

As it can be seen in table 1.b., in variant 6 there were observed 15 weed species, of which 12 where dicotyledonous (80%) and 3 where monocotyledonous (20%). In this variant there are only perennial monocotyledonous, the annuals not being found, so the percentage of annual weeds was of 40%, while the perennials represented 60% of the total number of weeds.

Variant 7 had a total of 15 weed species, of which 12 were dicotyledonous (80%) and 3 monocotyledonous (20%). The predominant weeds were: *Agropyron repens (17.43%), Cirsium arvense (11.93%, Stellaria media (11.93%) Cynodon dactylon (10.09%), Amaranthus retroflexus (9.17%)* and *Veronica hederifolia (9.17%),* and. Of the total number of weeds in this variant the percentage of annuals was 40% and of perennials was 60%.

In variant 8 the total number of weeds was of 154.67 weeds/m^2, being observed 15 weed species, of which there were predominant: *Agropyron repens*, *Cirsium arvense, Stellaria media, Cynodon dactylon*, *Amaranthus retroflexus* and *Veronica hederifolia* with over 8.50% participation degrees. Monocotyledonous weeds represent 20%, while dicotyledonous weeds represent 80%. By analysing the percent of annual and perennial weeds, we can observe that annuals represent 46.67% and perennials 53.33% of the total number of weeds (table 1.b.).

Variant 9 had 16 weed species and a total number of weeds 145.33 weeds/m^2, of which 13 where dicotyledonous (81.25%) and 3 where monocotyledonous (18.75%). In this variant the percentage of annual weeds (9) was of 56.25%, while the perennials (7) represented 43.75% of the total number of weeds.

In variant 10 there were observed 15 weed species, of which 12 where dicotyledonous (80%) and 3 where monocotyledonous (20%). In this variant there are only perennial monocotyledonous, the annuals not being found, so the percentage of annual weeds was of 40%, while the perennials represented 60% of the total number of weeds.

CONCLUSIONS

In case of Generos apple tree variety, in the climatic conditions of 2008 in Timisoara, it has been observed that the mostly spread weed species were the perennial monocotyledonous *Agropyron repens* and *Cynodon dactylon*, followed by the dicotyledonous species such as: *Cirsium arvense, Amaranthus retroflexus, Convolvulus arvensis, Stellaria media* and *Veronica hederifolia*.

There were preponderant the dicotyledonous weeds, mostly the annuals than the perennials, while of the monocotyledonous were more present the perennial than the annuals.

The weed extent was correlated with the precipitation amount registered in 2008, which was moderate, but favourable for weeds development.

By knowing the floristic composition of weeds of Generos apple tree variety we can use in the variants the specific products or works in order to get an efficient control of them

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TABLES

Table 1.a. Floristic composition of weeds, Generos variety – 2008 – initial weed filing

No	Species	Phenophase	Bot. class	Variant 1		Variant 2		Variant 3		Variant 4		Variant 5	
				Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)
1	*Agropyron repens*	A-C	M.p.	25,33	16,10	25,33	16,96	28,00	17,07	28,00	17,95	25,33	18,45
2	*Amaranthus retroflexus*	A-C	D.a.	9,33	5,93	13,33	8,93	17,33	10,57	14, 67	9,40	13,33	9,71
3	*Capsella bursa-pastoris*	A-C	D.a.	5,33	3,39	5,33	3,57	6,67	4,07	4,00	2,56	2,67	1,94
4	*Cardaria draba*	B-C	D.p.	6,67	4,24	10,67	7,14	5,33	3,25	9,33	5,98	6,67	4,85
5	*Chenopodium album*	B	D.a.	5,33	3,39	4,00	2,68	2,67	1,63	2,67	1,71	1,33	0,97
6	*Cirsium arvense*	A-B	D.p.	12,00	7,63	10,67	7,14	14,67	8,94	13,33	8,55	14,67	10,68
7	*Convolvulus arvensis*	A-C	D.p.	17,33	11,02	14,67	9,82	17,33	10,57	14, 67	9,40	13,33	9,71
8	*Cynodon dactylon*	A-C	M.p.	24,00	15,25	21,33	14,29	22,67	13,82	21,33	13,67	14,67	10,68
9	*Echinochloa crus-galli*	B	M.a.	4,00	2,54	4,00	2,68	5,33	3,25	5,33	3,42	5,33	3,88
10	*Papaver rhoes*	B-C	D.a.					1,33	0,81				
11	*Plantago major*	B	D.a.			1,33	0,89	2,67	1,63	2,67	1,71	2,67	1,94
12	*Polygonum aviculare*	B	D.a.					1,33	0,81			1,33	0,97
13	*Portulaca oleracea*	B-C	D.p.			2,67	1,79			4,00	2,56	4,00	2,91
14	*Rubus caesius*	A	D.p.									4,00	2,91
15	*Sinapis arvensis*	A-C	D.a.	2,67	1,69			1,33	0,81				
16	*Sonchus arvensis*	B-C	D.p.	5,33	3,33	5,33	3,57	2,67	1,63	5,33	3,42	5,33	3,88
17	*Sorghum halepense*	A-B	M.p.	4,00	2,54	4,00	2,68	8,00	4,88	4,00	2,56	2,67	1,94
18	*Stellaria media*	A-C	D.a.	21,33	13,56	13,33	8,93	12,00	7,32	13,33	8,55	8,00	5,82
19	*Taraxacum officinalis*	B-C	D.a.			2,67	1,79	5,33	3,25	2,67	1,71	5,33	3,88
20	*Veronica hederifolia*	A-C	D.a.	14,67	9,32	10,67	7,14	9,33	5,69	10,67	6,84	6,67	4,85
	TOTAL			**157,33**	**100,00**	**149,33**	**100,00**	**164,00**	**100,00**	**156,00**	**100,00**	**137,33**	**100,00**

Table 1.b. Floristic composition of weeds, Generos variety – 2008 – initial weed filing

No	Species	Phenophase	Bot. class	Variant 6		Variant 7		Variant 8		Variant 9		Variant 10	
				Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)	Av. no. of weeds/m^2	Participation (%)
1	*Agropyron repens*	A-C	M.p.	29,33	19,47	25,33	17,43	30,67	19,83	30,67	21,10	30,67	20,00
2	*Amaranthus retroflexus*	A-C	D.a.	14,67	9,73	13,33	9,17	13,33	8,62	13,33	9,17	13,33	8,69
3	*Capsella bursa-pastoris*	A-C	D.a.	10,67	7,08	9,33	6,42	6,67	4,31	5,33	3,67	10,67	6,96
4	*Cardaria draba*	B-C	D.p.	6,67	4,42	5,33	3,67	9,33	6,03	2,67	1,83	5,33	3,48
5	*Chenopodium album*	B	D.a.					2,67	1,72	2,67	1,83		
6	*Cirsium arvense*	A-B	D.p.	14,67	9,73	17,33	11,93	17,33	11,21	9,33	6,42	16,00	10,43
7	*Convolvulus arvensis*	A-C	D.p.	10,67	7,08	9,33	6,42	9,33	6,03	10,67	7,34	10,67	6,96
8	*Cynodon dactylon*	A-C	M.p.	13,33	8,85	14,67	10,09	14,67	9,48	18,67	12,84	14,67	9,56
9	*Echinochloa crus-galli*	B	M.a.							1,33	0,92		
10	*Papaver rhoes*	B-C	D.a.										
11	*Plantago major*	B	D.a.	2,67	1,77	2,67	1,83	4,00	2,59	1,33	0,92	2,67	1,74
12	*Polygonum aviculare*	B	D.a.										
13	*Portulaca oleracea*	B-C	D.p.	5,33	3,54	1,33	0,92			2,67	1,83	5,33	3,48
14	*Rubus caesius*	A	D.p.	1,33	0,88	2,67	1,83	2,67	1,72			2,67	1,74
15	*Sinapis arvensis*	A-C	D.a.							1,33	0,92		
16	*Sonchus arvensis*	B-C	D.p.	6,67	4,42	8,00	5,50	8,00	5,17	10, 67	7,34	6,67	4,35
17	*Sorghum halepense*	A-B	M.p.	1,33	0,88	2,67	1,83	2,67	1,72			1,33	0,87
18	*Stellaria media*	A-C	D.a.	18,67	12,39	17,33	11,93	17,33	11,21	14,67	10,09	18,67	12,17
19	*Taraxacum officinalis*	B-C	D.a.	1,33	0,88	2,67	1,83	2,67	1,72	9,33	6,42	1,33	0,87
20	*Veronica hederifolia*	A-C	D.a.	13,33	8,85	13,33	9,17	13,33	8,62	10,67	7,34	13,33	8,69
	TOTAL			**150,67**	**100,00**	**145,33**	**100,00**	**154,67**	**100,00**	**145,33**	**100,00**	**153,33**	**100,00**

Nutritional qualities of some cultivars of red and black currants from Banu Mărăcine, Craiova

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Keywords: anthocyanins, ascorbic acid, mineral composition

ABSTRACT

The cultivation of *Ribes* fruits (black- and redcurrants and gooseberries) is aimed at both fresh and processing markets, with the blackcurrant *R. nigrum* particularly important in the latter. Blackcurrants and other *Ribes* species are outstanding sources of antioxidants, both in the form of high ascorbate levels but also in the high concentrations of polyphenolic compounds that are contained within the fruit. The latter include flavonoids, such as anthocyanins and flavonols. The amounts of these compounds present in the berries varies with cultivar, environment and agronomic practices. The aim of our study was to evaluate total anthocyanin content, ascorbic acid content and other physicochemical properties of black and red currants collected from Banu Maracine Research Station, Craiova. Eight black currant (Ribes nigrum) and two red currant (Ribes rubrum) cultivars were investigated. For the quantification of total anthocyanins in fruits, a spectrophotometrical assay was performed. Also, it was evaluated the mineral composition by the method of atomic emission spectrophotometry, with inductively coupled plasma (ICP). The black currants were remarked by the higher dry matter content, titratable acid, ascorbic acid and anthocyanins content than red currants. The highest amount of anthocyanins in black currants was found in samples of Record and Tenah cultivars and twice lowest in Abanos, Bogatâr and Blackdown cultivars. Ascorbic acid content was higher in Tinker, Tenah, Abanos and Deea cultivars, with more than 200 mg ascorbic acid per 100 g and for 7 times lowest in red currants. Results showed that black and red currants have rich mineral composition, especially potassium and iron.

INTRODUCTION

Berry fruits, wild or cultivated, are proved as a traditional and rich source of bioactive compounds, possessing important biological activities (Badjakov et al., 2008).

Interest in fruit composition has intensified because of increased awareness of the possible health benefits of some of their nutrients (Burdulis et al., 2007).

Black currants (*Ribes nigrum* L.) are perennial bush plants of the gooseberry family (*Grossulariaceae*) native to central and northern Europe and northern Asia (Rubinskiene et al., 2006).

An extensive study by the Scottish Crop Research Institute confirms that black currants, a once illegal berry in the U.S., have higher levels of antioxidants and total vitamins and minerals than virtually any other fruit, including blueberries and pomegranates, for health-giving qualities.

The fruit has an extraordinarily high vitamin C content (302% of the Daily Value per 100g, table), good levels of potassium, phosphorus, iron and vitamin B_5, and a broad range of other essential nutrients.

Other phytochemicals in the fruit (polyphenols/anthocyanins) have been demonstrated in laboratory experiments with potential to inhibit inflammation mechanisms suspected to be at the origin of heart disease, cancer, microbial infections or neurological disorders like Alzheimer's disease. Major anthocyanins in blackcurrant pomace are delphinidin-3-O-glucoside, delphinidin-3-O-rutinoside, cyanidin-3-O-glucoside, and cyanidin-3-O-rutinoside which are retained in the juice concentrate among other yet unidentified polyphenols.

In addition, black currant seed oil contains 47% linoleic (18:2n6), 14% alpha-linolenic (18:3n3), 12% gamma-linolenic (18:3n6) and 2.7% stearidonic (18:4n3) acids. Of these, gamma-linoleic is rarely found in any other natural resource, and both alpha and gamma-linoleic are essential fatty acids, which means our body cannot produce them on its own.

Overall, black currants have been proven to have health benefits including: anti-inflammatory action; powerful anti-oxidant action; may be help prevent cancer; reduces the effects of arthritis.

The aim of this study was to investigate the chemical properties of different black and red currant cultivars collected in Banu Măracine Research Station, University of Craiova and to determine which varieties contain high amounts of ascorbic acid, anthocyanins and minerals.

MATERIALS AND METHODS

Biochemical studies on black and red currant berries were carried out in our laboratory in 2008. Black and red currants for analyses were collected at the breeding plantation of Banu Maracine Research Station, University of Craiova The cultivars studied included local and foreign varieties which are grown in Romania, including eight black currant cultivars (Tenah, Abanos, Bogatâr, Blackdown, Record, Ronix, Tinker, Deea) and two red currants cultivars (Rosu Timpuriu, Abundent).

The following analyses were carried out:

- dry matter content;
- soluble solids content by refractometer;
- titratable acidity expressed as citric acid by titration with 0.1 N NaOH;
- ascorbic acid content by the iodometric method;
- total sugar content by the Schoorl method;
- anthocyanins content: the concentration of total anthocyanins in black and red currants is determined using a spectrophotometric method, which is based on the characteristics of the dominant pigment, cyanidin-3-glucoside (Fuleki and Francis, 2006). Anthocyanins were extracted from 5 g of berries ground with quartz sand with 40°C water. The extract was diluted to 100 ml with water. Sediment should be removed by centrifugation of the sample. 2 ml aliquots were each diluted to 25 ml with pH 1.0 and 4.5 buffers. The sample must be diluted, so that the sample at pH 1.0 has an absorbance of less than 1.0 and preferably in the range of 0.4-0.6. The sample must be diluted the same amount at pH 1.0 and pH 4.5.

The difference in absorbance at the wavelength of maximum absorption (510 nm) will be proportional to the anthocyanin content. To correct for turbidity (haze) the absorbance at 700 nm is subtracted from the absorbance at 510 nm (the wavelength of maximum absorption).

To calculate the difference in absorbance between the two samples, we proceeded as follows:

ΔAbsorbance = (A_{510nm} pH 1.0 - A_{700nm} pH 1.0) - (A_{510nm} pH 4.5 -A_{700nm} pH 4.5)

Cyanidin-3-glucoside is the major anthocyanin of black currants and its molar absorbance, ε is 29.600 l/(mol cm) and its molecular weight, M is 445 g/mol. The dilution factor was 12.5. The values are substituted into the equation:

C (mg/l) = ΔAbsorbance/(29600 x 1) x 10^3 x 445 x 12.5

- mineral composition by the method of atomic emission spectrophotometry, with inductively coupled plasma (ICP). The following elements were determined: Ca, Mg, K, Fe, Mn, Zn, Al, Cr, Na.

RESULTS AND DISCUSSION

The results of the physicochemical composition of black and red currants fruits are given in table 1.

Analysing the results, the black currants were remarked by the more higher dry matter content, titratable acid, ascorbic acid content and anthocyanins content than red currants, while the values of soluble matter and total sugar content were almost the same.

Citric acid is the main acid in black currants (Rubinskiene et al., 2006). The titratable acid as citric ranged between 1.536 g/100 g for Abundent and Ronix cultivars and 2.432 g/100 g for Blackdown cultivar.

The ascorbic acid content of black currants was for 7 times greatest comparatively with that of the red currants.

The differences were significant also with regard to the anthocyanins content. The anthocyanins content of black currants was for 50 times greatest comparatively with that of the red currants.

Among the black currants, the dry matter content was higher in Tenah and Blackdown cultivars, Tenah having also the greatest soluble matter content (14%).

In particular, black currants are renowned for their high content in Vitamin C (a powerful antioxidant). Ascorbic acid content and its dynamics depend on the cultivar (Viola et.al., 2000). The ascorbic acid content was higher in Tinker, Tenah, Abanos and Deea cultivars, with more than 200 mg ascorbic acid per 100 g.

The berries of black currant are rich in polyphenolic compounds and especially in anthocyanins, demonstrating antioxidant activity. Anthocyanin pigments are responsible for the characteristic purple-dark colour of blackcurrants. The amount of anthocyanins was higher in Record and Tenah cultivars and twice lowest in Abanos, Bogatâr and Blackdown cultivars.

Table 2 presents the mineral composition of the studied black and red currants. The results were expressed by mg/100 g sample.

The results showed that black and red currants have rich mineral composition, especially potassium and iron. The values of Na were almost the same for the black and red currants cultivars and with regard to Ca and Fe, the black currants fruits were superior to those of red currants. A similar situation was established also analyzing the other mineral compounds. Thus, it can be concluded that the red cultivars were characterized by a smaller quantity of minerals than the black currants.

The Mn content of the black currant cultivars was very closed, excepting Tenah and Tinker with higher content (18-19 mg/100 g). Tenah is the cultivar with the highest content of Ca, Mg, K, Fe while Tinker is the cultivar with the highest content of Zn and Record is the cultivar with the highest content of Cr.

CONCLUSIONS

Black currants were remarked by the more higher dry matter content, titratable acid, ascorbic acid and anthocyanins content than red currants. The ascorbic acid content is for 7 times greatest comparatively with that of the red currants while the anthocyanins content is for 50 times greatest comparatively with that of the red currants.

Black and red currants have rich mineral composition, especially potassium and iron. The most valuable cultivar is Tenah with the highest content of dry matter, soluble matter, total sugar, Ca, Mg, K and Fe together with a very high anthocyanins and ascorbic acid content. Other valuable cultivars are also Record with the highest content of anthocyanins and Cr and Tinker with the highest content of ascorbic acid, Mn and Zn.

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TABLES

Table 1. Physicochemical composition of fresh black and red currants fruits

Cultivars	Dry matter (%)	Soluble matter (%)	Total sugar (g/100 g)	Titratable acid as citric (g/100 g)	Ascorbic acid (mg/100 g)	Anthocyanins (mg/100 g)
Tenah	20.47	14	7.31	2.304	232.32	183.56
Abanos	17.41	13	6.96	2.208	218.24	106.25
Bogatâr	18.35	12	6.59	2.016	183.04	112.37
Blackdown	19.92	10	6.02	2.432	197.12	115.59
Record	18.56	9	4.90	2.336	147.84	213.81
Ronix	19.65	12	5.73	1.536	163.68	156.41
Tinker	19.55	12	6.67	2.272	241.12	126.38
Deea	19.53	8	6.09	2.080	200.64	130.83
Roşu timpuriu	15.93	10	6.23	1.696	33.44	15.63
Abundent	16.40	11	6.02	1.536	36.96	4.31

Table 2. Mineral composition of black and red currants fruits

Cultivars	Ca	Mg	K	Fe	Mn	Zn	Al	Cr	Na
Tenah	64.20	65.93	305.05	1.72	0.18	0.21	1.03	0.07	1.19
Abanos	50.86	57.35	251.13	1.31	0.14	0.28	0.67	0.07	0.98
Bogatâr	31.27	45.74	302.15	1.13	0.14	0.16	0.55	0.05	1.22
Blackdown	53.27	56.71	268.04	1.38	0.15	0.32	0.50	0.09	0.99
Record	40.77	51.31	285.66	1.48	0.15	0.22	0.66	0.13	1.28
Ronix	43.50	57.30	286.51	1.53	0.18	0.17	0.85	0.10	1.24
Tinker	41.89	55.76	262.73	1.61	0.19	0.36	1.13	0.06	1.09
Deea	42.73	57.01	263.84	1.51	0.15	0.18	0.98	0.11	1.07
Roşu timpuriu	18.17	27.37	240.39	1.15	0.10	0.25	1.01	0.08	1.10
Abundent	33.99	38.17	249.55	1.38	0.14	0.34	0.78	0.09	1.31

The quality of highbush blueberry (*Vaccinium corymbosum*) hardwood cuttings rooted in different substrates

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Keywords: rooting, hormones, basal heating

ABSTRACT

Cutting is one of the principal propagation methods of highbush blueberry (*Vaccinium corymbosum.*). The paper presents some new aspects of the basal heating techniques on hardwood cuttings rooting. Cuttings of *Vaccinium corymbosum* varieties (Bluecrop, Blueray, Coville) were treated with alpha naphtyl acetic acid -NAA (1000 ppm), indolil butyric acid - IBA (1000 ppm) and NAA + IBA (1500 ppm). Composed rooting substrates, double layers and mixed with: wood flour + perlite; wood compost + perlite were used. The rooting percentage and the quality of formed roots were strongly influenced by variety, cutting moment, substrate type used and basal and atmospheric temperature.

OBJECTIFS

Choosing the optimal substratum for highbush blueberry plants (***Vaccinium corymbosum***.) cutting propagation and establishment of the optimal moment for cutting. For this was efectuated study of the substratum temperature effect on callous and root formation and study of some blueberry variety's behaviour on rooting process.

MATERIAL AND METHOD

In the present trial hardwood cuttings, 20-25 cm length, were used.

Biological material:

Vaccinium corymbosum varieties (Bluecrop, Blueray, Coville)

Cutting's period:

- November 2006
- November 2007

Hormonal treatment: 1000 ppm of NAA (α naphtil acetic acid) for 10 seconds.
1000 ppm of IBA (indolil butyric acid) for 10 seconds.
1500 ppm of NAA + IBA for 10 seconds.

Substratum types (experimental variants):

V1 - pearlite on wood flour
V2 - pearlite on wood compost
V3 – pearlite

Temperature: - at cutting's base: 22-25° C
in the air: 11-13° C

Cutting plant:

Cuttings technological platform type U.S.A.B.1

Rooting bench type U.S.A.B.2
Close circuit thermostat.

EXPERIMENTAL RESULTS

On V1 variant (pearlite on woodflour) the highest rooting percentage was obtained by Blueray cultivar and Coville (table 1). On this substratum, Blueray formed also the longest roots (3.01 cm). The medium number of roots per cutting varied from 3 to 7.3 (table 2).

On V2 variant (pearlite on wood compost) the rooting percentage has values between 85,93 and 60,1%. Best results were obtained by Coville, Blueray and Bluecrop varieties. The same Blueray has the longest roots (4.13 cm), and the root's number per cutting was among 4.3 and 8.2.

On V3 variant (pearlite) the percentage of rooting varied from 29.7 to 64.5%. On V3 also the root number was low (1.9-5.9).

CONCLUSIONS

During the trial ***Vaccinium corymbosum*** varieties: Blueray and Coville had the highest rooting percentage.

The optimal period for cutting was between the end of November and mid January.

Basal heating at 22-24° C and lower atmospheric temperature (11-13° C) were essential for obtaining a high rooting percentage in that periods.

The best results were obtained when pearlite on pearlite on wood flour (V1) and pearlite on wood compost (V2) were used.

On double layer variants (V1, and V2) the root's length was higher than in one layer variants (V3) but the root's number per cutting was lower. In the first case Blueray showed the best results like the same cultivar in the therd one.

Between the root's length and root's number per cutting an indirect relation was found. The methods presented are cheap and easy to apply by all the farmers.

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TABLES

Table 1. Rooting percentage (%) of highbush blueberry hardwood cuttings

VARIANT (rooting substrates)	VARIETY		
	Blueray	Coville	Bluecrop
V1 perlite/wood flour	73.33	57.29	44.3
V2 perlite/w.compost	85.93	60.1	52.21
V3 perlite	64.5	44.5	29.7

Table 2. Roots caractheristics at the Highbush Blueberry hardwood cuttings.

HYBRID AND VARIETY	V1 perlite/wood flour		V2 perlite/w. compost		V3 perlite	
	No. med	L(cm) med	No. med	L(cm) med	No. med	L(cm) med
Blueray	3.7	9.5	4.5	10.2	2.9	8.9
Coville	4.9	10.2	5.3	12.3	3.8	9.3
Bluecrop	6.1	15.3	6.8	15.9	5.7	12.1

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Researches regarding the shortening of the period for obtaining genetic disease resistant apple tree breeds

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Keywords: new methods for obtaining of apple trere breeds, with shortening of the period, performing solutions with reduced surfaces and costs.

ABSTRACT

In the genetic improvement programs, conventional methods are used for obtaining of new breeds – namely the intra- or interspecific hybridation, characterized by a long duration (34-27 years) and high costs. The new method, with shortening of the period of obtaining genetic disease resistant apple tree breeds, replaces the hybrids selection field with a field of elites, selected in the juvenile phase from the fortification field, according to the growth and disease resistance pecularities, grafted on weak vigour layers (M9), planted on definitive places, at a distance of 3x0,5m. The possibility is created to select elites according to theri disease resistance character and their fruit quality, during 3-4 years - and their rapid transfer into competition micro-cultures. The researches performed at the Tree Growing Research & Development Station Voineşti in the period 2007-2009 point out the fact, that by promoting of chain loops for shortening the obtaining duration of genetic disease resistant apple tree breeds in the improvement process, the period is shortened by 30-35%, as compared to the conventional method (25-28 years), the surface destined for the selection fields is reduced by almost 5 times – and the costs for the creation and the putting into account of a new breed decrease to a considerable degree.

INTRODUCTION

The realization of ecological fruits productions, of superior quality and at as low as possible costs, represent major priorities, both on a national and on a global level. Due to the demographice growth and the increase of the ecological fruits consumtion in the consumers' dayly diet, it becomes necessary to create and to extend into culture the breeds with genetic disease resistance.

In our cvountry, the genetic improvement programs use, for obaining new breds, especially conventional methods – intra- or interspecific hybridation, a method characterized by a long duration and high costs.

Branişte N. (1987) shows that in the improvement programs for the creation of apple tree breeds, from the hybridation until the homologation and the transfer of the new breed into production, 24-27 years are needed.

The experience of some European countries (Italiy, France, etc.), in the creation of the breeds in a shorter time by conventional methods, sparked the interest to identifify new solutions, leading to the shortening of the creation period of new breeds with genetic disease resistance in the Romanian research units.

The researches performed at the SCDP Voineşti, contribute to the promotion of some new chain loops for shortening the duration for obtaining genetic disease resistant apple tree breeds in the process of improvement and for a faster introduction of the modern ideas, so that the new breeds may arrive in a shorter time to the producers – and implicitly to the consumers.

MATERIAL AND METHODS

The researches were performed at the Tree Growing Research & Development Station Voineşti, in the experimental fields.

The experiments started by planting at the definitive place, in spring of the year 2007, the layers from the graft bearer M9, at a distance of 2,5 x 0,5m (8000 trees/Ha). On each layer planted on the definitive place, in August 2007 were grafted elites' eyes, selected according to their growth and leaves' disease resistance pecularities - from the apple tree hybrids field, in the second fortification year (hybrid series 2005) and from those of the first fortification year (hybrid series 2006).

The grafting was repeated in the year 2008, in the nursery being grafted 2 eyes on each graft bearer M 9, from each elite selected from the hybrid series 2006 and 2007, from the fortification fields.

In the first year after the grafting, the elites' behaviour was followed up under the aspect of the growth evolution and of the disease resistance.

In the years 2-3 (2008 and 2009 respectively) the fruit bearing apple tree elites were registred, following up the fruit setting degree, the fruit quality and the disease resistance. Fron the valuable elites, which coresponded to the proposed objectives, 20 eyes were grafted on each graft bearer M 26, in vue of the creation of a competition micro- culture.

RESULTS AND DISCUSSIONS

Both on global level and in our country, the breeds represent the most dynamic progress factor, so that the requirements towards the production and the fruit quality increase steadily, with competitive, ecologiceal breeds - suitable for the consumtion in fresh status and for processing, beneficial for people's health. The apple producers in our country will be obliged in the next years to replace the old plantations with modern culture systems, in which to provide for resistant, high productivity apple tree breeds, with superior quality fruits, competitive both on the internal and on the Community countries' markets. Therefore, it is necessary to have in view the elaboraration and the use of the most efficient and performing methods for the creatiohn of new breeds, in a shorter time and with reduced costs.

The creation process of the breeds is a continuos process, annually being created new hybrid generations.

After establshing the genetic resources engaged in the hybridation schemes, obtaining the seeds and the seedlings from the performed hybrid combinations takes place. The main objective being the creation of the genentic disease resistant apple tree breeds, the selection of the seedlings obtained in green houses can be done after a previous infection with virulent scurf strains, being continued also in the fortification field.

These activities are common, regardless of the used improvement method (table 1). After 2 years, the transplantation of the hybrids from the fortification field to the definitive place in the selection orchard takes place. For growth and fruit bearing, the hybrids need a period of at least 10-12 years, time in which the mass positive selection taskes place, for the direct observation and the marking of the selected hybrids, in accordance to the selection criteria (disease resistance, aspect and good test of the fruits, fruit bearing potential, etc.), their grafting in the nursery and their introduction into competition micro-cultures, in view of their promotion in the DUS test (distinctiveness, uniformitaty, stability) – mandatory for the homologation.

The new method proposes the shortening of these activities, by replacing the selection field of the hybrids on own roots with a field of elites, selected in the juvenile phase from the fortification field, according to the growth and disease resistance pecularities, grafted on a weak vigour layer (M.9), planted on the definitive place.

In this case, there is the possibility to make, in the next 2-3 years, the selection according to the disease resistance, the fruits features and quality.

This activity takes at most 4 years, as compared to the present scheme, which takes 10-12 years.

From the researches performed at Voineşti, the hybrid apple tree seedlings on own roots, left in the fortification field - a part of these bore fruits in the third year after planting in the hybrids nursery.

In this case, the 17-18 years period can be reduced by another 2 years; the hybrids selected according to their growth pecularities, their fruits quality and their genetic disease resistance, may be grafted directly on the graft bearers M 26 or MM 106 in the nursery and transfered into competition micro-cultures.

In order to enter trading, the apple tree hybrids, selected and introduced into competition micro-cultures, must traverse a testing period of 2-3 years in full fruit bearing, a testing performed by the ISTIS, in which time their authenticity, varietal purety, agronomical and use value are verified and confirmed. The introduction into culture takes place only after they have been registred in the Oficial Cathalogue.

By promoting the new improvement scheme for obtaining the genetic disease resistant apple trere breeds, the period is shortened by 8-9 yeaes.

Also the ground surface needed for obtaining and testing the hybrid materrial - until homologation and promoting into culture of the new breeds – is shortened very much (Table 2).

From the data presented in the table 2 results that, at a volume of 2500 hybrid apple tree seedlings, obtained in a hybrid series, after performing the selection for the disease resistance and their transplantation in the hybrids nursery for fortification, a surface of 340 m^2 is needed for both used methods, for the creation of new apple tree breeds.

At the conventional method, for the transfer of the 2500 hybrid seedlings into the selection orchard, a surface of 10.000 m^2 is needed.

At the method with period shortening, the fortified hybrids in the hybrids nursery are not any more tranfered into the selection orchard. By means of a rigurous selection, accordiong to the growth and diseasen resistance pecularities, maximum 10% genotypes result from the total hybrids number, these being grafted on M9 layers, planted on the definitive place, at a distance of 3 x 0,5 m. It results a selection orchard with about 250 hybrids, selected fron the hybrids nursery and 1-2 eyes grafted on each M9 layer, planted at the definitive place, wich will bear fruits in the year 2 and 3 after grafting, covering a surface of maximum 375 m^2.

At the Voineşti Station, from 250 hybrids selected according the growth and scurf resistance pecularities, grafted on the graft bearer M 9, in the year 3 a number of 15 eapple tree elites bore fruits. From these, 20 eyes from each elites were grafted in the nursery – only from those which presented fruits and disease resistance, in view of creating a competition micro-culture, which in both methods uses about 2400 m^2.

It has been ascertained that the conventional methoduses a total surface od 12.740 m^2, as compared to the method with shortening of the period for obtaining genentic disease resistant apple tree breeds, with only 3115 m^2 used, representing about 25%, with a surface reduction of 75%.

The promotion of the shortening method of the technology for obtaining of the genentic disease resistant apple tree breeds, stimulates the scientifical foundation of the solutions proposed for the competence increase, in accordance with the new orientations in the scientifical research of the Europena countries with an as advanced tree growing.

CONCLUSIONS

By promoting some chain loops for the duration shortening for obtaining the genentic disease resistant apple tree breeds in the improvement process, the period is shortened by 30-35%, as compared to the conventional method (25-28 years), the surface destined to the selection fields is reduced by almost 4 times – and the costs for the creation and the putting into account of a breed are decreased to a considerable degree.

By shortening the duration for obtaining the new breeds, the economical efficiency increases by reducing the expenses and the respective ground surface; the 3 cathegories of beneficiaries: the cultivators, the traders and the consumers being satisfied in a shorter time.

New selecion bases are created, composed of hybrid descendencies with complex variability, due to the implication into the hybridation process of some valuable breeds, coresponding to the proposed objectives, which lead to the creation new genentic disease resistant apple tree breeds.

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TABLES

Table 1.The Present Scheme as Compared with the Scheme for Shortening the Period for Obtaining Genetic Disease Resistant Apple Tree Breeds

The Present Scheme	The New Scheme
- Genitors choice - Hybridation - Hybrid seeds - Seeds Stratification (1 year)	- Genitors choice - Hybridation - Hybrid seeds - Seeds Stratification (1 year)
- Sowing in flower pots or jiffy-pots in the green house - Obtaining hybrid plants (selection by disease resistance) - Hybrids transplantation into the hybrids nursery for fortification (2 years)	- Sowing in flower pots or jiffy-pots in the green house - Obtaining hybrid plants (selection by disease resistance) - Hybrids transplantation into the hybrids nursery for fortification (1 year)
- Transplantation into the definitive place in the selection orchard - Hyibrids' growth (6-8 years)	- Hybrids' growth in the hybrids nursery (selection by the growth and disease resistance pecularities) - Grafting of 1-2 eyes of the selected elites on weak vigour graft bearers (M 9), (1 year)
- Hybrids' selection (Quality test) (4 years)	- Selection of hybrids grafted on tyhe graft bearer portaltoiul M9 (Quality test) (2 years)
- Grafting of the elites with perspective and introducing into competition micro-cultures (2 years)	- Grafting of the elites with perspective and introducing into competition micro-cultures (2 years)
- Observing the elites' behaviour in competition micro-cultures (production test) (4-5 years) - Registring the valuable elites at the ISTIS	- Observing the elites' behaviour in competition micro-cultures (production test) (4-5 years) - Registring the valuable elites at the ISTIS
- Testing the elites at the ISTIS in vue of homologation (3 years)	- Testing the elites at the ISTIS in vue of homologation (3 years)
- Introducetion into mother plantations for multiplying (3 years)	- Introducetion into mother plantations for multiplying (3 years)
Total **25 – 28 years**	Total **17 – 18 years**

Table 2. Comparative Data Regarding the Ground Surface Used for Obtaining Apple Tree Breeds by the Conventional Method and the Period Shortening Method

Methods Used for Apple Tree Breeds Creation	**Used Surface (m^2)**				
	Hybrids Nursery for Fortification (2500 seedlings)	**Selection Orchard with Fortified Hybrids (2500 seedlings)**	**Selection orchard with hybrids selected from the hybrids nursery and grafted on M 9 (250 selections)**	**Competition Micro-culture (15 selections x 20 trees)**	**Total**
Conventional Method	340	10,000	-	2,400	12740
Period Shortening Method	340	-	375	2,400	3115 (24.45%)

Nutrition Surface for an apple tree hybrid, depending on the planting distance, in:
- the hybrids nursery: 0,90m x 0,15m = 0,135 m^2
- the selection orchard with fortified hybrids: 4m x 1m = 4 m^2
- the selection orchards with hybrids selected from the hybrids nursery and grafted on M9: 3m x 0,5m = 1,5 m^2
- the competition micro-culture: 4m x 2m = 8 m^2

FIGURE

Aspects of the elite bred grafted on M.9

Preliminary results considering the fruiting phenophases development in the pedoclimatic conditions of the Didactic Station Timişoara

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Keywords: apple, varieties, flowering, fruit binding, harvest

ABSTRACT

In the Didactic Station of Timisoara we observed the development of the main fruiting phenophases of five apple varieties as it follows: a summer variety – Romus 2, two fall varieties – Generos and Pionier and two winter varieties – Jonathan and Florina. We observed and took notes of the beginning of each phenophase for all the varieties. The development of each phenophase is different for the mentioned varieties and it is directly influenced by the climatic conditions of the area. Knowing the fruiting phenophases is very important in fruit culture technology in order to know when and how to do the main technological works in the orchard.

INTRODUCTION

The apple tree is the first main species of the temperate climate due to the orchards surfaces and apple production. Its importance also comes out of the long keeping period of apples during winter and because there is a large number of varieties with different harvesting period along the year.

The beginning and development of fruiting phenophases is different for each variety and it is directly influenced by the climatic conditions of the cultivation area, and mainly the temperature.

Observing and knowing the development of each phenophase has a huge practical and theoretical importance, mainly to know exactly when and what technological works the fruit grower has to do.

MATERIALS AND METHODS

The biological material consists in five apple tree varieties that are being cultivated in the didactic orchard of our Faculty: a summer variety – Romus 2, two fall varieties – Generos and Pionier and two winter varieties – Jonathan and Florina.

The trees were planted in the spring of 1997, being in the X, XI and respectively XII year since planting, at the distance of 4 m between the rows and 2 m between the trees, having an intensive culture system of 1250 trees/ha. All the varieties were grafted on M26 and they have almost the same culture technology.

The fruiting phenophases that were observed in the orchard are: mixed buds' inflation, mixed buds' opening, flowering period, fruit binding, incipient ripening, harvesting and full ripening. The interpreting of data was done concerning the evolution of the main climatic conditions

RESULTS AND DISCUSSIONS

The fruiting phenophases were observed in the period 2006-2008 starting with the buds' inflation and ending with the full ripening of fruits.

In 2006, mixed bud's inflation started first in 02.04 for Romus 2 variety and the latest in 08.04 for Generos variety, all the other varieties staring this phenophase between these intervals (table 1).

Mixed buds' opening was first observed at Romus 2 variety in 09.04, being followed by Pionier variety in 10.04, Florina variety in 12.04, Jonathan and Generos varieties in 13.04.

The flowering period started in 16.04 and ended in 27.04 for Romus 2 variety, on the other side being Generos variety, which started in 19.04 and ended the flowering period in 30.04. Jonathan variety ended the flowering the latest at the beginning of May.

Fruit binding phenophase was observed in 03.05 for Romus 2 and Pionier, in 04.05 for Florina variety and in 06.05 for Jonathan variety.

The incipient ripening phenophase took place in the period 08.08-12.08 for Romus 2 and Pionier varieties and in the period 02.09-08.09 for Florina, Generos and Jonathan variety.

In 2006, the harvesting period began in 22.08 for Romus 2 variety and ended in 01.10 for Florina variety, while the full ripening took place in 28.08 for Romus 2 apples and 07.10 for Florina apples (table 1).

In 2007, mixed bud's inflation started in 23.03 for Romus 2 variety and the latest in 31.03 for Generos variety (table 2).

Mixed buds' opening was first observed at Romus 2, Pionier and Florina varieties in 28.03 and the latest in 05.04 for Generos and Jonathan varieties.

The beginning of flowering took place in 05.04 for Romus 2, Pionier and Florina varieties and in 12.04 for Generos and Jonathan varieties. The mid flowering was observed in the period 11.04-19.04 for all the varieties, while the end of flowering was observed in 17.04 for Romus 2 and Florina varieties and in 25.04 for Generos and Jonathan varieties.

Fruit binding phenophase was observed in the period 21.04 for Romus 2 and the latest in 30.04 for Generos and Jonathan varieties.

In 2007, the incipient ripening phenophase took place in 23.07 for Romus 2 variety and in 25.08 for Generos variety. The harvesting period began in 10.08 for Romus 2 variety and ended in 20.09 for Florina variety, while the full ripening took place in 18.08 for Romus 2 apples and 03.10 for Florina apples (table 2).

In 2008, mixed buds' inflation started in 26.03 for Romus 2, it continued with Pionier and Generos varieties in 28.03 and the latest in 29.03 for Florina and Jonathan varieties. Bud's opening started in 03.04 for Romus 2 and Jonathan varieties and in 05.04 for Generos and Florina varieties (table 3).

The flowering period developed in the period 10.04-21.04 for Romus 2 variety and 18.04-26.04 for Florina variety. Fruit binding phenophase has been observed in 2008 in 25.04 for Romus 2 variety and in the period 01/03.05 for Florina, Jonathan and Generos varieties.

The incipient ripening phenophases developed in the period 27.07 for Romus 2 variety, in 15.08 for Pionier variety and in 25.08-29.08 for Generos, Florina and Jonathan varieties, while the harvesting period started in 20.08 for Romus 2 apples and ended in 24.09 for Florina apples. The apples ripened completely in 25.08 for Romus 2 variety, in 26.09 for Pionier variety, in 28.09 for Jonathan variety and at the beginning of October (01-05.10) for Generos and Florina varieties (table 3).

CONCLUSIONS

Concerning the development of fruiting phenophases we can conclude that in 2007 they started earlier than in 2006 because the positive temperatures in those periods were higher, while in 2008 mixed buds' inflation and opening phenophases started almost in the same periods as in 2007 and then, because of a period with lower temperatures, the phenophases had stagnate determining a certain delay in their development.

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TABLES

Table 1. Development of fruiting phenophases in 2006

Variety	Mixed buds' inflation	Mixed buds' opening	Flowering			Fruit bind	Incip ripe	Harvest	Full ripe
			Begin	Mid	End				
Generos	08.04	13.04	19.04	25.04	30.04	05.05	03.09	27.09	04.10
Florina	06.04	12.04	17.04	23.04	28.04	04.05	02.09	01.10	07.10
Jonathan	07.04	13.04	18.04	24.04	01.05	06.05	08.09	28.09	06.10
Romus 2	02.04	09.04	16.04	22.04	27.04	03.05	08.08	22.08	28.08
Pionier	03.04	10.04	16.04	21.04	28.04	03.05	12.08	26.09	01.10

Table 2. Development of fruiting phenophases in 2007

Variety	Mixed buds' inflation	Mixed buds' opening	Flowering			Fruit bind	Incip. ripe	Harvest	Full ripe
			Begin	Mid	End				
Generos	31.03	05.04	12.04	19.04	25.04	30.04	25.08	18.09	25.09
Florina	24.03	28.03	05.04	11.04	17.04	24.04	20.08	20.09	03.10
Jonathan	30.03	05.04	12.04	18.04	25.04	30.04	22.08	18.09	25.09
Romus 2	23.03	28.03	05.04	12.04	17.04	21.04	23.07	10.08	18.08
Pionier	24.03	28.03	05.04	12.04	18.04	24.04	01.08	18.09	25.09

Table 3. Development of fruiting phenophases in 2008

Variety	Mixed buds' inflation	Mixed buds' opening	Flowering			Fruit bind	Incip. ripe	Harvest	Full ripe
			Begin	Mid	End				
Generos	28.03	05.04	17.04	21.04	26.04	03.05	25.08	21.09	01.10
Florina	29.03	05.04	18.04	22.04	26.04	01.05	28.08	24.09	05.10
Jonathan	29.03	03.04	16.04	21.04	26.04	02.05	29.08	20.09	28.09
Romus 2	26.03	03.04	10.04	15.04	21.04	25.04	27.07	20.08	25.08
Pionier	28.03	04.04	17.04	21.04	26.04	30.04	15.08	18.09	26.09

Preliminary results concerning the influence of manual thinning of fruits of some apple varieties in conditions of the Didactic Station Timişoara

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Keywords: Generos, Florina, production, weight

ABSTRACT

In the climatic conditions of the Didactic Station of Timisoara there were studied five apple trees varieties having different maturation periods: Generos, Florina, Jonathan, Pionier and Romus 2. In this article we present the results obtained during 2006, 2007 and 2008 after doing manual thinning in different stages. The manual thinning was done after the physiological fall in June, not later than the firs decade of July, more precisely after 30-40 days since the fruit binding phenophase took place. This operation has a major impact upon the fruits' quality, mainly the weight of fruits, but it does not influence too much the production per tree because, in the case of those variants where thinning was more severely of 40-50% there were less fruits on the trees, but heavier, compared with the variants where the thinning was lighter (20-30%) and there were many fruits left on the trees with normal weight.

INTRODUCTION

The apple tree is the most known and important fruit species in the temperate climate because of its seniority in culture, because of the surface cultivated with this species and the obtained production, of the alimentary, dietetic and therapeutic values of apples, because of the ecological plasticity and different culture technologies possibilities of its varieties.

Because it is a species that has a good percent of bind fruits it is necessary to do the thinning in order to obtain superior quality and quantity productions, but also to avoid the alternation phenomenon in those years when the harvest is in excess and inhibits the mixed buds' differentiation, which determines low or inexistent productions in the following year.

The consignment's rate-setting is made considering age, vigour and dimensions of the tree. It is by all means needed when there are lots of buds of rod and for reaching the optimal amount of fruits. In consequence of the researches made globally and nationally on these aspects CHILDERS N. (1966), KNIGHT, JACKSON (1979), DRĂGĂNESCU E., MIHUŢ E. (2003), LUPESCU FL. (1968), CEPOIU N. (1974), CONSTANTINESCU N (1967), there are more procedures used: cuts for fructification, thinning and reduction, annually thinning of mixed buds, chemical, manual and mechanical thinning of flowers and fruits.

MATERIALS AND METHODS

The research has been made on two varieties with different ages of maturation: Generos (autumn variety) and Florina (winter variety).

The trees were planted in spring of 1997, 4 meters in between the rows and 2 meters between two consecutive trees on a row, ensuring a density of 1250 trees/hectare, considering they are in IX, X and XI th year. The grafting was made on rootstock M26. The crown system was free pelmet, the growing technology was the regular one.

The research consisted in observing the influence of manually thinning of apples of different intensity on fruits' weight and fruit production on a tree.

The experimental variants were: V1(50% thinned fruits), V2(25% thinned fruits), V3(30% thinned fruits), V4(40% thinned fruits), V5(unthinned control).

The research method used was stationary, focusing on two stages: one field stage based on counting the fruits and the related weighting of the followed purpose; the lab stage based on processing the data obtained on field, considering the fact that the experience is a monophactoryal one, and the interpretation of data was based in the method of variance analysis.

RESULTS OBTAINED

The influence of manual thinning on weight and fruit production per tree at Generos variety are presented in tables 1, 2, 3,4, 5 and 6.

In 2006 the highest fruit weight was registered at V1 – 186,60 g, being significant positive to the witness 100g. Variants 2, 3 and 4 registered superior witness values considering fruit weight so that this tree variants are significant positive to witness (table 1).

In 2007 the highest fruit weight was registered at variant 1 – 168,00 g, being significant positive to the witness – 139,00g. A high value was registered also by variant 4- 157,30g, being also significant positive to witness. Variant 2, having a fruit weight value of 124, 4g, significant negative to witness. Variant 3- 141,00g did not obtain any signification due to its close value to the witness (table 2).

In 2008 the highest fruit weight was registered at variant 1-166,50g, significant positive to witness-121,00g. Variant 3 and 4 having 140,30g and 154,30g were significant positive to witness. Variant 2, with a weight of 105,20g was significant negative to witness (table 3).

In 2006 the highest production was registered at variant 2 – 19,30 kg/tree and because all variants registered close values to witness- 18,75kg/tree neither of them had differences to the witness (table 4).

In 2007 the highest apple production was obtained by variant 5- witness- 19,87kg/tree that is why all the other variants of this variety were significant distinct negative to the witness (table 5).

In 2008 the highest apple production was registered by witness- 23,60kg/tree. Variant 1 and 2 obtained inferior production to the witness being significant negative to it. Variant 3 and 4 having a close production value to witness did not obtain any signification (table 6).

The influence of manual thinning on weight and fruit production on tree at Florina variety is presented in tables 7, 8, 9, 10, 11 and 12.

In 2006 the highest fruit weight was registered by variant 1- 149,20g and that is why it is significant positive to witness with a fruit weight of 136,30g. Variants 2, 3 and 4 are significant negative to witness (table 7).

.In 2007 the highest value of fruit weight was obtained by variant 1- 153,20g being significant positive to witness-90,10g. The other variants, 2, 3 and 4 also obtained high values, being significant positive to witness (table 8).

In 2008, the highest weight value was registered by variant 1- 151,20g, significant positive to witness- 85,20g. All the other three variants, 2, 3 and 4 are significant positive to witness (table 9).

In 2006, variant 4 had the highest fruit production with 14,79kg/tree, but because of its closeness to the witness value-14,20kg/tree it did not obtain any signification like all the other three variants (table 10).

In 2007, the highest fruit production was registered by variant 1 with 11,64kg/tree, but due to its closeness to the witness value of 9,37kg/tree neither variant registered any signification (table 11).

In 2008, the highest production was obtained by variant 5-witness-16,78 kg/tree. The other variants were not statistically assured due to their close registered values (table 12).

CONCLUSION

Fruit thinning represents the most effective quality control method, improving their chemical and physical features.

Out of the researches made it concluded that the highest fruit weight were obtained by variants 1 and 4 (V1-50% thinned apples, V4-40% thinned apples) registering differences significant positive to witness at both varieties, in 3 years of study, reason why we recommend severe thinning for qualitative production.

Regarding tree production, it registered superior values over the study in a slightly manual thinning, variant 2 (25% thinned fruits); it is recommended to obtain superior quantity productions.

In Generos variety case it can be observed that the variants with a severe thinning and a high fruit weight registered negative signification to witness in production.

For Florina variety the number of fruits on tree was increased for witness, but the apples have had a low weight, even though the production was increased. For the variants with a severe apple thinning, the production was decreased in comparison to witness.

The researches made showed that manual fruit thinning does not influence the apple production, but it has a great influence on fruit quality and also on mixed buds differential of the following year.

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TABLES

Table 1. Fruit Weight in 2006 – Generos variety

DL 5% = 3,88 DL 1% = 5,65 DL 0,1% = 8,48

Variant	Average value	Relative value	Difference to the witness	Significance
V1 – thinned 50%	186,60	186,60	86,60	XXX
V2 – thinned 25%	137,20	137,20	37,20	XXX
V3 – thinned 30%	145,30	145,30	45,30	XXX
V4 – thinned 40%	160,30	160,30	60,30	XXX
V5 - witness	100,00	100	0	mt

Table 2. Fruit Weight in 2007 – Generos variety

DL 5% = 4,30 DL 1% = 6,26 DL 0,1% = 9,39

Variant	Average value	Relative value	Difference to the witness	Significance
V1 – thinned 50%	168,00	120,86	29,00	XXX
V2 – thinned 25%	124,40	89,49	- 14,60	000
V3 – thinned 30%	141,00	101,43	2,00	-
V4 – thinned 40%	157,30	113,40	18,63	XXX
V5 - witness	139,00	100	0	mt

Table 3. Fruit Weight in 2008 – Generos variety

DL 5% = 4,48 DL 1% = 6,51 DL 0,1% = 9,77

Variant	Average value	Relative value	Difference to the witness	Significance
V1 – thinned 50%	166,50	137,60	45,5	XXX
V2 –thinned 25%	105,20	86,94	- 15,80	000
V3 – thinned 30%	140,30	115,95	19,30	XXX
V4 – thinned 40%	154,30	127,52	33,30	XXX
V5 - witness	121,00	100	0	mt

Table 4. Production kg/tree in 2006 – Generos variety

DL 5% = 4,05 DL 1% = 5,89 DL 0,1% = 8,84

Variant	Average value	Relative value	Difference to the witness	Signification
V1 – thinned 50%	17,50	93,33	- 1,25	-
V2 –thinned 25%	19,30	102,93	0,55	-
V3 – thinned 30%	19,07	101,70	0,32	-
V4 – thinned 40%	18,03	96,17	- 0,72	-
V5 - witness	18,75	100	0	mt

Table 5. Production kg/tree in 2007 – Generos variety

DL 5% = 3,06 DL 1% = 4,46 DL 0,1% = 6,69

Variant	Average value	Relative value	Difference to the witness	Signification
V1 – thinned50%	14,36	72,26	- 5,51	00
V2 – thinned 25%	15,25	76,74	- 4,62	00
V3 – thinned 30%	14,52	73,07	- 5,35	00
V4 – thinned 40%	14,47	72,82	- 5,40	00
V5 - witness	19,87	100	0	mt

Table 6. Production kg/tree in 2008 – Generos variety

DL 5% = 3,67 DL 1% = 5,33 DL 0,1% = 8,00

Variant	Average value	Relative value	Difference to the witness	Signification
V1 – thinned 50%	19,64	83,22	- 3,96	0
V2 – thinned 25%	18,41	78,00	- 5,19	0
V3 – thinned 30%	23,15	98,09	- 0,45	-
V4 – thinned 40%	21,91	92,83	- 1,69	-
V5 - witness	23,60	100	0	mt

Table 7. Fruit Weight in 2006 – Florina variety

DL 5% = 3,99 DL 1% = 5,80 DL 0,1% = 8,71

Variant	Average value	Relative value	Difference to the witness	Signification
V1 – thinned 50%	149,20	145,84	12,90	XXX
V2 – thinned 25%	108,40	105,96	-27,90	000
V3 – thinned 30%	118,00	115,34	-18,30	000
V4 – thinned 40%	102,30	133,23	-34,00	000
V5 - witness	136,30	100	0	mt

Table 8. Fruit Weight in 2007 – Florina variety

DL 5% = 4,29 DL 1% = 6,24 DL 0,1% = 9,36

Variant	Average value	Relative value	Difference to the witness	Signification
V1 – thinned 50%	153,20	169,53	62,83	XXX
V2 – thinned 25%	111,20	123,05	20,83	XXX
V3 –thinned 30%	116,60	129,02	26,23	XXX
V4 – thinned 40%	129,40	143,19	39,03	XXX
V5 - witness	90,10	100	0	mt

Table 9. Fruit Weight in 2008 – Florina variety

DL 5% = 4,24 DL 1% = 6,17 DL 0,1% = 9,25

Variant	Average value	Relative value	Difference to the witness	Signification
V1 – thinned 50%	151,20	173,39	64,00	XXX
V2 – thinned 25%	100,80	115,59	13,00	XXX
V3 – thinned 30%	114,40	131,26	27,27	XXX
V4 – thinned 40%	120,30	138,18	33,30	XXX
V5 - witness	85,20	100	0	mt

Table 10. Production kg/tree in 2006 – Florina variety

DL 5% = 2,06 DL 1% = 3,00 DL 0,1% = 4,50

Variant	Average value	Relative value	Difference to the witness	Signification
V1 – thinned 50%	14,62	102,95	0,42	-
V2 – thinned 25%	13,65	96,12	- 0,55	-
V3 – thinned 30%	13,69	96,40	- 0,51	-
V4 – thinned 40%	14,79	104,15	0,59	-
V5 - witness	14,20	100	0	mt

Table 11. Production kg/tree in 2007 – Florina variety

DL 5% = 4,10 DL 1% = 5,96 DL 0,1% = 8,95

Variant	Average value	Relative value	Difference to the witness	Signification
V1 – thinned 50%	11,64	124,29	2,28	-
V2 – thinned 25%	10,73	114,51	1,36	-
V3 – thinned 30%	10,31	110,03	0,94	-
V4 – thinned 40%	10,48	111,84	1,11	-
V5 - witness	9,37	100	0	mt

Table 12. Production kg/tree in 2008 – Florina variety

DL 5% = 3,86 DL 1% = 5,62 DL 0,1% = 8,43

Variant	Average value	Relative value	Difference to the witness	Signification
V_1 – thinned 50%	15,42	91,89	- 1,36	-
V_2 – thinned 25%	16,43	97,91	- 0,35	-
V_3 – thinned 30%	15,55	92,66	- 1,23	-
V_4 – thinned 40%	14,21	84,68	- 2,57	-
V_5 – witness	16,78	100	0	mt

The creation and the promotion in the culture of some new genetic disease resistant apple tree breeds at the SCDP Voineşti

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Keywords: hybridations, selections with perspective, DUS test, breeds

ABSTRACT

The creation of genetic disease resistant apple tree breeds started in the years 1952 -1953, since the year 1970, this objective beining the exclusivity of the improvement program. Following the study of the elites with perspective, in the DUS test, in the period 1985-2006 were homologated and introduced into culture 5 disease resistant apple tree breeds: Pionier, Voinea, Generos (1985); Ciprian (1998), Luca (2006). Te continuation of the studies made possible the homologation and the promotion in culture of other 4 disease resistant apple tree breeds, namely Chindia, Pomona, Discoprim (2008) şi Dacian (2009), breeds that will comlete the resistent apple tree assortment.

INTRODUCTION

Situated in a zone with favorable ecological conditions for the apple tree culture, SCDP Voineşti initiated and developped wide researches regarding the creation and the improvement of the apple tree assortment, a species of primary importance in the zone's and in the country's tree growing.

Associating the ecological conditions, the rich biological fund created in time and also peoples' tradition and passion, the station obtained remarkable results, succeding to define its profile and its scientifical vocation by creating and promoting in culture the new created breeds.

The creaion activity of new apple tree breeds started in the year 1950 and followed 2 distinct ways:

- obtaining new apple breeds, superior in quality, as compared with those existing in culture;
- obtaining of genetic disease resistant breeds (scurf – *Venturia inaequalis*; mildew – *Podosphaera leucotrica*

The researches regarding the creation of genetic disease resistant apple tree breeds started in the year 1952-1953 and deployed themselves a time in în paralel with the first objective – and from the year 1970 these researches detained the exclusivity in the program's framework. Presently the genetic disease resitance is appreciated as the only viable alternative in the battle against the scurf and the mildew, an alternative justified by the very high costs of the pesticides and also by the necessity to reduce the polution of the fruits and of the environment.

The study of the selections with perspective in the test 2 allowed the introduction into culture, starting with the year 1985, of the first 5 genetic disease (scurf, mildew) resistant breeds: Pionier {[Verzisoare x Ionathan)xPrima)]}; Voinea (Frumos de Voineşti x Prima); Generos {[Frumos de Voineşti x (Parman d'or xM.Kaido)x Jonathan]}; Ciprian (Prima x Starkrimson)- 1998; Luca (Champion x Prima)- 2006.

In the period 2007-2009, following the performed resarches, were homologated and introduced into culture other 4 breeds: Chindia (Prima x Discovery) – 2008; Pomona (Prima x Starkrimson) – 2008, Discoprin (Prima x Discovery) – 2008; Dacian {[Delicios de Voineşti x [Jonathan x (W.r. x M.micromalus)]} – 2009, breeds that will be referred to in this paper.

MATERIAL AND METHODS

The mentioned breeds were studied in competition micro-culture (test 2- DUS), in different periods, before their homologation. The used material was grafted on the same graft bearer (M 106) – and the planting distances were of 4/2,5m in the case of the Chindia, Pomona and Discoprim breeds, respective of 4/3m at the Dacian breed. Fungicide tratments were not applied in the experimental lot. The used working methods were those specific for the competition cultures in the DUS test.

RESULTS AND DISCUSSIONS

In the present paper we present synthetically the behaviour of these breeds, referring to the principal tree growing characteristics (the phenology, teh growth strength, the production potential, the behaviour at the attack of the main diseases, the dry substances content in%, the keeping capacirty).

Chindia, Pomona, Discoprim

Breeds obtained by sexuate hybridation, performed in the year 1992 by L.Şerboiu and Gabriela Uncheaşu.

They were studied in the period 2002 – 2008 in a competition micro-culture (the DUS test), formed by 9 selections with perspective, disease resistant, identified in the selection orchard and grafted in the nursery in the year 2000 – and promoted in the test 2 in 2002.

The behaviour results of the 3 breeds are presented in the table 1, as compared with 2 resistant witness breeds (Generos and Ciprian) – and also with 2 sensible brereds (Ionathan and Golden Delicios). It is mentioned that the breeds Jonathan and Golden Delicios present, as productive potential and vigour, alltogether non typical values, following the lack of fungicide treatements - their role in the experience being to demonstrate the existence and the pressure of th pathogenic agents (scurf, mildew).

Also the Generos breed, although with field imunity to scurf in the first years since the homologation, this diminished afterwards under the level of the field imunity, presently being classified as a breed with a strong resistance.

The explanation consists in the fact that the resistance source (M.Kaido) was week, being defeated by the local scurf population, the Generos breed needing, after shaking, the performing of 2-4 fungicide treatments, in order to control the scurf attack.

Dacian

It is a descendent of the hybrid combination {Delicios de Voineşti x [Jonathan x (W.r. x M.micromalus)]}, performed by L.Şerboiu in the year 1981. It was identified and grafted in the nursery in the year 1988, having the indicator V 81-14-339 synonimus V 53/4.

The DUS test was performed in the period 1990-2008, besides other 25 disease resistant selections, as compared to the senesible breeds Jonathan and Golden Delicious.

It was homologated in the spring of the year 2009.

Its behavioural data are presented in the table 2.

Other features of the breed: green background and yellow cover fruit colour. The DS% content - 14,6; elastic and smooth skin and crisp, juicy pulp, with a medium firmness and a suitable sugar and acidity content. It is resistant against scurf, mildew and bacterial burning.

The taste qualities of the fruit are good. It can be kept until the second decade of april in natural cooled storasges.

CONCLUSIONS

The apple tree breeds homologated and promoted in culture by the Voineşti Station proved themselves in time as being valuable breeds, having the production potential and the quality of superior fruits, features that permitted their promotion into production.

The 4 newly created breeds: Discoprim, Chindia, Pomona and Dacian, due to their disease resistance, production capacity, fruits quality and their superior economical efficiency, will enter the assortment, besides other resistant breeds (Voinea, Pionier, Florina, a.o.). The treatments costs in a plantation with these breeds are drastically inferior, as compared with those in a classical breeds lot.

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TABLES

Table 1. Data regarding the behaviour of the breeds Chandra, Pomona and Discoprim in the DUS test

Breed	**Blossom period**	**Growth strength cm/ trunk**	**Prod. t/Ha**	**Disease behaviour**				**Medium fruit weight - g -**	**Dry subst. cont. DS%**
				Scurf		**Mildew**			
				F/%	**I**	**F/%**	**I**		
Chindia	medium	7,2	28,0	0	0	8,8	1	189	12,6
Pomona	medium	5,8	23,0	0	0	4,6	1	171	12,8
Discoprim	medium	6,1	27,0	0	0	9,1	1	173	13,6
Ciprian	medium	5,0	30,0	0	0	6,8	1	170	12,6
Generos	medium	4,0	23,0	2	1-^{1}3	26,8	1-^{1}4	183	12,8
Ionathan	medium	4,0	7,6	48,4	1-^{4}6	80	1-^{5}6	97	12,8
Golden Del.	medium	3,7	5,8	49,7	1-^{4}6	30	1-^{2}4	93	11,6

Table 2. Behaviour of the breed Dacian in the DUS test

Breed	**Blossom period**	**Growth strength cm/ trunk**	**Prod. t/Ha**	**Disease behaviour**				**Medium fruit weight - g. -**	**Dry subst. cont. DS%**
				Scurf		**Mildew**			
				F/%	**I**	**F/%**	**I**		
Dacian	medium	14,2	33,8	0	0	10,2	1	195	14,6
Florina	medium	13,1	28,0	0	0	41,2	1-^{2}3	156	15,0
Generos	medium	13,5	21,2	5,4	1	21,5	1-^{1}2	193	14,8
Ionathan	medium	12,0	12,5	62,9	1-^{4}6	80,3	1-^{5}6	134	13,4
Golden Del.	medium	7,9	7,1	75,4	1-^{5}6	39,7	1-^{3}6	125	13,6

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Determination of lead and cadmium from apples using electrothermal atomic absorption spectrometry

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Keywords: fruits, heavy metals, contaminants, food safety, ETAAS

ABSTRACT

Determination of chemical contaminants in food is important in environmental monitoring for the prevention, control and reduction of pollution. Heavy metals are one of a range of important types of contaminants that can be found on the surface and in the tissue of fresh fruits and vegetables. The presence of heavy metals in living organisms is harmful, undesired and it may create health problems. The aim of the study was to achieve lead and cadmium levels in apples collected from Romania. The measurements were performed using ETAAS technique. The lead concentration in apples varies from 0.001 up to 0.049mg/kg, with a mean value of 0.009 mg/kg. The cadmium content is between 0.0005mg/kg and 0.014 mg/kg, with a mean value of 0.005 mg/kg. The levels of lead and cadmium were correlated with those set by Commission Regulation 1881/2006 and Romanian legislation. Also, these levels were compared with those from previous published studies. The lead and cadmium contents obtained after chemical analysis showed that apples could serve as good dietary sources, the heavy metal levels being within safety baseline content for human consumption.

INTRODUCTION

Pollution of the natural environment produced by heavy metal is a worldwide problem because these metals are indestructible and most of them have toxic effects on living organisms, when they exceed a certain concentration (Harte et al., 1991). Because of this, the researchers from all over the world started to study the pollution with heavy metals in air, water, and foods to avoid their harmful effects (Oehme, 1989; Zakrzewski, 1991; Kennish, 1992), and to determine their permissibility for human consumption.

Essentially, the heavy metal contents have become a focus of public interest since analytical techniques have made it possible to detect them even in very small traces and also since it has been scientific demonstrated that in small quantities, these metals produce harm to human health.

Prolonged human consumption of unsafe concentrations of heavy metals in foodstuffs may lead to the disruption of numerous biological and biochemical processes in the human body. Sources of heavy metals contamination of most foodstuffs include adaptation of mechanized farming, sprays, seed preservatives (Jones, 1987) and components from global pollution. Heavy metals are extremely persistent in the environment; they are nonbiodegradable and nonthermodegradable and thus readily accumulate to toxic levels (Sharmaa, 2007).

Vegetables and fruits are the starting link of the food chain, which is the principal source of heavy metals for animals and humans. The main sources of heavy metals to vegetable crops are their growth media (soil, air, nutrient solutions) from which these are taken up by the roots or foliage (Lokeshwari et al, 2006).

The presence of heavy metals in living organisms is harmful and it is known that serious systemic health problems can develop as a result of excessive accumulation of dietary heavy metals in the human body (Oliver, 1997).

Cadmium is a nonessential metal, toxic even at low concentration to which humans are exposed through a variety of pathways including food, particularly leafy vegetables, grains, and cereals (Vitoria et al., 2001; Milone et al., 2003). It is now known that the itai-itai sickness in Japan is a result of the regular consumption of highly cadmium contaminated rice.

Sources of cadmium exposure are cigarette smoking, ingestion of food grown on contamined soil. It is known that phosphate fertilisers contain cadmium (Reuss, 1978).

Cadmium is a typical example of cumulative poison and causes softening of bones (Ginter, 1993), can disturb kidney functions, and it cannot be excluded that it acts as a human carcinogen (Merian, 1984; EC1881/2006). Interest in the potential link between Cd and carcinogenicity has drawn attention to the Cd concentration in body fluids, tissues, foods and other environmental samples (Yaman, 1999).

Lead can be accumulated in biological systems becoming potential contaminants along the alimentary chain (Jurado et al., 2007). As far as it known till today, lead has no essential function for plants, animals and microorganisms. Foods such as fruit, vegetables, meats, grains, seafood, soft drinks and wine may contain significant amounts of lead. Its absorption may constitute a serious risk to public health. It may induce reduced cognitive development and intellectual performance in children and increased blood pressure and cardiovascular diseases in adults (EC1881/2006) and inhibits the thiolic groups of some enzymatic systems, especially those that potentate haemoglobin synthesis (Grecu et al., 1982).

Lead is a naturally occurring substance and can be found in organic and inorganic forms (Ebadi et al., 2005) that have the most significant toxic effect from the heavy metals. Sources of lead exposure are represented by leaded gasoline, leaded paints, pesticides, cans, battery manufacturing, drinking water, vegetal products grown on lead-contamined soil.

The ingestion of lead and cadmium from fruits and vegetables grown in the home environment is a potential route of exposure that has received, lately, attention (Gallacher et al., 1984; USEPA, 1997). The World Health Organization (WHO) reported tolerable weekly intakes of Cd and Pb as 0.007 and 0.025 mg/kg body weight, respectively, for all human groups (WHO, 2000).

MATERIALS AND METHODS

The aim of this study was to determine the lead and cadmium concentrations in seven varieties of apples grown near Oltchim S.A. (a well developed manufactory that produces chemicals, which could be a source of environmental pollution) and to establish if these fruits are suitable for consumption. Also, the results concerning heavy metal contents in apples will be compared with previously published results regarding lead and cadmium contents in other fruits (plums, strawberries) (Artimon et al., 2007).

In literature are presented studies developed in other countries concerning the heavy metal monitoring in fruits and vegetables (Thomas et al., 2006; Bednarek et al., 2006; Bakirdere et al., 2008).

Instrumentation

Heavy metals concentrations were achieved by electrothermal atomic absorption spectrometry (ETAAS). In order to effect the measurements it was used an atomic absorption spectrometer Zeenit 700 from Analytic Jena equipped with autosampler AS52 S for dilution. Data were analyzed and processed with soft Win AAS version 3.16.0. The used ultra pure water for samples' analytic preparation was obtained with a Simplicity system from Millipore. The apples were digested using a microwave Millestone Ethos Pro apparatus according with SR EN 14084:2003. The microwave program is presented in table 1.

Reagents and samples

The calibration curves were plotted separately for all the metals by running different concentrations of standard solutions. The etalons were obtained through dilution with HNO_3 0,5% solution prepared from suprapure HNO_3 65% from Merck. The calibration curves applied are linear for the studied ranges (fig. 1, 2).

Procedure

For metal analysis, all the fruit samples were washed with distilled water in order to eliminate the air borned pollutants.

The samples were sliced and dried on a sheet of paper in order to eliminate the excess of moisture. After these procedures, samples were precisely weighted. The mineralization procedure was made using a mixture of nitric acid and hydrogen peroxide according with the microwave program described in table 1.

Microwave-assisted acid decomposition of samples is often performed in a microwave oven in order to reduce mass loss of analytes and to increase the sample dissolution rate (Lima et al., 2002). Addition of both nitric acid and hydrogen peroxide for dissolving samples is preferred to reduce carbonaceous residues (Vinas et al., 2000; Acar, 2001). For both metals' determination was used deuterium lamp correction (D_2-HCL background correction).

Average values of two replicates were taken for each determination. The results of determinations are presented in table 2.

RESULTS AND DISCUSSION

Commission Regulation (EC) 1881/2006 sets a lead limit of 0.1mg/kg in fruits and a cadmium limit of 0.05 mg/kg in all fruits. Romanian legislation (Order no.1/03.01.2002) set for lead the maximum admitted level 0.5 mg/kg meanwhile for cadmium 0.05 mg/kg.

The lead content apples range between 0.001- 0.049mg/kg (average 0.009 mg/kg). The cadmium content in apples is between 0.0005-0.014 mg/kg (average 0.005 mg/kg).

The highest lead content was found for Florina variety. Comparing the results, the mean lead content in analyzed fruits is much lower (11.11 times) than safe limits set by EC 1881/2006 and also by Romanian legislation.

Cadmium content of analyzed fruits indicated that the mean concentration is 10 times lower than safe limit. The highest concentration was found for Sir Prize variety.

The lowest contents of lead and cadmium, in the same time, were found for the same variety, Idared.

As a conclusion that can be withdrawn analyzing the mean values, it can be said that analysed apples accumulated more lead than cadmium.

Taking into account the safety limits imposed by legislation, it can be concluded that analysed fruits contain very small quantities of lead and cadmium (fig. 3). Anyway, it is known that generally plants translocate larger quantities of metals to their leaves than to their fruits or seeds (Chang, 1974; Callow, 1995; Dudka et al., 1999).

The quantification of the results allowed us to conclude that these apples could be included in our everyday diet without any limitation concerning these metals contents.

Some researchers (Bednarek et al., 2007) developed a similar research on apples and found that lead content is between 0.023 mg/kg and 0.046 mg/kg. Regarding cadmium content in apples, they found concentrations that are between 0.042 mg/kg and 0.089 mg/kg.

Comparing the results obtained on apples with our previously published studies (Artimon et al., 2007) carried out on strawberries and plums collected from the same area, it can be said that apples contain the lowest lead and cadmium levels from all analysed fruits.

CONCLUSIONS

Apples are fruits frequently consumed in our country due to their great taste value, the content of easily available sugars, mineral salts and vitamins. Heavy metals are important environmental pollutants and many of them are toxic and produce serious damages to human health even at very low concentrations. Therefore, the aim of the research was to asess the lead and cadmium contents from these fruits.

Atomic absorption spectrometry, a modern method with high sensibility for the analysis of heavy metals' contents, allowed us to detect lead and cadmium concentrations in apples.

Lead and cadmium contents in analyzed fruits are much lower than safe limits set by EC 1881/2006 and also by Romanian legislation and from this point of view the analyzed products correspond to consumer's requirements.

Furthermore, the levels of Cd and Pb obtained do not appear to pose any serious health hazard problem of concern, but, the study has helped to show that apples grown near Oltchim SA could serve as good dietary sources, since toxicity in humans may result in severe health consequences.

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TABLES

Table 1. Microwave program

Step	Time (minutes)	Temperature (°C)	Microwave Power (watt)
1	10	150	600
2	20	150	750
3	15	0	0

Table 2. Lead and cadmium contents in apples

Apple	Pb (mg/kg) fresh weight	Cd (mg/kg) fresh weight
Florina	0.049	0.012
Granny Smith	0.007	0.005
Sir Prize	0.020	0.014
Ionatan	0.006	0.001
Golden delicious	0.017	0.002
Generos	0.009	0.0007
Idared	0.001	0.0005
Average	**0.009**	**0.005**
Safe limit (mg/kg) (EC 1881/2006), fresh fruits	**0.1**	**0.05**

FIGURES

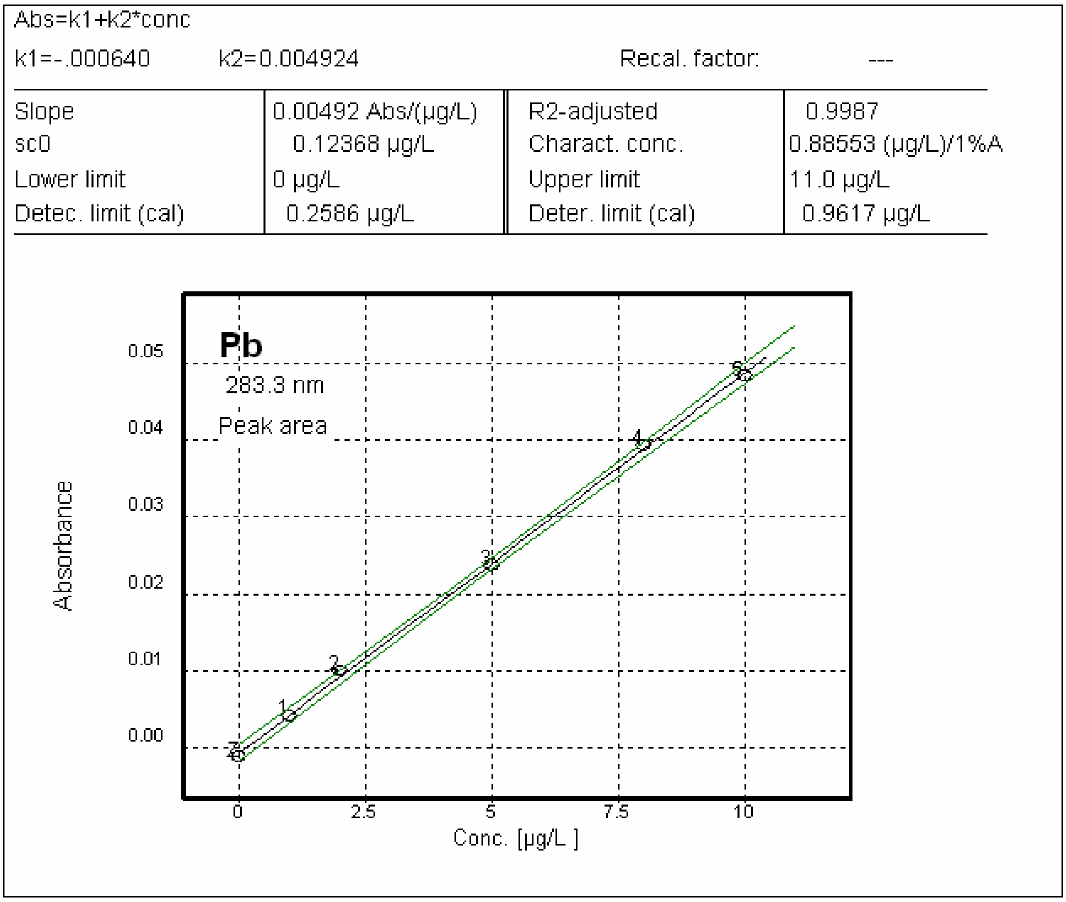

Fig. 1. Calibration curve and method characteristics for lead

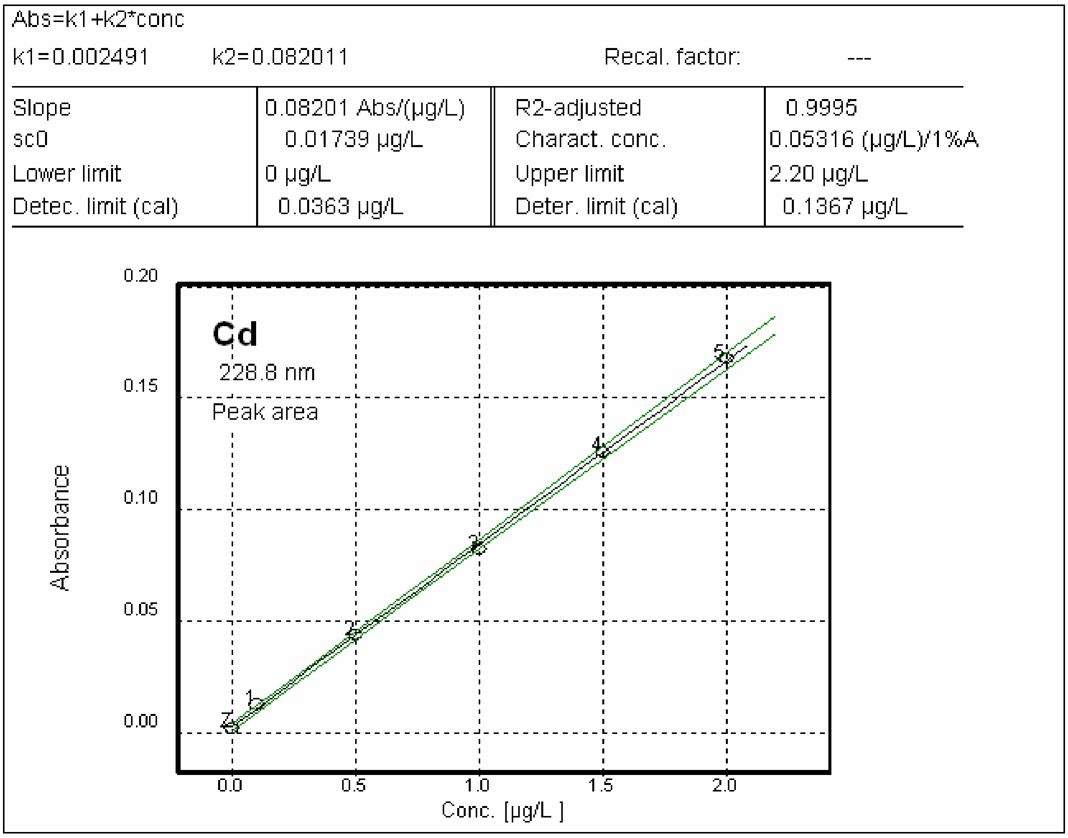

Fig. 2. Calibration curve and method characteristics for cadmium

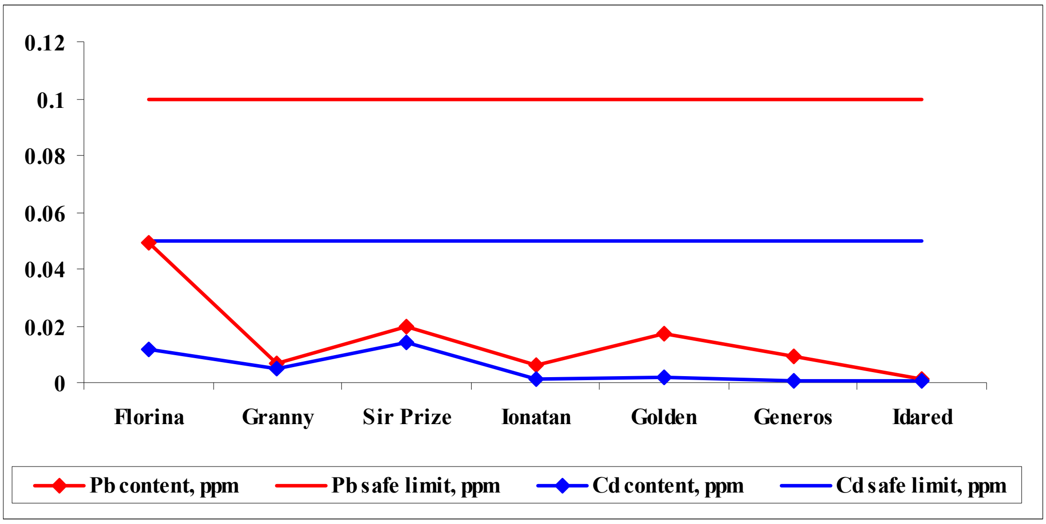

Fig.3. Lead and cadmium concentration in apples

Researches regarding the establishing the favorability and suitability of the acid soils, situated in the western part of the country, for the seed fruit species

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Keywords: hidropedo-improving system, production capacity, land calibration.

ABSTRACT

The researches that were carried out in Bihor County highlight the favorability and suitability of the main acid soil types in order to establish new orchards. The studies resemble the favorability and suitability classes of the acid grounds from the county for the main seed species. The whole studied area refers to a surface of 272.236 ha, from which 251.816 ha were taken into consideration. This surface represent 92,5% from the entire area, including a number of 56 land territories, situated between Crişul Repede (North), the border to Hungary (West), Crişul Negru (South) and Munţii Apuseni (East).

INTRODUCTION

The main reason of this paper is to highlight some essential aspects concerning the acid soils quality and less acid soils situated in Bihor County.

The studied information were taken from the pedology papers from O.S.P.A. Bihor and from the national monitoring system organized by I.C.P.A. Bucharest.

The approached issues refer to a surface of 22.864 ha, containing high acid soils, 118.578 ha medium acid soils and 129.039 less acid soils, resulting a surface of 270.481 ha, which represent the surface which will be the studying object.

In accordance with the Romanian Soils Taxonomy System (SRTS-2003) in the area studied, there have been identified 10 categories of soils, 18 types approximately 120 sub-types and numerous detailed units.

In close relation with the variety of geomorphologic and geolitic factors which lead to a great diversity of parental materials, as well as of the various anthropic interventions, there resulted a numerous population of soils which, in keeping with the Romanian Soils Taxonomy System (SRTS-2003) and with the percentage at soil type level encountered in the area studied, present the following situation: litosoils 3,5%, regosoils 1.3%, psamosoils 1,6%, alluviosoils 7,6%, chernozom 6,8%, phaeozom 3,0%, rendzins 0,7%, entricambosoils 10,9%, districambosoils 1,8%, preluvisoils 11,1%, luvosoils 31,8%, podosoils 3,6%, vertosoils 0,8%, gleysols 7,5%, stagnosols 0,2%, solonetz 1,9% and erodosoils 5,9%.

MATERIALS AND METHODS

To calculate the evaluation marks, which characterizes each soil unit limited in the pedological study which were made in Bihor County, there were made the most important characteristics, easy and certainly measurable, that are found in pedologic studies known as indicators of evaluation. Evaluation marks for each utilization category of soils and crop were made multiplications by 100 the product of the coefficients (17 indicators), which participate directly to the calculus:

$$y = (x_1 * x_2 * \dots * x_{17}) * 100$$

where:

y = evaluation marks;

$x_1 * \dots * x_{17}$ = the value of the 17 indicators

RESULTS AND DISCUSSIONS

The favorability, according to the Romanian Pedology School, is the measure that a soil meets the needs of a plant's life, in the usual climate conditions and within a good agrotechnique.

So the agricultural land calibration regarding the favorability establishment for the seed species resemble the followings:

For the apple crop (table nr.1, figure nr.1), the phaezom obtained 71 points, being situated in the 3rd fertility class and the vertosoil obtained 7 points, being situated in the 10th fertility class.

For the pear crop (table nr.1, figure nr.2), the phaezom obtained 71 points, so that it is situated in the 3rd fertility class and the regosoil obtained 5 points, being situated in the 10th fertility class.

Concerning the suitability of the studied lands, an important role before establishing of the orchards of seed species, has the knowledge of the production capacity of every soil unit and land calibration.

The studies that were carried out resemble the following suitability classes:

- 1rst class, with very suitable lands, occupy 8,09% from agricultural surface of the studied land.
- 2nd class, with a suitable lands, occupy 16,22% from the agricultural surface of the studied land.
- 3rd class, with a medium suitability, occupy 32,92% from the studied land.
- 4th class, with less suitable lands, occupy 30,32% from the agricultural studied land.
- 5th class, with unsuitable lands, occupy 11,85% from the agricultural studied land.

CONCLUSIONS

From the geomorphological point of view, in Bihor County there took place many hidropedoimproving interventions, significant changes, representing an important element for the pedological research.

The acid soils improvements target the state reaction adjustment and the other negative aspects amendment, that have an influence over the production capacity, as well as the insufficient supply with nutrients and the defective aerohidric system.

The acid reaction is usually followed by a low macro and microelements system.

The acid soil physical and hydrophysical acuities should be completed with fertilization and improvement systems.

Regarding the favorability of the acid soils from the Bihor County, for the seed species plantation, the situation is a following:

- for the apple crop:
  - → the phacozom obtained 71 points, being situated in the 3rd fertility class,
  - → the vertosoil obtained 7 points, being in the 10th fertility class.
- for the pear crop:
  - → the phaezom obtained 71 points, being situated in the 3rd fertility class,
  - → the regosoil obtained 5 points, being situated in the 10th fertility class.

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TABLE AND FIGURES

Table 1. Soil's favorability for apple-tree and pear-tree

Nr. crt.	Soil type	Apple		Pear	
		Marks	Class	Marks	Class
1.	Regosol	7	X	5	X
2.	Aluviosol	55	V	58	V
3.	Entiantrosol	52	V	58	V
4.	Faeoziom	71	III	71	III
5.	Eutricambosol	39	VII	40	VII
6.	Preluvosol	67	IV	67	IV
7.	Luvosol	34	VII	35	VII
8.	Planosol	58	V	66	IV
9.	Vertosol	7	X	16	IX
10.	Erodosol	35	VII	35	VII

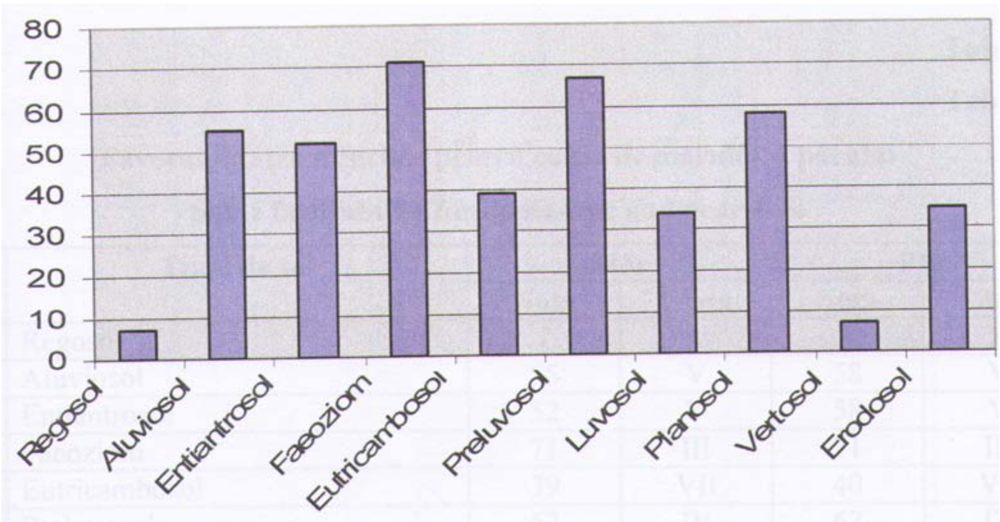

Fig. 1. Graphical representation of soil's favorability for apple-tree

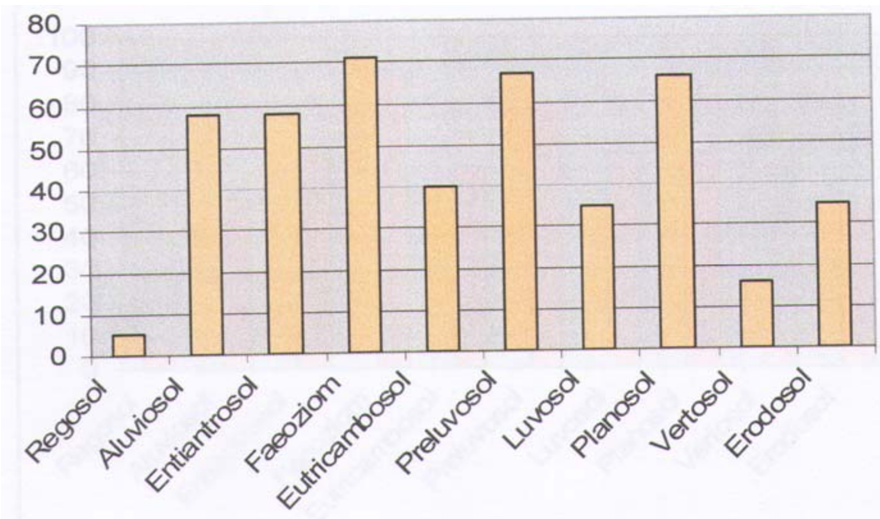

Fig. 2. Graphical representation of soil's favorability for pear-tree

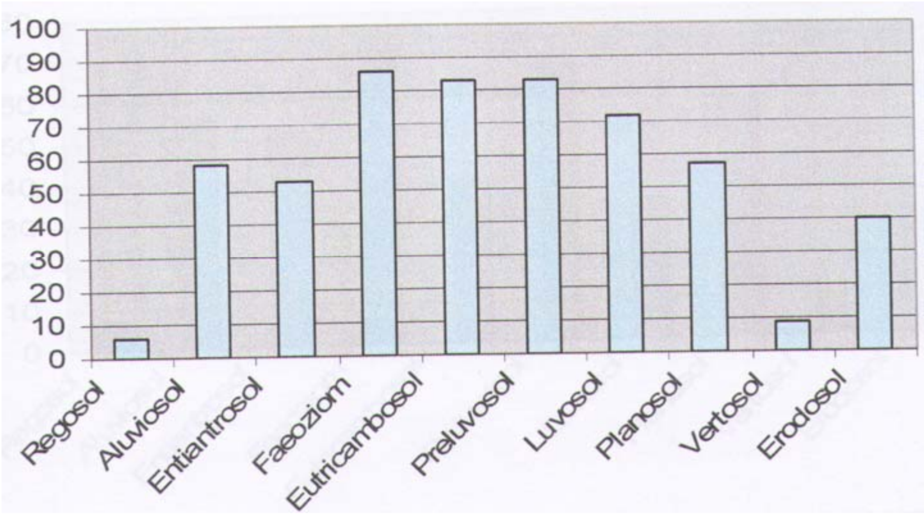

Fig. 3. Graphical representation of soil's favorability for orchard

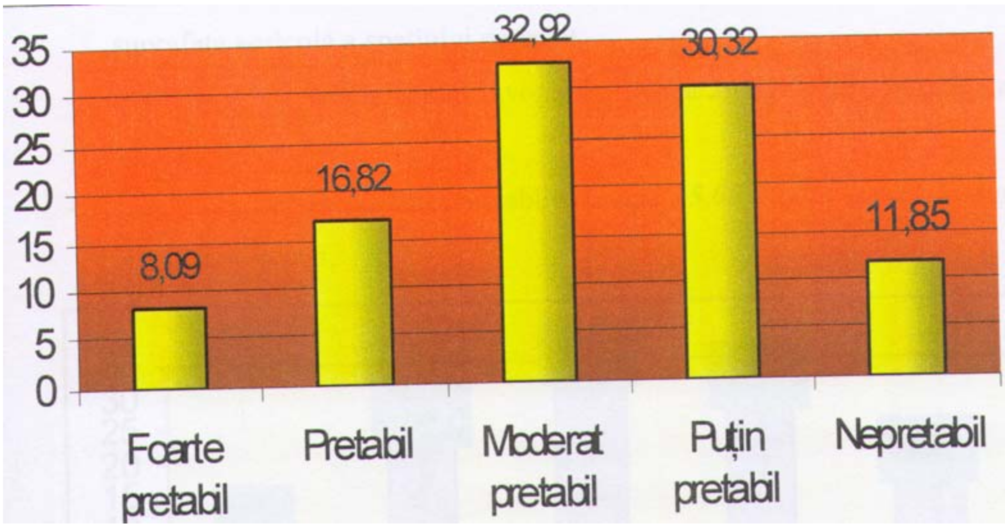

Fig. 4. Agricultural land's favorability for orchards

VITICULTURE&OENOLOGY

The influence of terroir on the chemical composition of Fetească Neagră red wines

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Keywords: physico-chemical analysis, colour analysis, winemaking technology, oenoclimatic suitability index, total polyphenolic index.

ABSTRACT

Grapes of Fetească neagră produced in three different viticultural centres (Pietroasa, Valea Călugărească and Odobeşti) were used to obtain a total of 27 batches of red wine, meaning 3 variants with 3 repetitions for each of these centres. Variants differed with respect to the oenological materials used (selected yeast, enzyme, colour enhancer). The wines obtained were subjected to standard OIV physico-chemical analysis as well as sensory analysis of colour. Interpretation of the results indicates the wide variation of the properties of Fetească neagră wines according to the terroir of the cultivation place. Moreover, the differences induced by terroir appeared to be more significant than any of the differences induced by the variations of the technology or materials employed during winemaking.

INTRODUCTION

Recognized as a key representative of the red wines assortment in our country, Feteasca neagra (Fig. 1) is an indigenous grapevine variety cultivated at present on significant surfaces in various viticultural regions.

Together with important qualities, Feteasca neagra also displays variable yield from one year to another. Also, the wines made of this variety, even though well-balanced and pleasant, sometimes do not display the sensory profile which has been established insofar as "typical" for Fetească neagră. In this study we attempted to revaluate the main characteristics of the typical sensory characterization of this variety and the effect of terroir on the qualities expressed in the wine, by analyzing several wines of Fetească neagră obtained in three different viticultural areas where this variety enjoys a good reputation.

MATERIALS AND METHODS

Grapes of Fetească neagră of the 2008 vintage were harvested from the viticultural centres of Pietroasa, Valea Călugărească and Odobeşti (Fig. 2). The main quality parameters of the grapes are given in Table 1. Using these grapes and variations of the winemaking technology, several experimental variants of Fetească neagră wines (Table 2) were obtained at the Department of Victiculture and Enology at the University of Agronomical Sciences and Veterinary Medicine Bucharest (with 3 repetitions for each variant). All wines were analyzed by classical (standard OIV) methods for the determination of alcohol, acidity, dry content, colour intensity and hue, as well as total polyphenolic index.

RESULTS AND DISCUSSION

Table 3 shows the values of the Oenoclimatic Suitability Index (IAO) computed based on climatic data monitored for the last 10 years. An important parameter which characterizes the terroir in the three viticultural centres chosen for the harvesting of the Fetească neagră grapes, IAO takes values between 4748 (for Odobeşti) and 5114 (for Pietroasa) which indicated a good suitability of these areas for the cultivation of this particular variety.

Furthermore, the suitability of these centres for the production of red wines of Fetească neagră is also confirmed by the content of sugars of the grapes harvested at full maturity (Table 1): 216 g/l glucides at Pietroasa, 211 g/l at Valea Calugareasca and 195 g/l in Odobeşti.

Table 4 presents the results of the physico-chemical analyses of all the 27 batches of wine analyzed (results give are means of all repetitions ± standard deviation).

Examination of the results given in Table 4 leads to the conclusion that the influence of the agro-ecosystem (terroir) on the general characteristics of the wines obtained is more decisive than the winemaking technology applied for each variant. For example, it is obvious that the acidity of the wines depends on the production place more than on the winemaking technology. The wines produced at Pietroasa display acidity values between 4.71 and 4.86 g/l tartaric acid, compared to those of Valea Călugărească (5.42 ~ 5.75 g/l) and the significantly more acid wines of Odobeşti (8.03 ~ 8.21 g/l).

Another parameter useful for discerning the effect of terroir on the wines is the total polyphenolic index (Table 4, Fig. 3). In this case too, it appears that there is a similarity between the wines made in Pietroasa and Valea Călugărească; those of Odobeşti have lower values of the TPI parameter, corresponding to lower concentrations of tannins.

For red wines, colour is one of the most important parameters of quality, and that is why this was the next parameter investigated. Table 5 presents the results of the colour analysis of the wine samples studied. Wines of Valea Călugărească presented higher values of *L*, *b* and *Cab* compared to Pietroasa and Odobeşti; also, some of the other differences observed in hue and chromaticity can be better examined in Figures 4 and 5.

Figure 6 presents the result obtained when the studied wines are plotted in the space of colour parameters (*a*, *b*). This diagram also points out very clearly the differences between the three groups of wines (Pietroasa, Valea Călugărească and Odobeşti) and strengthens the conclusion that the effect of terroir is more important than that of the winemaking technology (and materials) employed. However, regarding this aspect we also decided to evaluate the colour of the studied wine samples by sensory analysis (visual examination), tasters being asked to choose from the following descriptors: black, violet, purple, sour cherry red, ruby red, deep brick-red and acajou, i.e brown-red.

An interesting conclusion could thus be drawn: although in Fig. 6 the wines of Pietroasa seem to display closer to those of Odobeşti, to the human eye the wines of Odobeşti appeared to have a dominant purple component, which was different from the wines from the other two regions, described unanimously as “mature sour-cherry red”.

The results of the spectrophotometric analysis of colour showed high values both for the red component of the colour and for the blue one in Pietroasa wines, making them distinct from the wines obtained in the two other regions. In general, by weighing in all the studied parameters, it can be considered that the results in this study come as a confirmation of the high suitability of the Pietroasa terroir for the obtaining quality red wines of Fetească neagră.

CONCLUSIONS

The analysis of the composition and colour of wines produced from grapes of three locations proved that terroir is more important for this variety than the tested variations in the winemaking technology.

Due to specific local conditions, the wines of Valea Călugarească and Pietroasa were richer, with a higher alcohol concentration and dry content than those produced from grapes of Odobesti.

In all wines the colour (intensity, hue, CIELab parameters) was influenced by the terroir more than by the technological variations.

ACKNOWLEDGEMENTS

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TABLES

Table 1. Quality parameters of Fetească neagră grapes at full maturity (average for 2006-2008)

Region	Weight of 100 berries (g)	Sugar conc. (g/l)	Potential alcohol (% v./v.)	Total acidity (g/l)
V. Călugărească	140	**211**	12.41	4.95
Pietroasa	138	**216**	12.71	5.27
Odobeşti	159	**195**	11.47	6.05

Table 2. Technological variants for Fetească neagra vinification

Nr.	Variant*	Type of oenological material used	Dosage and time of addition
1	FN1-x	Selected yeast (Lalvin BM 45)	20 g/hl yeast (in the beginning of fermentation)
2	FN2-x	Selected yeast + enzyme Lallzyme OE	20 g/hl yeast + 2 g/hl enzyme (in the beginning of fermentation)
3	FN3-x	Selected yeast + Lallzyme OE + OptiRED	20 g/hl yeast + 2 g/hl enzyme + 15 g/hl yeast cell wall polysaccharides (in the beginning of fermentation)

* x= P (FN 1P) for Pietroasa wines, V for Valea Călugăreasca and O for Odobeşti.

Table 3. Climatic data and Oenoclimatic Suitability Index (IAO) for the three regions evaluated

Region	Year round		Vegetation period			Oenoclimatic suitability index
	Average temp (°C)	Sum of rainfall (mm)	Sum of °C	Sunshine (hours)	Sum of rainfall (mm)	
Valea Călugă-rească	11.3	642	3411	1520	394	**4929**
Pietroasa	11.4	557	3360	1599	384	**5114**
Odobeşti	20.2	624	3264	1466	439	**4748**

Table 4. Principal physico-chemical parameters (average ± standard deviation)

Sample	Alcohol vol./vol %	Acidity g/l tartaric acid	Dry content g/l	Colour intensity ICM = D420+D520+D620	Colour hue T = D420/D520	Total polyphenolic index, TPI
FN1P	14.35 ± 0.35	4.72 ± 0.35	33.33 ± 0.47	7.53 ± 0.01	0.93 ± 0.02	30.89 ± 0.30
FN2P	14.44 ± 0.51	4.86 ± 0.04	35.17 ± 0.24	7.94 ± 0.18	0.84 ± 0.11	29.37 ± 0.42
FN3P	14.70 ± 0.15	4.71 ± 0.02	36.67 ± 0.47	8.95 ± 0.45	0.93 ± 0.07	28.93 ± 1.47
FN1V	12.81 ± 0.30	5.42 ± 0.05	25.17 ± 0.24	4.97 ± 0.95	0.80 ± 0.00	29.67 ± 3.13
FN2V	14.16 ± 0.48	5.75 ± 0.19	29.67 ± 0.94	7.83 ± 0.97	0.79 ± 0.04	29.89 ± 2.20
FN3V	12.60 ± 0.00	5.48 ± 0.03	28.67 ± 4.71	6.80 ± 0.97	0.75 ± 0.01	29.77 ± 1.94
FN1O	13.75 ± 0.07	8.24 ± 0.06	32.50 ± 2.12	9.40 ± 0.01	0.92 ± 0.03	28.67 ± 0.90
FN2O	13.60 ± 0.42	8.03 ± 0.02	33.17 ± 3.06	9.73 ± 0.56	1.01 ± 0.09	28.08 ± 1.17
FN3O	13.45 ± 0.07	8.21 ± 0.82	36.33 ± 6.60	9.47 ± 0.20	0.85 ± 0.14	29.64 ± 2.14

Table 5. Principal colour parameters (average ± standard deviation)

Sample	x	y	L	a	b	Cab	hab
FN1P	0.70 ± 0.00	0.29 ± 0.00	17.11 ± 0.71	49.23 ± 0.61	28.32 ± 0.89	56.80 ± 0.97	0.52 ± 0.01
FN2P	0.70 ± 0.00	0.38 ± 0.13	14.81 ± 0.49	47.07 ± 0.26	24.86 ± 0.65	53.23 ± 0.54	0.39 ± 0.14
FN3P	0.70 ± 0.00	0.29 ± 0.00	14.08 ± 0.33	45.58 ± 0.25	23.70 ± 0.50	51.37 ± 0.45	0.48 ± 0.01
FN1V	0.63 ± 0.02	0.31 ± 0.00	31.30 ± 4.77	54.58 ± 3.07	37.33 ± 0.52	66.14 ± 2.83	0.60 ± 0.02
FN2V	0.70 ± 0.01	0.30 ± 0.01	20.12 ± 2.63	52.81 ± 1.80	33.80 ± 3.88	62.72 ± 3.61	0.57 ± 0.04
FN3V	0.67 ± 0.02	0.30 ± 0.00	25.72 ± 3.07	55.78 ± 0.57	38.66 ± 0.46	67.86 ± 0.73	0.61 ± 0.00
FN1O	0.72 ± 0.00	0.28 ± 0.00	15.18 ± 1.49	50.26 ± 1.97	26.11 ± 2.51	56.65 ± 2.91	0.48 ± 0.02
FN2O	0.72 ± 0.00	0.28 ± 0.00	14.83 ± 0.85	49.69 ± 1.22	25.44 ± 1.45	55.83 ± 1.75	0.47 ± 0.01
FN3O	0.72 ± 0.00	0.28 ± 0.00	13.38 ± 1.88	47.99 ± 2.39	22.96 ± 3.19	53.21 ± 3.53	0.45 ± 0.06

FIGURES

Fig. 1. Feteasca neagră clone 10 Pietroasa,
cultivated in the Research Station Pietroasa on a surface of 10 ha

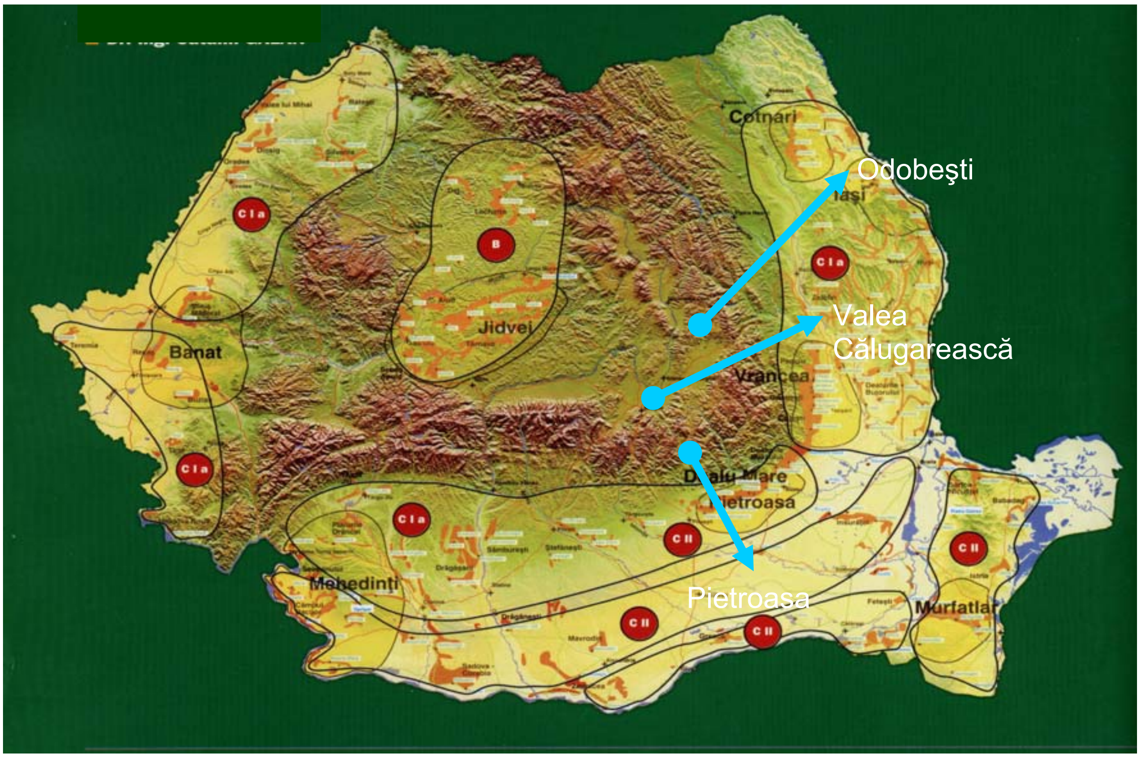

Fig. 2. Regions where the grapes of Feteasca neagră wines were produced

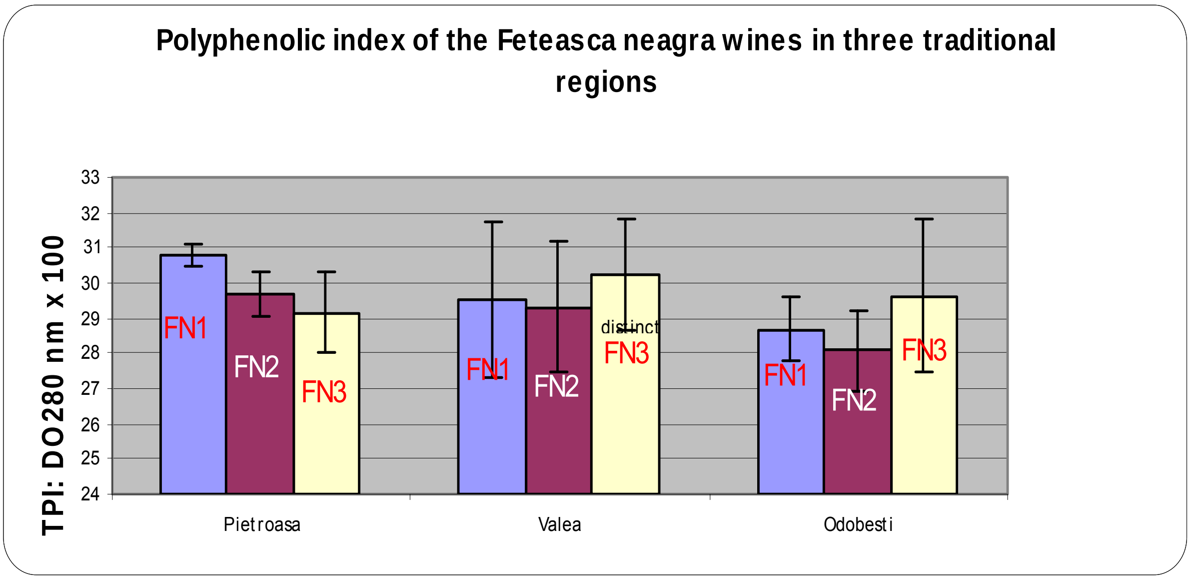

Fig. 3. Total polyphenolic index of the Feteasca neagră wines from three traditional regions and three technological variants

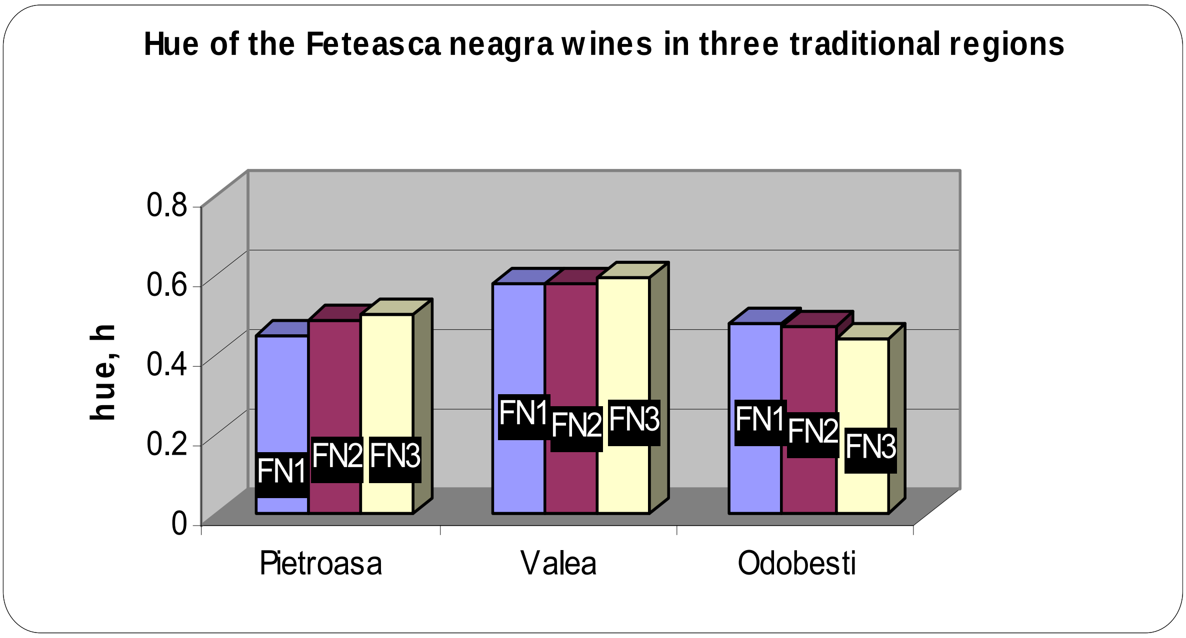

Fig. 4. Hue of the Feteasca neagră wines studied

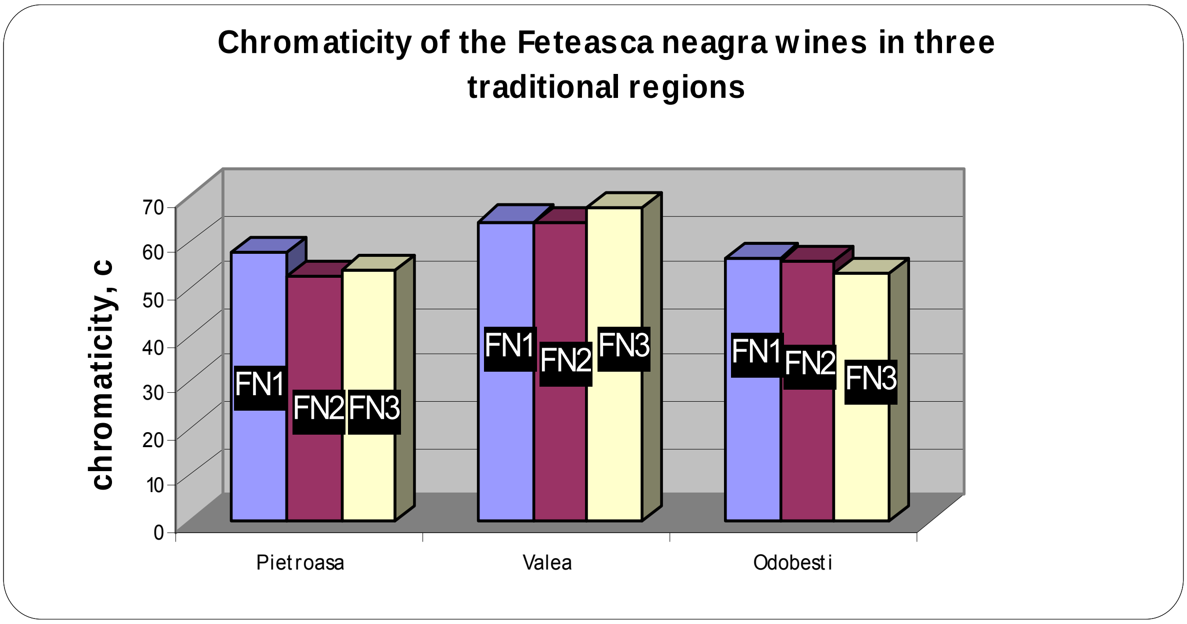

Fig. 5. Chromaticity of the Feteasca neagră wines studied

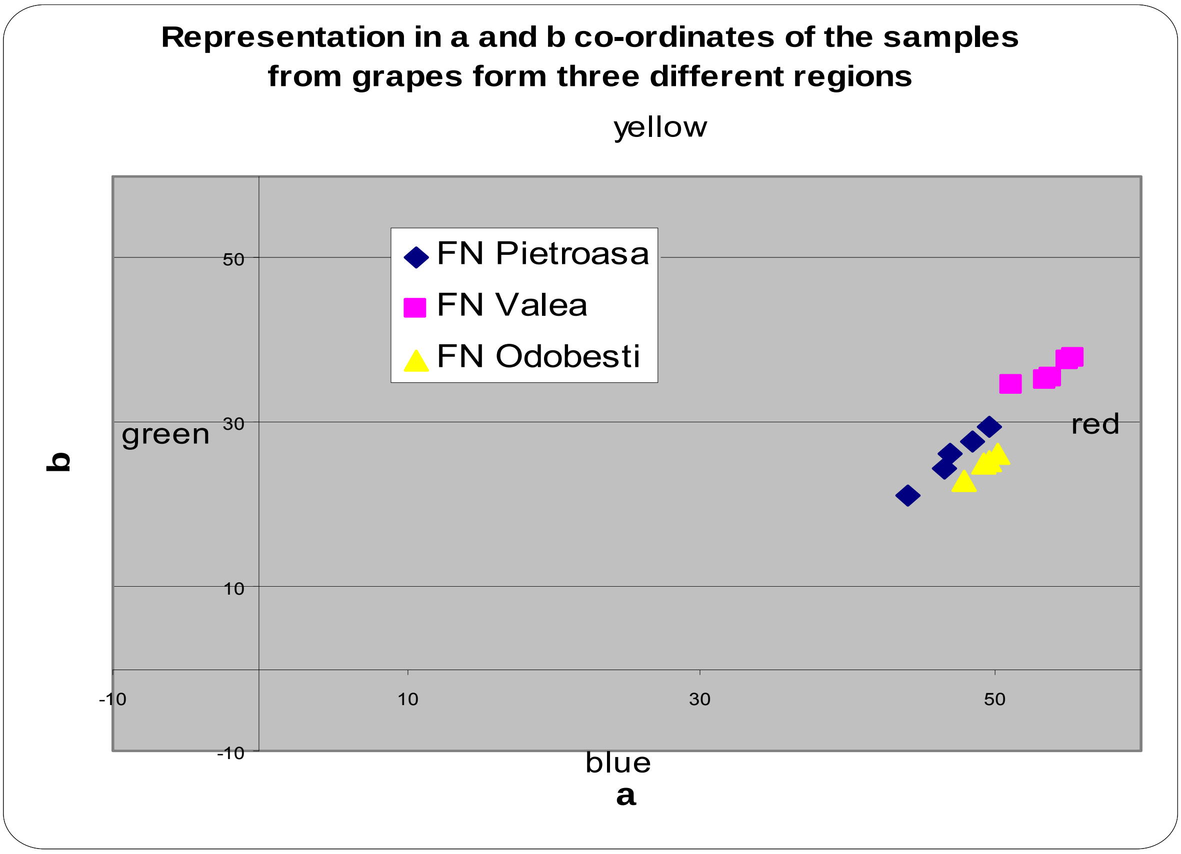

Fig. 6. Representation of the studied wines in the space of the *a* and *b* colour coordinates

The influence of terroir on the sensory profile of Fetească Neagră red wines

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Keywords: sensory analysis, sensory profile, winemaking technology

ABSTRACT

Wines obtained by several variants of winemaking technology from grapes of Fetească neagră harvested from the viticultural centres of Pietroasa, Valea Călugărească and Odobeşti were subjected to sensory analysis using a specially designed score sheet in order to praise differences induced by terroir. Results show that, although the wines were obtained from the same grapevine variety, the effect of terroir is clearly discernable in the sensory profile of the wine. Moreover, the differences induced by terroir were more significant then any variations due to the factors related to the winemaking technology, under the experimental conditions used.

INTRODUCTION

The wines obtained from the well know Romanian grapevine variety Fetească neagră are usually described in the literature as characterized by very specific aromas, such as those reminding of blackcurrants, smoked prunes and plums. However, this "typical" sensory profile has been established based on the traditional place of cultivation of this variety, i.e. Valea Călugărească. Considering that Fetească neagră has been widely introduced in recent years to other viticultural centres, there is a need to revaluate the sensory profile of wines of Fetească neagră produced elsewhere, to see whether there are any significant changes or features which might be introduced as a result of the specific terroir of these places. Another point of interest is to see the effect of various technological variations during winemaking on the obtained wines of Fetească neagră.

MATERIALS AND METHODS

Table 1 shows the wines (experimental variants) made at USAMVB from grapes harvested in 2008 from 3 different viticultural regions where Fetească neagră is cultivated.

All the wines were analyzed for the determination of composition and colour parameters (these results are published in a different paper), as well as for their sensory attributes. A specially designed tasting sheet was developed and handed out to the member of the sensory analysis panel (made of 5 to 7 judges); they evaluated and made notes on the tasting sheet regarding each descriptor, and after that the notes were transformed into numerical information for analysis, description and plotting. This procedure was carried out for all 27 wines; the most interesting or representative attributes were selected for data analysis and the results are presented as follows.

RESULTS AND DISCUSSION

The old literature on the wines of Fetească neagră indicates – most often – the aroma of smoked plums as being characteristic to these wines; the next most frequently quoted being that of dried prunes. The wine tasting sessions carried out in this work, however, resulted in a slightly different conclusion: the most frequently indicated aromas were those of black currants and cherries (Fig. 1).

The intensity of these aromas was not very high – they were rather subtle for the wines from Valea Călugărească and Odobeşti, and somewhat more powerful for those from Pietroasa. In fact, the wines of Pietroasa were found to have a more complex aromatic profile, with nuances of several kinds of berries as well as vanilla, caramel and violets (Fig. 2). On the other hand, they did not display the notes usually associated with Fetească neagră wines, that is, smoked plums and prunes.

For comparison, the wines from Valea Călugărească – which is the traditionally most appreciated cultivation place for Fetească neagră – are less complex in aroma, but indeed do show the presence of the classical notes of smoked plum, and also black currants. Some other characteristic flavour notes are smoked character and black pepper scent (Fig. 3).

As for the Odobesti wines (Fig. 4), the most appreciated feature was their vinosity and the most frequently observed aromatic feature was a note of sour cherry which may be related to the higher acidity of these wines compared to those from the other 2 regions (around 8 g/l in Odobeşti, 5 g/l in Pietroasa and 6 g/l in Valea Călugărească). Overall, the perception regarding quality was similar to that of Valea Călugarească wines.

Figure 5 shows a comparison of the general sensory profile of the wines of Fetească neagră from the 3 regions (the plotted values are averages of the three repetitions and three variants from each region). It can be seen that the sensory panel was capable of discerning various organoleptic differences among the studied wines, many of these differences being related to the place of origin of the grapes used for winemaking.

The comparison of aromatic profiles, as well as the other sensory parameters associated with quality, appears to point out that the Fetească neagră wines obtained in Pietroasa are more balanced, but also have the highest aroma complexity and a high persistence of the aroma. They are also characterized by a good colour intensity which is better expressed, as well as a good tannic structure (mouthfill) and body perception (Fig. 6).

By comparison, the wines from Valea Călugarească (Fig. 7) appeared to be next in line, with deep and intense colour, with a more intense astringency and more tannin extracted. These arguments for the suitability of these wines are for aging or at least for a maturation period before being consumed.

The general sensory profile of the Fetească neagră wines from Odobeşti (Fig. 8) indicates brisk acidity, but also lowers values of descriptors such as aroma complexity and fineness, as well as colour intensity and hue.

CONCLUSIONS

The sensory profiles derived from this work indicated that the Fetească neagră wines from Valea Călugărească and Pietroasa were richer in structure and also presented higher values of alcoholic concentration and dry content, compared to those obtained from grapes harvested in Odobeşti. It is apparent that these differences are due to the variability of specific local conditions (terroir). However, although somehow similar in physico-chemical properties and obtained from grapes grown in the same Dealu Mare region, the wines of Valea Calugareasca and Pietroasa differed significantly in their sensory profile.

The Pietroasa wines appeared to be more complex, with a combination of aromas of red fruits and berry notes (cherry, bitter cherry, wild strawberry, blackberry, raspberry and black currant) mixed with floral (violets), caramel and vanilla flavours. In comparison, the wines of Valea Călugărească showed lower flavour complexity, with notes of smoke and black pepper accompanied by a very good tannic structure, which make these wines more suitable for maturation and aging.

Closer to the traditional description of the wines of this variety, the wines of Odobeşti displayed the so-called typical aroma of prunes and black currants, but at a lower aromatic intensity. Moreover, the wines of Odobeşti distinguished themselves through a brisk acidity and a lower colour intensity and astringency, due to lower polyphenolic content.

ACKNOWLEDGEMENTS

This work was financed within the frame of the Romanian national research programme PNCDI 2, Domain 5.

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***ISO 13301:2002, Sensory analysis -- Methodology -- General guidance for measuring odour, flavour and taste detection thresholds by a three-alternative forced-choice (3-AFC) procedure.
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***ISO 6564:1985, Sensory analysis -- Methodology -- Flavour profile methods.
***ISO 6658:2005, Sensory analysis -- Methodology -- General guidance.
***ISO 8586-1:1993, Sensory analysis -- General guidance for the selection, training and monitoring of assessors -- Part 1: Selected assessors.
***ISO 8586-2:2008, Sensory analysis -- General guidance for the selection, training and monitoring of assessors -- Part 2: Expert sensory assessors.
***ISO 8587:2006, Sensory analysis -- Methodology – Ranking.

TABLE

Table 1. Technological variants for Fetească neagră vinification

Nr.	Variant*	Type of oenological material used	Dosage and time of addition
1	FN1-x	Selected yeast (Lalvin BM 45)	20 g/hl yeast (in the beginning of fermentation)
2	FN2-x	Selected yeast + enzyme Lallzyme OE	20 g/hl yeast + 2 g/hl enzyme (in the beginning of fermentation)
3	FN3-x	Selected yeast + Lallzyme OE + OptiRED	20 g/hl yeast + 2 g/hl enzyme + 15 g/hl yeast cell wall polysaccharides (in the beginning of fermentation)

* x= P (FN 1P) for Pietroasa wines, V for Valea Călugărească and O for Odobeşti

FIGURES

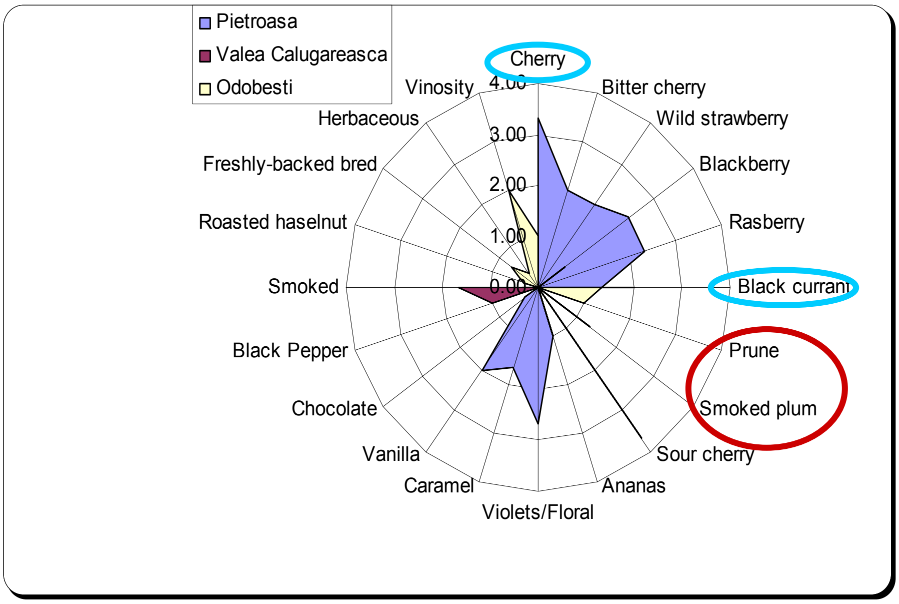

Fig. 1. Flavour profile of the Feteasca neagră wines studied

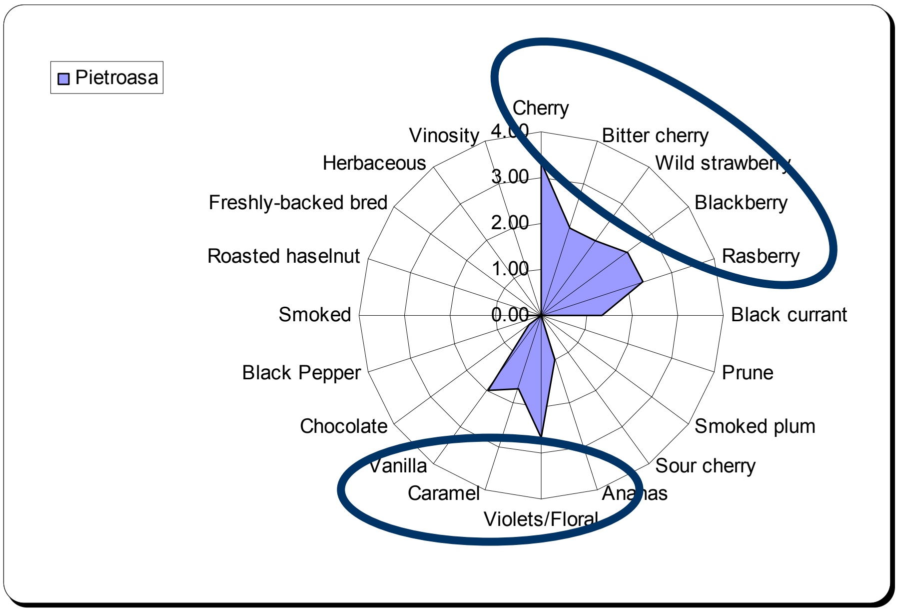

Fig. 2. Flavour profile of the Fetească neagră wines of Pietroasa

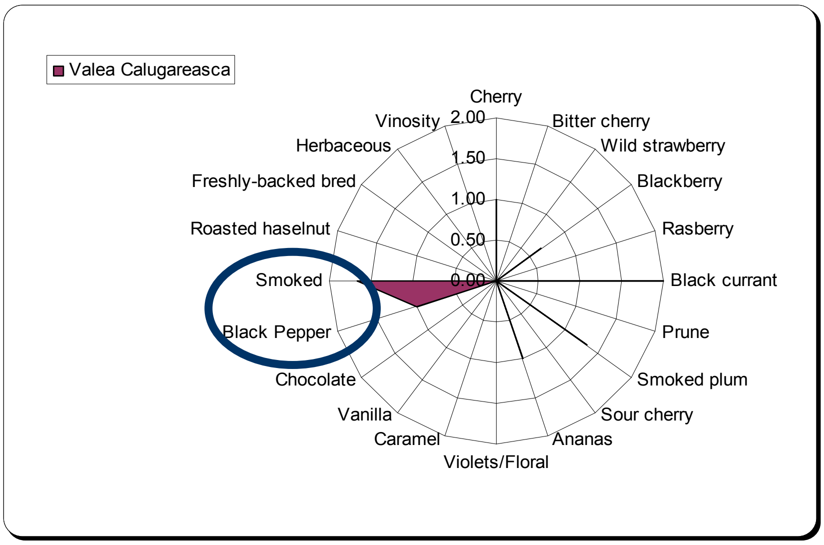

Fig. 3. Flavour profile of the Fetească neagră wines of Valea Călugărească

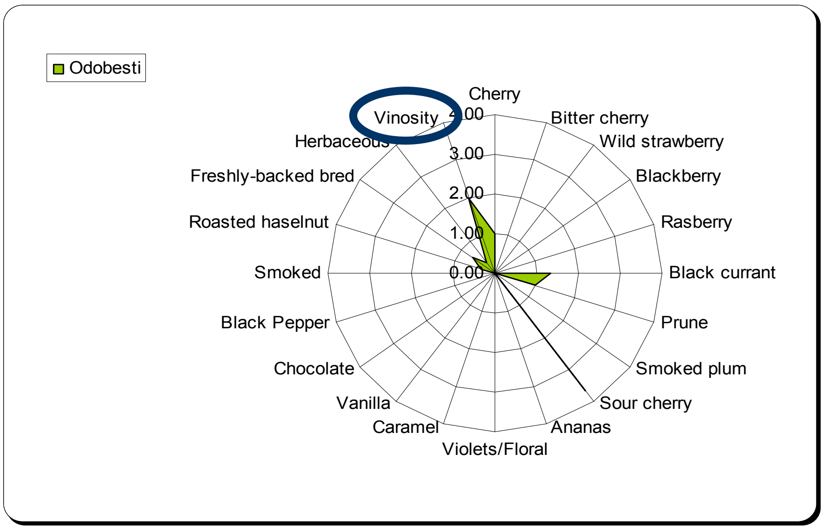

Fig. 4. Flavour profile of the Fetească neagră wines of Odobeşti

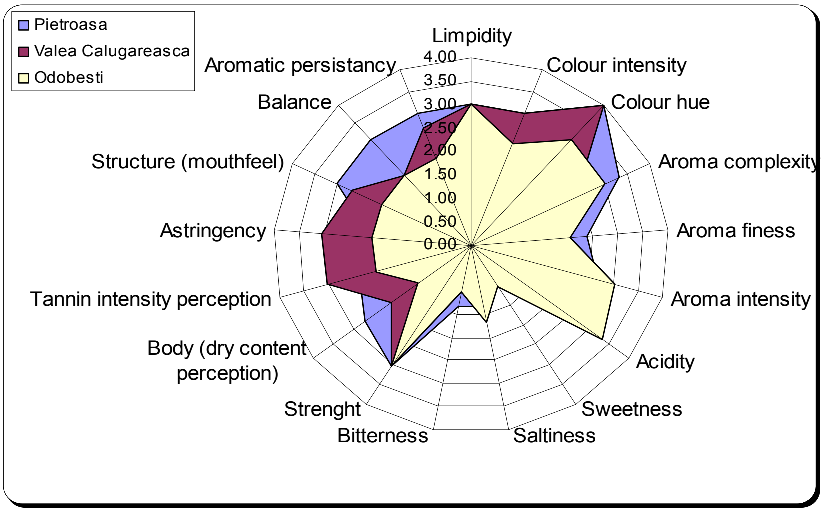

Fig. 5. General sensory profile of Feteasca neagră wines from three different regions

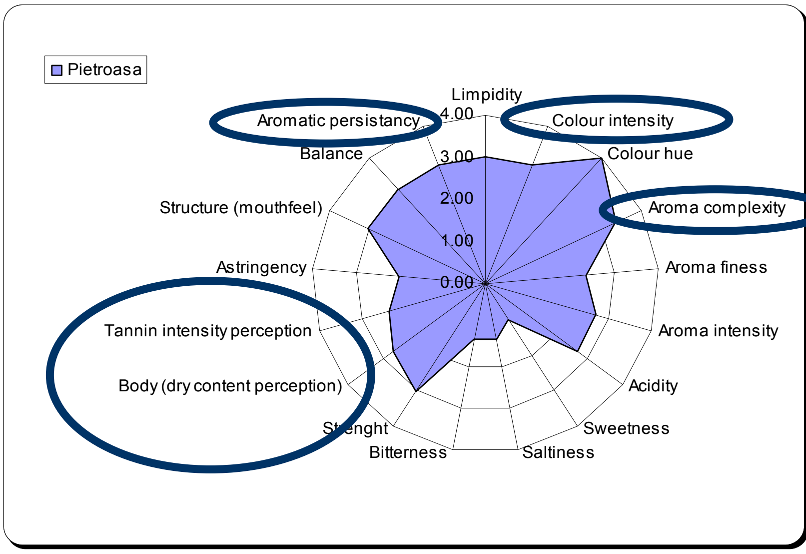

Fig. 6. General sensory profile of Fetească neagră wines from Pietroasa

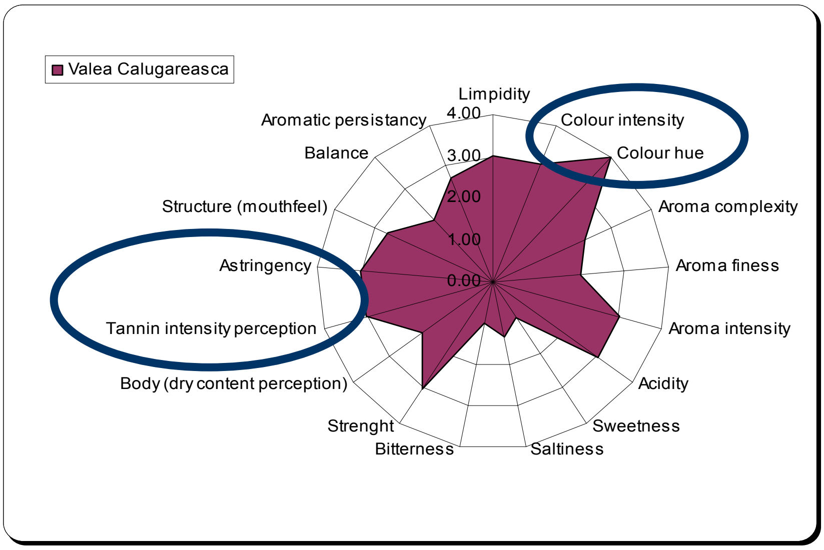

Fig. 7. General sensory profile of Feteasca neagră wines from Valea Călugărească

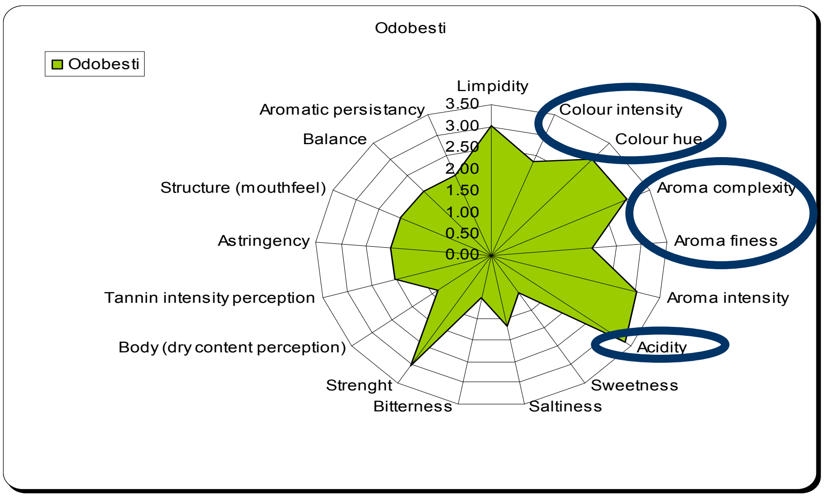

Fig. 8. General sensory profile of Feteasca neagră wines from Valea Călugărească

Volatile profiles of Fetească Neagră wines from three regions differentiated by the use of an electronic nose

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Keywords: electronic nose, Heracles, oak chips, sensory profile, fingerprint

ABSTRACT

Wines of Fetească neagră obtained from grapes harvested in 3 different viticultural centres (Pietroasa, Valea Călugărească and Odobeşti) using 5 technological variants for each viticultural centre and 3 repetitions for each variant, were assayed using an electronic nose (Heracles Analyzer, Alpha MOS, France). Results show excellent differentiation of wines based on their origin and/or technological variant used during winemaking. In particular, it was possible to discriminate wines produced using oak chips aromatization from those obtained without this technique.

INTRODUCTION

Feteasca neagră is a valuable grapevine variety for red wines which has come to be known for the good results it has provided for many years in the special terroir of Valea Călugărească. As a result, most of the literature containing description and characterization of this variety is based on its behaviour in Valea Călugărească. However, in recent years Feteasca neagră has spread to several other grapevine cultivation areas in the country and in this process it has displayed a pronounced versatility, wines made in Pietroasa, for example, being sometimes even more interesting and complex than those produced in Valea Călugărească.

In this study an electronic nose was employed to investigate the influence of terroir on wines made of this variety, compared to the influence of several variations of the winemaking technology.

MATERIALS AND METHODS

Wines were made from grapes of Fetească neagră harvested in Pietroasa, Valea Călugărească and Odobeşti, using 5 technological variants for each viticultural centre (for each variant there were 3 repetitions), as shown in Table 1.

The wines were analyzed using a **Heracles Analyzer/Electronic Nose** produced by Alpha M.O.S. (France), which consists of a Flash Gas Chromatograph with two columns, equipped with a Combi PAL Auto-Sampler System (CTC Analytics AG, Switzerland) for processing multiple groups of samples. The apparatus comes with a dedicated software package capable of performing advanced multivariate statistic data processing. Wines were analyzed with the electronic nose at 30, 45 and 60 days after fermentation (some samples were also analyzed after aromatization with oak chips).

RESULTS AND DISCUSSION

For each sample analyzed the Alpha MOS Heracles analyzer (electronic nose) records 2 chromatograms (one for each column), which are analyzed by the specialized software of the apparatus (Alpha Soft ver. 11.0). By treating the peaks of the recorded chromatograms as "sensors" which detect a certain volatile substance in the sample, the Heracles works like an electronic nose with a very large number of sensors, with very good results regarding the discrimination performance. Also, the software of the apparatus can select automatically the most important sensors (peaks), meaning those which contribute most to the differentiation of samples. As a result, the recorded chromatograms can be processed as fingerprints characteristic of the samples tested.

Most importantly, the data are processed by using complex statistical techniques such as Principal Component Analysis (PCA) and Discriminant Function Analysis (DFA). The DFA procedure is even more suitable for the differentiation for our types of samples.

In Fig. 1 we have the DFA plot showing the discrimination of the Fetească neagră wines produced from grapes obtained in the 3 different locations. Each group contains all the variants of wines with all technologies (with use of enzyme, Optired and/or oak chips). The DFA plot was derived from the data recorded for all 45 wines grouped in accordance with the origin of the grapes. We can see that the apparatus discriminates very well between the groups differencing clearly the wines of the three regions.

Another DFA discrimination attempt (Fig. 2), performed only on the wines from Pietroasa region, also reveals a good discrimination in accordance with the technology involved in the production of these wines.

In Fig. 2 it can be seen that the Heracles Analyzer is capable of grouping the wine samples based on the variations in the winemaking technology. Moreover, we can see the effect of oak chips aromatization: the two groups at the left of the plot are without oak chips treatment, and the groups of the right – without overlapping each other – are the two groups of samples to which oak chips were added during winemaking.

Figure 3 shows a PCA plot obtained after grouping the wine samples only on the basis of their place of origin (Valea Călugărească, Pietroasa and Odobeşti) and use or non-use of oak chips. Again, the electronic nose is able to correctly differentiate the 6 groups of wines. In many wines treated with oak chips the varietals aroma is overcome by the oak and vanilla scents introduced by oak and the wines can lose their personality and terroir typicality. It is believed that, in the case of Fetească neagră, the volatile profile is not completely overwhelmed by the oak aromatization, due to its tannic structure and complexity.

It is also possible to add on a plot similar to the one given in Fig. 3 the “loading” vectors which indicate the proportion in which each sensor (chromatographic peak) taken into consideration has contributed to the differentiation of the wines along the two Principal Component axes. The result is given in Fig. 4, which illustrates the fact that most sensors considered have their main effect along the PC1 axis (and therefore are presumably related to the use/non-use of oak chips); but, unless they are completely horizontal, they also contribute to the differentiation of samples along the PC2 axis.

The effect of the addition of oak chips can also be praise by examining the chromatograms recorded for samples with and without chips – under the polar or “radar” or “fingerprint” representation, as shown in Fig. 5.

It can be seen in Fig. 5 that there are visible differences – some more important, some apparently less significant – between the black chromatographic curve (corresponding to the sample without oak chips) and the blue curve (corresponding to the sample after oak chips treatment). These differences, even if hardly perceptible by the eye, are actually essential, when analyzed by multivariate statistic techniques, for the successful differentiation of the two wines.

CONCLUSIONS

The evaluation of the wines using the electronic nose has shown that a clear discrimination of the wine groups can be achieved based on the terroir in which the grapes have been produced, but also based on the variations in the winemaking technology, in particular the use or non-use of oak chips. T

The effect or the influence of terroir on the discrimination of the wines by the electronic nose was more significant than the effect of the variations in the winemaking technology. This was true even in relation with the oak chips treatment, which is a rather strong intervention on the wine aroma susceptible of making some wines unrecognizable by human subjects, unless they are very well trained.

While the variety Fetească neagră is very well known for its results in Valea Călugărească, it was found that wines obtained in Pietroasa have more flavour intensity and complexity and are clearly distinguishable by those obtained in Valea Călugărească and also from those obtained in another traditional terroir for this variety, which is that of Odobeşti.

ACKNOWLEDGEMENTS

This work was financed within the frame of the Romanian national research programme PNCDI 2, Domain 5.

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***ISO 6564:1985, Sensory analysis -- Methodology -- Flavour profile methods.

TABLE

Table 1. The studied wines of Fetească neagră.

No.	Variant*	Type of oenological material used	Dosage and time of addition
1	FN1-x	Selected yeast (Lalvin BM 45)	20 g/hl yeast (in the beginning of fermentation)
2	FN2-x	Selected yeast + enzyme Lallzyme OE	20 g/hl yeast + 2 g/hl enzyme (in the beginning of fermentation)
3	FN3-x	Selected yeast + OptiRED + oak chips**	20 g/hl yeast + 15 g/hl yeast cell wall polysaccharides (in the beginning of fermentation) + oak chips (after fermentation)
4	FN4-x	Selected yeast + Lallzyme OE + OptiRED + oak chips**	20 g/hl yeast + 2 g/hl enzyme + 15 g/hl yeast cell wall polysaccharides (in the beginning of fermentation) + oak chips (after fermentation)
5	FN5-x	Selected yeast + Lallzyme OE + OptiRED	20 g/hl yeast + 2 g/hl enzyme + 15 g/hl yeast cell wall polysaccharides (in the beginning of fermentation)

* x= P (FN 1P) for Pietroasa wines, V for Valea Călugăreasca and O for Odobeşti.

**The oak chips were not introduced in the wine from the beginning, but 7 days after the fermentation.

FIGURES

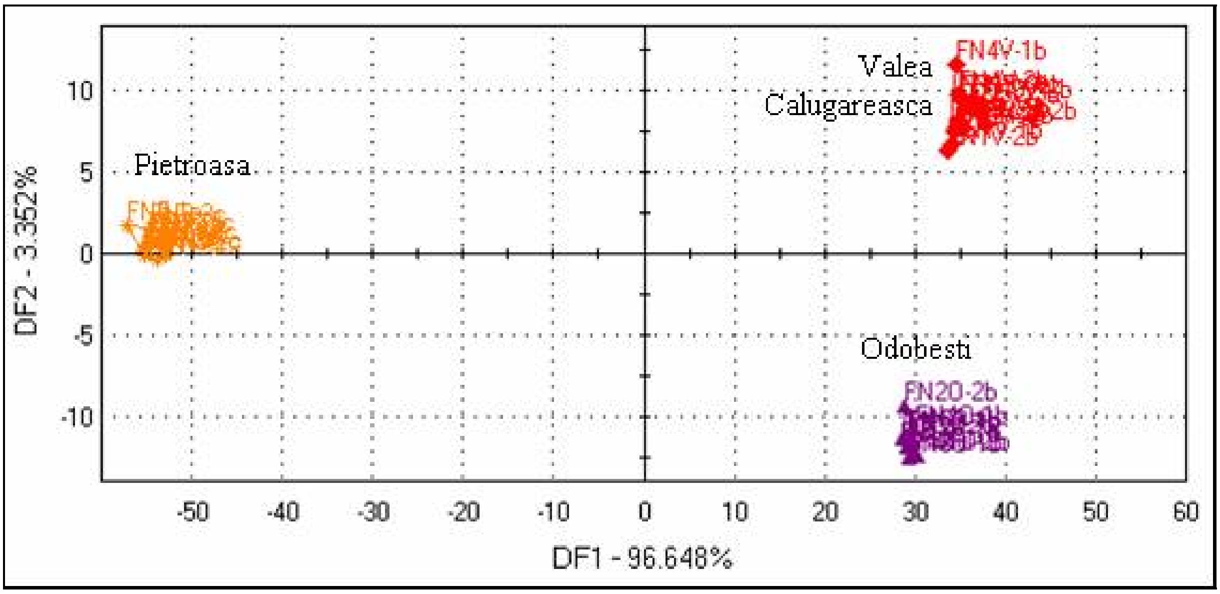

Fig. 1. DFA plot of the Feteasca neagră wines grouped according to the region of grapes origin. Each group contains all the variants of wines of a certain region, with all types of technologies (with use of enzyme, Optired and/or oak chips)

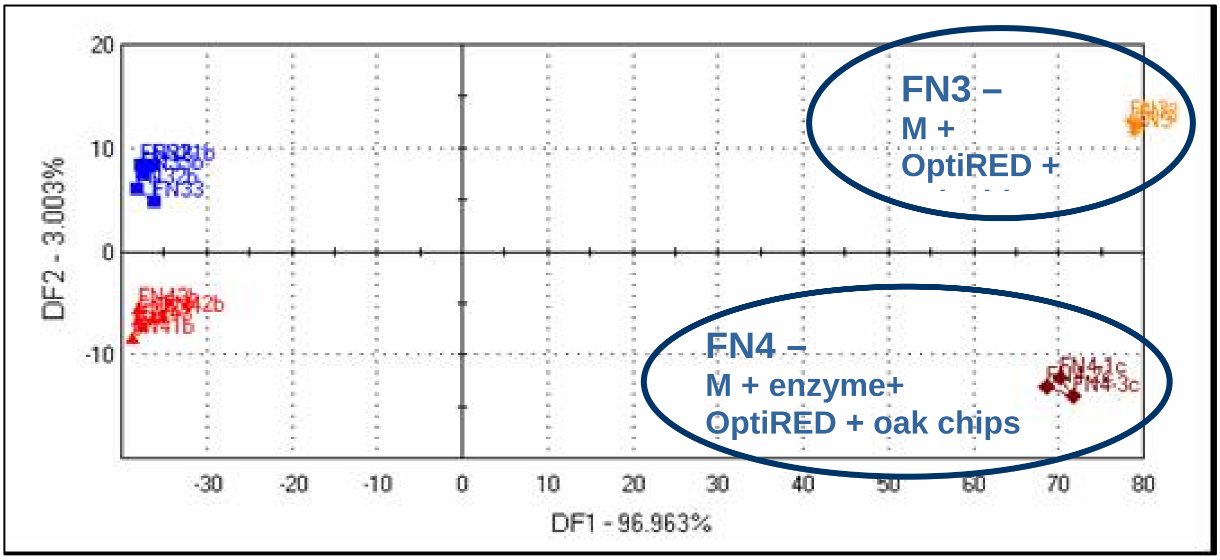

Fig. 2. DFA plot of the Feteasca neagra wines from Pietroasa grouped according to the types of production technologies (with use of enzyme, Optired and/or oak chips)

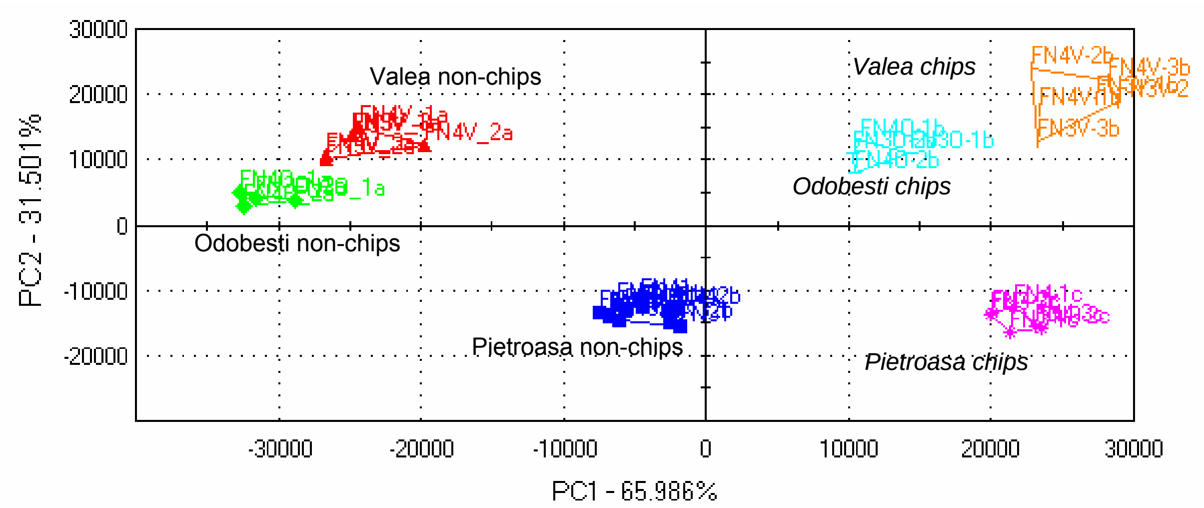

Fig. 3. PCA plot of the Fetească neagră wines of all three regions (Valea Călugărească, Pietroasa and Odobeşti) grouped according to the winemaking technologies, with and without oak chips addition.

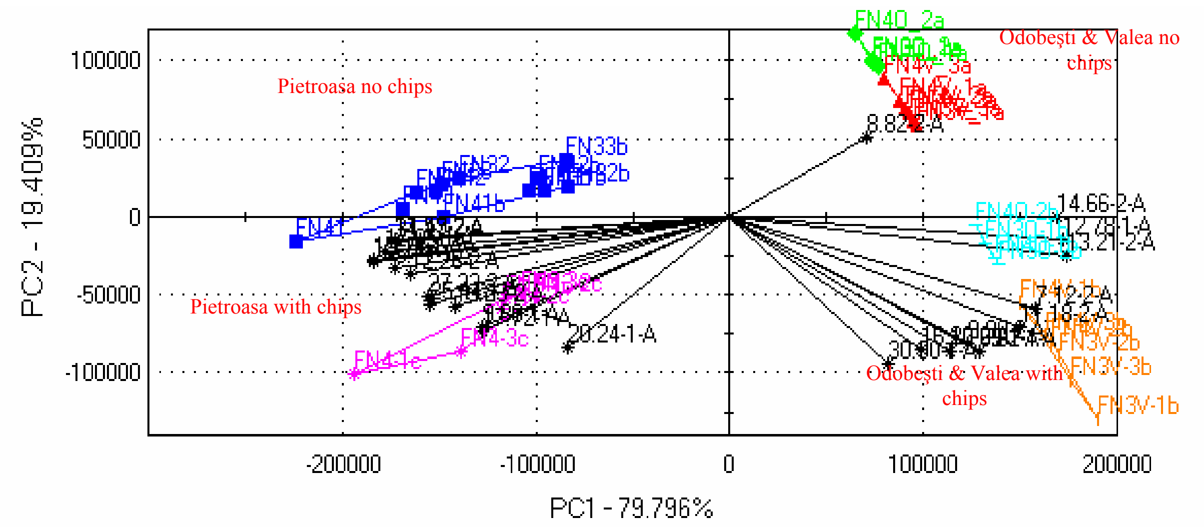

Fig. 4. Differentiation sensors on the PCA plot of the Fetească neagră wines of all three regions (Valea Călugărească, Pietroasa and Odobeşti) grouped according to the winemaking technologies, with and without oak chips addition.

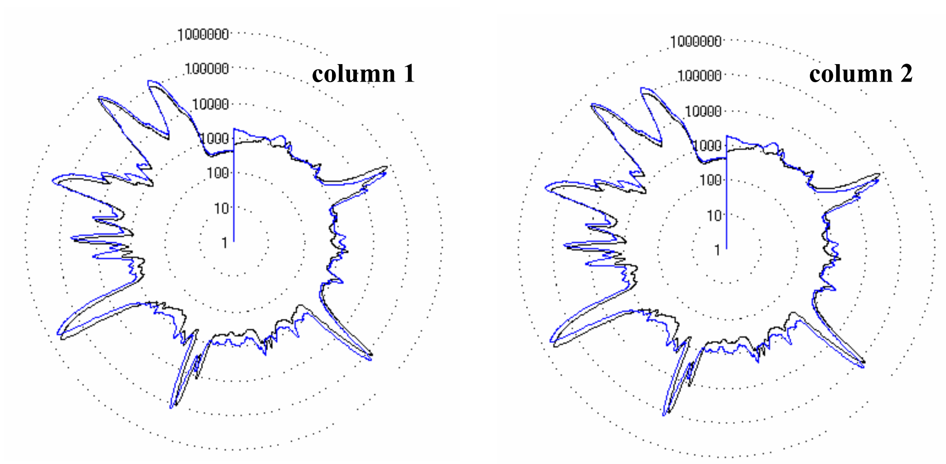

Fig. 5. Fingerprints on both chromatographic columns for a Fetească neagră wine before (black line) and after (blue line) oak chips addition

Lucrări ştiinţifice USAMVB, Seria B, vol. LIII, 2009

Researches concerning the correlations between environmental conditions influence from the fruit buds differentiation period on grape yield levels in Odobeşti Vineyard

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Keywords: bud burst differentiation, bioclimatic indicators, heliothermic, hydrothermic, fertility, interrelationsheep

ABSTRACT

Fertility, and thus level of annual grapevine yield are mostly determined by the evolution of flower induction and fruit buds differentiation processes, with the two periods (before and after bud burst) as well as conditions during flower bloom. In respect, a very important role in development of these processes is held by the favourability of the environmental factors of these periods. This paper aims to study the correlations between annual grape yields in the Odobeşti vineyard from 1999 to 2008, with main ecological indicators of synthesis from fruit buds differentiation period but also, with the main climatic factors from the blooming period. This study has highlighted a positive correlation with various degrees of intensity between the grape yield with the grapevine bioclimatic index (G.b.i.) and the heliothermic index (H.I.) from the fruit bud differentiation period, and also with useful thermal balance (U.T.B.) from blooming period. There has also, been noted a negative correlation, however insignificant, of grape yield with hydrothermic quotient (H.Q.) from differentiation period and also with precipitations (Pp.) during bloom.

INTRODUCTION

From the technical literature (Oslobeanu and colab., 1980), as well as researches conducted over time (Titiunik,1952, Winkler, 1962, Moser, 1966), it is a known fact that during the flower induction and fruit bud differentiation period, a major role is played by the favourability of environmental factors of this period, such as light (intensity and the light day) and also the temperature values and water supply level, necessary during the flower induction and fruit bud differentiation period as well as during the growth of fruit and bearing shoots.

It is acknowledged that the grapevine yield is determined by a large number of factors which may be grouped in several categories, as well: genetics, environmental, technologies, economics, socials, and all. Between these, in the knowable conditions of technology the environmental factors have a distinctive importance.

MATERIALS AND METHODS

In order to establish the correlations between the level of annual grape yield and the environmental conditions during the flower induction and period of fruit bud differentiation has been observed a series of ecological indicators with a synthetic character, witch integrated the combined action of two or three environmental factors. These were: the heliothermic index (H.I.) (Barnas and colab., 1946), the hydrothermic quotient (H.Q.) (Seleaninov, 1936) and the grapevine bioclimatic index (G.b.i.) (Constantinescu and colab., 1964) for flower induction, the before bud burst differentiation period (first interval: May-June) and after bud burst (second interval: April-May).

Also the favourability of climatic factors for the phenological blooming phase has been analyzed, such as the sum of useful temperatures ($\Sigma t^o u$) or the useful thermal balance (U.T.B.) and the quantity of precipitations (Pp.)

The primary climatic data at the basis of the calculations of environmental indicators from the observed period (1999-2008) have been provided by the meteorological station of S.C-D.V.V. Odobeşti, and dates on the average annual grape yield have been taken from the records of Development sector, on the most important grapevine varieties.

RESULTS AND DISCUSSION

The obtained results interpretation is presented in tables 1 and 2 and graphic represented are in figures 1 and 2. These reveals that between the absolute value of ecological factors determined during the fruit bud differentiation and blooming period and level of average annual yield, there are direct links or/and indirect interrelations, which may be established and explained to some extent.

Thus, it has been ascertained that the higher values of the bioclimatic index of grapevine calculated for both the before and after bud burst periods (from 20.69 to 32.25) usually correspond to higher levels in grape yield (years 2002, 2006, 2007, 2008), while lower values (from 9.2 to 16.73) are associated with decreased yield (years 2000, 2001, 2003, 2005). This indicator shows evident relations to the way the differentiation process of the fruit buds during two develop periods (before and after bud burst).

From this point of view it has resulted that years with higher yields of grapes (2002, 2006, 2007, 2008), recorded higher values of the grapevine bioclimatic index (G.b.i.) during the before bud burst differentiation period (between 11.78 and 23.44), compared to those from the after bud burst differentiation period (between 3.98 and 8.81). In 1999, 2000, 2001, 2004, although the conditions during the after bud burst period were favourable, shown by high values of the bioclimatic index (between 11.07 and 12.85), the before bud burst differentiation period did not benefit from the same favourable factors, with lower values of G.b.i. (between 4.74 and 7.66).

There are also situations (years 2003 and 2005) when differentiation weakly initiated during before bud burst period recorded an involution in the after bud burst period due to unfavourable climatic factors, low values of grapevine bioclimatic index (from 3.83 to 6.37), with obvious effects on annual grape yield.

Also, on comparing the absolute annual values of heliothermic index (H.I.) with average of annual yields, may be observed a positive relation with higher values of the index (0.55-0.62) recorded during the years with higher yield (2002, 2007, 2008). However, the absolute values of the hydrothermic quotient (H.Q.) and average level of annual yield levels are correlate negatively and higher yield was obtained during the years when this indicator recorded lower values (1.84-1.93).

A decisive influence over the proportioning of annual grapevine yield was determined by climatic conditions from the blooming period, with a positive correlation between yields and useful thermal balance (U.T.B.) or the sum of useful temperatures (useful $\Sigma t^{o}C$) from this period and a negative one with the sum of precipitations recorded in this interval (tables 1 and 2). Thus, in years with higher yields (2002, 2007, 2008), the values of the useful thermal balance have been above those accumulated during years with lower yields (between 117.6 and 179.1ºC), and precipitations during in this period recorded low figures.

The statistical and mathematical interpretation of intensity and direction highlighted between the determinant environmental indicators and the level of annual grape yields has been achieved through the calculation of the correlation quotients (r) for each environmental indicator (table 3). Thus very significant direct positive links may be observed between the average of annual yield and grapevine bioclimatic index (G.b.i.), the heliothermic index (H.I.), and distinctly significant with the useful thermal balance (U.T.B.) from blooming period. Negative links have been observed, however, insignificant from this point of view of statistical interpretation with the hydrothermic quotient (H.Q.) and the quantity of precipitations during bloom (Pp.).

CONCLUSIONS

1. The environmental conditions present in the period of differentiation for the fruit buds and during bloom influence fertility and the level of annual grape yield.

2. There correlations are positive or negative to different intensities between grape yield and determining environmental indicators
3. The sum values of the grapevine bioclimatic index (I and II) from fruit bud differentiation period confirms the existence of two periods of maximum importance in the initiation, formation and development of fruit buds.
4. Based on these correlations, completed with observations concerning the viability of eyes may be established prognosis, so that it may help rationalize the annual fruit load and the use of the adequate agrofitotechnical measures in order to preservation and stimulate the fertility of the grapevines.
5. For to confirm the correlations highlighted in this study, between grape yield and the determinant environmental indicators, we recommend the extension of these determinations over a larges period of time.

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TABLES

Table 1. The determinant environmental indicators and yield obtained in 1999-2008 periods (10 years)

Years	Average yield (t/ha)	Determinant environmental indicators							
		During the period before burst(I) and after bud burst(II) differentiation						During bloom	
		G.b.i.		H.I.		H.Q.		Useful Σt°(°C)	Pp. (l/sq.m)
		I	II	I	II	I	II		
1999	5.9	5.14	12.85	0.27	0.12	1.63	0.55	87.0	6.0
2000	4.6	4.74	12.00	0.26	0.10	2.00	0.72	95.5	15.8
2001	5.0	5.29	11.07	0.25	0.18	0.46	0.93	84.0	49.5
2002	8.5	23.44	8.81	0.39	0.19	0.91	0.93	122.7	2.3
2003	4.4	5.37	3.83	0.22	0.09	1.54	0.81	80.7	8.8
2004	5.7	7.66	11.15	0.37	0.11	0.54	1.23	89.7	14.1
2005	4.5	10.10	6.37	0.24	0.19	0.62	1.63	60.8	47.4
2006	6.4	11.78	9.17	0.31	0.18	1.44	1.77	61.1	42.7
2007	7.0	16.70	3.98	0.43	0.12	1.13	0.80	117.6	1.6
2008	8.5	20.72	6.29	0.47	0.15	0.80	1.11	179.1	23.9
Average 1999-2008	6.05	11.09	8.55	0.32	0.14	1.10	1.04	97.8	21.2

Table 2. The sum of the environmental indicators in two differentiation periods, 1999-2008

Years	Average yield (t/ha)	Sum values of the environmental indicators in fruit bud differentiation period			During bloom	
		I.b.c.v.	I.H.	C.H.	Useful Σ t° (°C)	Pp. (l/sq.m)
1999	5.9	17.99	0.39	2.18	87.0	6.0
2000	4.6	16.73	0.36	2.72	95.5	15.8
2001	5.0	16.36	0.43	1.39	84.0	49.5
2002	8.5	32.25	0.58	1.84	122.7	2.3
2003	4.4	9.20	0.31	2.35	80.7	8.8
2004	5.7	18.80	0.48	1.77	89.7	14.1
2005	4.5	16.48	0.43	2.25	60.8	47.4
2006	6.4	20.94	0.49	3.21	61.1	42.7
2007	7.0	20.69	0.55	1.93	117.6	1.6
2008	8.5	27.01	0.62	1.91	179.1	23.9
Average 1999-2008	6.05	19.65	0.46	2.15	97.8	21.2

Table 3. Correlations between analyzed environmental indicators and grape yields in 1999-2008 period

Correlation quotients(r)	Values revealed by the analyzed environmental indicators and their significance		
	1. During fruit bud differentiation period(I + II)		
	G.b.i.	H.I.	H.Q.
r	0.920***	0.910***	-0.221
	2. During bloom		
	Σ t°u (U.T.B.)	Precipitation	
r	0.768**	-0.337	

FIGURES

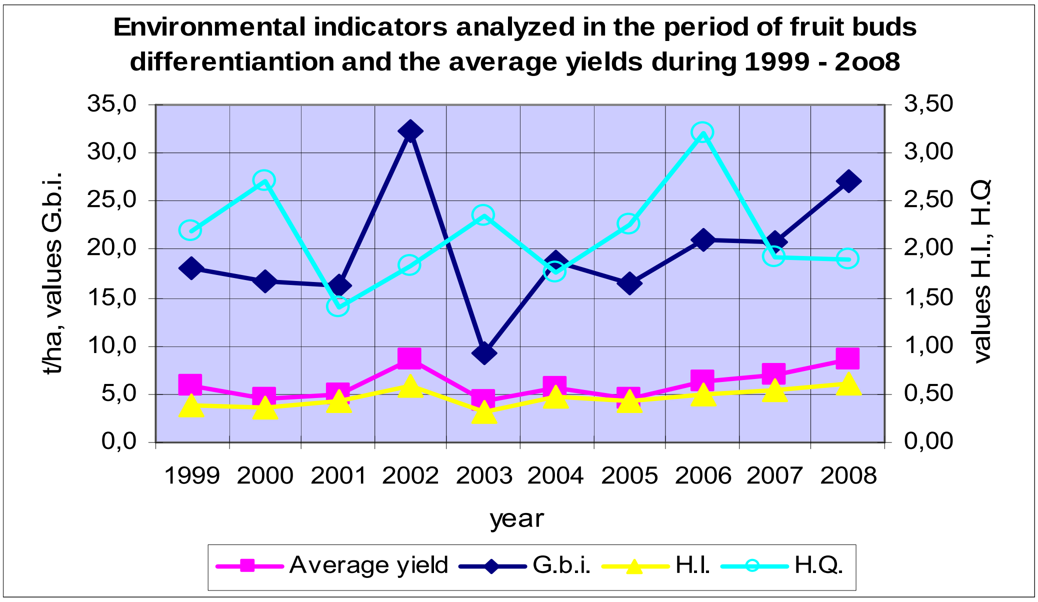

Fig. 1. The evolution of the environmental indicators in the fruit bud differentiation period and the average annual yield during 1999-2008

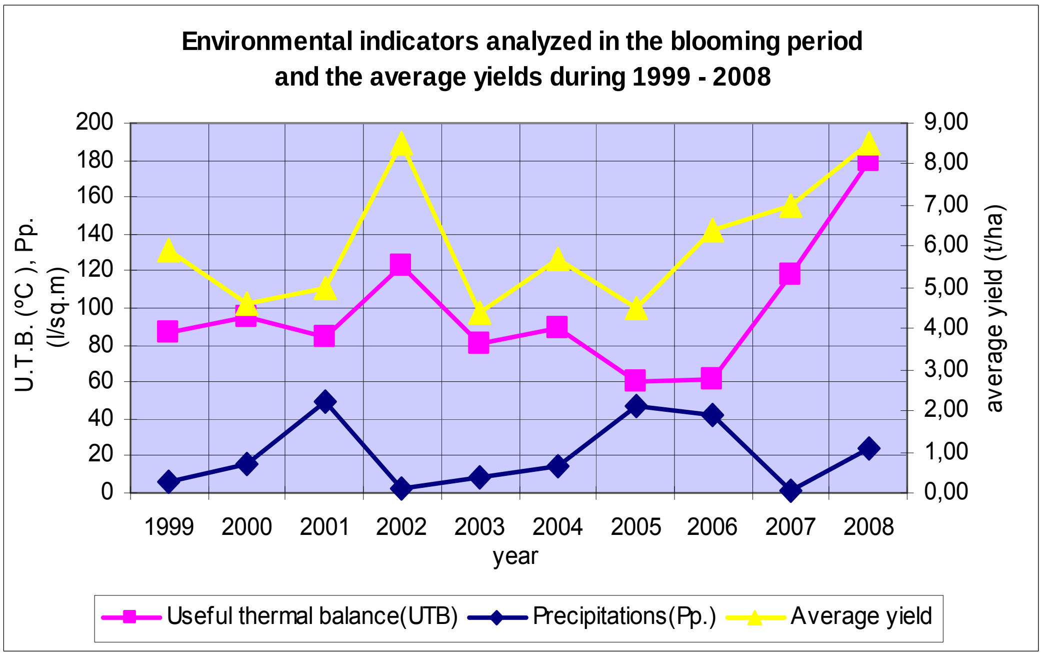

Fig. 2. The evolution of the environmental indicators in bloom period and average annual yield during 1999-2008 periods

Perspective elites obtained at SCDVV Blaj

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Keywords: viticulture, grapes, homologated elite

ABSTRACT

The activity of improving vine types at the Research Station for Viticulture and Enology Blaj (SCDVV Blaj), is a 50 year old tradition. Ten cloning elites were homologated in the Târnave Vineyard and not only (Fetească regală - 21; Traminer roz- 60; Pinot gris- 34; Saugvinon – 9; Neuburger-10; Muscat Ottonel-12; Riesling italian -3; Rhin Riesling -72; Iordana-91; Feteasca alba -29.)

Through sexual crossbreeding there were homologated:

- Three types of superior white wines: [Astra,(1995 Moldovan S.D., Cristea St.,Bacila Al.), Blasius (1994, Cristea St., Moldovan S.D., Bacila Al.), Selena (1995, Cristea St., Moldovan S.D., Bacila Al.)].
- One type for red wines: [Amurg (1989, Csavossy Gh.)].
- Three types with biological resistance to diseases and frost: [Brumariu (1983, Toader M. Moldovan S.D. Cristea St.); Radames (1994 Moldovan S.D., Cristea St., Bacila Al.); Rubin (2007, Moldovan S.D.)].

THE USED MATERIAL AND THE WORK METHOD

Two elites obtained through sexual crossbreeding are studied compared to 2 cloning elites taken as control samples.

Elite 6-9 is obtained after the sexual crossbreeding between 2 valuable elites existing in the laboratory for vine improvement; 9-35-10 (Traminer X Iordana) X (51-19 Raisin de Saint Pierre X Perla de Csaba) studied in comparison to the Feteasca regala- 21 Bl.

Elite 5-26, obtained after the sexual crossbreeding of 2 elites in the laboratory of Ameliorating the vine, 8-33-44 (Iordana X Traminer) X (51-19 Raisin de Saint Pierre X Perla de Csaba). The comparative study took place under the conditions of the year 2009.

RESULTS AND DISCUSSIONS

Climate conditions: the year 2009 is a special year, compared to the average point of all the other years, being characterized by 2 great drought periods. The first period was registered in April and May, during which the vine did not particularly suffer. In June it rained a lot, the rain remaking the humidity in the ground, and July maintained the humidity level within the optimum parameters by registering some rains with important quantities of water.

The second drought period took place during August and September, when significant rainfalls were registered. Compared to the multi-annual rainfalls of 120,7 mm, during the two months, only 42,9 mm rainfalls were registered (Table 1).

The vine had a favorable growth and development until it turned to its first stage, when the drought was felt by the plants. The maturation period started about 2 weeks earlier than during the normal years. In the last two days of September, the fading phenomenon of the vine appeared, also felt by the grapes.

THE MAIN CHARACTERISTICS OF THE STUDIED ELITES

Elite 6-9 has an outstanding growth, with big leaves whose lobs are slightly visible. The petiole of the leaf is reddish and the ribs are yellow-green. On the surface, the leaf has a skinny aspect of a yellowish green. On the inferior side, the leaf is slightly whitish due to the small hairs which cover the limb. The grapes are big (for wine types), cylindrical-conical, winged or ramified in the superior side and widened in the shape of a fish tail in the superior side. The grain is spherical, green-yellow with a very thin skin, very juicy, with one or two small seeds. The taste is sweet-sour, tasty when it is freshly consumed from the log. The grains are relatively placed very closely on the cluster. The size and the aspect of the grains resemble the Fetească regală – 21, taken as a control sample.

Elite 5-26 is very much like the Traminer roz – 60 type. The leaf has three lobes and an embossed limb, with the ribs colored in red towards the petiole. Given the marginal acuteness, which is more prominent than the one of the Traminer roz – 60 type, the grape is in the shape of a truncated cone, usually winged or ramified with the grain the size of the one of the witness type of a pink-ruby color. The grains are placed at a distance from each other, not like in the case of the witness type. The taste is sweet-sour, really tasty when it is freshly consumed.

We can notice the **6-9 elite** which has a calculated grape production/ha of 18.747 kg and which at the same time achieved a very high sugar concentration in the must of 235.6 g/liter, also having a very high acidity (6.27 g/liter).

Elite 6-9 exceeds the Fetească regală type - the 21 control sample, at the level of the grape production with 7.082 kg/ha, the calculated sugar for a hectare being of 4.417 kg/ha, compared to 2.500 kg/ha for the control sample.

It is also worth mentioning the data regarding the sugar concentration and the acidity taken for large quantities of must from the micro-vine proofs (30-50 liters of must).

Regarding the **5-26 elite**, the grape production was of 12.373 kg/ha with a sugar concentration of 220.5 g/liter.

The **5-26 elite** exceeds the control sample at the grape production with 2.708 kg/ha.

The sugar concentration is lower than the one in the control sample with 2 g/liter. The sugar calculated for a hectare is of 2.728 kg for the **5-26 elite** compared to the Traminer roz control sample – 60 which achieved 2.150 kg. The **5-26 elite** reach 578 kg more sugar for a hectare than the control sample.

The acidity level for the **5-26 elite** is of 6.9 g/liter, which means it still has the potential of increasing the sugar concentration in the must.

CONCLUSIONS

Elite 6-9 significantly exceeds the production of grapes and especially the sugar concentration in the must of the Feteasca regala type – 21 control sample. The elite will continue to be studied and will be suggested that it should become a type of quality of white wines.

Elite 5-26 exceeds the production of grapes of the control sample, but it reaches a little lower sugar concentration. Through its production, the total sugar calculated for each hectare is higher than the one for the control sample. The homologation of the elite will be proposed for approval after it has been continuously studied compared to the Traminer roz – 60 sample. The 5-26 elite will become a variety for high quality white wines of the Traminer type.

The homologation of the two elites, as well as their expansion in the production can contribute to the increase of the economic efficiency in wine growing. The two elites can become national brands after their homologation.

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TABLES

Table 1. The climate conditions – 2009 – the period of active vegetation

Month	Monthly average temperature		Absolute extreme temperatures		The sum of temperatures (°C)			The rainfall sum (mm)	
	Normal	Real	minimum	maximum	Active temperatures No. of days A.T.	Useful temperatures No. of days U.T.	Global temperature No. of days G.T.	Normal	Real
March	4.7	4.4	-6.9	25.5	39.5/3	9.5/3	39.5/3	23.9	-
April	10.4	13.0	1.0/26	23.2	379.8/29	89.8/29	389.2/30	68.3	11.3
May	15.2	16.3	1.6/8	30.2/19	496.8/30	196.8/30	504.9/31	80.2	33.1
June	18.3	19.0	5.6	32.5	570.7/30	270.7/30	570.7/30	93.6	98.4
July	19.8	21.1	10.0	34.0	653.9/31	343.9/31	653.9/31	99.0	51.5
August	19.3	20.8	12.0	34.4	643.4/31	333.4/31	643.4/31	64.0	42.9
September	15.1	17.0	6.0	33.2	509.6/30	209.6/30	509.6/30	56.7	-

Table 2. The production of grapes and the quality of the must at the elites studied in 2009

Type	No. of grapes	Production			The quality of the must		
		kg/log	The medium weight of a grape (g)	kg/ha	Sugar g/l	Sugar Kg/ha	Acidity H_2SO_4
Elite 6-9	18	4.50	250	18.747	235.6	4.417	6.27
Feteasca regală-21 witness	28	2.80	100	11.665	212.5	2.500	5.19
Elite 5-26	27	2.97	110	12.373	220.5	2.728	6.9
Traminer roz-60 witness	29	2.32	80	9.665	222.5	2.150	5.09

FIGURES

Fig. 1 Elite 6-9

Fig. 2 Feteasca regala – 21- witness

Fig. 3 Elite 5-26

Fig. 4 Traminer roz – 60 - witness

Effects of climate change on dry matter accumulation and partitioning at grapevine

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Keywords: climate change, pruning system, dry matter, sugar

ABSTRACT

The grapevine is a good plant indicator of climate changes. The climatic changes of the last years have significantly influenced the growth and the fructification at the grapevine. The aim of this research is to study the influence of climatic change on the dry matter partitioning and sugar accumulation at grapevine in the period 2006-2008. The research was carried out in Bucharest (N 44^0 25', E $26^0 6'$) in a vineyard of Fetească regală cultivar grafted on Kobber 5 BB. Vines were spaced 2.20 x 1.20 m by using three pruning systems (Guyot on demi-high trunk, Cazenave cordon and spur-pruned cordon) and two levels of bud load (10 and 15 buds/m^2). As a consequence of the variability of the climatic conditions from one year to another, the accumulation of dry matter in the aerial annual organs of the vine (leaves, wood and grapes) registered high variations, according to the hydric and the heliothermic regime, the pruning systems and bud loads. The year 2007, the hottest in the last decade, with a pronounced deficit of precipitations from the interval May-August determined a predominance of a productive activity and high content of sugar (224.1 g/l in Guyot on demi-high trunk, 216.2 g/l in Cazenave cordon and 202.7 g/l in spur-pruned cordon). In the spur-pruned cordon, the dry matter accumulated in the pruning wood represented 27% and in the grapes 52%. The climate warming accentuated in the last years has influenced positively the quality of grapes allowing the acquirement of high quality wines.

INTRODUCTION

The climate changes effects the grapevine physiology, vegetative growth, yield and quality of grapes, as diseases and pests attack.

The accumulation of biomass of grapevine as ligneous perennial plant has a special importance not only for the insurance of vegetative and production balance, but also for the passing through the periods of unfavorable conditions, but especially for the insurance of the quality of the grapes.

The different training systems and bud load left on vine at pruning, determined important modifications regarding the accumulation and distribution of dry matter in different parts of grapevines (Palliotti et al., 2003; Orlandini et al., 2008).

As a result of the nutritional reserves existing in the plant, the grape vine has a high capacity of adapting to different stress periods (Burzo et al., 2005; Carbonneau et al., 2007).

Some organs of the plant do not produce assimilates (roots, buds, ligneous structures), but consume or store them, while the green organs produce photoassimilates. The green organs, in certain moments of the vegetation period consume assimilates, such as the young leaves, incompletely developed, inflorescences, grapes, green shoots and tendril. The report between the productions of assimilates and their consumption may be modified through cultural interventions which must insure the optimization of the distribution of assimilates in the favor of the important organs for production.

Climate change can modify the growth, physiology of grapevine cultivars and wine quality (Jones G., 2007; Seguin B., 2007).

The objective of this study is the evaluation of the effect of climatic changes over the repartition of the dry matter renewable in the annual aerial parts of the plant and its influence over the quality of the grapes in different training systems and bud load left at pruning.

MATERIALS AND METHODS

The researches have been performed during the period 2006-2008, in the experimental vineyard of the Department of Viticulture and Enology from the University of Agronomical Sciences and Veterinary Medicine Bucharest (N 44^0 $25^{'}$, E 26^0 $6^{'}$). The vineyard was established in 1995 with the variety Fetească regală, with the clone 21 Bl, grafted on the Kober 5BB rootstock, with planting distances of 2.2/1.2 m.

There have been studied three pruning systems (Guyot on demi-high trunk; Cazenave cordon and spur-pruned cordon) with two bud load: 10 and 15 bud/m^2.

Pruning weight (kg/vine), grape yield (kg/vine), sugar (g/l) and titratable acidity (g/l H_2SO_4) were determined.

For the calculation of the dry matter, the quantity of wood eliminated at the pruning and the grapes' yield have been multiplied by the coefficients 0,5 and respectively 0,2.

The dry matter of the leaves was calculated with the help of the formula "m^2 leaf surface x 65 g/ m^2" (Martinez de Toda and Sancha, 1998).

RESULTS AND DISCUSSIONS

Following the climatic conditions of the three experimentation years (2006-2008), (Tab. 1, 2, 3) we notice that 2006 is very close to the multi-annual average (1901-2000), from the heliothermic resources point of view as well as the hydric resources. In exchange, 2007 and 2008 are characterized by a plus of heliothermic resources in comparison to the normal. In the growing period of 2007, in the interval April – July a deficit of precipitations was registered (96.7 mm) representing 37% of the normal quantity for this period (258.8 mm). Much more increased values were noticed for the medium temperature in the hottest month (July 2007 – 26.2^0C in comparison to 22.9^0C the normal) and August 2008 (24.1^0C in comparison to 22.4^0C the normal). Also, increased values of the thermal active balance and of the amount of real insolation hours were registered for the growing period. The precipitations deficit for the May – August period registered much more increased values (250 mm in 2007 and 221 mm in 2008), in comparison to the normal (99 mm).

As a result of the hidric deficit accentuated in the first part of the growing period of 2007, the increases were much more reduced in comparison to the other years, resulting in average for the three experimental vine training systems) a wood quantity eliminated by cutting (Tab. 4) of 0.580 kg/block, in comparison with 1,147 kg/block in 2006 and 0.904 kg/block in 2008.

The greatest differences considering the wood quantity eliminated by cutting is noticed in the experiment years; between the experimented training systems and the bud loads the differences being much more reduced.

The foliar surface registered maximum values in Guyot training system and, generally, in load of 15 buds/block.

Determining the total quantity of dry matter accumulated in the annual aerial organs of the vine (leafs, wood and grapes), we notice great differences from one year to another, the values obtained in 2006 being almost double regarding the ones obtained in 2007. The greatest quantity of dry matter in 2006 has been obtained in spur pruned cordon (2,168 kg/vine); in 2007 the differences have been smaller between the three experimental training systems, and in 2008 the greatest quantity of dry matter was obtained in Cazenave cordon (2,089 kg/vine), while in spur pruned cordon was registered the smallest value of the dry matter (1,708 kg/vine).

The same tendency was ascertained in the regard of the yield achieved on the vine as well (Tab. 5); in 2007 the production obtained was situated at almost half (3,195 kg/vine) of the one of 2006 (6,223 kg/vine).

Regarding the accumulation of the sugar in grapes, in all the three experimental year were obtained high values for the breed Fetească Regală (between 198 and 214 g/l), being superior to approximately 30-35 g/l in comparison to the ones obtained under normal conditions.

Figure 1 represents the repartition of the dry matter between the annual aerial organs of the vine for the three training systems and the two bud loads attributed on cutting, in the three experimental years.

The dry matter of the grapes was greater in 2006 and 2008. The different repartition of the biomass in the three experimental years may be due to the greater increases in 2006 and 2008.

CONCLUSIONS

1. The climate change registered in the last years, under the report of the higher heliothermic resources and some precipitations deficits in the first part of the growing period positively influenced the quality of the grapes.

2. The vine behaved differently regarding the repartition and accumulation of dry matter in different annual aerial organs, depending on the year's characteristics, the training systems and the bud load left at pruning.

3. The greatest accumulation of sugars at the maturity of the grapes in 2007 was registered on values of the dry matter between 1.151 and 1.174 kg/vine and between 1.873 and 1.892 kg/vine in 2008.

4. The anticipated maturation of the grapes, in conditions of higher temperature, makes necessary a correction of the deficit acidity of the musts.

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FIGURE

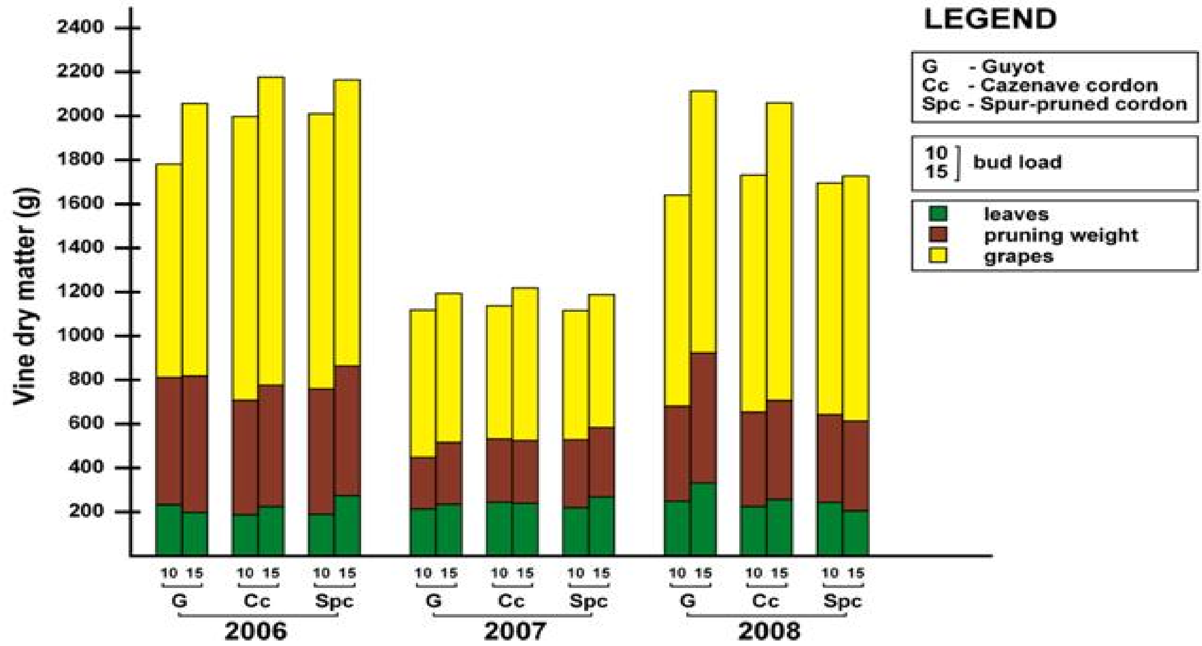

Fig. 1 - The repartition of the dry matter between different aerial annual organs of the vine (Feteasca regala, 2006 - 2008)

TABLES

Table 1. The temperature of the air – monthly averages (^{0}C) (Bucureşti – Filaret)

Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average
1901-2000	**-2.2**	**-0.2**	**5.3**	**11.6**	**16.9**	**20.7**	**22.9**	**22.4**	**17.7**	**11.8**	**5,5**	**0.4**	**11.0**
2006	-3.2	-1.5	4.8	11.8	16.6	21.0	22.6	22.3	17.7	12.9	5.9	2.6	**11.1**
2007	3.6	2.7	7.0	11.5	18.7	23.3	26.2	23.3	16.0	11.2	3.1	-0.9	**12.1**
2008	-3.0	2.1	7.8	12.4	16.1	21.6	22.5	24.1	16.1	11.4	5.5	1.9	**11.5**
Average 2006-2008	**-0.9**	**1.1**	**6.5**	**11.9**	**17.1**	**21.9**	**23.7**	**23.2**	**16.6**	**11.8**	**4.8**	**1.2**	**11.5**

Table 2. Monthly precipitations (mm) (Bucureşti - Filaret)

Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual sum
1901-2000	**39.5**	**33.3**	**38.1**	**46.0**	**68.1**	**85.5**	**59.2**	**50.0**	**40.6**	**42.9**	**47.8**	**41.4**	**567.7**
2006	40.5	15.7	34.8	20.8	54.5	76.4	65.4	60.6	36.8	34.5	85.0	37.3	**562.3**
2007	33.1	17.5	47.1	6.9	44.1	23.8	21.9	87.3	24.4	63.4	73.8	86.7	**530.0**
2008	39.4	7.9	8.9	80.5	36.7	42.0	59.4	8.6	51.9	26.1	25.9	21.0	**408.3**
Average 2006-2008	**37.6**	**13.7**	**30.2**	**36.0**	**45.1**	**47.4**	**48.9**	**52.1**	**37.7**	**41.3**	**61.5**	**48.3**	**500.2**

Table 3. Climatic indicators

Climatic index	1901-2000	2006	2007	2008	Average 2006-2008
Average year temperature (ºC)	**11.0**	11.1	12.1	11.5	11.5
Average temperature from the growing period (⁰C)	**18.2**	18.2	19.2	18.0	18.4
Average temperature of the hottest month (VII-VIII) (⁰C)	**22.9**	22.6	26.2	24.1	24.3
Length of the growing season (days)	**201**	202	199	207	203
Active thermic balance ($\Sigma\ ^0$ t a)	**3667**	3675	3816	3709	3733
Useful thermic balance ($\Sigma\ ^0$ t u)	**1657**	1655	1826	1649	1710
Sum of the hours of real insolation (Σ ir)	**1557**	1568	1604	1694	1622
Sum of the annual precipitations (mm)	**567.7**	562.3	530.0	408.3	500.2
Sum of the precipitations from the growing period (mm)	**370**	340	248	298.5	295.5
Real heliothermic index (IHr)	**2.44**	2.59	2.93	2.79	2.77
Hydrothermic coefficient (CH)	**1.00**	0.92	0.65	0.80	0.79
Deficit of precipitations (DP-mm)	**99**	96	250	221	189
Viticultural bioclimatic index (Ibcv)	**8.67**	8.39	12.4	10.16	10.31
Index of the oenoclimatic aptitude (IAO_e)	**4694**	4803	5266	5092	5054

Table 4. The vegetative elements of the vine for the experimental period (2006 – 2008)

Specification	Training system	Bud load (bud/m²)	2006	2007	2008	Average 2006-2008
Pruning weight (kg/vine)	Guyot	10	1.160	0.469	0.864	0.831
		15	1.240	0.563	1.185	0.996
		Mean	**1.200**	**0.516**	**1.024**	**0.913**
	Cazenave cordon	10	1.040	0.579	0.859	0.826
		15	1.106	0.572	0.900	0.859
		Mean	**1.073**	**0.575**	**0.879**	**0.842**
	Spur-pruned cordon	10	1.152	0.618	0.800	0.856
		15	1.188	0.681	0.819	0.896
		Mean	**1.170**	**0.649**	**0.809**	**0.876**
	Mean		**1.147**	**0.580**	**0.904**	**0.877**
Leaf area (m²/vine)	Guyot	10	3.532	3.234	3.781	3.515
		15	2.995	3.558	5.050	3.867
		Mean	**3.263**	**3.396**	**4.415**	**3.691**
	Cazenave cordon	10	2.826	3.717	3.412	3.318
		15	3.453	3.625	3.904	3.660
		Mean	**3.139**	**3.671**	**3.658**	**3.489**
	Spur-pruned cordon	10	2.852	3.326	3.704	3.294
		15	4.170	4.073	3.857	4.033
		Mean	**3.511**	**3.699**	**3.780**	**3.663**
	Mean		**3.304**	**3.588**	**3.951**	**3.614**
Total dry matter accumulated in the aerial annual organs (kg/vine)	Guyot	10	1.786	1.114	1.637	1.512
		15	2.054	1.189	2.110	1.784
		Mean	**1.920**	**1.151**	**1.873**	**1.648**
	Cazenave cordon	10	2.001	1.134	1.728	1.621
		15	2.178	1.215	2.057	1.816
		Mean	**2.089**	**1.174**	**1.892**	**1.718**
	Spur-pruned cordon	10	2.172	1.112	1.692	1.658
		15	2.165	1.184	1.724	1.691
		Mean	**2.168**	**1.148**	**1.708**	**1.674**
	Mean		**2.059**	**1.157**	**1.824**	**1.680**

Table 5. Yield of grapes according to the quantitative and qualitative aspect (2006-2008)

Specification	Training system	Bud load (bud/m^2)	2006	2007	2008	Average 2006-2008
Yield (kg/vine)	Guyot	10	4.885	3.347	4.803	4.345
		15	6.197	3.385	5.955	5.179
		Mean	**5.541**	**3.366**	**5.379**	**4.762**
	Cazenave cordon	10	6.487	3.020	5.392	4.966
		15	7.005	3.468	6.774	5.749
		Mean	**6.746**	**3.244**	**6.083**	**5.357**
	Spur-pruned cordon	10	6.269	2.935	5.261	4.821
		15	6.500	3.018	5.573	5.030
		Mean	**6.384**	**2.976**	**5.417**	**4.925**
	Mean		**6.223**	**3.195**	**5.626**	**5.014**
Average weight of a grape (g)	Guyot	10	148.0	106.9	107.9	120.9
		15	156.0	106.1	91.1	117.7
		Mean	**152.0**	**106.5**	**99.5**	**119.3**
	Cazenave cordon	10	172.4	100.5	98.6	123.8
		15	161.0	82.2	88.0	110.4
		Mean	**166.7**	**91.3**	**93.3**	**117.1**
	Spur-pruned cordon	10	144.2	88.6	95.7	109.5
		15	146.8	97.1	92.7	112.2
		Mean	**145.5**	**92.8**	**94.2**	**110.8**
	Mean		**154.7**	**96.8**	**95.6**	**115.7**
Weight of one hundred berries (g)	Guyot	10	179.5	157.7	180.2	172.4
		15	190.2	157.5	188.3	178.6
		Mean	**184.8**	**157.6**	**184.2**	**175.5**
	Cazenave cordon	10	190.1	154.0	183.6	175.9
		15	192.1	161.9	177.7	177.2
		Mean	**191.1**	**157.9**	**180.6**	**176.5**
	Spur-pruned cordon	10	183.2	135.8	168.6	162.5
		15	177.1	131.6	180.0	162.9
		Mean	**180.1**	**133.7**	**174.3**	**162.7**
	Mean		**185.3**	**149.7**	**179.7**	**171.5**
Sugar (g/l)	Guyot	10	208.2	220.8	203.8	210.9
		15	200.6	227.4	201.3	209.7
		Mean	**204.4**	**224.1**	**202.5**	**210.3**
	Cazenave cordon	10	198.6	216.0	200.3	204.9
		15	197.9	216.5	198.9	204.4
		Mean	**198.2**	**216.2**	**199.6**	**204.6**
	Spur-pruned cordon	10	188.8	203.7	196.6	196.3
		15	194.3	201.8	194.0	196.7
		Mean	**191.5**	**202.7**	**195.3**	**196.5**
	Mean		**198.0**	**214.3**	**199.1**	**203.8**
Acidity (g/l H_2SO_4)	Guyot	10	4.40	3.33	3.62	3.78
		15	4.59	3.25	3.55	3.79
		Mean	**4.49**	**3.29**	**3.58**	**3.78**
	Cazenave cordon	10	4.66	3.45	3.67	3.92
		15	5.13	3.56	3.58	4.09
		Mean	**4.89**	**3.50**	**3.62**	**4.00**
	Spur-pruned cordon	10	4.87	3.99	3.56	4.14
		15	4.96	4.11	3.56	4.21
		Mean	**4.91**	**4.05**	**3.56**	**4.17**
	Mean		**4.76**	**3.61**	**3.58**	**3.98**

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The study of fertility and productivity at Vilarom and Alutus grape varieties in Drăgăşani Vineyard

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Keywords: Grape variety, fertile copse percentage, fertility coefficient, productivity coefficient, grape weight average

ABSTRACT

The study was done in Dealul-Olt plantation belonging to S.C.D.V.V. - Drăgăşani, part of Drăgăşani vineyard. The study followed the coefficients of fertility and productivity of new two grape varieties, Vilarom (for obtaining flavour wines), and Alutus (for obtaining red superior wines) in the years 2007 and 2008.

INTRODUCTION

These grape varieties were obtained at S.C.D.V.V. Drăgăşani, Vilarom (M. Mărculescu 2003) of sexual hybridisation between the elite 3.23.17 (Muscat Hamburg x Cramposie) x Muscat Ottonel and Alutus (M. Marculescu, 2003) of sexual hybridisation between the grape varieties Băbească neagră x Saperavi (Oprea Stefan, Sergiu Dan Moldovan).

MATERIALS AND METHODS

These varieties are in the research field, the Comparison Field of SCDVV Drăgăşani. The system of culture is non-protected, semi stem and the vines are planted at the distance of 2 meters between the rows and 1.1 meters between the vines of a row. There were studied five vines from each grape variety and noticed total buds, total dead buds, total viable buds, total copse, fertile copse, sterile copse, total inflorescences fertile copse percentage and the average weight of the grapes and relative and absolute productivity coefficient.

The fertile copse percentage is obtained by dividing the fertile copse at total copse (Tc) and multiplies with 100.

$$\mathbf{Fc\% = Fc/Tc \times 100}$$

The relative fertility coefficient (r.f.c.) is obtains by dividing the number of the inflorescences at the number of fertile copse (Fc).

$$\mathbf{r.f.c. = Tinf/Tc}$$

The absolute fertility coefficient (a.f.c.) is obtained by dividing the number of the inflorescences at the number of fertile copse.

$$\mathbf{a.f.c. = Tinf/Fc}$$

The relative productivity coefficient (r.p.c.) is obtained by multiplying the relative fertility coefficient with the average weight of a grape index (i.g).

$$\mathbf{r.p.c. = r.f.c. \times i.g}$$

The absolute productivity coefficient (a. p.c.) is obtained by multiplying the absolute fertility coefficient with the average weight of a grape index (i.g).

$$\mathbf{a.p.c. = a.f.c. \times i.g}$$

RESULTS AND DISCUSSIONS

Situated in the great geomorphological unit called Getic Piemont, the Drăgăşani vineyard covers the Oltet Platform. Situated at 44˚30'nordic latitude and 23˚27'eastern latitude, at 182 meters altitude, the Drăgăşani vineyard belongs to A3 oenoclimatic zone which includes regions and lawns that produces, specially red, white and flavoured superior quality wines, with name of controlled denomination.

The results about the fertile copse percentage at both grape varieties in both studied years are shown below and, also, in the Table no.1.

In 2007, Alutus reached 82,7% fertile copse percentage while Vilarom only 54,5, in stead, Vilarom is superior at total viable buds/vine with 20,2% compared with 17,8 at Alutus. In 2008, the fertile copse percentage is higher at both grape varieties, 80.2% at Vilarom and 84,2% at Alutus.Alutus is superior to Vilarom also at the total viable buds/vine with 25,6 at 19,4.

In 2008 the fertile copse percentage raised with 25,7%, while at Alutus only with 1,5%.

The results about the fertility and productivity coefficient (relative and absolute) and the average of of grape weight are shown below and, also, in the Table no.2.

In 2007, we can see that Vilarom have a smaller fertility coefficient, with 0.59 the relative and 1,29 the absolute and the grape weight is 154g. Due to these values, the productivity coefficient is 90,86 (the relative) and 291,54.

Alutus have a greater fertility coefficient, 1,43 (the relative one) and 1,56 (the absolute). The grape weight reached 226g and so, the productivity coefficient is higher, 220,22 (relative) and 352,56 (absolute).

The greatest relative fertility coefficient is at Alutus (1.45, in 2008) and the smallest i sat Vilarom (0,59, in 2007).

The greatest absolute fertility coefficient is, also, at Alutus (1.72) and the smallest at Vilarom (1.29, in 2007).

In 2008, the differences are not so great: 1.36 and 1,45 (the relative fertile coefficient) and 1,70 and 1,72 (the absolute fertile coefficient). While at Vilarom the values raised a lot, at Alutus only a few. The relative productivity coefficient, at Vilarom, is 197.8 and the absolute productivity coefficient is 247,4.

At Alutus, in 2008, the relative productivity coefficient is 228.1 and the absolute productivity coefficient is 270.5.

The greatest relative productivity coefficient is at Alutus (228.1, in 2008) and the smallest is at Vilarom (90.86, in 2007).

The greatest absolute productivity coefficient is as at Alutus (352.56, in 2007) and the smallest at Vilarom (247.4, in 2008).

At Vilarom, the relative productivity coefficient is smaller in 2007 than 2008 (90.86 to 197.8), but the absolute productivity coefficient is greater in 2007 than 2008 (291.54 to 247.4).

At Alutus, is same as Vilarom, with a higher value of relative productivity coefficient in 2008 than 2007, and a smaller absolute productivity coefficient in 2008 than 2007.

CONCLUSIONS

From the fertility point of view, it was observed that the year 2008 was better than 2007 at the both grape varieties.

In 2007, the relative fertile coefficient is small at Vilarom and the absolute coefficient is middle.

At Alutus, the both fertility coefficient are middle.

In 2008, at Vilarom and Alutus, the fertility coefficient is middle.

From the productivity point of view the Vilarom grape variety has a superior quality in the year 2008, while at the Alutus grape variety is inversely.

In 2007, the relative productivity coefficient is small at Vilarom and the absolute productivity coefficient is middle to big; at Alutus the relative productivity coefficient is middle and the absolute productivity coefficient is big.

In 2008, at Vilarom, the productivity coefficient is middle, and at Alutus, is also middle and the absolute coefficient is middle to big.

The grape's weight is superior in 2007 (Vilarom - 154 g, Alutus - 226 g) than 2008 (Vilarom -145,5 g and Alutus - 157,3 g).

Due to the absolute productivity coefficient, the both grape varieties are considered favourable to be planted in Drăgăşani vineyard.

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TABLES

Table 1. The fertility at Vilarom and Alutus

Studied characteristics	2007		2008	
	Vilarom	Alutus	Vilarom	Alutus
Tb	24,8	24,2	26	34,8
Tx	4,6	6,4	6,6	9,2
Tv	20,2	17,8	19,4	25,6
Tc	22,4	18,6	20,2	26,6
Fc	12,2	15,4	16,2	22,4
Sc	10,2	3,2	4	4,2
Tinf	13,2	24	27,6	38,6
Fertile copse (%)	54,5	82,7	80,2	84,2

Table 2. The synoptic table of fertility and productivity

Studied characteristics			2007		2008	
			Vilarom	Alutus	Vilarom	Alutus
Statistic data/vine	**Tc**		22,4	18,6	20,2	26,6
	Fertile copse	**Nr.**	9,2	15,4	16,2	22,4
		%	54,5	82,7	80,2	84,2
	Sc		10,2	3,2	4	4,2
	Tinf		13,2	24	27,6	38,6
Fertility coefficient	**Rel**		0,59	1,43	1,36	1,45
	Abs		1,29	1,56	1,70	1,72
Grape weight			154	226	145,5	157,3
Productivity coefficient	**Rel**		90,86	220,22	197,8	228,1
	Abs		291,54	352,56	247,4	270,5

in which: Tb = Total number of buds/vine;
Tx = Total dead buds/vine;
Tv = Total viable buds/vine;
Tc = Total number of copse/vine;
Fc = Number of fertile copse/vine;
Sc = Number of sterile copse/vine;
Tinf = Total number of inflorescences/vine.

Optical methods used for wines studies

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Keywords: colour, absorbance spectrum, authenticity

ABSTRACT

Optical methods are one of the favourite techniques for the inspection of wine quality, because are rapidly, simply and versatility. In this paper, the colour and absorbance spectrum were studied for different sorts of red wines (Fetească Neagră, Pinot Noir, Merlot and Cabernet Sauvignon) from the same year (2000) and the same place (Oreviţa). We choose to observe the same sort of wine (Fetească Neagră - Oreviţa) from different years (2000, 2001 and 2003), too.

INTRODUCTION

The optical methods have a large applicability in the oenologie laboratories, because with their help can be observed the quality parameter of wine. The advantages of optical methods are: simplicity, rapidly and relatively low cost. In this paper, the colour and the absorbance of different types of red wine were investigated. Red wine is a complex fluid; it contains water, alcohol, acids, phenolic compounds, sugars and other compounds (Burns et al, 2001).

The spectral analyses (absorbance spectrums) have higher sensibility and are precisely. The absorbance gives information about the clarity of wine and the colour is one of the main parameters of the quality of wine (Niskanen et al., 2009). For white wines, the colour is due to the flavones and the phenol hidroxycinaminic acids. The colour of red wine is a more complex phenomenon then for white wine because is due to the poliphenols (anthocyani and tannins) (Ţârdea C., 2007; Rădoi Florentina, Pomohaci N., 1999). The fingerprint anthocyanin helps to establish the authenticity of wines.

MATERIALS AND METHODS

The colour and the absorbance spectrum of different sorts of red wine (Fetească Neagră, Pinot Noir, Merlot and Cabernet Sauvignon) from the same year (2000) and the same place (Oreviţa) were investigated. In the second part, we were interested about the differences between the absorbance spectrums of the same sort of wine (Fetească Neagră - Oreviţa) from different years (2000, 2001 and 2003).

The absorbance spectrums were studied with a Perkin Elmer UV/VIS spectrophotometer Lambda 25, with double fascicule.

The color of wine is one of the most important parameters in the study of wine quality. By spectrophotometer methods, the chromatically characteristics of red wine are expressed by ***nuance*** and ***intensity*** of color.

The intensity of colour is:

$$\mathbf{I = A_{420\ nm} + A_{520\ nm} + A_{620\ nm}}$$

The nuance of colour is calculated like the ratio between the absorbance for 420 nm and the absorbance for 520 nm (P. Sudraud, 1990).

RESULTS AND DISCUSSION

It remarks from table 1, that the intensity of colour is higher for Merlot – Oreviţa (2000). The lower value for the intensity of colour is noticed for Cabernet – Sauvignon (0.66477).

We didn't notice meaningful differences for nuance values. The absorbance at 520 nm (corresponding to red colour) decreases due to the antochyans copolymerization with tannins from wine.

From the absorbance spectrums of the different sort of red wine from the same year (2000) and the same place (Oreviţa) (fig 1), we observed that Merlot and Fetească Neagră have been characterised by a sustainable pigmentation, comparative with the other two sorts: Cabernet – Sauvignon and Pinot Noir. This fact is characteristic for Pinot Noir, because it not contains acylat anthocyans, but is unusual for Cabernet – Sauvignon (it has a fingerprint anthocyanin about 4.6%). For the old wines, the anthocyanic spectrum is modified and the Cabernet – Sauvignon wine tends to form polimerisated anthocyans.

From the chromatically characteristics for the same sort of red wine Fetească Neagră - Oreviţa, but from different years (2000, 2001 and 2003) it remarks that intensity of color is lower for Fetească Neagră (2003); the differences are not significant for Fetească Neagră (2000) and Fetească Neagră (2001) (table 2).

The absorbance spectrums are like in figure 2. It remarks that these samples contain very little anthocyans in the ionic form and the curves are the same for the Fetească Neagră – 2000 and Fetească Neagră – 2001. The absorbance spectra of Fetească Neagră – 2003 is different because this sample presents an enzymatic oxidation.

CONCLUSIONS

The results indicated that the spectral methods could supplement the traditional methods (chemical analysis and human evaluation) in study the quality of wine.

There are differences in chromatically characteristics and absorbance spectrums of the same sort, from the same place, but different years, due to the climatic conditions (atmospheric temperature, humidity, rainfall amount, etc). From these reasons, the spectral methods could be tools for studying the authenticity of red wines.

We expected to obtain the differences in colour and absorbance for the different sort of red wine from the same year (2000) and the same place (Feteasca Neagra - Oreviţa).

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Table 1. Chromatically characteristics for different sort of red wine Oreviţa (2000)

Sort	**Intensity of colour**	**Nuance**
Cabernet - Sauvignon	0.66477	0.86782
Pinot Noir	0.70811	0.81406
Merlot	0.96368	0.81600
Fetească Neagră	0.87021	0.83365

Table 2. Chromatically characteristics for the same sort of red wine Fetească Neagră - Oreviţa, but from different years

Sort	Intensity of colour	Nuance
Fetească Neagră (2000)	0.87021	0.83365
Fetească Neagră (2001)	0.90845	0.81387
Fetească Neagră (2003)	0.43215	0.68166

FIGURES

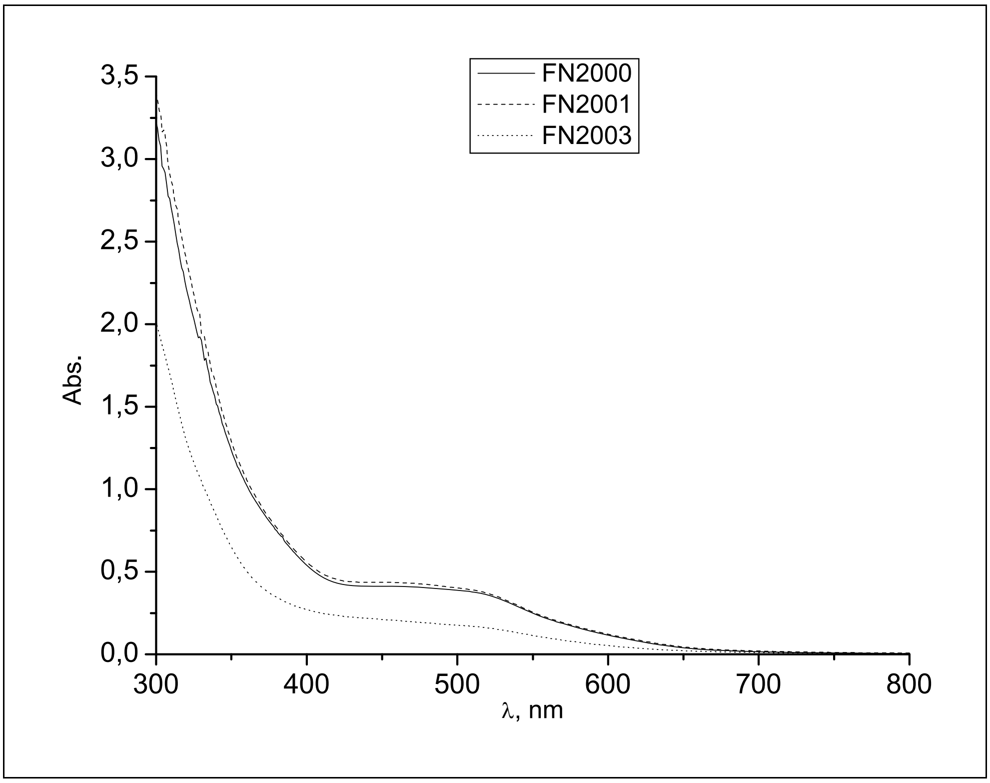

Fig. 1. The absorbance spectrums for Fetească Neagră - Orevița, from different years: 2000, 2001, 2003

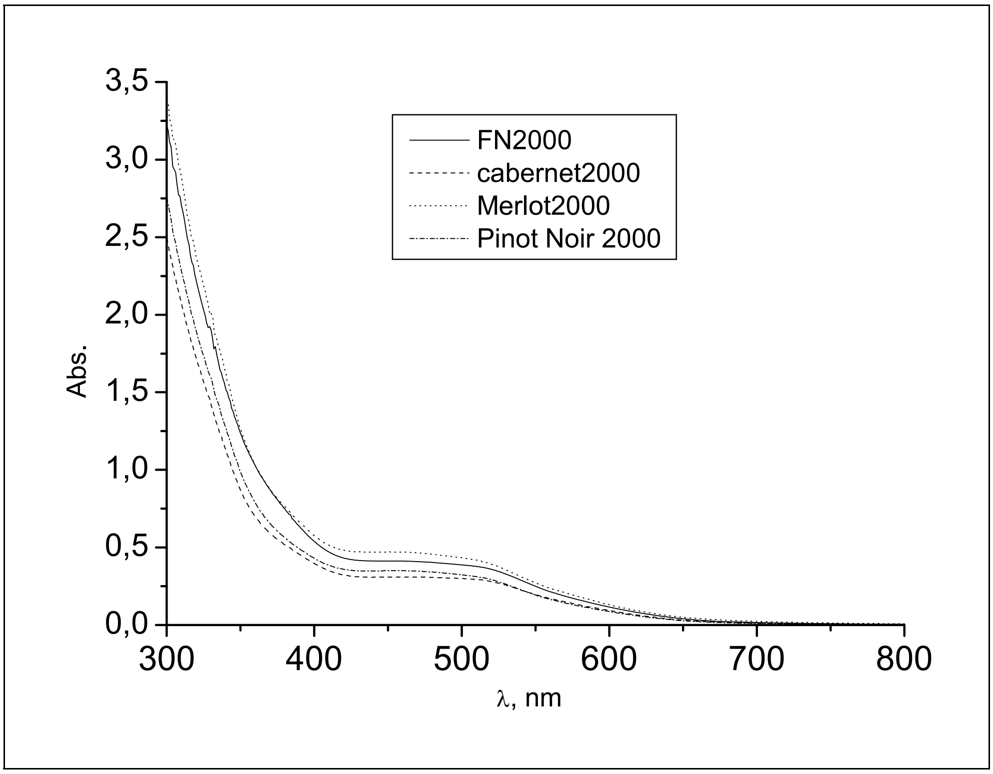

Fig. 2. The absorbance spectrums for different sorts of red wine from Orevița (2000)

Examination of phytotoxic effect of viricides on grapevine in controlled medium

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Keywords: *Vitis vinifera,* GFkV, chemotherapy, *in vitro*, phytotoxicity

ABSTRACT

The aim of the study was to evaluate the phytotoxicity of antiviral drugs ribavirin and oseltamivir used in controlled medium, in various concentration and period of exposure in grapevine virus elimination by *in vitro* chemotherapy. Grapevine shoot cultures belonging to *V. vinifera* L., cv Canner infected by fleck virus (GFkV) were grown on M&S (1962) basic medium supplemented with antiviral chemicals for *in vitro* sanitation. Ribavirin or oseltamivir in increasing concentrations were added to the proliferating medium for several subsequent subcultures. In the end treatment, regenerated shoots were transferred on rooting M&S medium. Phytotoxicity was evaluated on *in vitro* drug-treated plantlets regarding multiplication rate and mortality for each antiviral agent. Leaf samples collected from regenerated acclimated plants determined as GFkV-free by enzyme-linked immunosorbent assay (ELISA) were subjected to biochemical analysis (polyphenols, soluble carbohydrates, assimilating pigments concentration) and variety identity analysis (polymerase chain reaction - PCR) of the studied grapevine genotype. The increasing of the exposure induced the significant decreasing of the multiplication rate for each chemical drug concentration. The phytotoxic effect has diminished with plant transfer on free-drug rooting medium. Not significant differences between drug treated and control referring to the biochemical compounds have been registered. The trueness to type was total. The phytotoxic effect should be correlated with viruses elimination efficacy and grapevine infected genotype.

INTRODUCTION

Taking into consideration the large number of known grapevine viruses, their association in viral complexes, their economical influence on the quality and quantity of the yield (Martelli and Boudon-Padieu, 2006), and the different behaviour of the viruses at sanitation methods, *in vitro* chemotherapy is considered as an alternative, economic and environment friendly method (Panattoni et al., 2003; 2007a, b).

Molecular techniques are powerful and valuable tools used in analysis of genetic fidelity of *in vitro* propagated plants. Of several molecular markers used for such assessment, Random Amplified Polymorphic DNA (RAPD) is the simplest, cheapest and appears to be a useful tool for the analysis of the genetic fidelity of *in vitro* propagated plants. The polymerase chain reaction (PCR) has been previously used in conjunction with short randomly amplified polymorphic DNA (RAPD) primers to assess the genetic stability of micropropagated grape plantlets (Singh *et al.*, 2005; Khawale *et al.*, 2006).

The aim of the study was to investigate the phytotoxic effect of antiviral drugs ribavirin and oseltamivir used in controlled medium, in various concentration and period of exposure for grapevine fleck virus elimination by *in vitro* chemotherapy in *V. vinifera* L, cv. Canner. In the present study, RAPD technique was used to confirm the genetic stability among virus free plants obtained after *in vitro* chemotherapy.

MATERIAL AND METHODS

Grapevine shoot cultures belonging to *V. vinifera* L., cv. Canner infected by fleck virus (GFkV) were grown on M&S (1962) basic medium supplemented with antiviral chemicals for *in vitro* sanitation (Panattoni et al., 2006). Thus, ribavirin and oseltamivir in increasing concentration (until 40 mg/L and 120 mg/L respectively) were added to the proliferating medium for several subsequent subcultures (S1, S2, S3). In the end of the treatment period, regenerated shoots were transferred on free-drug rooting M&S medium. Than, *in vitro* rooted plants were fortified and acclimated in the greenhouse.

Phytotoxicity was evaluated after each sub-culture on drug-treated plantlets regarding: multiplication rate, rhizogenesis and mortality for each antiviral agent. Also, leaf samples collected from regenerated acclimated plants determined as GFkV-free by enzyme-linked immunosorbent assay (ELISA) were subjected to biochemical analysis (polyphenols, soluble carbohydrates, chlorophyll pigments) and randomly amplified polymorphic DNA (RAPD) analysis in order to evaluate their genetic and/or detect likely existing variation among them.

RAPD amplification was performed in a reaction volume of 25 µl containing 4 mM $MgCl_2$, 0.4 mM of each dNTP, 0.6 units Taq DNA polymerase, 0.8 µM primer and 100-200 ng genomic DNA. The amplification reactions were carried out in an Abi Prism 7900 HT Real Time PCR (Applied Biosystem) programmed as following: preliminary denaturation of DNA at 94°C for 30 s, 45 cycles of 92°C for 30 s, 36°C for 25 s and 72°C for 74 s, and a final extension step at 72°C for 8 min. The PCR products obtained were separated by gel electrophoresis on a 1.5 % agarose gel stained with ethidium bromide (10 mg/ml), in 1 x TBE buffer during 1 h at 90 V. Photographs of the gels were obtained with a Gene Flash Syngene Bio Imaging. The 100 bp DNA Ladder (Fermentas) was used as a molecular size standard and the size of the amplification products was estimated using LabImage software from the photographs of the gels. RAPD analysis using each primer was repeated at least twice to establish the reproducibility of banding pattern of the DNA sample studied.

Statistical significance of differences between drug treated variants compared with the control (untreated) was analyzed by SPSS 10 for Windows, taking $P<0.05$ as significant according to one-way ANOVA.

RESULTS AND DISCUSSION

Evolution of intense regenerative apices during the first six days on the experimental variants was normal, without obvious differences recording between the material grown on medium with chemical drugs as compared to control. Microshoots of 1-1.5 cm long with axillary multiplication tendency were developed.

Increasing concentration of ribavirin induced the decreasing of multiplication rate after first culture, with significant differences comparatively with the control; on contrary, in the presence of oseltamivir not significant differences have been registered (figure 1).

After the thirds sub-culture infected explants registered more than 95% mortality at the highest concentration of ribavirin. On the other hand, Os induced an increasing proliferation of adventive buds in the beginning of exposure, without shoot elongation during the treatment. Ribavirin induced vitrification and necrosis phenomena in all sub-cultures; in the end of the culture, either adventive buds or microshoots formation have not been identified; the oseltamivir presence not significant differences comparatively to ribavirin have been registered (figure 2).

The phytotoxic effect of ribavirin and oseltamivir has diminished with plant transfer on free-drug rooting medium.

The acclimatization process to *ex vitro* conditions revealed the decreasing of the number of regenerated grapevine plants on experimental variants comparatively to the control.

The means of three independent determination of biochemical indicators studied on virus free regenerated grapevines (10 plants) are shown in table1.

The evaluation of dry matter content at healthy plants as compared to control revealed that the sanitation induced a higher accumulation of dry matter in leaves, with 1-4%. Also, some differences have beeen registered regarding the carbohydrates and chlorophyll a content; multiple correlations did not find significant differences concerning the polyphenols and chlorophyll b content, or chlorophyll a/b ratio. The biochemical analysis of acclimated grapevines revealed the beneficial effect of GFkV elimination, without negative effects of chemical drugs used in virus free plants regeneration process.

Genetic fidelity of randomly selected eleven plants was tested through RAPD analysis. The twelve primers selected for this study generated a total number of 70 scorable bands, ranging from 2620 bp to 200 bp in size table 2. The number of scorable bands for each primer varied from 3 (OPC09 and OPC13) to 9 (OPA05). A total of 840 bands (number of plants analyzed X number of bands with all primers) were generated by the RAPD technique, giving rise to monomorphic patterns across all plants studied. Examples of RAPD patterns amplified with primers OPA05 and OPC 16 are shown in figure 3a and 3b.

RAPD analysis of the micropropagated plants of grape cultivar *V. vinifera* L, cv. Canner showed an identical profile with the control plant, indicating that no genetic variation had occurred after chemotherapy and *in vitro* culture. All RAPD profiles from micropropagated plants were found to be monomorphic and analogous to those of the control plant.

CONCLUSIONS

The increasing of the exposure period induced the significant decreasing of the multiplication rate for each ribavirin and oseltamivir concentration; also, increased ribavirin concentrations causes vitrification and necrosis phenomena in all subcultures. The phytotoxic effect of ribavirin and oseltamivir has diminished with plants transfer on free-drug medium. Visual observations on the experimental variants emphasized that oseltamivir has a low phytotoxic effect compared with the ribavirin.

The biochemical investigations of acclimated grapevines revealed the beneficial effect of GFkV elimination, without negative correlation concerning the chemical drugs involvement in virus free plants regeneration process or their persistence in the plant tissues.

Because there were no changes in the banding patterns observed in the tissue culture plants as compared with that of the control plant, we conclude that our sanitation protocol can be carried out time without much risk of genetic instability.

The aim of *in vitro* chemotherapy is virus free plants regeneration; therefore, the study of the behavior of infected genotypes on culture media with chemical drug incorporated should be correlated with the different viruses elimination efficacy and grapevine infected genotype.

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FIGURES

Fig. 1. GFkV infected - Canner cv.
left: Control-R1-R2-R3; right: Control-O1-O2-O3

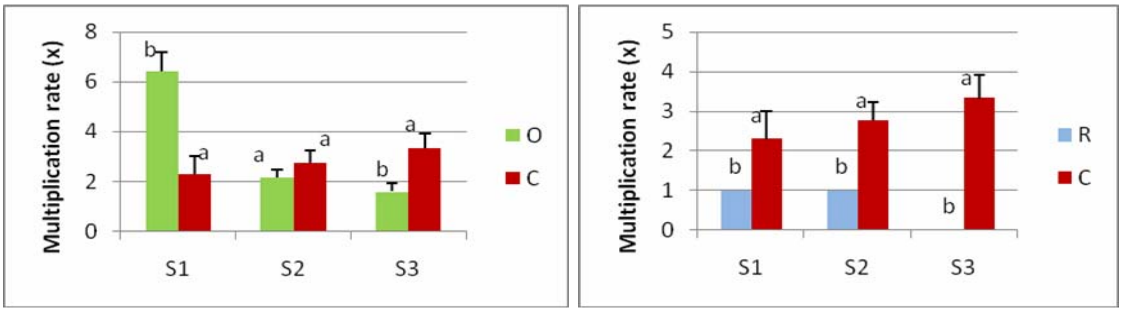
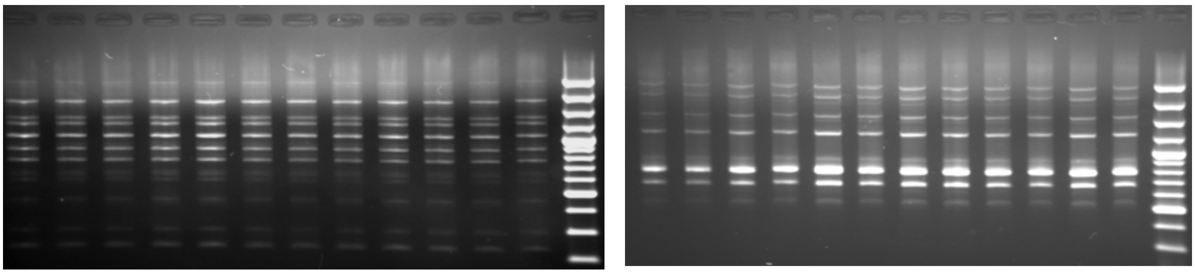


Fig. 2. Influence of the culture medium containing chemical drugs during tree subcultures (S1, S2, S3), at 40 mg/L ribavirin (R) and 120 mg/L oseltamivir (O) on the grapevine multiplication rate. Values are mean ± s.d. based on 3 independent determinations, the bars indicate standard deviations, the lowercase letters represent significant differences compared to control (C) at P < 0,05 (GFkV – infected Canner cv.)



M 2 3 4 5 6 7 8 9 10 11 12 L M 2 3 4 5 6 7 8 9 10 11 12 L

a) **b)**

Fig. 3 RAPD profiles of the plants investigated with primers OPA05 (a) and OPC16 (b).
The numbers represent the plant material investigated in this study:
M=mother plant; 2-12= randomly selected plants; L= 100 bp DNA ladder

TABLES

Table 1. Level of accumulation of some biochemical compounds in leaves collected from ten GFkV – free regenerated grapevines by *in vitro* chemotherapy, at Canner cv. Values are mean ± s.d. based on 3 independent determinations

Healthy regenerated grapevines	Dry matter (%)	Soluble carbohydrates (% d.m.)	Total polyphenolic compounds (% d.m)	Clorophyll a (mg/g fm)	Clorophyll b (mg/g fm)	Carotenoids (mg/g fm)	Clorophyll a / b
1	29.1600± 0.4309	3.4367± 6.028E-02	7.0433± 0.2060	0.34667± 1.7010E-02	0.23900± 1.6523E-02	0.24133± 2.0984E-02	1.44433± 0.16876
2	32.3267± 0.4986	4.9367± 5.686E-02	6.5667± 0.359±5	0,50667± 1.6258E-02	0,28433± 2.7502E-02	0.38933± 1.1015E-02	1.78900± 0.11612
3	30.6100± 0.8762	5,2467± 6.110E-02	7.2633± 0,3927	0.40400± 1.2490E-02	0.24500± 2.9138E-02	0.34300± 2.7875E-02	1.66633± 0.22821
4	28.7867± 1.0584	4.4900± 5.568E-02	6.4767± 0,4077	0.42833± 1.7214E-02	0.25767± 3.0665E-02	0.33167± 1.6258E-02	1.67933± 0.22113
5	32.2400± 0.5533	3.4700± 4.359E-02	6.5733± 0.3121	0.44967± 2.7610E-02	0.23567± 2.9143E-02	0.38500± 4.7655E-02	1.91767± 0.11405
6	35.2733± 0.5718	4.2000± 21.07 E-02	7.1967± 0.3153	0.43067± 2.1127E-02	0.24600± 3.7000E-02	0.32900± 2.6514E-02	1.76867± 0.17557
7	29.1400± 0.3517	4.1967± 6.506E-02	6.1833± 0.5689	0.35100± 3.7470E-02	0.24433± 2.4705E-02	0.33867± 3.4078E-02	1.44233± 0.16057
8	33.1900± 0.8648	4.2633± 18.23 E-02	6.1467± 0.1955	0.43867± 2.7610E-02	0.27533± 4.5567E-02	0.35000± 2.9462E-02	1.59333± 0.22262
9	31.0600± 0.3747	3.7433± 6.028E-02	6.0867± 0.2631	0.43233± 4.3132E-02	0.25267± 3.0288E-02	0.34300± 2.3812E-02	1.71633± 0.12079
10	33.6267± 0.6503	3.9667± 13.50 E-02	6.5600± 0.1637	0.50900± 2.4880E-02	0.30233± 1.5177E-02	0.37200± 2.2716E-02	1.68400± 0.0036056
Control	29.6167± 0.4858	3.6300± 7.000E-02	5.9067± 0.2750	0.38333± 1.6042E-02	0.25800± 1.0149E-02	0.38900± 8.8662E-02	1.48667± 0.10111

Table 2. List of primers, their sequence and size of the amplified fragments generated by 12 RAPD primers

No.	Primer	Sequence	No of scorable bands	No of monomorphic bands	Size in bp
1	OPA01	CAGGCCCTT	5	5	2350-850
2	OPA02	TGCCGAGCTG	7	7	1900-911
3	OPA05	AGGGGTCTTG	9	9	1948-221
4	OPA07	GAAACGGGTG	4	4	2130-584
5	OPA19	CAAACGTCGG	7	7	2667-267
6	OPB15	GGAGGGTGTG	6	6	2015-664
7	OPC05	GATGACCGCC	8	8	1736-277
8	OPC06	GAACGGACTC	6	6	2200-450
9	OPC08	TGGACCGGTG	6	6	2313-305
10	OPC09	CTCACCGTCC	3	3	1540-621
11	OPC13	AAGCCTCGTC	3	3	2130-1639
12	OPC16	CACACTCCAG	6	6	2732-661

Research concerning the behaviour of some new table grape cultivars in Huşi Vineyard

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Keywords: table grapes, new cultivars, Huşi vineyard

ABSTRACT

This study presents the behaviour of some new table grapes cultivars (Azur, Tamina, Victoria, Napoca, Xenia and Moldova) in the climatic conditions of the Husi vineyard. The researches were performed between 2006-2008 in a plantation founded in 1989, by using the rootstock Kober 5BB and planting distances of 2.2/1.2. By comparing the main climatic indicators of the experimenting period to the multi-annual average, the existence of some higher heliothermal resources are found out, as well as an acute deficit of precipitations, the effects of global warming being noted. Out of the cultivars, Victoria and Xenia had the best behaviour.

INTRODUCTION

The Romanian viticulture is featured by a diversified assortment of cultivars for table grapes; along the traditional ones (Chasselas doré, Muscat Hamburg, Afuz Ali, Italia), numerous new cultivars were obtained in the last 3-4 decades, with features added to the modern consumer's requests: shape, sizes and regularity of grapes and each berry separately, consistence of the each berry, ripening period etc. Out of these, the cultivars of Victoria, Transilvania, Tamina, Xenia, Istrita, Greaca are distinguished, which complete the varied range of the cultivars for table grapes (Grecu et. al, 1998, Indreas and Visan, 2001, Oslobeanu et. al, 1991, Rotaru et. al, 2008, Tardea and Rotaru, 1996).

A good part of these new cultivars ensures even a higher productive and commercial competitiveness of the sector of table grapes, even if this has widely decreased during the last decades.

At a worldwide level, we witness a significant increase of the fresh grapes production for consumption, by approximately 25% in the last few decades.

In 2005, the main producers of table grapes were: China, Iran, Turkey, India, Italy and Egypt (OIV, 2005). The problems the sector faces at a worldwide level are connected to the global competition, which is shown at a stronger intensity on the market, for various reasons (lower production costs, commercial facilities, distribution efficiency, a positive commercial image and, as consequence, an increased consumers' confidence).

In order to cope with this competition, which become more and more aggressive from year to another, the quality of grapes must be significantly improved, not only under an aesthetic report, but under a morphologic one too (the shape and regularity of grapes and each berry separately), as well as with regard to the organoleptic qualities (sugar contents, sugar/acidity ratio, aromas, pulp consistence) and from a sanitary point of view (absence or very low level of residues of phytosanitary products), (Colapietra, 2004, Fregoni, 2005, Matei 2002, Varga et. al, 1994).

Next to the genetic diversification, the adequate choice of the cultivation environment must also play an important role, with vocation into the direction of the production, as well as of the adequate cultural techniques (Bishtawi, 2005).

In this paper work, we are trying to study the behaviour of some new cultivars of table grapes in Husi Vineyard, in order to expand the varied range and adapt it better to the requirements of the market.

MATERIAL AND METHODS

The experience was organised in the Recea Farm at S.C. Vincon Vrancea S.A., in between 2006-2008.

The following cultivars have been studied: Azur, Tamina, Victoria, Napoca, Xenia and Moldova grafted on the rootstock Kober 5BB, planted at distances of 2.2/1.2 (meaning 4132 vines/ha), in 1989.

The genealogy and general features of these cultivars have been described by Indreas and Visan (2000).

At pruning, a load of 15 buds/m^2 have been assigned, and during the vegetation period, the standardisation of the number of inflorescences (22).

All maintenance works (phytosanitary treatments, soil maintenance and other green operations) were evenly applied.

The observations and determinations took into account the following: the fertility and productivity of the vine; yield and quality of grapes: marketable production; average weight of a grapes; average weight of 100 berries; the sugar contents (g/l) and acidity (g/l H_2SO_4) of the juice; the glucoacidimetric ratio; the maturation period of grapes for the studied cultivars.

RESULTS AND DISCUSSIONS

By analysing the simple and synthetic climatic indicators for the experimentation period (2006-2008), compared to the multi-annual average (1970-2005), important differences are found out, especially regarding the heating and hydric deficit, shown during the last years (table 1). Thusly, the annual average temperature during the past 3 years was 11.3^{o}C, compared to 9.9^{o}C; the average temperature during the vegetation period also increased to 18.1^{o}C, compared to 16.8^{o}C. An elongation of the vegetation period was also found out, from 186 to 198 days, as it was averagely registered during the past 3 years.

The temperature resources during the vegetation period have known significant increases: the active thermal balance from 3120^{o}C to 3591^{o}C and the useful one from 1260^{o}C to 1608^{o}C.

The deficit in precipitations during the period of May-August was increased during the past 2 years, reaching values of 211 mm in 2007 and 108 mm in 2008.

Generally, the studied cultivars have an average fertility (table 2). The highest values of the fertility coefficients were registered for the cultivars Victoria and Xenia, the absolute fertility coefficient being of 1.60 and 1.61. As consequence of a higher percentage of fertile shoots, the relative fertility coefficient had higher values for the cultivars Moldova (1.14), Napoca (1.13) and Victoria (1.12).

As consequence of the big sized grapes, specific to the table grape cultivars, the values of the productivity indices have varied within large limits: from 256.2 (Azur) to 496.0 (Victoria) for the absolute one and between 128.1 (Azur) and 347.2 (Victoria) for the relative one.

Important differentiations were also found out regarding the average weight of grapes; the smallest values were obtained for the Azur cultivar (216 g), and the highest ones for Tamina (328 g) and Victoria (315 g) (table 3).

Compared to the average value of 272.8 g/grapes for the 6 cultivars studied, for the Tamina and Victoria cultivar, very significant differences were obtained.

The berries had the largest sizes for Tamina (5.28 g) and Victoria (4.30 g), and the smallest for the Azur (2.05 g).

From the analysis of the variant regarding the influence of the cultivars onto this parameter, very significant differences are found out for Tamina, Victoria and Moldova, compared to the average of the experience of 352.6 g.

The biggest productions were obtained for the Tamina (6.40 kg/vine), being followed by the Victoria (5.43 kg/vine), differences compared to average of the experience (4.79 kg/vine) being also very significant.

The Tamina cultivar is detached from the other studied cultivars, by the low percentage of marketable production (55%), due to the unevenness of the coloration of grapes.

Regarding the accumulation of sugars, Xenia cultivar is distinguished (162.8 g/l), and regarding the gustative balance – Victoria, with a glucoacidimetric index of 39.5.

CONCLUSIONS

1. The fertility of cultivars studied is generally average, with higher values for the Victoria and Moldova.

2. The values of the productivity indices are relatively high, specific to the majority of cultivars of table grapes.

3. The Victoria and Xenia cultivars have a good behaviour in cultivation, with pleasantly looking grapes and gustative balance appreciated by consumers, and can also be promoted in cultivation in the Husi Vineyard, also taking into account the climatic warming, which does not limit anymore the cultivation habitat of table grapes cultivars, with a big grape.

4. The Moldova cultivar has pleasantly looking grapes, thick skin on the grape and a good behaviour for storage, and can be extended in cultivation.

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FIGURES

Fig. 1 – The ripening period of table grapes in Huşi vineyard

Nr. crt.	Cultivars	Month and decade								
		August			September			October		
		I	II	III	I	II	III	I	II	III
1	Napoca									
2	Azur									
3	Victoria									
4	Xenia									
5	Tamina									
6	Moldova									


Azur


Tamina


Victoria


Napoca


Xenia

TABLES

Table 1 - Climatic indicators

Climatic index	1970-2000	2006	2007	2008	Average 2006-2008
Average year temperature (ºC)	9.9	10.5	12.0	11.5	11.3
Average temperature from the growing period (^{0}C)	16.8	18.0	19.0	17.4	18.1
Average temperature of the hottest month (VII-VIII) (^{0}C)	21.6	22.6	26.1	22.8	23.8
Length of the growing season (days)	186	201	191	203	198
Active thermic balance ($\Sigma\ ^0$ t a)	3120	3613	3635	3526	3591
Useful thermic balance ($\Sigma\ ^0$ t u)	1260	1603	1725	1996	1608
Sum of the hours of real insolation (Σ ir)	1547.3	1659.3	1684.9	1674.3	1703.2
Sum of the annual precipitations (mm)	493.3	495.2	530.0	412.1	479.1
Sum of the precipitations from the growing period (mm)	329.5	359.7	244.2	284.4	296.1
Real heliothermic index (IHr)	1.95	2.6	2.9	2.5	2.7
Hydrothermic coefficient (CH)	1.06	0.99	0.67	0.08	0.82
Deficit of precipitations (DP-mm)	42.9	8.5	211	108	109
Viticultural bioclimatic index (Ibcv)	7.87	8.29	13.13	10.20	10.53
Index of the oenoclimatic aptitude (IAO_e)	4665	4949.8	5241.5	4844.1	5011.8

Table 2 - The fertility and productivity characteristic of cultivars studied (Husi, 2006-2008)

Cultivars	Fertility coefficient		Productivity index	
	absolute	relative	absolute	relative
Azur	1.22	0.61	256.2	128.1
Tmina	1.45	0.65	464.0	208.0
Victoria	1.60	1.12	496.0	347.2
Napoca	1.43	1.13	368.9	291.5
Xenia	1.61	0.92	394.4	225.4
Moldova	1.54	1.14	423.5	313.5

Table 3 - Yield of quality of grapes (Husi, 2006-2008)

Cultivars	Average weight of the grapes			Weight of 100 berries			Yield			Marketable production %	Sugar	Acidity	Gluco-acidimetric index
	g	Difference	Significance	g	Difference	Significance	kg/ vine	Difference	Significance		g/l	g/l H_2SO_4	
Azur	216	79.17	ooo	205	58.13	ooo	4.24	88.58	ooo	70	155.1	4.0	38.7
Tamina	328	120.22	***	528	149.72	***	6.40	133.70	***	55	145.1	4.5	32.2
Victoria	315	115.46	***	430	121.93	***	5.43	113.44	***	83	146.5	3.7	39.5
Napoca	258	94.56	o	267	75.71	ooo	4.25	88.79	ooo	75	150.8	4.7	32.1
Xenia	245	89.80	ooo	305	87.33	ooo	3.68	76.88	ooo	82	162.8	4.2	38.7
Moldova	275	100.79	N	378	107.18	***	4.72	98.61	N	88	152.3	5.0	30.4
Average	272.8	0.00	Mt	352.6	0.00	Mt	4.79	0.00	Mt	75.5	152.1	4.3	35.2

DL5% = 10.970 DL5% in % = 4.02 DL5% = 12.210 DL5% in % = 3.46 DL5% = 0.07 DL5% in % = 1.46
DL1% = 15.610 DL1% in % = 5.72 DL1% = 17.380 DL1% in % = 4.92 DL1% = 0.11 DL1% in % = 2.29
DL01% = 22.580 DL01% in %= 8.27 DL01% = 25.130 DL01% in % = 7.12 DL01% = 0.16 DL01% in % = 3.34

The quality of Cardinal grape variety through the use of biologically-active substances

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Keywords: table grapes, Cardinal, gibberellic acid.

ABSTRACT

The culture of table grapes has become a complex issue today; the settlement will depend on the correct choice of varieties for cultivation, harvesting, storage and selling of grapes. Worldwide, the vines' cultivation in the last decade, had subjected a changes of vine assortment but the high results obtain in developed countries now. Without knowing the basic laws of physiological growth and fruiting vines, and methods of adjustment can not be obtained high yields, stable and high quality with low cost and long-term use of the productive capacity of grapes. The objectives of the study include the identification of the influence of the treatment period, the optimal dose of gibberellin on the quantity and quality of grapes and efficiency of table grapes of Cardinal variety.

INTRODUCTION

Analysis of extensive experimental material shows that the action of gibberellin is accelerated of shoot growth, a stronger development of tendrils, elongation of petioles of leaves, the formation of open petiole sinus, the appearance of bright coloration of the upper leaves (Manankov, 1981).

The sensitivity of any tissue to gibberellin is dependent on many factors: the quantity and quality of light, the physiological age of tissue, the presence of other growth regulators. The great importance on the result has the type of tissue or organ, applied gibberellin and its concentration.

Katarân (1963) and other scientists note that, increases of the shoots growth there are when spraying bushes of all varieties with gibberellin, but the sensitivity of the bushes of seed varieties for the same concentration of solution is significantly higher than that of the seedless varieties. Invoked stimulation of growth by gibberellin can be expressed not only in the elongating internodes, but also to increase their number, increasing the formation and growth of lateral shoots, increasing the number of leaves and their size. As a result, the general habitus of plants treated with gibberellin is different from the control bushes.

In grapes, like many other plants (tomatoes, peppers, etc.) the treatment with gibberellin induces the formation of seedless grapes (Katarân, 1963; Singh, 1978; Radžabov, 1993; Reynolds, 2006 etc.). Positive results, in order to obtain seedless berries were obtained in Japan, USA, Bulgaria, India and other countries.

The purpose of our researches was to study the influence of inflorescences treatment with gibberellin (GA3) on the productivity of Cardinal table grapes variety in the Republic of Moldova

MATERIALS AND METHODS

Studies performed in 2007-2009 at the experimental station with table grape variety: Cardinal, in The Central part of the Moldova Republic. We used the methods recommended for this type of research in viticulture. During the period of vegetation we studied the agrobiological properties of varieties. The inflorescences were treated with gibberellin: 25, 50 and 100 ppm.

RESULTS AND DISCUSSION

Cardinal (Flame Tokay x Alphonse Lavallée) [E. Snyder, CA, USA] is a table grapes variety. It became widespread in United States, Bulgaria, France, Italy, Romania, Spain, Moldova and other countries. Crown and top young leaves from the young shoots are light green, without pubescence, with poorly-bronzing on the ends of the teeth. Dissected of leaves is average. Annual maturate shoot is bright brown, dark brown knots. The leaves are large or very large. The upper lateral sinuses are medium. The underside of leaves is glabrous. Petiole often painted in bright pink colour. Autumn leaf colour is yellow. The flowers are hermaphroditic.

Bunch are large size (length 19-28 cm, width 13-19 cm), cylindrical-conical form, loose and very loose. Weight of bunch is 342-510 g. The berries are very large (length 21-29 mm, width 18-23 mm), round-oval or oval form, and violet-red with wax coating. The 100 berries weight 600-700 g. The skin is relatively thick, but easily broken. Flesh fleshy, juicy, crisp, greenish-white, grape pleasant, with a weakly pronounced muscatel aroma. In berries there are 2-4 large seeds.

Cardinal is a variety, where refers to the grapes very early ripening. From blooming buds to maturity are needed 121 days and the sum of active temperatures of 2308°C. Bushes are medium vigour of growth.

Shoots maturity are satisfactorily. Cardinal is a variety of potentially high, but unstable yield.

The Cardinal variety is unstable to powdery mildew (*Plasmopara viticola*), downy mildew (*Uncinula necator*), bacterial cancer (*Agrobacterium tumefacience*), strongly susceptible to botrytis berries (*Botrytis cinerea*). Grapes are very unstable to frosts and frost damage. The variety was much inclined to shattering of flowers, ovaries and formed small berries in some years with unfavourable weather conditions during the flowering period. Consequently reduced the marketability of variety in clusters often remains only 10-15 normal berries.

The results of our researches are shown in the Tables 1 and 2, as well as in the Fig. 1.

In the control variant the average weight of bunches are 390,2 gr. and berries – 383,4 gr. The bunches size are: length – 24,2 cm, width: top 13,7 cm, medium – 7,2 cm and bottom – 5,5 cm.

Established that under the action of gibberellin is an increase in bunches weight with 31,5 (GA_3-25 mg/l), 85,6 (GA_3-50 mg/l) and 77,6% (GA_3-100 mg/l), the berries weight in clusters, compared with the control. The result is a decrease the bunch structure on 1,5; 1,1 and 1,6 times, respectively.

Economic benefit analysis showed that the highest level of profitability – 818,34%, obtained in the variant GA_3-50 mg/l, which is 274,82% higher compared with control.

CONCLUSIONS

The gibberellin test on the seed varieties (clones) of table grapes; it was found that the drug's effect depends by the biological characteristics of the varieties and concentration of gibberellin.

The application of gibberellin on seed varieties – Cardinal leads to increase bunches weight, the berries weight in bunches, and decrease clusters structure rate. The optimum concentration of the gibberellin is GA_3-50mg/l. Yield increases on 31,4-85,8%. In the clusters reduces the number of substandard berries and increasing the seed rate index;

Increasing the number of seedless berries in the bunch of the seed varieties of table grapes under the action of gibberellin treatment, increase the sugar content, accelerate ripening, which is an important factor for the early varieties such as Cardinal.

ACKNOWLEDGEMENT

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*** Contract no. 59/ind (2008).

*** Contract no. 13/ind (2009).

FIGURE

Fig. 1. Effect of gibberellin (GA3) on the appearance of bunches and berries of Cardinal variety

TABLES

Table 1. The reaction of Cardinal variety for treatment of cauliflowers with gibberellic acid (GA_3) on the stage after fecundation period

Indicators	Variants								$DL_{0,95}$
	Control - H_2O		GA_3-25 ppm		GA_3-50 ppm		GA_3-100 ppm		
	$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%	
Weight of bunches, g berries, g	390,2 383,4	100,0 -	513,1 499,3	131,5 -	724,5 709,7	185,6 -	693,2 673,7	177,6 -	 -
Bunches size, cm - Length - Width/top mid bottom	 24,2 13,7 7,2 5,5	 - - - -	 28,8 21,2 11,5 5,7	 - - - -	 29,7 19,7 8,9 7,8	 - - - -	 29,5 20,7 9,8 7,6	 - - - -	 - - - -
Peduncle size, mm	11,1 ± 0,2	100,0	12,1 ± 0,4	109,6	12,0 ± 0,2	108,4	11,2 ± 0,2	101,5	-
The number of berries in the bunch, (normal/ abnormal), pieces	68,7 8,3	100,0 -	125,3 15,3	182,5 -	141,3 5,7	205,8 -	189,0 20,7	275,2 -	- -
Berry size, mm -length -width	 23,5 24,3	 100,0 100,0	 24,4 24,1	 103,8 99,2	 26,4 26,1	 112,3 107,4	 20,7 21,7	 87,9 89,5	 1,34 1,35
Weight of 100 berries, g	642,2 ± 33,5	100,0 -	681,6 ± 10,6	106,1 -	831,1 ± 15,5	129,4 -	758,7 ± 26,6	118,1 -	-
The index composition of berries (pulp weight/ skin weight)	41,86	-	62,00	-	66,08	-	73,00	-	-
The number of seeds per 100 berries	285,0	100,0	170,0	59,6	220,0	77,2	190,0	66,7	-
Indicator seed index (weight of pulp/weight of seed)	41,86	-	62,00	-	66,08	-	73,60	-	-
The strength of the berries on the crushing, g	1085	100,0	1425	131,3	1120	103,2	1340	123,5	-
Yield, kg per vine	5,85	100,0	7,70	131,6	10,87	185,8	10,40	177,7	0,31
Content of sugars content of acids	125 8,1	- -	141 8,3	- -	151 8,6	- -	141 8,5	- -	- -

Table 2. The economic efficiency of Cardinal grapes production for gibberellic acid treatment

Indicators	Variants			
	Control - H_2O	GA_3-25 ppm	GA_3-50 ppm	GA_3-100 ppm
The costs during the growing season without gibberellic acid, MDL	12000	12000	12000	12000
The costs of closure and opening of the vines, MDL	3000	3000	3000	3000
Yield, tones per hectare	12,99	17,11	24,15	23,11
The costs for harvesting of grapes, MDL	5199,48	6843,76	9661,26	9243,52
The cost for the treatment with gibberellic acid, MDL	-	1514,632	1639,569	1890,017
The total cost, MDL	20199,48	23358,39	26300,83	26133,54
The cash proceeds from the sale of grapes, MDL	129987,00	171094,00	241531,40	231088,00
The profit, MDL	109787,52	147735,61	215230,57	204954,46
The profitability, %	543,52	632,47	818,34	784,26

Note: 1 USD ≈ 11,5 MDL

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Gibberellin - as a determinant factor of grape's quality of Codreanca (Black Magic) variety

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Keywords: table grapes, Codreanca (Black magic), gibberellic acid.

ABSTRACT

The vine area and volumes of production of table grapes in the country are not stable. In the last 15 years the vineyards decreased by 8 thousand ha (from 28 thousand to 20 thousand ha). The harvest and total production of grapes decreased too. The quality of grapes and the structure of assortment are unsatisfactory. The technological methods, which have a substantial contribution to improving the quality of table grapes, represents: foliar fertilizer use; removal cauliflowers; growth regulators use, which are used little or not use in the vineyards. Growth regulator use in the vineyards is used to improve the appearance of the grapes, increasing the productivity of plants and improve their taste. The purposes of investigations include the identification of the influence of the treatment period, the optimal dose of gibberellin on the quantity and quality of grapes and efficiency of table grapes of Codreanca (Black Magic) variety.

INTRODUCTION

Many authors have reported the influence of gibberellin on the growth of clusters, peduncle length and thickness of all grape varieties. There are formed the clusters with a high number of mechanical tissues by the gibberellin treatment. There has been rapid growth and lignification of tendrils, intense twisting them (Manankov, 1981).

The effect of gibberellin on generative sphere of grape plants so far poorly understood. At the same time found that, the number of berries is changed under the action of gibberellin treatment. Depending on the particularities of varieties, as well as the conditions of the ensuing impact gibberellin berries may not only increase but also decrease (Muromcev, 1973).

The seed varieties under the influence of gibberellin treatment can formed deteriorates berries usually (Manankov, 1981). How to improve things and the bad form of berries to a large extent determined dosages of gibberellin. The positive effect is enhanced with increasing concentration to the optimum, which is different for different varieties. Excessively high concentrations of gibberellin less effective, because increase its negative effect on fruiting.

Batukajev AA (1987, 1996) found that the higher seed index (ratio of the pulp weight to the seeds weight), the quantity of seedless berries are formed is greater, under the action of gibberellin treatment. Moreover, the increase in seed index is not only from the increased flesh weight, but also by reducing the seeds weight.

The purpose of our researches was to study the influence of inflorescences treatment with gibberellin (GA_3) on the productivity of Codreanca (Black magic) table grapes variety in the Republic of Moldova

MATERIALS AND METHODS

Studies performed in 2007-2009 at the experimental station with table grape variety: Codreanca (Black magic), in The Central part of the Moldova Republic. We used the methods recommended for this type of research in viticulture. During the period of vegetation we studied the agrobiological properties of varieties. The inflorescences were treated with gibberellin: 25, 50 and 100 ppm.

RESULTS AND DISCUSSION

Codreanca (Moldova x Marshal) [Moldova] Synonym: Black Magic - super-early table grape variety, with high resistance to disease. From blooming buds to maturity are needed 110-118 days. Bushes are high vigour of growth. Weight of bunch are 400-600 g, some up to 1,5 kg. The berries are very large (31 x 19 mm), dark-violet. The taste is simple, but due to the dense pulp, a small number of easily separates seeds, skins are not perceived when eating - taste good. The sugar content is 18-19%, but the acid content is 6-7 gr/l. The variety was much inclined to shattering of flowers, ovaries and formed small berries in some years with unfavorable weather conditions during the flowering period. Consequently, reduced the marketability of varietiy, the yield is high. Устойчивость к милдью у сорта 2,5-3,0 балла, к морозу -22°C. The resistance to mildew is appreciated with 2,5-3,0 points, to frost -22 ° C.

The results of our researches are shown in the Tables 1 and 2, as well as in the Fig. 1.

In the control variant the average weight of bunches are 390,2 gr. and berries – 383,4 gr. The bunches size are: length - 24,2 cm, width: top 13,7 cm, medium – 7,2 cm and bottom – 5,5 cm.

Established that under the action of gibberellin is an increase in bunches weight with 21,7 (GA_3-25 mg/l), 31,4 (GA_3-50 mg/l) and 30,4% (GA_3-100 mg/l), the berries weight in clusters, compared with the control. The result is a decrease the bunch structure on 1,35; 1,26 and 1,88 times, respectively.

Economic benefit analysis showed that the highest level of profitability – 611,66%, obtained in the variant GA_3-50 mg/l, which is 82,96% higher compared with control.

CONCLUSIONS

The gibberellin test on the seed table grapes varieties, it was found that the gibberellin treatment's effect depends by the biological characteristics of the varieties and concentration of fisiological substancies.

The gibberellin treatment on seed varieties - Codreanca (Black magic) leads to increase bunches weight, the berries weight in bunches, and decrease clusters structure rate. The optimum concentration of the gibberellin is GA_3-50mg/l. Yield increases on 21,7-31,4%. In the clusters reduces the number of substandard berries and increasing the seed rate index;

Increasing the number of seedless berries in the bunch of the seed varieties of table grapes under the action of gibberellin treatment, increase the sugar content, accelerate ripening, which is an important factor for the early varieties such as Codreanca (Black magic).

ACKNOWLEDGEMENT

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*** Contract no. 59/ind (2008).
*** Contract no. 13/ind (2009).

TABLES

Table 1. The reaction of Codreanca (Black magic) variety for treatment of cauliflowers with gibberellic acid (GA_3) on the stage after fecundation period

Indicators	Variants								$DL_{0,95}$
	Control - H_2O		GA_3-25 ppm		GA_3-50 ppm		GA_3-100 ppm		
	$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%	
Weight of bunches, g berries, g	378,3 371,8	100,0 -	460,3 449,5	121,7 -	496,9 486,1	131,4 -	493,2 477,3	130,4 -	 -
Bunches size, cm - Length - Width/top mid bottom	 20,3 17,0 11,6 8,0	 - - - -	 22,3 17,7 11,6 6,3	 - - - -	 21,1 17,3 10,1 5,6	 - - - -	 24,0 19,7 10,8 6,4	 - - - -	 - - - -
Peduncle size, mm	11,8 ± 1,1	 100,0	14,0 ± 1,0	 118,0	14,2 ± 0,8	 120,6	14,4 ± 0,4	 122,3	 -
The number of berries in the bunch, (normal / abnormal), pieces	74,0 58,0	100,0 -	119,0 42,0	160,8 -	139,7 42,0	188,7 -	130,7 46,0	177,6 -	- -
Berry size, mm - length - width	 30,5 20,6	 100,0 100,0	 31,1 20,3	 102,0 98,5	 27,6 20,0	 90,6 97,3	 29,2 19,8	 95,9 96,1	 1,04 0,64
Weight of 100 berries, g	632,0 ± 19,6	100,0 -	557,7 ± 47,2	88,2 -	516,3 ± 7,0	81,7 -	512,3 ± 38,6	81,1 -	 -
The index composition of berries (pulp weight/skin weight)	18,32	-	16,32	-	14,82	-	15,56	-	-
The number of seeds per 100 berries	135,0	100,0	165,0	122,2	130,0	96,3	100,0	74,1	-
Indicator seed index (weight of pulp / weight of seed)	124,6	-	100,7	-	100,8	-	132,3	-	-
The strength of the berries on the crushing, g	1517	100,0	1529	100,8	1487	98,0	1621	106,9	-
Yield, kg per vine	5,67	100,0	6,90	121,7	7,45	131,4	7,40	130,5	0,11
Content of sugars content of acids	145 7,1	- -	139 7,0	- -	142 6,5	- -	138 7,9	- -	- -

Table 2. The economic efficiency of Codreanca (Black magic) grapes production for gibberellic acid treatment

Indicators	*Variants*			
	Control - H_2O	*GA_3-25 ppm*	*GA_3-50 ppm*	*GA_3-100 ppm*
The costs during the growing season without gibberellic acid, MDL	12000	12000	12000	12000
The costs of closure and opening of the vines, MDL	3000	3000	3000	3000
Yield, tones per hectare	12,60	15,33	16,55	16,44
The costs for harvesting of grapes, MDL	5039,496	6132,72	6621,56	6577,12
The cost for the treatment with gibberellic acid, MDL	-	1370,28	1202,53	1489,339
The total cost, MDL	20039,5	22647,35	23261,13	23467,14
The cash proceeds from the sale of grapes, MDL	125987,40	153318,00	165539,00	164428,00
The profit, MDL	105947,90	130670,65	142277,87	140960,86
The profitability, %	528,70	576,98	611,66	600,67

Note: 1 USD ≈ 11,5 MDL

FIGURE

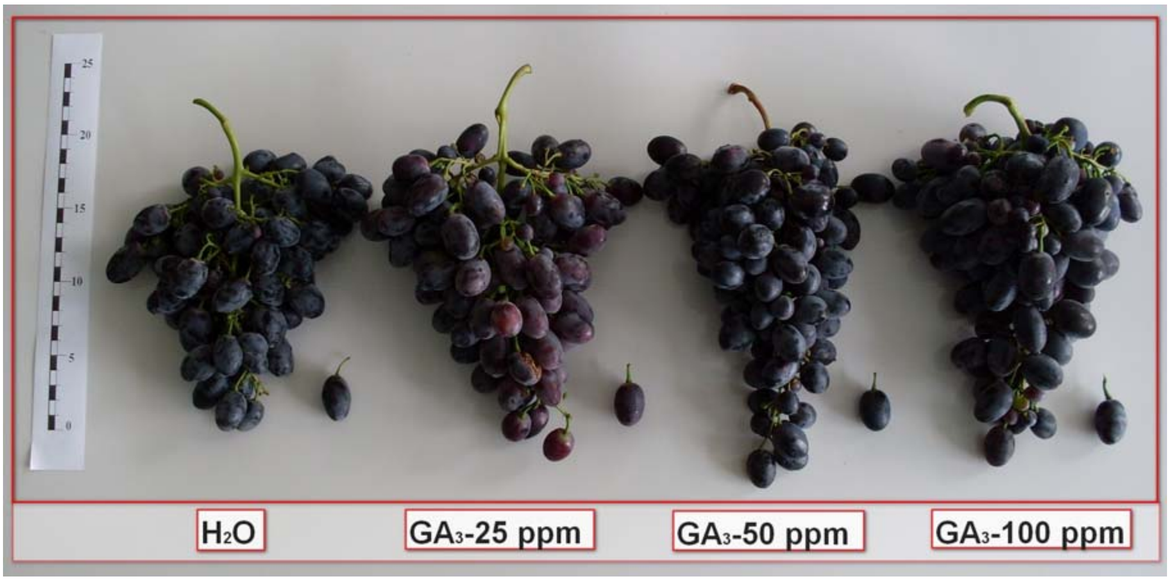

Fig. 1. Effect of gibberellin (GA3) on the appearance of bunches and berries of Codreanca (Black magic) variety

Aspects concerning the influence of alcoholic strength on the insolubilisation of wine's tartaric compounds

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Keywords: Must, wine, alcoholic strength, tartaric compounds, excess tartrates, saturation temperatures.

ABSTRACT

This study presents aspects concerning the influence of the alcoholic strength on the solubility of the tartaric compounds (acid potassium tartrate - KHT and neutral calcium tartrate - CaT), respectively these compounds' insolubilisation during wine processing. For obtaining as much data on the alcoholic strength 0÷20 % vol., an experimental process was realized in laboratory conditions, comprising the alcoholic fermentation phase as well as the mutage technique from the technological process of fortified wine process. At the same time with the increase of the alcoholic concentration during wine formation (fermentation of the must, mutage moment and after), the solubility of the tartaric compounds is practically shown by the diminishing of the main compounds (tartaric acid, potassium, calcium) involved in the insolubilisation and theoretically evaluated, in regard to the values of the concentration and solubility products (P_C, K_S) at -4 ºC, the KHT and CaT excess at -4 ºC and the theoretical saturation temperatures of KHT and CaT. Therefore, according to obtained data, in parallel with alcoholic strength increase, the stability state is more evident, due to tartaric compounds' insolubilisation (mainly of the acid potassium tartrate), fact proved also by the decrease of both the concentration and solubility products as well as diminish of the KHT and CaT excess. Theoretical saturation temperatures ($\mathbf{T_{TS}}$), of the KHT and CaT, mainly dependent on the alcoholic concentration, had a decreasing evolution during the alcoholic fermentation and slightly increasing evolution in wine samples obtained by mutage.

INTRODUCTION

Precipitation (insolubilisation) of tartaric compounds in wine is a complex process that is influenced by many factors, like: temperature, alcoholic degree, pH, tartaric acid, potassium, calcium content (Cotea and Sauciuc, 1988). For a better understanding of this process, a better understanding of the aspects concerning solubility of tartaric compounds is necesry, in regard to the influence the above mentioned factors show.

This study presents data concerning the ways in which the solubility of the tartaric compounds (acid potassium tartrate and neutral calcium tartrate) is influenced by the increase in alcoholic concentration during the making process of a Muscat Ottonel wine. For obtaining varied data of the alcoholic concentration within 0 and 20 % vol., an experiment was done in laboratory conditions comprising the fermentation phase as well as the mutage one, from the fortified wines' obtaining.

MATERIALS AND METHODS

The research concerning the influence of alcoholic strength on the solubility of tartaric compounds in wines was done at the Oenological Research Centre of the Romanian Academy-Iaşi Branch, during the months of September-November. The experiments were done on a white wine from Muscat Ottonel, of Avereşti Wine Centre of Huşi vineyard, harvest of 2007. 20 L of must obtained by crushing and destemming of grapes, were fermented in glass vessels of 25 litres at 20 ± 2 ºC. At the initial time (0 days) and at intervals established beforehand (2, 3, 4, 5, 6, 8, 10 and 12 days), samples (P_0, P_1, P_2, P_3, P_4, P_5, P_6, P_7 and P_8) were taken. After analysing P_1, 80 g/L sugars as saccharose were added to reach the minimal limit 280 g/L total sugars necessary for obtaining a fortified wine with over 80 g/L reductive sugars. Each sample, after filtering and decarbonisation, was physical-chemical analysed. When P_8 had an alcohol content of 11.20 % vol. and the reductive sugars were of 93.05 g/L, five more wine samples were executed (P_{M0}, P_{M1}, P_{M2}, P_{M3}, P_{M4}, and P_{M5}). Sample

P_8 became P_{M0} by adding equivalent quantities of refined ethylic alcohol (96.00 % vol.) in doses of 0.8, 2.8, 4.8, 6.8 and 8.8 % vol., respectively 10, 34, 57, 81, 104 mL alcohol at 990, 966, 943, 919, 896 mL wine, in order to obtain a value of the alcoholic strength as different as possible in value. The new obtained wines were sulphited with 200 mg/L SO_2 and fined with bentonite (2 g/L) as gel of 20 %. After a day (24 hours) and after 40 days (1238 hours) from the stopping of the alcoholic fermentation (mutage), samples P_{M0}, P_{M1}, P_{M2}, P_{M3}, P_{M4} and P_{M5} called from now on P_{P0}, P_{P1}, P_{P2}, P_{P3}, P_{P4} and P_{P5}, were physical-chemical analysed. During this period, the wines were kept at 10 ± 1 ºC.

The analyses concerning the main compositional characteristics (reductive sugars, alcohol, total acidity, pH-ul, tartaric acid, potassium and calcium cations) of the samples (must, must-wine mix, wine) were done according to national and international standards (***1998; ***2009) and literature (Ribereau-Gayon et al., 1972; Țârdea, 2007; Würdig and Woller, 1989). The relative deviations (δr) in %, by which the reductive sugars, alcoholic strength, total acidity, pH-ul and tartaric acid were modified at analysed samples are presented, too.

The values of the concentration (P_C) and solubility (K_S) products, KHT and CaT excess (refrigeration wine temperature) and theoretical wine saturation temperatures (T_{TS}) for acid potassium tartrate and neutral calcium tartrate were evaluated according to data from speciality literature (Cotea and Sauciuc, 1988; Flanzy 1998; Odăgeriu et al., 2008; Usseglio-Tomasset 1985; Usseglio-Tomasset et al., 1992; Würdig et al., 1982) according to a calculus program (Odageriu, 2006, 2008).

RESULTS AND DISCUSSION

The main compositional characteristics of analysed samples are registered in tab. 1. The initial must (P_0) had the following values: 203.9 g/L reductive sugars, 0.00 % vol. alcohol; 6.47 g/L $C_4H_6O_6$ total acidity; 3.40 pH; 5.45 g/L total tartaric acid; 1530 mg/L potassium; 126 mg/L calcium.

During the alcoholic must fermentation, the main compositional characteristics evolved as follows: the sugar content transformed into alcohol, until values of 93.1 g/L and 11.20 % vol. were reached. Alcohol addition was performed in order to obtain fortified wines, different in alcohol concentration; the total acidity grew from 6.47 g/L $C_4H_6O_6$ (noted H_2T) (sample P_0), meaning 22.9 %, to 7.95 (P_2 sample) and then dropped to 6.64 at P_8 sample, meaning 2.6 % compared to the control sample (P_0); the pH dropped more at the beginning, at 3.28 at sample P_2 (-3.5 %), and then slower, reaching 3.25 at sample P_8 (-4.4 %); total tartaric acid decreased linearly from 5.45 to 2.44 g/L in sample P_8, while potassium and calcium, the most involved cations in the insolubilisation of tartaric compounds, had a decreasing evolution from 1530 to 860 mg/L, in the case of the first sample and from 126 to 94 mg/L at the second one.

When adding alcohol at the control sample P_{M0}, its value grew, reaching 12.06 % vol., at sample P_{M1} (7.7 %), 14.05 % vol. at sample P_{M2} (25.4 %), 16.04 % vol. at sample P_{M3} (43.2 %), 18.04 % vol. at sample P_{M4} (61.1 %) şi 20.05 % vol. at sample P_{M5} (79.0 %). The other compositional characteristics have diminished correspondingly to the dilution index of the alcohol addition.

The physical-chemical analyses made after 40 days at the wine samples P_{P0}, P_{P1} P_{P2}, P_{P3}, P_{P4}, şi P_{P5} had the following changes in comparison to the samples P_{M0}, P_{M1}, P_{M2}, P_{M3}, P_{M4} şi P_{M5}, respectively:

The total acidity diminished in proportion of -1.4, -2.4, -3.6, -3.7, -5.6 and -6.7 % in comparison to control sample; pH-ul dropped by - 0.3 % at the control sample P_{P0} and rose in proportion of 0.6, 0.9, 1.5, 1.8 and 2.7 % at the other samples; tartaric acid decreased the most, in proportion of -7.4, -9.1, -12.1, -15.2, -18.6 and -22.4 % compared to the same samples; potassium decreased by 50, 98, 85, 72, 60, and 50 mg/L, while calcium dropped by 4, 5, 5, 4, 4 and 3 mg/L.

The variation of the concentration and solubility products (P_C, K_S), KHT and CaT excess at -4 ºC and theoretical saturation temperatures (T_{TS}) of KHT and CaT from analysed samples are registered in tab. 2.

Based on the obtained data, one can see that during the alcoholic fermentation of must, respectively during the 40 days following the alcohol addition, the variation of the pH and the alcoholic degree influence the solubility of tartaric compounds (KHT, CaT). This is proven by a change in concentration values of acid tartrate [HT^-] and neutral tartrate [T^{2-}] ions, that induce different values of concentration and solubility products (P_C, K_S), directly involved in evaluating the KHT and CaT excess and the theoretical saturation temperatures calculus (T_{TS}).

Therefore, the KHT excess (calculated at temperatures of -4 ºC), had values that decreased from 5075.0 mg/L at the initial must (P_0) to 2214.8 mg/L (sample P_8) at the end of the alcoholic fermentation. The KHT excess increased in wines obtained by alcohol addition and decreased in the same wines after 40 days of storage.

The neutral calcium tartrate (calculated at temperatures of -4 ºC) had a value of 103.9 mg/L at the initial must (P_0). In correlation with the solubility product (K_S) of CaT, during the alcoholic fermentation of must, at the other wine and must samples ($P_1 \div P_8$), a deficit CaT was registered. These values (as absolutes values) have decreased, varyind between 55.5 mg/L at sample P_1 and 218.2 mg/L at sample P_8. At the wines $P_{M0} \div P_{M5}$, obtained by mutage from wine P_8, the CaT deficit (in absolute values) dropped from 215.9 mg/L in sample P_{M0} to 84.1 mg/L in sample P_{M5}. In the case of wines $P_{P0} \div P_{P5}$ (after 40 days of storage) the CaT deficit (in absolute value) had a similar evolution, from 237.4 mg/L at sample P_{P0} to 50.9 mg/L in sample P_{P5}

One can notice, that, during the alcoholic fermentation of must, the increase of alcoholic concentration and the decrease of the pH favour a state of unsaturation (stability of neutral calcium tartrate), increasing therefore, the solubility of the tartaric compound in hydro-alcoholic solutions, as is wine. During the storage period, (40 days), due to partial CaT precipitation, the stability states diminish, and CaT's solubility decreases.

The main dependence of theoretical saturation temperatures (T_{TS}) to alcoholic strength is demonstrated by the fact that their values have a decreasing evolution (generally) and slightly oscillating during the alcoholic fermentation, slightly increased in wines obtained by alcohol addition, respectively their diminishing during storage keeping after the mutage phase. The theoretical saturation temperature (**T_{TS}**) of neutral calcium tartrate drops from 44.41 to 26.17 ºC during the alcoholic fermentation, rising in wine samples $P_{M0} \div P_{M5}$ and dropping again in wines $P_{P0} \div P_{P5}$.

CONCLUSIONS

The diminishing of the main compounds (tartaric acid, potassium, calcium) that are involved in the insolubilisation of tartaric compounds shows that their precipitation is very much influenced by the alcoholic strength by diminishing their solubility in hydro-alcoholic solutions, as is wine.

During fermentation, as the alcoholic strength rises, the insolubilisation of the tartaric compounds can also be seen in parallel with a diminishment of the values of concentration and solubility products (P_C, K_S) of KHT and CaT, respectively by diminishment of the excess (calculated at -4 ºC) of acid potassium tartrate and neutral calcium tartrate.

The theoretical saturation temperatures (T_{TS}), of KHT and CaT, which are dependant on the alcoholic strength, have a diminishing evolution during alcoholic fermentation and slightly rising evolution at wine samples obtained after mutage (alcohol addition).

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TABLES

Table 1. Variation of main compositional characteristics of Muscat Ottonel musts during alcoholic fermentation and of wines obtained after alcohol addition at mutage and after 40 days of storage

*	Reductive sugars		Alcoholic strength		Total acidity		Real acidity (pH)		Tartaric acid		K^+ (mg/L)	Ca^{2+} (mg/L)
	(g/L)	δ_r (%)	(% vol.)	δ_r (%)	(g/L H_2T)	δ_r (%)		δ_r (%)	(g/L)	δ_r (%)		
During alcoholic fermentation												
P_0	**203.9**	0.0	**0.00**	0.0	**6.47**	0.0	**3.40**	0.0	**5.45**	0.0	**1530**	**126**
P_1	**161.3**	-20.9	**2.50**	22.3	**6.58**	1.7	**3.31**	-2.6	**5.26**	-3.5	**1485**	**123**
P_2	**198.1**	0.0	**5.02**	44.8	**7.95**	22.9	**3.28**	-3.5	**4.86**	-10.8	**1440**	**120**
P_3	**180.6**	-8.8	**6.05**	54.0	**7.59**	17.3	**3.26**	-4.1	**4.33**	-20.6	**1310**	**115**
P_4	**162.9**	-17.8	**7.09**	63.3	**7.38**	14.1	**3.26**	-4.1	**4.04**	-25.9	**1240**	**113**
P_5	**145.6**	-26.5	**8.11**	72.4	**7.21**	11.4	**3.25**	-4.4	**3.65**	-33.0	**1165**	**100**
P_6	**129.6**	-34.6	**9.05**	80.8	**7.04**	8.8	**3.26**	-4.1	**3.22**	-40.9	**1055**	**98**
P_7	**110.9**	-44.0	**10.15**	90.6	**6.79**	4.9	**3.25**	-4.4	**2.82**	-48.3	**955**	**96**
P_8	**93.1**	-53.0	**11.20**	100.0	**6.64**	2.6	**3.25**	-4.4	**2.44**	-55.2	**860**	**94**
24 hours after the mutage												
P_{M0}	**93.1**	0.0	**11.20**	0.0	**6.64**	0.0	**3.25**	0.0	**2.44**	0.0	**860**	**94**
P_{M1}	**92.1**	-1.0	**12.06**	7.7	**6.57**	-1.1	**3.25**	0.0	**2.41**	-1.2	**851**	**93**
P_{M2}	**89.8**	-3.5	**14.05**	25.4	**6.41**	-3.5	**3.27**	0.6	**2.32**	-4.9	**830**	**91**
P_{M3}	**87.3**	-6.1	**16.04**	43.2	**6.22**	-6.3	**3.28**	0.9	**2.24**	-8.2	**808**	**88**
P_{M4}	**84.8**	-8.9	**18.04**	61.1	**6.04**	-9.0	**3.29**	1.2	**2.15**	-11.9	**785**	**86**
P_{M5}	**82.1**	-11.8	**20.05**	79.0	**5.86**	-11.7	**3.30**	1.5	**2.05**	-16.0	**760**	**83**
after 40 days												
P_{P0}	**93.1**	0.0	**11.20**	0.0	**6.55**	-1.4	**3.24**	-0.3	**2.26**	-7.4	**810**	**90**
P_{P1}	**92.1**	0.0	**12.06**	0.0	**6.41**	-2.4	**3.27**	0.6	**2.19**	-9.1	**755**	**88**
P_{P2}	**89.8**	0.0	**14.05**	0.0	**6.18**	-3.6	**3.30**	0.9	**2.04**	-12.1	**745**	**86**
P_{P3}	**87.3**	0.0	**16.04**	0.0	**5.99**	-3.7	**3.33**	1.5	**1.90**	-15.2	**735**	**84**
P_{P4}	**84.8**	0.0	**18.04**	0.0	**5.70**	-5.6	**3.35**	1.8	**1.75**	-18.6	**725**	**82**
P_{P5}	**82.1**	0.0	**20.05**	0.0	**5.47**	-6.7	**3.39**	2.7	**1.59**	-22.4	**710**	**80**

* - must or wine sample

Table 2. Variation of concentration and solubility products (P_C, K_S), KHT and CaT excess at - 4 ºC and theoretical saturation temperatures (T_{TS}) of KHT and CaT in analysed wine and must samples

*	**Acid potassium tartrate (KHT)**				**Neutral calcium tartrate (CaT)**			
	P_C ×10^6 (mol^2/L^2)	**K_S ×10^6 la -4 ºC (mol^2/L^2)**	**KHT excess at -4 ºC (mg/L)**	**T_{TS} (ºC)**	**P_C ×10^8 (mol^2/L^2)**	**K_S ×10^8 la -4 ºC (mol^2/L^2)**	**CaT excess at -4 ºC (mg/L)**	**T_{TS} (ºC)**
During alcoholic fermentation								
P_0	900.5	72.0	5075.0	32.7	1412.5	126.4	103.9	44.4
P_1	807.7	59.4	4989.1	33.8	956.6	102.1	-55.5	39.2
P_2	701.2	48.0	4761.0	34.6	716.6	80.1	-115.1	37.7
P_3	556.5	43.4	4175.5	31.5	545.7	69.7	-169.6	34.2
P_4	487.1	39.2	3892.8	30.5	475.4	61.2	-173.7	33.9
P_5	406.5	35.2	3513.8	28.7	348.2	52.7	-213.6	30.0
P_6	324.0	31.8	3946.7	26.2	293.8	45.6	-206.3	29.3
P_7	251.8	28.1	2618.5	23.6	229.4	38.4	-218.2	27.5
P_8	193.7	24.9	2214.8	21.0	182.5	32.2	-215.9	26.2
24 hours after the mutage								
P_{M0}	193.7	24.9	2214.8	21.0	182.5	32.2	-215.9	26.2
P_{M1}	187.4	22.5	2226.2	21.7	170.6	28.3	-203.1	27.3
P_{M2}	174.6	17.7	2237.8	23.4	154.0	20.4	-154.9	31.6
P_{M3}	161.2	13.8	2242.1	25.1	132.8	14.3	-120.0	35.5
P_{M4}	147.3	10.7	2221.3	26.7	114.4	10.0	-92.3	39.2
P_{M5}	132.9	8.5	2168.0	28.0	96.0	7.8	-84.1	40.3
after 40 days								
P_{P0}	167.5	24.7	1982.2	19.0	155.5	31.5	-237.4	23.4
P_{P1}	153.5	22.3	1906.3	18.9	153.8	27.2	-196.9	26.0
P_{P2}	141.2	17.6	1886.5	20.3	138.7	19.7	-145.2	30.1
P_{P3}	129.8	13.7	1855.0	21.9	124.4	13.8	-99.7	34.7
P_{P4}	116.8	10.6	1785.8	23.1	106.4	9.8	-71.9	38.1
P_{P5}	104.5	8.4	1677.9	24.1	94.9	7.9	-50.9	40.7

* - must or wine sample

Studies on the useful and harmful fauna within the grapevine plantations of the Odobeşti ecosystem

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Keywords: harmful, numerical abundance, relative abundance, useful fauna, harmful fauna

ABSTRACT

The paper presents data concerning the evolution and dynamics of the useful and harmful fauna within the Odobesti grapevine ecosystem for several varieties of grapevine. This paper continues the series of researches conducted by systematically observing the evolution over time of useful and harmful fauna, contributing with further information. Thus, the conclusions drawn after the research stated that the percentage of harmful or useful fauna was of 43.58% on the 20.08.2008 and 56.41% on 20.10.2008. Data resulted from this study prove useful for setting the prognosis on the incidence and evolution of populations and the prognosis of the dynamics and the virulence of the attacks of soil pests of interest for the useful and harmful grapevine fauna, meant to contribute to establishing the control plan together with the avoidance of crop loss and the prevention of needless expenses for phytosanitary treatments.

MATERIAL AND METHOD

The few data concerning the Odobeşti vineyard ecosystem compelled us to approach this research, aware of its scientific and economic importance. The biological material collected through: Barber traps, soil sampling 25/25/30 and 30 cm screws allows us to show data in four tables.

RESULTS AND DISCUSSIONS

In table 1 we present the invertebrate fauna containing 14 taxons collected from a number of 6 varieties. On the first place we have the Black Feteasca variety with an occurrence of 31.14%, on the second place we have the Aligote variety with 21.31%. On the third position we have the Sauvignon variety with 18.1%, and then the Chasselas variety with a percentage of 13.12%, and finally, the Galbena de Odobesti variety with 6.55 % from the total of 61 samples. In table 2 we illustrate the numerical and relative abundance of the hazel leaf-roller of the grapevine (*Bictyscus betulae* L., Ordinul *Coleoptera*), on grapevine varieties. Observations have been conducted on 25.05.2008 on twelve grapevine varieties (Figure 1 and Figure 2). At the top of the list we have the Plavaie variety with 184 specimens of adults with an occurrence of 25.24%, the Royal Feteasca with 52 specimens and an occurrence of 7.14%, and last, the Pinot noir variety with 20 specimens with an occurrence of 2.75%. The second set of observations conducted on a similar number of 6 vines, the Plavaie variety had a numerical abundance of 111 specimens, with a percentage of 24.56%, for the Royal Feteasca variety 25 specimens in a percentage of 5.53%, and for the Pinot noir variety 5 specimens with 9.11%, Fig.1. It is notable that the Italian Riesling variety showed no signs of attack from *Bictyscus betulae* L.

The useful fauna counts a number of 44 specimens (table 3 and Figure 3) from four samplings and a harmful fauna of 22 specimens (Figure 4 and Figure 5). On the 21.10.2008 (table 3) the useful fauna counted 35 specimens and the harmful fauna 16, with a sum total of 51 specimens. The occurrence of the two fauna categories is of 56.41% on 20.08.2008 and 43.58% on 21.10.2008. In table 4 we prezent fauna sampled on the 28.10.2008 from the grapevine collection of SCDVV Odobesti. We note that from a total of 11 taxons, 4 taxons are harmful and 7 taxons are useful. Of the first group of pests, the *Polydesmidae* (*Miriapodae*) stand out, with a percentage of 44.42% (table 4) and the least present *Trombidium Holosericeum* with an occurrence of 3.49 %. Of the useful fauna we mention the presence of

Allobophorei caliginosa with a percentage of 11.62% and the least present *Formicidae* with 5.81 %.

CONCLUSIONS

The development of previous research led to new contributions about the invertebrate fauna from the Odobesti vineyard ecosystem.

Concerning the invertebrate fauna containing 14 taxons collected from 6 varieties, the highest occurrence is on the Black Feteasca variety with 31.14%, while the lowest is on the Galbena de Odobesti variety with 6.55%.

Of the ten studied varieties concerning numerical and relative abundance of the hazel leaf roller of the grapevine (*Bityscus betulae* L.) on first place we have the Plavaie variety with a percentage of 25.24%,while on the last place, the Pinot noir variety with 2.75%

The occurrence of harmful and useful fauna was of 56.41% on the 20.08.2008 for the Royal Feteasca in the SCDVV Odobesti Collection and of 43.58% on the 21.10.2008 for the White Feteasca variety, in Carligele viticultural centre of the Odobesti vineyard.

The data resulted from this study are indeed valuable for establishing the prognosis about the occurrence and evolution of populations, the prognosis of the dynamics and and the virulence of the attacks of soil pests of interest for the useful and harmful grapevine fauna, meant to contribute to establishing the control plan together with the avoidance of crop loss and the prevention of needless expenses for phytosanitary treatments.

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TABLES AND FIGURES

Table 1. The Invertebrate Fauna From The Odobesti Viticultural Ecosystem, Vrancea County. Soil Samples 25/25/30

Nr. crt.	Group And Species	25.06.08	26.06.08	26.06.08	27.06.08	30.06.08	16.06.08
		Odobesti Stationary	**Odobesti Stationary**	**Sarba Odobesti**	**Odobesti Complex**	**Carligele**	**Carligele**
		Chasselas	**Aligote**	**Black Feteasca**	**Saugvinon**	**Galebena de Odobest**	**Sarba**
1	*Formicidae* Hym.	4	1	-	-	1	3
2	*Amara aenea* Dejean.	1	-	2	-	-	-
3	*Agriotes ustulatus* Schall.	1	2	-	-	-	-
4	*Zabrus tenebrioidis* Goeze.	2	2	1	6	1	-
5	*Melolontha melolontha* L.	-	3	-	-	-	-
6	*Harpalus pubescens* Mull	-	4	-	1	1	-
7	*Fridericia bulbosa* Ross.	-	1	10	1	-	-
8	*Athous schneideri* L. Elateridae	-	-	-	-	-	-
9	*Lepidopter –Noctuid- Buha*	-	-	1	-	-	-
10	*Mantis religiosa* L.	-	-	1	-	-	-
11	*Melanotus crassiecallis* Erw. Elateridae	-	-	1	-	-	-
12	*Araneae*	-	-	2	2	1	-
13	*Allolobophora rosea* L.	-	-	1	1	-	1
14	*Homoptera hyalestes obsoletus* Sign.	-		-	-	-	2
	Abundenta numerica	8	13	19	11	4	6
	Total samples	61					
	Relative abundance	13,12	21,31	31,14	18,1	6,55	9,83

Table 2. The numerical and relative abundance of the hazel leaf-roller (*Byctiscus betulae* L., *Ord Coleoptera*) on grapevine varieties

Nr. crt.	Grapevine variety	Numerical abundance of rolled leaves on 6 vines	Relative abundance of rolled leaves on 6 vines	Numerical abundance of adults on 6 vines	Relative abundance of adults on 6 vines
1	Plavaie	184	25,24	111	24,56
2	Milcov	102	14,01	83	18,37
3	Sarba	98	13,46	66	14,60
4	Merlot	72	9,89	49	10,84
5	Aligote	54	7,42	45	9,96
6	Royal Feteasca	52	7,14	25	5,53
7	Black Babeasca	50	6,87	23	5,08
8	Codana	46	6,32	19	4,20
9	Black Feteasca	28	3,85	16	3,54
10	Chasselas dore	22	3,02	10	2,21
11	Pinot noir	20	2,75	5	1,11
12	Italian Riesling	0	0	0	0
Total		728	100	452	100

Fig.1. The relative abundance of rolled leaves and adults of *B. betulae L.* on several grapevine varieties

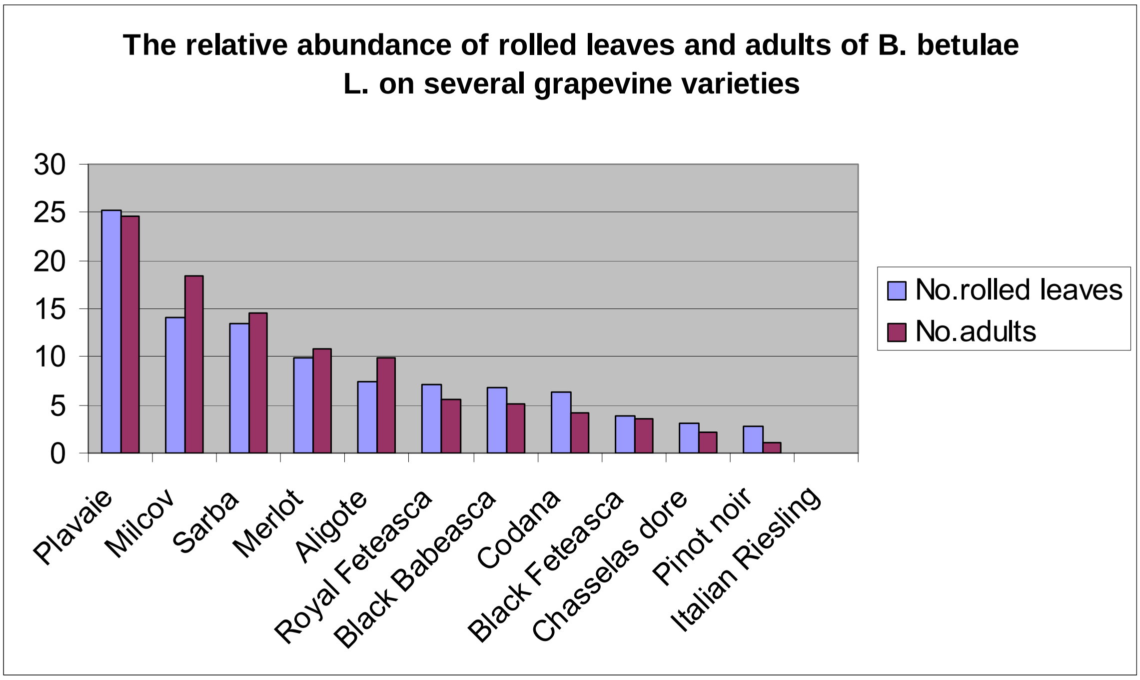

Table 3. The invertebrate fauna from the grapevine soil of SCDVV Odobesti

Nr. crt.	Group and species	20.08.2008	Royal Feteasca	21.10.2008	White Feteasca
		Numerical bundance/4 samp	**Numerical abundance/m²**	**Numerical abundance/4 samp.**	**Numerical abundance/m²**
1	*Lumbricus terestris* Mich.	2	8	1	4
2	*Lumbricus rubelus* L.	1	4	2	8
3	*Allobophora caliginosa* L.	4	16	3	12
4	*Allobophora roseae* L.	5	20	7	28
5	*Fridericia bulbosa* L.	8	32	4	16
6	*Geophilidae*	3	12	4	16
7	*Gordidae*	2	12	4	16
8	*Lytobius forficatus* L.	2	8	2	8
9	*Formicidae*	13	52	5	20
10	*Araneae*	4	16	3	12
Total useful fauna		44	176	35	140
11	*Julidae - Diplopoda*	7	28	5	20
12	*Melolontha melolontha* L.	2	8	-	-
13	*Planorbis marginatus* L. *Gasteropoda*	3	12	-	-
14	*Porcellio scaber* L. *Isopoda*	3	12	4	16
15	*Polydesmus* Sp. *Miriapodae*	-	-	2	8
16	*Harpalus pubescens* Mull.	4	16	-	-
17	*Harpalus distinguendus* Duft.	1	4	-	-
18	*Bembidion properans* Steph.	1	4	1	4
19	*Agriotes ustulatus* Schall.	1	4	2	8
20	*Opatrum sabulosum* L.	-	-	1	4
21	*Zabrus tenebrioides* Goeze.	-	-	1	4
Total harmful fauna		22	88	16	64
Numerical abundance		66	264	51	204
Total samples		66+51=117			
Relative abundance		56,41		43,58	

Fig. 2. The numerical abundance of rolled leaves and adults of *B. betulae L.* on several grapevine varieties

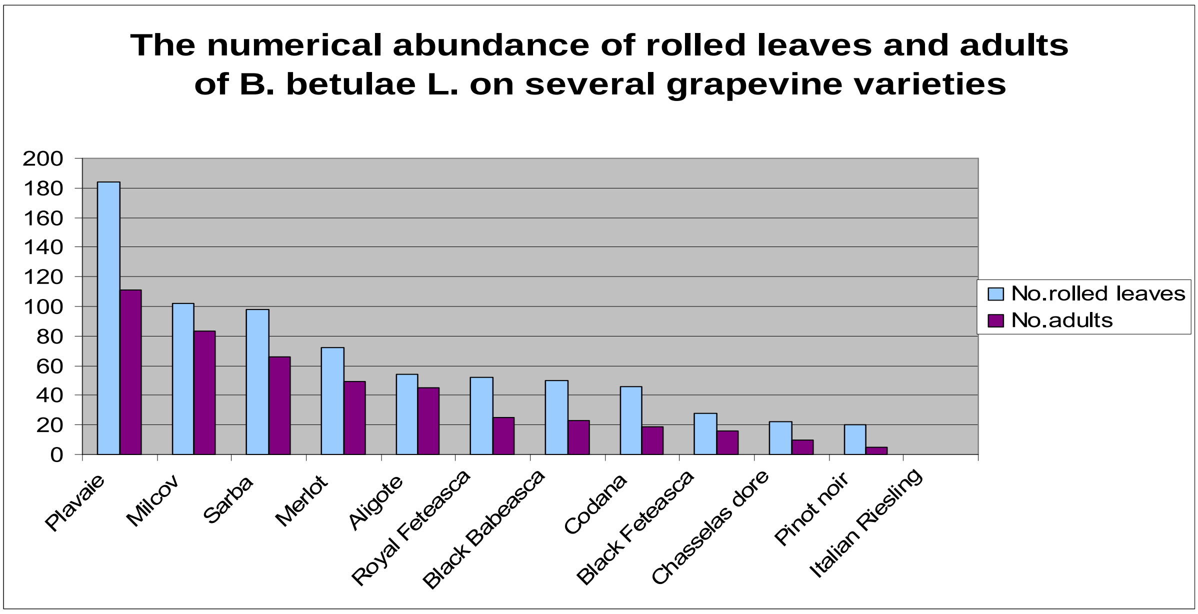

Table 4. The invertebrate fauna from the soil – Collection – 28.10.2008 S.C.D.V.V Odobesti

Nr. crt	Group and species	Numerical abundance	Relative abundance [%]
1	*Lumbricus terestris* Mich.	2	3,32
2	*Allolobophora caliginosa* L.	10	11,62
3	*Allolobophora rosea* L.	9	10,46
4	*Octolasium lacteum* L.	7	8,14
5	*Mamestra brasicae* L.	11	12,79
6	*Formicidae*	5	5,81
7	*Geophylidae*	6	6,92
8	*Fridericia bulbosa* F.	11	12,74
9	*Polydesmidae* (*Miriapodae*)	21	24,42
10	*Harpalus auratus* L.	1	1,16
11	*Trombidium holosericeum* L.	3	3,49
Total		86	100


Fig. 3:*Agriotes ustulatus* Schall.


Fig. 4:*Lumbricus terestris* Mich.


Fig. 5:*Zabrus tenebrioides* G.

Characterization of oxidative enzymes from white grapes (*Vitis vinifera L. cv. Feteasca regala*)

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Keywords: tyrosinase, laccase, peroxidase, optical density.

ABSTRACT

The aim of this paper was to characterize the tyrosinase, laccase and of peroxidase from the white grapes. The research has been done at the Integrated Centre of Research and Education for Applied Biotechnology in Food Industry, Bioaliment Platform, at the Food Science and Engineering Faculty from Galati, during the period 2008-2009. The type of white grapes used for this research was *Feteasca Regala*, which were harvested at full technological maturity from the *Dealu Bujorului* vineyard. In the raw grape must the tyrosinase showed full activity at pH = 6.0 and 25^oC temperature by using 4-methyl-pyrocatechol as substrate, in 0,1 M citrate-phosphate buffer. The laccase showed maximum activity at pH = 4.8 and 30^oC temperature by using N,N-dimethyl-1,4-phenylendiamine as substrate, 1g/L in citrate-phosphate buffer. The maximum activity of the peroxidase from the grape must was obtained at pH = 6.0 and 25^oC temperature using 0.75% pyrogallol, 0.8% hydrogen peroxide as substrate in phosphate buffer.

The oxidative enzymes shown affinity for the specific substrates, fact proved by the value calculated for kinetic parameters (K_m and V_{max} from the Michaelis-Menten equation). Tyrosinase shown a good affinity for the substrate 4-methyl-pyrocatechol (K_m = 0.16129 moli/L and V_{max}= 22.85 OD_{420nm}/min). The laccase presented a good affinity for the N,N-dimethyl-1,4-phenylendiamine substrate (K_m = 1.66 mM and V_{max} = 31.25 OD_{520nm}/min) and the peroxidase had a good affinity for the pyrogallol substrate with an optimum hydrogen peroxide concentration (K_m = 23.2 mM and V_{max} = 4.54 OD_{420nm}/min).

INTRODUCTION

The biochemical and microbiological stabilization of musts and wines is an important goal to be followed by the manufacturer during the production process (Rapeanu 2005). Regarding the musts and wines which are in contact with air, the oxidoreducing enzymes, especially the laccase, has a large spectrum of action being resistant to SO_2 and catalyze the reaction of the oxygen over the polyphenolic compounds from musts and vines. Laccase is working as an oxidation catalyst is easing the reactions between the phenolic compounds and the dissolved oxygen from wine and it represents the main cause of the rapid degradation of the red wines. As any catalyst, small quantities of laccase can contribute to high quantities of phenolic compounds unsolubilization (Cotea et al. 1988). The presence of tyrosinase can cause dramatic changes of color and turbidity, which are modifying the stability and the sensory characteristics of musts and grape juices (Macheix et al. 1991). The forming reactions of the quinonic compounds during the wine maturation are more intense when the ortodiphenolic group is oxidized both from monomer phenolic compounds and from polycondensed compounds. Besides the quinonic compounds considered being main compounds, also results hydrogen peroxide, which by oxidizing the ethanol forms acetaldehyde.

Due to its oxidizing action and its capacity to combine with acetaldehyde, the SO_2 is an efficient factor for protecting the phenolic compounds from wine. The SO_2 is a chemical additive used to control the polyphenols oxidation in the wine industry. Currently, researches are conducted in order to reduce or even eliminate the utilization of the SO_2 in food and drinks (Muller-Spath 1990).

The thermal treatments and the addition of additives used as conventional methods of food products stabilization are difficult to apply at the wine production because of the loss of the sensorial qualities of the finite products the most affected being the wine color (Daoudi et al. 2003). The thermal processing, which usually is seen as the most efficient method of inactivating the tyrosinase (Golan-Goldish et al. 1984, McElvily et al. 1992), is associated with noticeable quality loss, both from a sensorial and nutritional point of view. The main objective of this study was to characterize the oxidative enzyme present in white grapes must.

MATERIALS AND METHODS

The preparation of the grape must

The research had been done at the Integrated Center of Research and Education for Applied Biotechnology in Food Industry, Bioaliment Platform, at the Food Science and Engineering Faculty from Galati, during the period 2008-2009. The type of white grapes used for the analysis was *Feteasca Regala* harvested at full technological maturity from the *Dealu Bujorului* vineyard. The grapes were crushed and the resulted homogenate was filtered through four layers of cheese cloth. The filtered must (sugar 181 g/L and pH = 3.5) was cleared through decantation at $4^{o}C$ for 24 h and then stored in plastic bottles at $-73^{o}C$ in Ultrafreezer and used as an enzyme source.

The tyrosinase and laccase activities were quantified using the method described by Dubernet et al. 1974. The peroxidase activity was evaluated using the method described by Ciopraga et al. 1978. The equipments used to assay the enzymatic activity were: technical balance, cooling centrifuge 320 R Universal Hettich, spectrophotometer UV VIS Jenway 6505 and thermostatic water bath. In order to analyze the musts and the wines there were used official methods OIV. All measurements were made in double and the standard relative deviations were less +/- 1%.

Effect of pH on the oxidative enzymes in must

The dependence of the enzymatic activity on pH was determined following the standard conditions of evaluating the enzymatic activity in concordance with the used methods. To study the pH influence on the oxidative enzymatic activity enzymes from must the pH variation was analyzed using citrate-phosphate, acetate, phosphate and carbonate-bicarbonate buffers.

Effect of temperature on the oxidative enzymes in must

The behaviour of tyrosinase, laccase and peroxidase from must was analyzed in the temperature domain 10 – $80^{o}C$. To study the temperature influence on the oxidative enzymes the substrates (4-methyl-pyrocatechol 0.1 in citrate-phosphate buffer with pH = 6 – optimum pH – for the tyrosinase activity, N,N-dimethyl-1,4-phenylendiamine 1g/L in citrate-phosphate buffer with pH = 4.8 for the laccase activity and pyrogallol 0.75%, hydrogen peroxide 0.8%, in phosphate buffer with pH = 6.0 for the peroxidase activity) were incubated in a water bath (10 - 80 ^{o}C) for 10 min before the introduction of the enzyme.

Effect of substrate concentration on the must tyrosinase, laccase and peroxidase activity

The activity of the oxidative enzymes from the raw grape must was studied taking into account different values of the substrate concentration. The enzymatic activity of tyrosinase from grapes must was studied in relation with the concentration of the substrate 4-methyl-pyrocatechol 0.1m in phosphate-citrate buffer with pH = 4.8, the enzymatic activity of laccase in relation with the concentration of the substrate N,N-dimethyl-1,4-phenylendiamine 1g/L in phosphate-citrate buffer with pH = 4.8 and that of peroxidase in relation with the concentration of pyrogallol (0.75%), hydrogen peroxide (0.8%) in acetate buffer with pH = 4.71.

The kinetic parameters, Michaelis Menten constant (Km) and maximum rate (Vmax) values for the oxidative activity from grapes must, were estimated by non-linear regression analysis using the following equation.

$$v = \frac{V_{\max}\ x\,[S]}{K_m + [S]} \quad (1.1)$$

where [S] corresponds to the substrate concentration, while K_M is the Michaelis Menten constant and Vmax is the apparent maximum rate for the enzymatic reaction.

Effect of enzyme concentration on the activity of oxidative enzymes from must

The influence of the enzyme concentration on the reaction rate in optimum reaction conditions was studied. For the standard reaction conditions (fresh solution of 4-methyl-pyrocatechol 0.1 M, pH = 4.8, T = 25°C) the influence of the tyrosinase on the reaction rate was studied. The influence of the laccase on the reaction rate was studied for the standard reaction conditions (fresh solution N,N-dimethyl-1,4-phenylendiamine 1g/L, pH = 4.8, T = 25°C). Finally, for the standard reaction conditions (fresh pyrogallol 0.75% and hydrogen peroxide 0.8% solution, pH = 4.71, T = 25°C) the influence of the peroxidase concentration on the reaction rate was also studied.

RESULTS AND DISCUSSION

Effect of pH on the oxidative enzymes in must

The pH influence on the oxidative enzymes from must was studied on the pH range of 2.6 to 10 (4-methyl-pyrocatechol 0.1M substrate, 25°C temperature for the tyrosinase activity, N,N-dimethyl-1,4-phenylendiamine 1g/L, 30°C for the laccase activity and pyrogallol 0.75%, hydrogen peroxide 0.8%, 25°C for the peroxidase activity). In fig. 1, 2 and 3 there are presented the variations of the oxidative enzymes activities from must with the different values of pH.

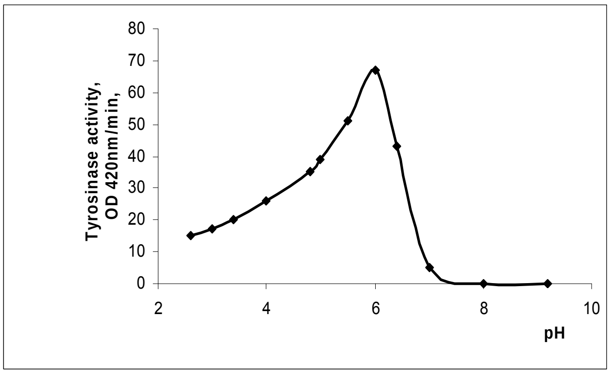

Fig. 1 - Tyrosinase activity variation from must with the pH

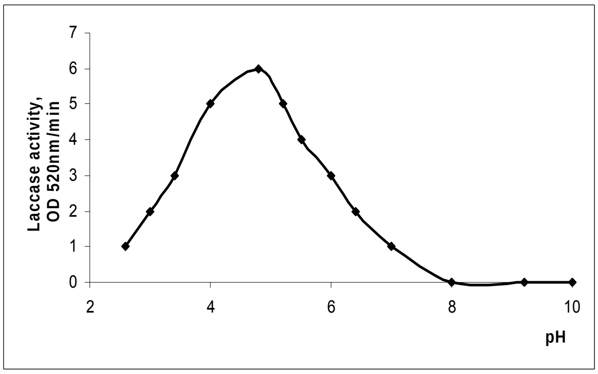

Fig. 2 - Laccase activity variation from must with the pH

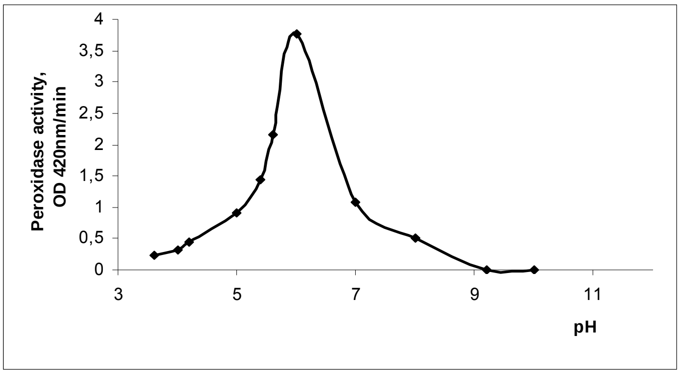

Fig. 3 - Peroxidase activity variation from must with the pH

From the activity diagrams (fig. 1, 2 and 3) can be observed that the tyrosinase and peroxidase activities from must present a maximum values at pH = 6.0 and the laccase enzymatic activity is maximum at pH = 4.8. The oxidative enzymes from must are active at acid pH (2.6 - 4). At pH = 3.4 the tyrosinase still have 20% from its maximum enzymatic activity and only 3% from maximum laccase activity. At pH = 3.6 the peroxidase has 0.23% from its maximum enzymatic activity. The enzymatic activity decreases rapidly at alkaline pH (7.0 - 10.0). The tyrosinase at pH = 7.0 show 5% from its maximum enzymatic activity, the laccase only 1% and the peroxidase 1.08% respectively. At pH between 8.0 - 10.0 the oxidative enzymes activities from must are zero.

Effect of temperature on the oxidative enzymes in must

At constant substrate concentration (4-methyl-pyrocatechol 0.1M solution in phosphate-citrate buffer) and optimal pH (6.0) the maximum tyrosinase activity from must was registered at 25^{o}C temperature (fig. 4). In the case of laccase activity (N,N-dimethyl-1,4-phenylendiamine 1g/L solution in phosphate-citrate buffer and optimal pH = 4.8) the maximum of enzymatic activity laccase activity was achieved at 30^{o}C (fig. 5).

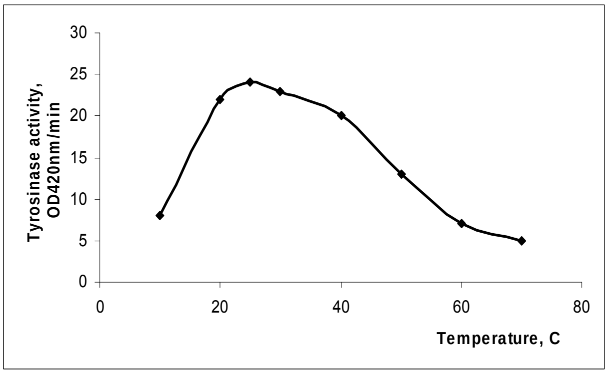

Fig. 4 - The tyrosinase activity as a function of temperature

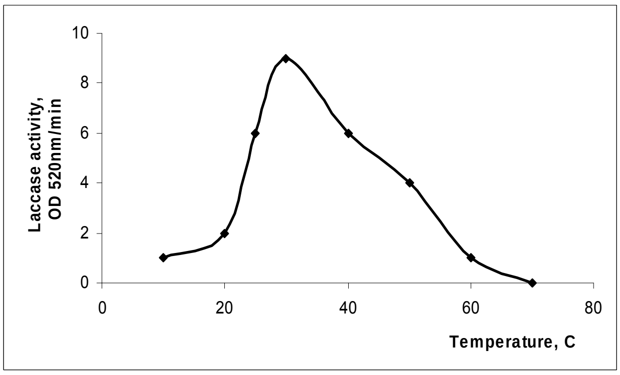

Fig. 5 - The laccase activity as a function of temperature

The tyrosinase activity decreased gradually at temperatures lower or higher than 25^{o}C. At temperature of 10^{o}C tyrosinase activity was 8 (OD_{420nm}/min) and at 40^{o}C its enzymatic activity was 20 (OD_{420nm}/min). The laccase activity decreased gradually at temperatures lower or higher than 30 ^{o}C. At 10^{o}C its laccase activity was 1 (OD_{520nm}/min) and at 40^{o}C its enzymatic activity was 6 (OD_{520nm}/min).

At constant substrate concentration (pyrogallol 0.75% solution, hydrogen peroxide 0.8% in sodium acetate - acetic acid buffer) and optimum pH = 6.0 the maximum peroxidase activity from must was obtained at 25^{o}C (fig. 6).

The enzyme activity decreased at temperatures lower or higher than 25^{o}C. Peroxidase activity was 1.93 (OD_{420nm}/min) at 10^{o}C and at 40^{o}C had a value of 1.56 (OD_{420nm}/min).

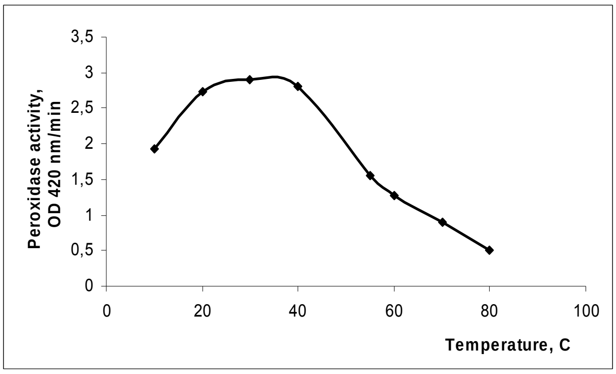

Fig. 6 - The peroxidase activity as a function of temperature

Effect of substrate concentration on the must tyrosinase, laccase and peroxidase activity

The influence of 4-methyl-pyrocatechol concentration on the reaction rate was also studied (fig. 7). By using the equation 1.1 the Michaelis-Menten constant was calculated. The value of the constant K_m was 0.16129 moli/L. This value expresses the enzyme affinity for the 4-methyl-pyrocatechol substrate. The reaction rate V_{max} was 22.85714 (OD_{420nm}/min).

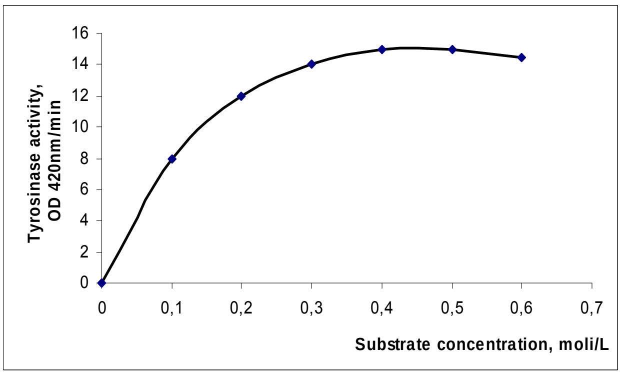

Fig. 7 – The substrate concentration influence on the tyrosinase activity

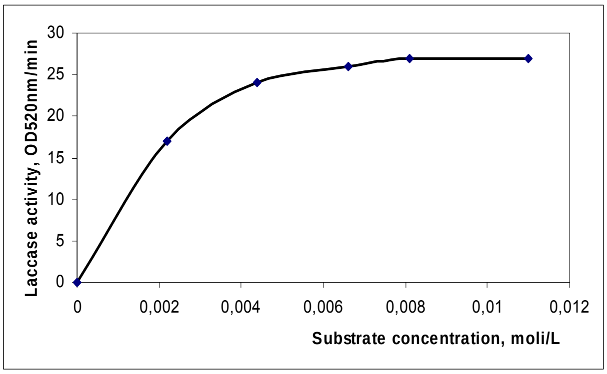

Fig. 8 – The substrate concentration influence on the laccase activity

The influence of N,N-dimethyl-1,4-phenylendiamine concentration on the reaction rate in the case o laccase was studied (fig. 8). The Michaelis-Menten constant was estimated at K_m = 1.66 mM, expressing the enzyme affinity for the substrate used (N,N-dimethyl-1,4-phenylendiamine). The reaction rate was 31.25 OD_{520nm}/min.

There was also studied the influence of the pyrogallol and hydrogen peroxide concentration over the reaction rate (fig. 9). The Michaelis-Menten constant K_m = 23.2 mM expresses the enzyme affinity for the pyrogallol and hydrogen peroxide substrate.

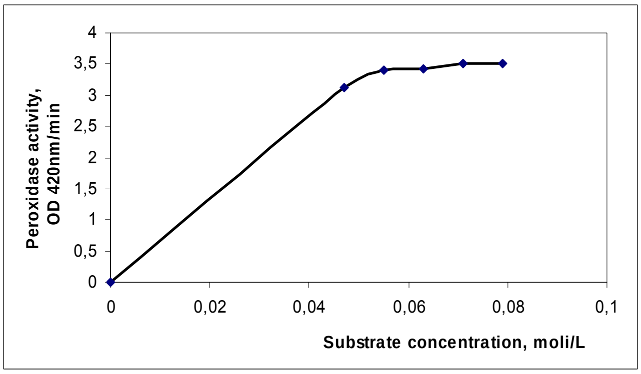

Fig. 9. The substrate concentration influence on the peroxidase activity

The influence of the enzyme concentration on the oxidative enzymatic activities

For the standard reaction conditions (4-methyl-pyrocatechol 0.1 M solution, pH = 4.8, T = 25°C) the influence of the tyrosinase concentration over the reaction rate was studied (fig.10). For laccase activity (N,N-dimethyl-1,4-phenylendiamine solution, pH = 4.8, T = 25°C) the influence of the laccase concentration on the reaction rate was studied (fig.11).

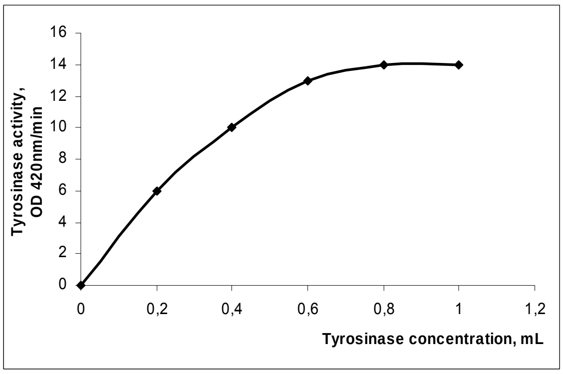

Fig.10 – The influence of the tyrosinase concentration on the reaction rate

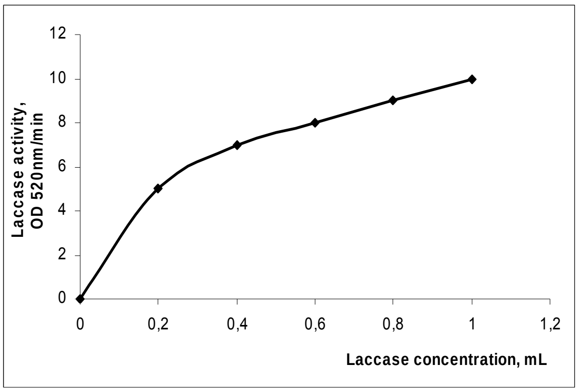

Fig.11 – The influence of the laccase concentration on the reaction rate

As it can be seen in fig. 10 and 11 the enzymatic activities increased proportionally with the enzyme concentration until it can be observed an inhibition as a result of the enzyme excess for a 0.8 mL tyrosinase concentration and 1 ml laccase concentration.

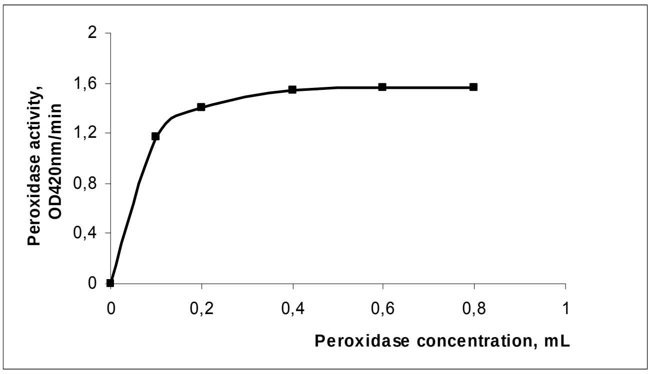

Fig.12 – The influence of the peroxidase concentration on the reaction rate

For the standard reaction conditions (pyrogallol 0.75% and hydrogen peroxide 0.8% solution, pH = 4.71, T = 25°C) the effect of the peroxidase concentration on the reaction rate was studied (fig. 12). In fig. 12 the absorbance increasing with the enzyme concentration until an inhibition can be observed as a result of the enzyme excess for a 0.6 mL concentration.

CONCLUSIONS

In the grape must the tyrosinase had maximum activity at pH = 6.0, T = 25°C by using as a substrate 4-methyl-pyrocatechol 0.1 M in a citrate-phosphate buffer; the laccase had maximum activity at pH = 4.8, T = 30°C by using as a substrate N,N-dimethyl-1,4-phenylendiamine 1g/L in a citrate-phosphate buffer and the peroxidase had maximum activity at pH = 6.0, T = 25°C using pyrogallol 0.75% and hydrogen peroxide 0.8% as a substrate in phosphate buffer.

The must tyrosinase showed good affinity for the 4-methyl-pyrocatechol substrate, fact demonstrated by the kinetic parameters K_m = 0.16129 moli/L and V_{max} = 22.85714 OD_{420nm}/min. The laccase from white grapes must presented a good affinity for the N,N-dimethyl-1,4-phenylendiamine, fact demonstrated by the kinetic parameters K_m = 1.66 mM and V_{max} = 31.25 OD_{520nm}/min. The must peroxidase had a good affinity for the pyrogallol substrate with an optimum hydrogen peroxide concentration, fact demonstrated by the calculated kinetic parameters K_m = 23.2 mM and V_{max} = 4.54 OD_{420nm}/min.

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Effect of hydrogen cyanamide (Dormex) on bud break, yield and quality of Thompson Seedless grapes under the Egyptian Nile Delta conditions

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Keywords: table grapes; subtropical conditions; hydrogen cyanamide

ABSTRACT

This work studied the effect of hydrogen cyanamide on bud break and yield of *Vitis vinifera* L. cv Thompson Seedless. The grapevine was conducted on spur-pruned training system under subtropical conditions in the Nile Delta (Egypt). Dormex (49% hydrogen cyanamide) was spayed on vines in the winter of 2006, 2007 and 2008, right after pruning, in the concentrations of 2, 3 and 5%, at three moments (1, 8 and 15 January). Percentage of bud break, yield and total soluble solids were analyses separately. As a consequence, there was an increase in bud break percentage, yield and soluble solid in grape juice. It was observed that hydrogen cyanamide caused on earlier spouting. The results show that hydrogen cyanamide may be an efficient tool to promote grapevine bud break and yield table grapes in the mild winter conditions.

INTRODUCTION

The most widespread vine species *Vitis vinifera* L., is a temperate climate plant, adapted for warm summers and cold winters. In the traditional European grapevine cultivation regions, the cold autumn and winter are sufficient to satisfy the chilling requirement of the grapevine for bud dormancy release.

In the warmer cultivation regions of the world (Egypt, Israel, Brazil, Argentina, Chile, Peru, South Africa, Australia etc.), this chilling requirement is not necessarily met and the resulting spring growth is often not satisfactory.

The development of table grapes industry in Egypt is based on the production of an early maturing, high quality product to supply domestic markets. Table grape varieties grown in the Nile Valley and in some new desert conditions begin to mature from the last week of June to late in September (Omar and Girgis, 2004).

The winter chill hours received by grapevine in this area through the winter months often is not adequate and can result in an erratic budburst. This has implications for the management of the crop (Dokoozlian, 1999; Colapietra, 2004; Lombard et al., 2006).

Prolonged dormancy is considered to be major obstacle to economic production.

The application of the dormancy – breaking agent Dormex (hydrogen cyanamide) to vines is an essential management tool in countries with subtropical and tropical conditions (Sourial et al., 1994; Rizk and Rizk, 1994; Pires , 1999; Or et al., 2000; Omran et al., 2005; Burzo et al., 2005; Fregoni, 2005; Potjanapimon et al., 2007; Muthaseb and Ghnaim, 2008; Perez et al., 2008).

The effect of hydrogen cyanamide varies according to the concentration, time of application, climatic conditions, and cultivar, among many factors that may have influence on it.

The aim of this 3 year study was to evaluate the effects of different concentration and times of application of hydrogen cyanamide and grapevine bud break and yield of Thompson Seedless cultivar.

MATERIAL AND METHODS

The experiment was conducted from 2006 to 2008 in a private vineyard in Tanta city apart at El-Gharbia Governorate from Egypt (latitude 30º49', longitude 30º56' E Gr., altitude 6 m).

The investigation was carried out on 15 years old Thompson Seedless grapevines planted at 2x2m in a loamy clay soil, flood irrigation and spur pruned training system.

The commercial product (Dormex) used contained 49% of hydrogen cyanamide (H_2CN_2), and Triton was added to a solution at a concentration of 0.2%, as a wetting agent. The vines were sprayed with the solution till runoff, after pruning.

Experimental design was completely randomized, with three treatments (2, 3 and 5% of Dormex), comparatively with control (water spraying), and three application moments (1, 8 and 15 January).

The treatments were as the following: 9 treatments (3 concentrations x 3 dates of application) x 3 replicates x 6 plants/replicate.

The variables studied were percentage of bud break, yield and total soluble solide. Percentage of bud break was measured in the middle of Mars (on 15 Mars) and yield at the end of July.

RESULTS AND DISCUSSIONS

The results obtained in this research have shown the hydrogen cyanamide had a significant effect on the percentage of bud break (table 1).

The results concerning the percentage of bud break show that increasing the applied concentration of hydrogen cyanamide from 0.0% (control) up to 5% it was associated with progressive increment of this parameter.

The highest percentage of bud break was obtained with 5% H_2CN_2, applied in the first week of January (77.6-83.7%), and the lowest to the control vines (65.4%).

The bud break of vines treated with hydrogen cyanamide was anticipated by two weeks (15 Mars), comparatively to the control (29 Mars).

With the bud break increasing there was a yield increasing at all concentrations of H_2CN_2 (table 2).

The yield was comprised between 8.95 and 12.00 kg/vine after hydrogen cyanamide treatment in all three experimental years and the three moments of application, comparatively with the control (6.20-7.85 kg/vine).

Increased yields of hydrogen cyanamide treated vines were due to increased weight of cluster, weight of 100 berries, and increased number of cluster per vine.

The influence of hydrogen cyanamide on grapevine yield has been attributed to its effect on the level of bud break: a high level of bud break would lead to an increased shoot number and to high yield.

The data presented in table 3 show a significant increase of total soluble solid percentage after the applications of H_2CN_2 treatments at three concentrations and three times of applications.

The lowest values of total soluble solid were recorded by the control treatment (17.8 %; 18.10 % and 18.40 %).

The highest total soluble solid in berry juice was obtained by 5% hydrogen cyanamide applied in the third week of January: 21.90 %; 20.70 % and 21.73 %.

CONCLUSIONS

1. The interaction of the two factors considered (hydrogen cyanamide concentration and application moment) determined a series of physiological and biochemical modifications of vegetative growing bud behaviour, yield and grape quality.

2. The use of H_2CN_2 were shown to be an important tool for obtaining on earlier, more even and higher bud breaking percentage, a higher yield, quality and precocity.

3. Taking into account the various advantages of H_2CN_2 application on the Thompson Seedless cultivar within the subtropical conditions in the Nile Delta (Egypt), we

recommended the application of 5% concentration of Dormex (49% active ingredient) treatment after pruning during the first week of January.

4. This practice is indispensable for maintaining economic production of table grapes in this region.

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TABLES

Table 1. Effect of hydrogen cyanamide treatment on the percentage of bud breaks (2006-2008)

Data of sprayng	Concen-tration (%)	Percentage of bud break (%)					
		2006		2007		2008	
		15.03	29.03	15.03	29.03	15.03	29.03
1.01	0	18.9^{d}	61.2	15.4^{c}	58.7	18.2	65.4
	2	71.1^{c}	-	69.7^{b}	-	74.5^{bc}	-
	3	73.8^{ab}	-	72.4^{ab}	-	75.6^{bc}	-
	5	81.3^{a}	-	77.6^{a}	-	83.7^{a}	-
	F=	33.18**	0.0	19.18*	0.0	15.47**	0.0
	LSD 0.05 =	2.57	-	4.59	-	9.45	-
8.01	0	16.5^{d}	57.8	15.9^{b}	54.3	20.2^{d}	64.9
	2	70.9^{c}	-	68.5$^{a.b}$	-	72.8^{bc}	-
	3	72.6^{ab}	-	70.2$^{a.b}$	-	72.5^{bc}	-
	5	80.7^{a}	-	77.0^{a}	-	82.7^{a}	-
	F=	33.71**	0.0	24.58*	0.0	16.48**	0.0
	LSD 0.05 =	1.94	-	2.30	-	0.30	-
15.01	0	16.5^{c}	57.8	17.9^{c}	55.4	19.4^{d}	66.5
	2	69.8^{ab}	-	65.7^{b}	-	70.2^{bc}	-
	3	71.4^{a}	-	69.9^{ab}	-	71.8^{bc}	-
	5	80.2^{a}	-	76.5^{a}	-	81.5^{a}	-
	F=	19.76*	0.0	17.48*	0.0	19.47**	0.0
	LSD 0.05 =	2.79	-	4.81	-	1.6	-

- within each variable, and for each column, means followed by the some letter do not significantly differ at $p<0.05$

-$^{*, **}$: significant at $p < 0.05$, < 0.01

Table 2. Effect of spraying hydrogen cyanamide treatments on yield (kg/vine) of Thompson Seedless grapevines during 2006, 2007 and 2008 seasons

Year	Concen-tration (%)	Date of spraying			Control
		01.01	8.01	15.01	
2006	2	10.25 ^{bc}	10.10 ^{bc}	10.00 ^{b}	7.50
	3	11.22 ^{bc}	10.75^{bc}	10.60^{ab}	
	5	11.53 ^{a}	11.10 ^{a}	10.95 ^{a}	
	F=	15.58*	21.48*	21.47*	-
	LSD 0.05=	0.87	0.87	0.14	-
2007	2	9.25 ^{bc}	9.10 ^{bc}	8.95 ^{c}	6.20
	3	9.70^{bc}	9.25bc	9.10 ^{ab}	
	5	9.85 ^{a}	9.60 ^{a}	9.30 ^{ab}	
	F=	14.58*	36.26**	11.58*	-
	LSD 0.05=	0.03	0.08	0.03	-
2008	2	11.50 ^{bc}	11.45 ^{bc}	11.20^{bc}	7.85
	3	11.85 ^{bc}	11.50 ^{bc}	11.45^{bc}	
	5	12.00 ^{a}	11.75 ^{a}	11.60 ^{a}	
	F=	25.48*	25.89*	2.15*	-
	LSD 0.05=	0.05	0.16	0.65	-

- within each variable, and for each column, means followed by the same letter do not significantly differ at $p < 0.05$.

- *, **: significant at $p < 0.05$, < 0.01

Table 3. Effect of time application and concentration of hydrogen cyanamide treatments on total soluble solid content in berry juice (%) (2006-2008)

Time of application	Concentration (%)	Total soluble solid content (%)		
		29.07.06	29.07.07	29.07.08
01.01	0	18.24^{b}	17.90^{b}	17.80^{c}
	2	19.60^{ab}	19.20^{a}	20.00^{b}
	3	19.90^{ab}	19.40^{a}	20.30^{ab}
	5	20.93^{a}	20.20^{a}	21.40^{a}
	F=	4.65*	10.39**	14.45**
	LSD 0.05=	1.67	0.96	1.29
08.01	0	18.30^{b}	18.00^{b}	18.10^{c}
	2	19.90^{b}	19.40^{a}	20.50^{b}
	3	20.10^{b}	19.90^{a}	20.50^{b}
	5	21.10^{a}	20.40^{a}	21.50^{a}
	F=	17.52***	6.02*	33.00***
	LSD 0.05=	0.90	1.37	0.82
15.01	0	18.30^{c}	18.10^{c}	18.40^{b}
	2	20.10^{b}	19.63^{b}	21.00^{a}
	3	20.40^{b}	20.50^{ab}	20.90^{a}
	5	21.90^{a}	20.70^{a}	21.73^{a}
	F=	24.47***	14.65**	8.52**
	LSD 0.05=	0.97	1.08	1.62

- within each variable, and for each column, means followed by the same letter do not significantly differ at $p < 0.05$.
- *, **, ***: significant at $p < 0.05$, < 0.01,<0.001

Study concerning authenticity and typicity of wines obtained from Fetească Neagră grape variety

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ABSTRACT

Wines' authenticity and typicity is a difficult but important problem that can be solved by a correct quantification of a large segment of aspects, starting with vine cultivation conditions and ending with ways of selling the wine. Establishing methods of wines' authenticity and typicity are represented by the complex of all experimental and sensorial techniques that, by data processing, confirm or infirm the characteristics of a certain wine. This study has as main objective obtaining data referring to the evaluation of authenticity and typicity of red wines obtained from Fetească neagră grape variety, of three Romanian vineyards (Panciu, Dealu Bujorului, Uricani-Iaşi and Copou-Iaşi), through different maceration-fermentation procedures (traditional maceration, thermo-maceration, roto-maceration and carbonic maceration). Identification of anthocyans in wines made from Romanian traditional grape variety Fetească neagră (*Vitis vinifera L.*) was carried out and their profile was determined by high-performance liquid chromatography using a HP 1100. The dependence of anthocyans profile and specific characteristics from different maceration treatments was investigated and results indicate that the different maceration treatments exert important differences on the anthocyans' content and important variations in the colour and composition of Fetească neagră wines. The different kinds of maceration and the vineyards' location determine different influences to the participation percentage of each anthocyan in the specific profile of Fetească neagră wine.

INTRODUCTION

Anthocyans are pigments of red, blue and purple colours, mainly occurring in cellular vacuoles of grape skin [Odăgeriu et al, 2007]. Anthocyans are important compounds for characterization of red grape varieties; they are chemical markers in distinguishing varietals red wines [Zamfir et al, 2008]. It is known that the mutual relations of anthocyans (the anthocyans profile) belongs to the vine variety, even though their absolute content in ripe grapes varies a lot and depends on factors that concern the climatic factors, such as intensity of light and temperature [Odăgeriu et al, 2008]. Although the wine anthocyans composition is firstly determined by the genetic factor of the grape sort, the vinification parameters also have an important impact. It was shown that the maceration parameters have a significant influence on extraction of anthocyans from grape skins. The conditions of maceration, fermentation and maturation of wine influence the anthocyans composition, which is very significant, because the total concentration and composition of anthocyans determine the colour of red wines [Cotea et al, 2007].

Fetească neagră is a Romanian autochthonous red variety of *Vitis silvestris*, which acquires its superior quality in the Iasi, Dealu Bujorului and Panciu vineyards where wine with a protected geographic origin are produced. This grape variety is very important for production of high-quality red wines.

The aim of this study consist in evidencing the influence of different maceration-fermentation technologies as well of different arias of grapes production upon authenticity and typicity of wines obtained from Fetească neagră grape sort.

Identification of anthocyanins was performed by the HPLC method detection.

MATERIALS AND METHODS

The experiments were done during September 2006 – May 2007, at the Oenological Research Centre of the Romanian Academy, Iasi branch and at the Oenology Laboratory of the University of Agricultural Studies and Veterinary Medicine "Ion Ionescu de la Brad" Iaşi.

Vinification was carried out on 1000 kg of the Fetească neagră grape variety by random sampling in the four vineyards. The grapes were harvested at the full maturity.

After destemming and crushing three quarters of the total quantity- vineyard, pectolitic enzymes were added to better extract the color. Maceration was performed in four ways: the traditional fashion, roto-tanks maceration, thermo-maceration and carbonic maceration.

Treatment 1 (V1). Classical maceration: 50 kg of pomace was kept in static vessels, selected yeasts for fermentation were added, the cap was punched 6 times / day, for 3 days. After pressing, the wine was transferred into classic glass vessels, to complete its alcoholic and malolactic fermentation. The maceration process proceeded at a temperature of maximum 29 °C.

Treatment 2 (V2). Thermo-maceration: The pomace (50 kg) was divided in three. Two thirds of the obtained must was heated up to 80 °C and then transferred onto the pomace, bringing the temperature of the total mass up to 60 °C. When everything cooled, a 3 day maceration followed, with 6 times / day homogenization. After pressing, the wine was transferred into classic glass vessels, to complete its alcoholic and malo-lactic fermentation.

Treatment 3 (V3). Roto-tanks maceration: 50 kg of pomace was kept in roto-tanks, selected yeasts for fermentation were added, the content was homogenized 6 times/ day for 5 minutes, clockwise and anti-clock wise. The roto-tanks maceration lasted for 3 days. After pressing, the wine was transferred into classic glass vessels, to complete its alcoholic and malolactic fermentation. The maceration process proceeded at a temperature of maximum 29 °C.

Treatment 4 (V4). Carbonic maceration: The selected grapes (50 kg), the remaining fourth of the total quantity were transferred into a mini carbonic maceration tank. This had at the bottom a grill under which fermenting must of Feteasca neagra (with the same physical-chemical characteristics as the one above) was kept. The grapes are positioned without being crushed. After 12 days, the obtained mass is destemmed and pressed; fermenting yeasts are added, the wine being transferred into classic glass vessels, to complete its alcoholic and malo-lactic fermentation

After the maceration treatment was completed, the wine was decanted from the pomace, the free SO_2 was kept at 20 mg/L, sterile filtered and transferred into 0.75 L bottles, closed with cork stoppers and left at cellar temperature (8 °C).

Each wine, after decarbonatation, was analysed: alcoholic concentration, total acidity, volatile and real acidity, free and total sulphur dioxide, reductive sugars, non-reductive extract, total phenolic compounds and anthocyans content were done according to present standards (***2009) and specific literature.

Chromatic parameters of the analysed wine samples were calculated according to CIE Lab 76 method, taking into consideration the registered absorption spectrum for each wine sample (Odăgeriu et al., 2007, 2008; Zamfir et al., 2008; Zamfir, 2009). A Specord S200 spectrometer and calculator were used. An automated registration and classification of absorption spectrums was copied in a file. To minimize analysis errors when determining absorbencies, specific vials were used, with an optical characteristic of 1.0 cm. The spectres were processed with a soft realised within the research group, for obtaining the chromatic parameters (L, a, b, C, H°), colour intensity (I) and hue (N).

A computerised simulation of each wine's colour was done with the help of software Digital Colour Atlas 3.0, based on the calculated chromatic parameters, in order to underline colour differences and classify the wines based on their sensorial perception.

The colour differences were also calculated with the ΔE 2000 formula, in order to observe if the wines obtained from different grape varieties but through the same maceration-fermentation method can be differentiated according to chromatic parameters. The International Commission on Illumination (CIE) defines the measurable distance between two colours ΔE*ab (or ΔE*, dE*, dE, "Delta E"), where delta Δ is a Greek letter used to note differences and where E represents „sensation". The difference or the distance between two colours is a metrical measure of interest in colour sciences. It allows notions' quantification that would otherwise be described only in adjectives.

It was considered that, for values of ΔE smaller that the unity, the colours of two wines are seen as identical, or otherwise said, they cannot be sensorial differentiated.

Analysis of anthocyans was performed in a Hewlett-Packard HP-1100 high-performance liquid chromatograph. The injected sample volume was 20 μL. Separation of anthocyans was carried out at the column C18 (250 mm × 4.6 mm, 5 μm particle size) at 25 °C. The chromatographic method conditions were as follows: mobile phase flow rate: 1.2 mL/min; DAD detection in the visible at 518 nm; mobile phase A: water:formic acid:acetonitrile 87:10:3; mobile phase B: water:formic acid:acetonitrile 40:10:60, with the elution program being a gradient starting from 6 % to 60 % to mobile phase B for 35 min. Anthocyans were identified in correlation to the retention time, elution sequence, and UV-VIS spectral properties.

RESULTS AND DISCUSSION

One can notice the different quality classification of wines regarding maturation degree of the grapes at harvest, observing the fact that the weakest results were obtained in Fetească neagră wines processed by carbonic maceration (Tab. 1).

Classification of the obtained wines according to their colour is similar to the order given by tracings of the absorbtion curves of the studied wines.

Analysing the colour differences obtained with the ΔE 2000 formula, the most rigorous one, it can be observed that the majority of wines can be sensorial differenced with some exceptions: variant F.N.-V1-Dealu Bujorului and variant F.N.-V3-Dealu Bujorului and F.N.-V1-Adamachi and variant F.N.-V2-Dealu Bujorului with variant F.N.-V2-Adamachi (Fig. 1).

Concerning the total phenolic compounds and anthocyans content of Fetească neagră wines, one can observe that they present very close values, in the case of wines that cannot be sensorial differenced, bearing in mind that total phenolic compounds and anthocyans take part in forming red wine's (Tab. 1).

The order established by the values of total phenolic compounds of studied wines is the same with the hierarchy established based on anthocyans' content, the order established by absorption spectrums of each wine and the one drawn by digital simulation of wines' color (Tab. 2).

Area percentages values of each main anthocyan are the only ones based on which the studied wines can be differenced, with some exceptions like F.N.-V1-Dealu Bujorului, F.N.-V1-Adamachi and F.N.-V3-Dealu Bujorului. These presented the same value (0.45 ± standard deviation for each wine sample) when the ratio between the sum of participation percentage of acetilated anthocyans and the sum of participation percentage of cumaril anthocyans was calculated (Tab. 3). The allure of the three chromatograms is very similar, situation explained by the use of the same grape variety, respectively Fetească neagră. These wines are the ones that were mentioned above as having no difference from a sensorial point of view, differences calculated with ΔE 2000 formula.

All the other variants were identified as different from a sensorial point of view, they have different values of the ratios between the sum of participation percentage of acetilated anthocyans and the sum of participation percentage of cumaril anthocyans, as well as different values of the ratios of the area percentages' sum of monoglicosidic anthocyans and area percentages' sums of acetilated and cumaril anthocyans. Even though the chromatograms had similar alllures, they could be differentiated as shown above.

CONCLUSIONS

Using different techniques of determination of certain characteristics and components of red wines lead to obtaining similar results concerning classification and differentiation of Fetească neagră wines from three Romanian vineyards, processed by different maceration-fermentation procedures. The obtained analytical profile is unique for each wine and can be safely used in order to determine authenticuty and typicity of wines.

Concerning wines' typicity, one can note that, by using some maceration-fermentation procedures that are adequate to compositional characteristics and phyto-sanitary parameters of crops, wines that „simulate" very well the typicity prints of different wines either from other vineyards or by other maceration-feremementation technologies.

Of course, there are also other instrumetntal determinations, that, together with sensorial evaluations are useful and can generate high precision results, but they cannot be used by themselves. Wine's authentocity and typicity appreciation is strongly connected to all factors that can influence the physical-chemical and sensorial state of the studied wines.

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TABLES AND FIGURE

Table 1. Main composition characteristics of wines obtained from Fetească neagră

No	Grape variety	Alcohol conc. (%vol.)	Total acidity (g/L) $C_4H_6O_6$	Volatile acidity (g/L) $C_2H_4O_2$	pH	Reduc sugar. (g/L)	Non-reduc. extract (g/L)	Anthoc. content (mg/L)	Total phenolic comp. (g/L)
1	F.N.-V1-Panciu	11.67	7.58	0.49	3.56	24.92	21.04	348	2.44
2	F.N.-V1-D. Bujorului	12.19	7.23	0.21	3.36	4.35	21.45	400	2.60
3	F.N.-V1-Adamachi	11.07	7.66	0.14	3.45	3.15	21.85	393	2.58
4	F.N.-V1-Uricani	11.93	8.19	0.17	3.45	5.39	22.21	307	2.29
5	F.N.-V2-Panciu	12.61	8.53	0.49	3.60	8.74	25.16	381	2.54
6	F.N.-V2-D. Bujorului	12.24	7.31	0.17	3.36	4.08	22.02	405	2.63
7	F.N.-V2-Adamachi	11.17	7.66	0.21	3.44	3.12	22.18	400	2.62
8	F.N.-V2-Uricani	11.81	8.62	0.17	3.44	3.53	23.87	329	2.38
9	F.N.-V3-Panciu	12.37	7.58	0.45	3.64	11.61	23.02	359	2.51
10	F.N.-V3-D. Bujorului	11.98	7.31	0.21	3.38	3.75	21.55	399	2.60
11	F.N.-V3-Adamachi	11.17	7.66	0.21	3.43	3.60	21.90	374	2.53
12	F.N.-V3-Uricani	12.04	8.27	0.17	3.45	3.04	22.26	302	2.26
13	F.N.-V4-Panciu	11.66	6.88	0.94	3.55	4.93	16.67	234	1.83
14	F.N.-V4-D. Bujorului	10.23	5.31	0.31	3.45	1.23	14.67	289	2.18
15	F.N.-V4-Adamachi	10.50	5.31	0.66	3.66	43.72	74.87	239	1.89
16	F.N.-V4-Uricani	11.62	5.31	0.38	3.90	10.07	33.66	219	1.71

Table 2. Values of chromatic parameters of wines from Fetească neagră

No.	Grape variety	Colour computerised simulation	L	a	b	C	H	I (1 cm)	N
1	F.N.-V2-D. Bujorului		23.29	56.04	37.06	67.18	33.48	8.60	0.43
2	F.N.-V2-Adamachi		24.16	56.57	36.12	67.12	32.56	8.53	0.44
3	F.N.-V1-D. Bujorului		24.25	57.19	39.18	69.32	34.41	8.19	0.44
4	F.N.-V3-D. Bujorului		24.39	56.69	38.85	68.72	34.42	7.63	0.46
5	F.N.-V1-Adamachi		25.51	57.60	39.16	69.65	34.21	7.24	0.46
6	F.N.-V2-Panciu		27.47	59.69	40.59	72.18	34.22	6.97	0.50
7	F.N.-V3-Adamachi		28.63	59.05	36.35	69.34	31.62	5.73	0.52
8	F.N.-V3-Panciu		31.23	60.16	33.46	68.84	29.08	5.43	0.55
9	F.N.-V1-Panciu		33.45	62.50	37.93	73.11	31.25	5.08	0.56
10	F.N.-V2-Uricani		37.05	61.47	31.09	68.89	26.83	4.34	0.57
11	F.N.-V1-Uricani		41.55	61.99	29.71	68.74	25.60	3.79	0.58
12	F.N.-V3-Uricani		42.85	64.31	29.13	69.80	22.87	3.62	0.58
13	F.N.-V4-D. Bujorului		45.68	62.69	27.49	68.45	23.68	3.08	0.64
14	F.N.-V4-Adamachi		56.55	47.91	22.43	52.90	25.09	2.18	0.68
15	F.N.-V4-Panciu		58.59	45.89	18.28	49.03	21.24	1.68	0.75
16	F.N.-V4-Uricani		62.26	44.06	13.78	46.16	17.36	0.87	1.01

Nr. crt.	SOIUL	Nr crt	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	**F.N.-V1-Dealu Bujorului**	1	0,00	0,93	7,39	15,01	1,07	1,35	2,47	11,16	0,17	3,75	6,34	16,41	18,95	29,44	32,16	36,91
2	**F.N.-V1-Adamachi**	2	0,93	0,00	6,48	14,13	1,79	1,60	1,57	10,29	0,86	2,91	5,52	15,53	18,07	28,60	31,33	36,11
3	**F.N.-V1-Panciu**	3	7,39	6,48	0,00	7,89	7,98	7,28	5,08	4,29	7,32	3,88	2,50	9,27	11,83	22,81	25,61	30,38
4	**F.N.-V1-R2-Uricani**	4	15,01	14,13	7,89	0,00	15,42	14,64	12,88	4,00	14,92	11,33	8,93	1,49	4,02	15,54	17,98	21,90
5	**F.N.-V2-Dealu Bujorului**	5	1,07	1,79	7,98	15,42	0,00	0,87	3,33	11,52	1,08	4,17	6,63	16,80	19,35	29,89	32,56	37,27
6	**F.N.-V2-Adamachi**	6	1,35	1,60	7,28	14,64	0,87	0,00	2,95	10,72	1,31	3,42	5,81	16,02	18,58	29,23	31,89	36,60
7	**F.N.-V2-Panciu**	7	2,47	1,57	5,08	12,88	3,33	2,95	0,00	9,10	2,42	2,08	4,57	14,27	16,81	27,38	30,17	34,98
8	**F.N.-V2-R2-Uricani**	8	11,16	10,29	4,29	4,00	11,52	10,72	9,10	0,00	11,07	7,43	4,95	5,35	7,99	19,47	22,09	26,50
9	**F.N.-V3-Dealu Bujorului**	9	0,17	0,86	7,32	14,92	1,08	1,31	2,42	11,07	0,00	3,68	6,26	16,32	18,86	29,33	32,05	36,80
10	**F.N.-V3-Adamachi**	10	3,75	2,91	3,88	11,33	4,17	3,42	2,08	7,43	3,68	0,00	2,61	12,72	15,30	26,16	28,88	33,66
11	**F.N.-V3-Panciu**	11	6,34	5,52	2,50	8,93	6,63	5,81	4,57	4,95	6,26	2,61	0,00	10,28	12,91	24,07	26,75	31,49
12	**F.N.-V3-R2-Uricani**	12	16,41	15,53	9,27	1,49	16,80	16,02	14,27	5,35	16,32	12,72	10,28	0,00	2,74	14,48	16,79	20,57
13	**F.N.-V4-Dealu Bujorului**	13	18,95	18,07	11,83	4,02	19,35	18,58	16,81	7,99	18,86	15,30	12,91	2,74	0,00	11,63	13,81	17,46
14	**F.N.-V4-Adamachi**	14	29,44	28,60	22,81	15,54	29,89	29,23	27,38	19,47	29,33	26,16	24,07	14,48	11,63	0,00	2,78	6,74
15	**F.N.-V4-Panciu**	15	32,16	31,33	25,61	17,98	32,56	31,89	30,17	22,09	32,05	28,88	26,75	16,79	13,81	2,78	0,00	4,00
16	**F.N.-V4-R2-Uricani**	16	36,91	36,11	30,38	21,90	37,27	36,60	34,98	26,50	36,80	33,66	31,49	20,57	17,46	6,74	4,00	0,00
Nr. crt.	SOIUL	Nr crt	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Fig. 1. Nomogram of colour difference calculation between studied wines by ΔE 2000.

Table 3 Aria percentage of the nine main anthocyans (% anthocyans ± standard deviation) of wines obtained from Fetească neagră grape sort

No.	Grape variety	Del-3-gl [%]	Cya-3-gl [%]	Pt-3-gl [%]	Po-3-gl [%]	Mv-3-gl [%]	Po-3-gl-acet [%]	Mv-3-gl-acet [%]	Po-3-gl-cum [%]	Mv-3-gl-cum [%]	Σgl/(Σacet+Σcum)	Σacet/Σcum
1	F.N.-V1-Panciu	4,10±0,16	0,37±0,05	10,80±1,35	1,63±0,52	71,21±8,60	0,77±0,01	2,81±0,2	1,49±0,23	6,81±1,98	7,42±0,02	0,43±0,01
2	F.N.-V1-D. Bujorului	3,12±0,09	0,25±0,12	8,43±1,65	0,92±0,45	74,90±10,23	0,99±0,08	2,86±0,32	1,25±0,62	7,28±1,74	7,08±0,00	0,45±0,00
3	F.N.-V1-Adamachi	5,87±0,19	0,35±0,01	11,96±1,23	1,51±0,45	63,80±9,60	2,14±0,02	2,99±0,12	1,23±0,21	10,16±2,01	5,05±0,00	0,45±0,00
4	F.N.-V1-Uricani	4,40±0,10	0,28±0,23	9,87±2,45	1,22±0,09	70,19±8,84	1,26±0,23	3,80±1,2	1,12±0,12	7,86±1,76	6,12±0,03	0,56±0,01
5	F.N.-V2-Panciu	6,30±0,14	0,92±0,03	13,77±1,98	5,80±0,45	64,21±10,23	0,91±0,10	2,00±0,18	1,64±0,34	4,44±1,18	10,12±0,01	0,48±0,01
6	F.N.-V2-D. Bujorului	4,96±0,21	0,21±0,21	9,71±1,12	2,29±0,67	73,07±10,38	0,31±0,06	3,36±0,25	1,60±0,74	4,50±1,02	9,24±0,01	0,60±0,00
7	F.N.-V2-Adamachi	7,69±0,12	0,56±0,05	14,14±1,26	4,04±0,37	62,18±9,89	1,55±0,08	2,23±0,13	1,62±0,35	5,99±1,15	7,78±0,02	0,50±0,01
8	F.N.-V2-Uricani	5,86±0,32	0,62±0,38	11,67±2,34	4,33±0,62	66,62±9,95	0,64±0,28	4,09±1,89	1,48±0,45	4,69±1,67	8,17±0,02	0,77±0,01
9	F.N.-V3-Panciu	3,57±0,18	0,38±0,08	10,30±1,45	1,11±0,65	72,40±9,50	1,09±0,09	2,55±0,25	1,19±0,21	7,41±2,10	7,17±0,01	0,42±0,02
10	F.N.-V3-D. Bujorului	3,45±0,12	0,69±0,23	8,46±1,87	0,93±0,29	73,96±12,23	1,10±0,12	2,79±0,27	0,94±0,59	7,68±1,45	6,99±0,00	0,45±0,00
11	F.N.-V3-Adamachi	4,77±0,15	0,90±0,01	11,91±1,32	1,20±0,35	67,55±8,56	1,51±0,05	2,64±0,20	0,95±0,03	8,58±1,32	6,31±0,03	0,44±0,00
12	F.N.-V3-Uricani	4,40±0,21	0,31±0,27	10,08±2,98	1,25±0,23	73,26±12,35	0,77±0,10	3,56±1,09	0,77±0,23	5,61±1,44	8,34±0,01	0,68±0,01
13	F.N.-V4-Panciu	0,00±0,00	0,00±0,00	3,87±0,65	0,00±0,00	96,13±2,57	0,00±0,00	0,00±0,00	0,00±0,00	0,00±0,00	0,00±0,00	10,00±0,00
14	F.N.-V4-D. Bujorului	0,96±0,18	0,00±0,00	4,29±1,34	0,50±0,06	80,71±3,57	0,59±0,14	2,92±0,34	0,66±0,68	9,38±1,61	6,39±0,01	0,35±0,02
15	F.N.-V4-Adamachi	4,36±0,11	0,09±0,01	9,77±1,45	1,85±0,54	74,84±10,02	0,66±0,10	2,22±0,15	0,53±0,06	5,68±1,56	10,01±0,04	0,46±0,02
16	F.N.-V4-Uricani	3,87±0,12	0,48±0,34	7,24±1,89	3,74±0,54	70,56±11,10	0,25±0,09	7,51±2,23	1,63±0,1	4,71±1,39	6,09±0,02	1,22±0,02

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Contributions to the knowledge of synanthropic flora from the Mioveni area

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ABSTRACT

The research of synanthropic plant species from the urban environment offers information about their relation with the anthropic environment in which they live, on one hand, and on the other hand, they can be used as indicators of the pollution level and pollution effect on the environment. The research was performed in the city of Mioveni from June 2008 to may 2009 to compile an inventory of the flora, to establish biological and ecological spectra, the phytogeographic elements and their economic importance. The fresh above ground phytomass of the synanthropic plant species from 10 sample location, was determined. It was identified 188 species (from 27 orders and 36 families). The most species are from the following families: Asteraceae (40 species), Poaceae (23 species), Fabaceae (16 species) and Brassicaceae (15 species). The biological and ecological categories spectrum shows the high percentages of hemicryptophytes (32%) and therophytes (25%), eutrophic species (56%), xeromesophilous-mesophilous species (30%) as well as **eurytherm** and euryacide species. The phytogeographic spectrum shows a high number of species from Eurasia (88 species). From the total number of identified species 55% are **polyploid** and 30% (55 species) present economic importance. It was found that the fresh above ground phytomass varies between 340 g m^{-2} (*Lactuca serriola*) and 20 g m^{-2} (*Setaria viridis*), for a number of 32 species; 6 species are dominant through their phytomass (average values between 340 g m^{-2} and 200 g m^{-2}). The results enable us to estimate the value of the synanthropic plants as ecologic indicators in the Mioveni area.

INTRODUCTION

The synanthropic plants are plants related to the human activities. In the urban environment conditions the synanthropic plants can found in places like the green spaces, abandoned sites, around trees, in parking lots, along the walking and railroad lines and in the streets asphalt cracks. The study of synanthropic plants from the urban environment represents an important objective considering that those species can, on one hand, offer important information regarding their relationship with the environment in which they live (about their adaptation capacity to the conditions of the urban ecosystem and their ability to produce an offspring gradually better adapted to the environment) while, on the other hand, they can be good pollution indicators. Practical applications of similar studies include the urban zones management with respect to the nature preservation in the urban environment and the employment of the synanthropic plants as bio-indicators in the monitoring of the air quality (Cilliers and Bredenkamp, 2000; Chylinski and Fornal, 2005; Šilc and Košir, 2006). The aim of the present paper is to present the floral inventory of the synanthropic species at the Mioveni area, to establish the life forms, the phytogeographic elements and that of the ecologic categories according to climate factors – temperature, light, water – and edaphic factors – chemical elements, soil reaction. This enables us to estimate the value of the synanthropic plants as ecologic indicators in the Mioveni area. The Mioveni city is located in Romania’s central-south (North-West of Muntenia) in the Meridional sub-Carphatian at approximately 115 km from Pitesti, the county’s capital and at 125 km from the country’s capital, Bucharest city; 44°95′N and 24° and 95′E, with a surface of 51 ha and a population of

35.849 citizens (2008). It is neighbored in the north with village Titesti, in south with village Stefanesti, in the east with village Calinesti and in the west with village Darmanesti. First historical documented mentioning of the city was in 1485. Mioveni has a varied landscape, dominated by hills crossed by the large valleys of the three rivers: Doamnei, Targului and Argesel. The moderate climate allows for economic activities to be carried out all through the year. With respect to the vegetation, the city is located in an area with mixed plains and forest vegetation. The climate diagram reveals that, at the city's level, for the 2007-2008 periods, the absolute minimum temperature was -15.0°C and the absolute maximum 34.6°C; the average minimum of the coldest month was -6.3°C and the average maximum of the warmest month was 29.8°C; the multiannual daily average was 11.8°C. The multiannual monthly average for precipitations was 615.9 mm. The rainfall exceeding had values of 176 mm while its deficit reached 312 mm (Fig. 1). The city's economy has a pronounced industrial character strongly influenced by the industrial platform Dacia-Renault and that of I.C.N. Mioveni. The air quality is generally acceptable - the main pollution sources registered by the air monitoring stations are generated by the auto traffic. Water quality is in the class II and III, except for the minor unregistered sources which are in the class V.

MATERIAL AND METHODS

The research was performed during June 2008 – May 2009 and was carried out in two phases, one in the field and one in the laboratory. During the first phase in-field research was conducted from June to October 2008 and March to May 2009 to identify the synanthropic species in various phenological phases, collecting botanical material to confirm and/or identify its class in the laboratory conditions. During the second phase, the species identification was concluded – according to Ciocarlan (2000) and Popescu and Sanda (1998) - the vascular flora was catalogued, and the results from the work of both phases were interpreted. The synanthropic plants were listed by order and family following the "Romanian Flora" guidelines (Ciocarlan, 2000), each species being followed by a series of biological, phytogeographic and ecologic indicators having listed the place and the collection date, the number of chromosomes, its economic importance and its degree of presence in Mioveni. The fresh above ground phytomass of the synanthropic plants from the 10 sample location were determined with a one square meter metric frame. The plants were subsequently weighted grouped by species.

RESULTS AND DISCUSSION

Following the research were identified a number of 188 synanthropic plant species. Species were from 27 orders and 36 families and the family grouping is presented in fig. 2. Most species were from the following families: Asteracee (40 species), Poaceae (23 species), Fabaceae (16 species), Brassicaceae (15 species) and Lamiaceae (10 species). Other families were present with a smaller number of species (2-3) or even a single species (11 families) (Fig. 2). When analyzed from their life expectancy, was found that 71 species (38%) are annual, 13 species (7%) are biennial and 84 species (45%) are perennial. The remaining species (6%) were annual-biennial (1%), annual-biennial-perennial (1%) or biennial-perennial (2%) (Fig. 3). The biological spectrum for the researched area shows that most species were hemicryptophytes (32%), then therophytes (25%), geophytes (8%) and hemitherophytes (7%), while the chamaephytes making up only 3% of the total identified species and the phanerophytes participate with 2%. The other species are characterized as beeing hemitherophyte-hemicryptophyte (3%), therophyte-hemicryptophyte (2%) and therophyte-hemitherophyte (18%) (Fig. 4). Following the phytogeographic criteria, which makes reference to the geographic territory in which those plants can be found spontaneously, the plant species identified belong to the following categories of elements: European (67%), continental (9%), Pontic (4%), cosmopolitan (15%), adventive (5%). Were identified 88 species from Eurasia, which are predominant while the Atlantic-Mediterranean, Pontic, Pontic Mediterranean, Pontic-Balkanic, Pontic, Balkanic-Caucasian species are rare - only one species each (Fig 5).

Among the species of synanthropic plants identified found representatives of foreign species (alien plants) both archaeophytes as well as neophytes. Among the archaeophytes found were: *Agrostemma githago* L., *Cardaria draba* (L.) Desv., *Lamium amplexicaule* L., *Polygonum aviculare* L., *Sonchus arvensis* L., *Sonchus oleraceus* L., *Setaria viridis* (L.) Beauv., *Setaria pumilla* (Poiret) Schultes (Morariu, 1943, quoted by Chirila, 2001). From the neophytes, the most notable are: *Amaranthus retroflexus* L., *Ambrosia artemisiifolia* L., *Conyza canadensis* (L.) Cronq., *Erigeron annuus* (L.) Pers., *Galinsoga parviflora* Cav., *Xanthium italicum* Moretti, *Xanthium strumarium* L.. Two archaeophytes – *Cardaria draba* (L.) Desv. and *Portulaca oleracea* L. – are considered invasive species (Anastasiu and Negrean, 2005), as well as from the neophytes: *Conyza canadensis* (L.) Cronq., *Erigeron annuus* (L.) Pers., *Ambrosia artemisiifolia* L. and *Xanthium italicum* Moretti. *Agrostemma githago* L. is found on the Red List published for Romania (Anastasiu and Negrean, 2005).

The synanthropic plant species were analyzed by their ecologic criteria, in which case the species reaction to the main ecological factors was considered. By their ratting on the trophic scale the identified plants belong to the following categories: eutrophic (56%), mesotrophic (8%), oligotrophic (6%) and euritrophic species (3%). Other species were considered eutrophe-mesotrophe (9%), mesotrophe-eutrophe (8%) or oligotrophe-mesotrophe (6%) (Fig. 6). As far as the synanthropic plant species classification by their water needs, using the Ellenberg humidity scale with 7 grades (U_1-U_6, U_0), were observed that 22 species are xeromesophytes and 3 species are mesoxerophytes (U_2), 36 species are mesophytes (U_3), 7 species are mesohygrophytes (U_4), 4 species are hygrophytes (U_5) and 5 species are euriphytes. As placing a species in a category is at times difficult – given the fact that many species have either a great demand for water or the ability to resist water excess (Chirila, 2001) – the remaining species are characterized as xeromesophilous-mesophilous (56 species), mesophilous-mesohygrophilous (27 species) or other types that outline the high degree of adaptability of the synanthropic plants to humidity in the various urban environments (Fig. 7). With respect to their N need or their adaptation degree to the presence of this element, 68 of the identified synanthropic plant were nitrophytes. Species were classified according to Ellenberg's six grades scale for N. Most species (17%) belong in the N_3 category, 11% to the N_4 category, 11% to the N_2 category, 2% to the N_5 category and 1% to the N_1 category. As the degree of adaptability of a species to the presence of N can vary, the remaining nitrophilic plant species belong to the following categories: N_{1-2}, N_{2-3}, N_{3-4}, N_{4-5} (Fig. 8). By other ecologic characteristics analyzed (such as the Ca soil content) was observed that 18 species are calcicoles/calciphytes and 9 are calcifuges. Among the plant species analyzed were identified 2 phosphorus-loving plant species and 2 silicon-loving plant species, respectively 12 species of halophile, tolerable and facultative plants. The plant species classification on the scale by the acidity (pH level) shows that most species are euryacide (21%) and acidophytes; other species are characterized as acid-neutrophilic, neutro-basophilic or acidophilic-alkalophilic – the species affinity to a certain degree of acidity or alkalinity is quite relative (Chirila, 2001). With respect to the light factor (the light scale), most synanthropic plant species are heliophytes and heliosciophytes and by their temperature factor (the heat scale) most plants are eurytherms and subthermophytes (moderately thermophytes).

By their degree of polyploidy, the synanthropic plant species polyploid (54%) was more numerous than the diploid species (46%) which seem more adapted to the urban environment. The polyploidy species have a greater ecologic plasticity when compared to the diploid species, so they are more adaptable to the living environment in the cities. By their economic importance, many of the identified synantrophic plant species are important medicinal (26 species), some can serve as animal feed (13 species), other are toxic (11 specii), tinctorial (10 species), ornamental (5 species), nutritious (5 species) and melliferous (4 species). Although some synanthropic plants might have some economic values, most are unwanted and must be eradicated. There are over 40 types of pollen from those plants that can induce allergies. In the spring and the beginning of the summer many of the following allergies can be induced by the plant species: *Urtica sp., Plantago sp., Artemisia absinthium* L., *Artemisia vulgaris* L., *Ambrosia artemisiifolia* L. etc.

The fresh above ground phytomass of the synanthropic plants oscillated between 340g m^{-2} şi 20g m^{-2} for a number of 32 species. The dominant species (through their phytomass) in the 10 sample locations were, as follows: *L. serriola, C. intybus, C. arvense, E. vulgare, J. effusus, X. italicum* (with average phytomass values between 340 g m^{-2} şi 200 g m^{-2}) (Fig. 9). Those are eutrophic species (except for *J. effusus* which is a mesotrophe-oligotrophe), nitrophilic (except for *J. effusus* and *E. vulgare*), xeromesophilous-mesophilous, mesophilous-mesohygrophytes (*Xanthium italicum)* or mesohygrophytes (*J. effusus*). On taxonomic groups, the highest phytomass is produced by species from the Asteraceae families (11 species) and Poaceae (6 species), and by economic groups species from the Poaceae family (Fig. 10).

CONCLUSIONS

Following our research were identified in Mioveni a number of 188 synanthropic plant species. from 27 orders and 38 families. Most species were from the following families: Asteracee (40 species), Poaceae (23 species), Fabaceae (16 species) Brassicaceae (15 species). 71 species (38%) were annual, 13 species (7%) were biennial and 84 species (45%) were perennial. Most species were hemicryptophyte (32%) and therophytes (25%). Based on their areal, 67% of the synanthropic plant species identified were European and 88 species are from Eurasia. Among the identified species were foreign species of archaeophytes and neophytes, 6 of them being considerate invasive. On the trophic scale, most species were eutrophe (56%) and 76 plant species were nitrophytes, most of them (34%) belonging to the N_{3-4} category. On the humidity scale, most are xeromesophilous-mesophilous species (29.8%). On the acidity, heat and light scales the dominant species are euryacide (21%), eurytherms (21%), and, respectively, the heliophytes and heliosciophytes. The synanthropic plant species polyploid were more numerous (54%) than the diploid species (46%). 58 species had an economic importance. The fresh above ground phytomass of 32 synanthropic plants from 10 sample locations varied from 340 g m^{-2} for *Lactuca serriola* and 20 g m^{-2} for *Setaria viridis*.

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FIGURES

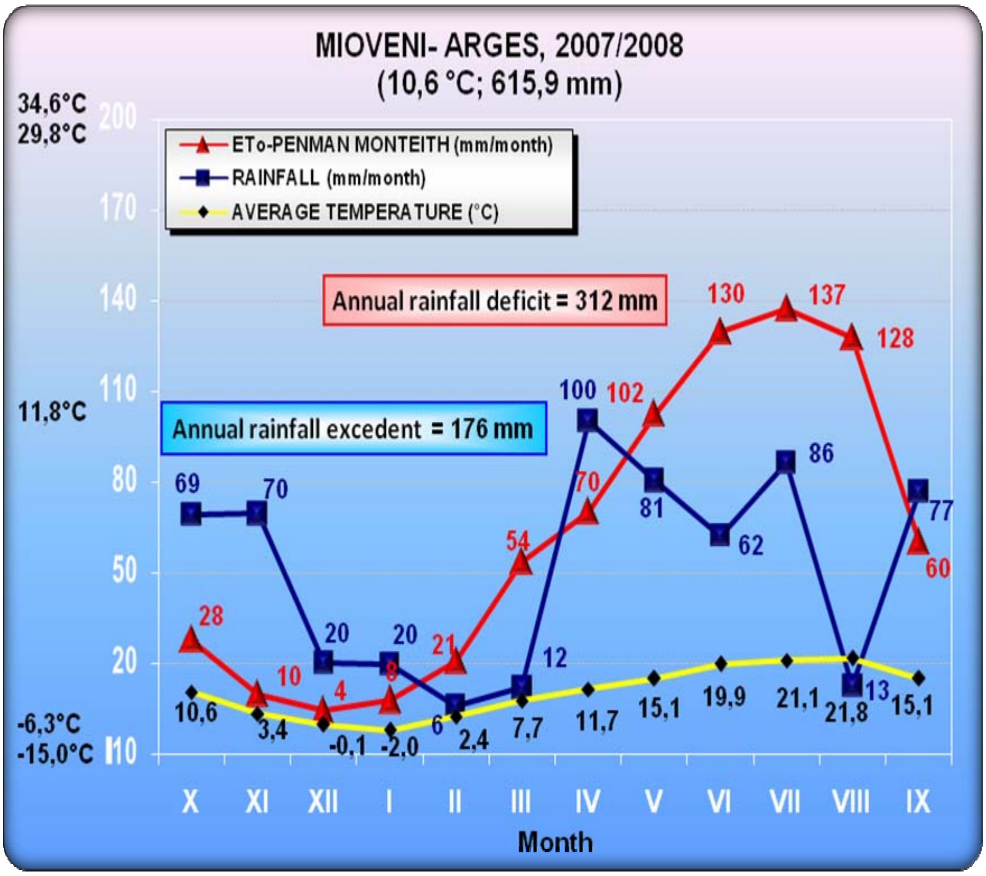

Fig. 1. The climate diagram for Mioveni

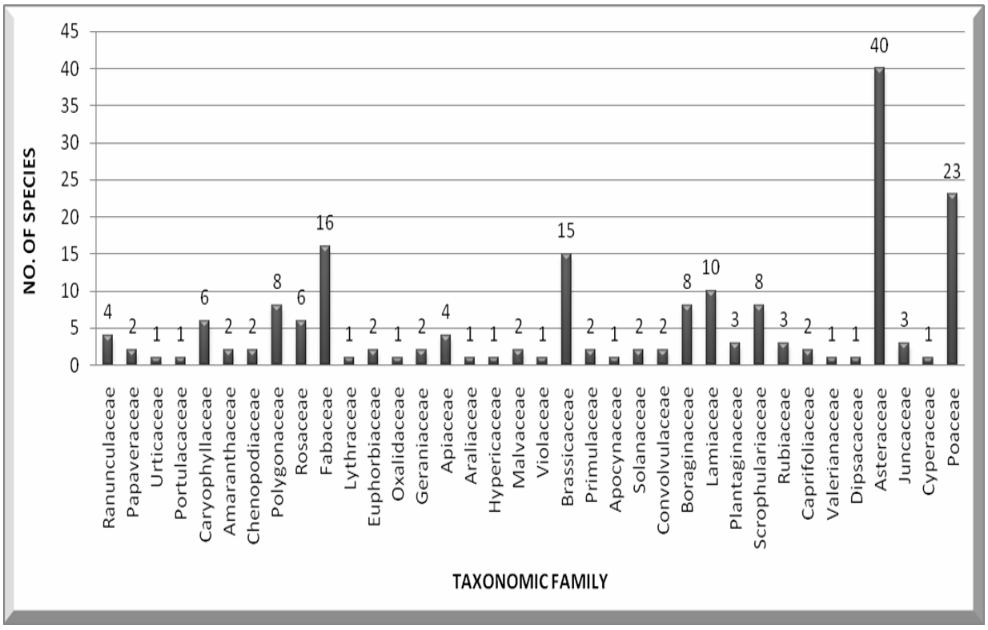

Fig. 2. Synanthropic plant species
repartition by family

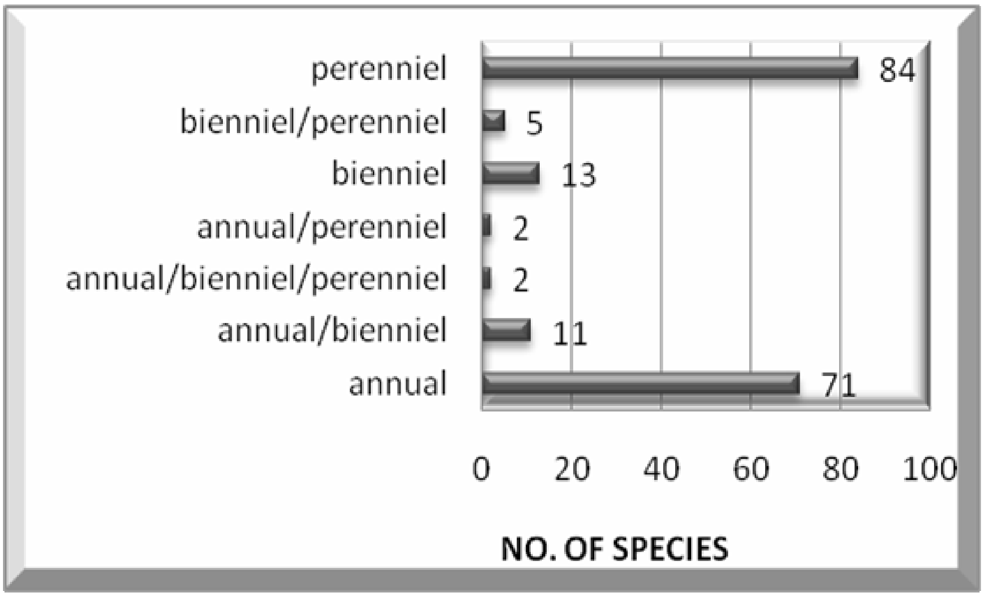

Fig. 3. Synanthropic plant classification by their life cycle

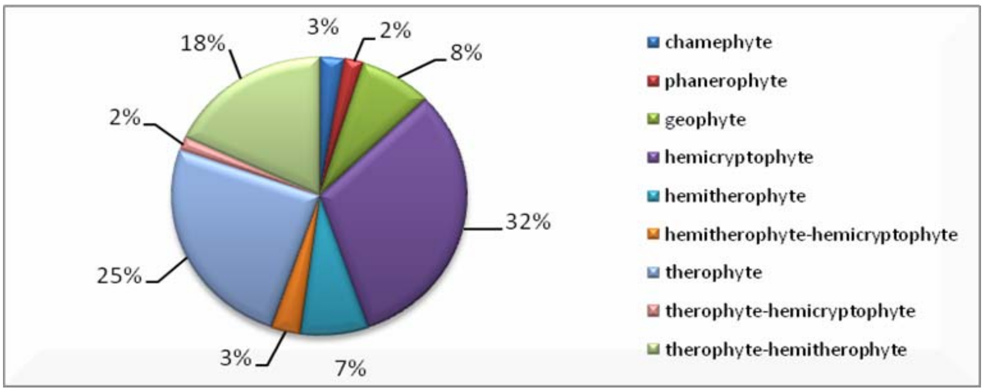

Fig. 4. Synanthropic plant classification by their biological forms

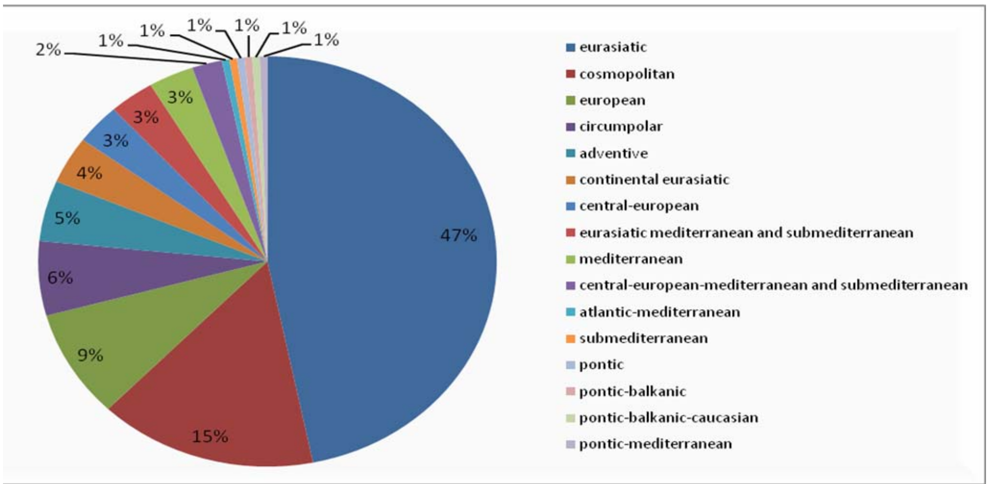

Fig. 5. Synanthropic plant classification by their origins

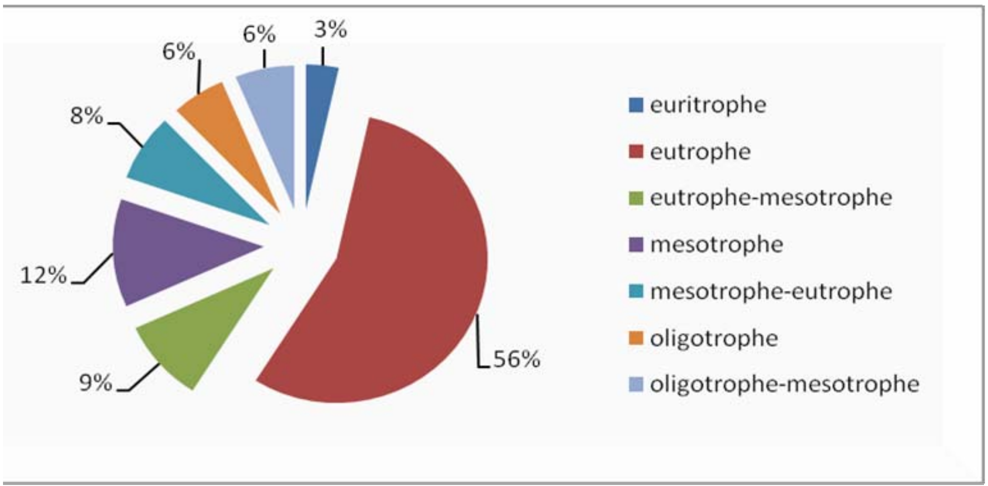

Fig. 6. Synanthropic plant classification by their trophic scale

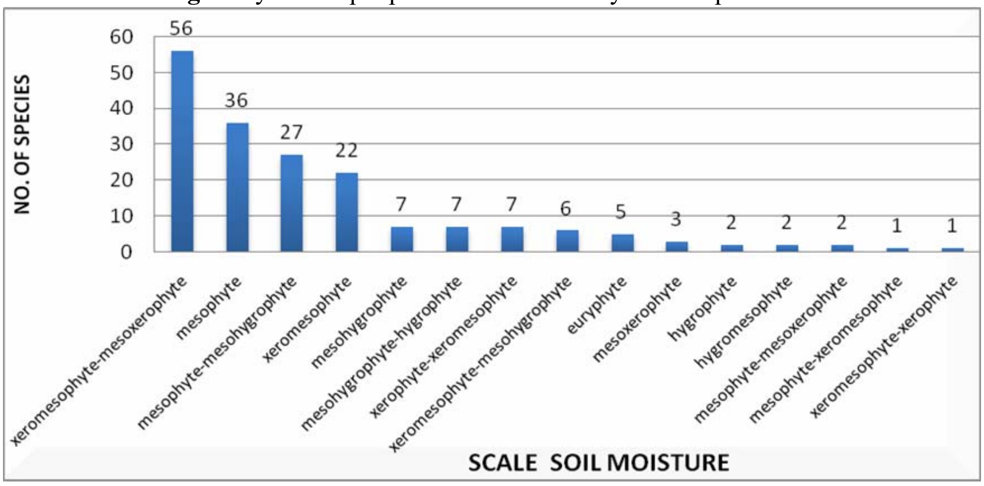

Fig. 7. Synanthropic plant classification by their humidity scale

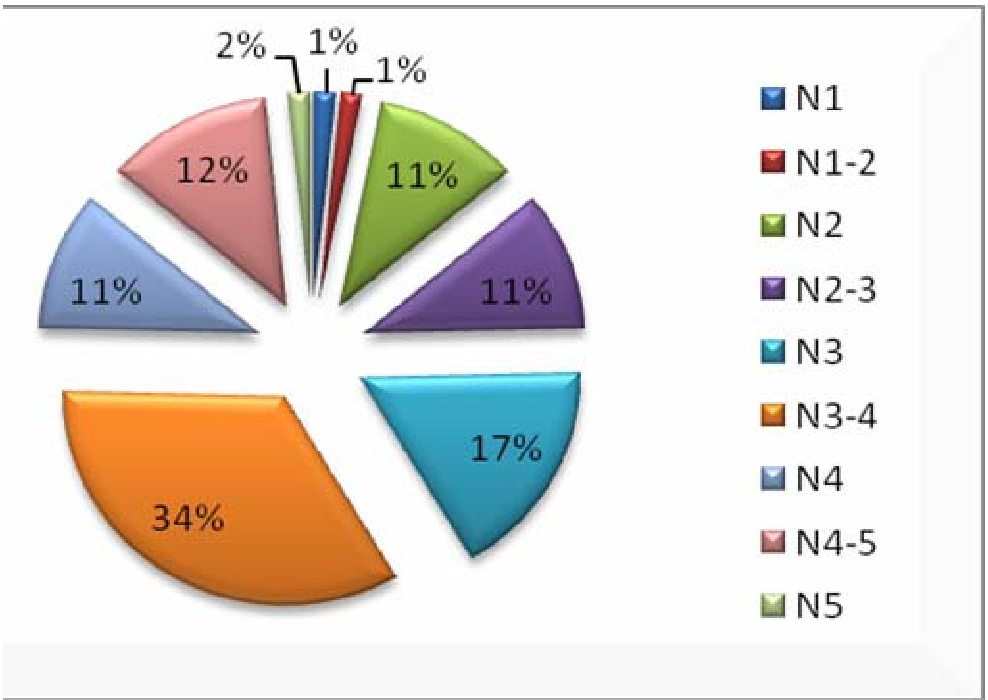

Fig. 8. Synanthropic plant classification by their N scale

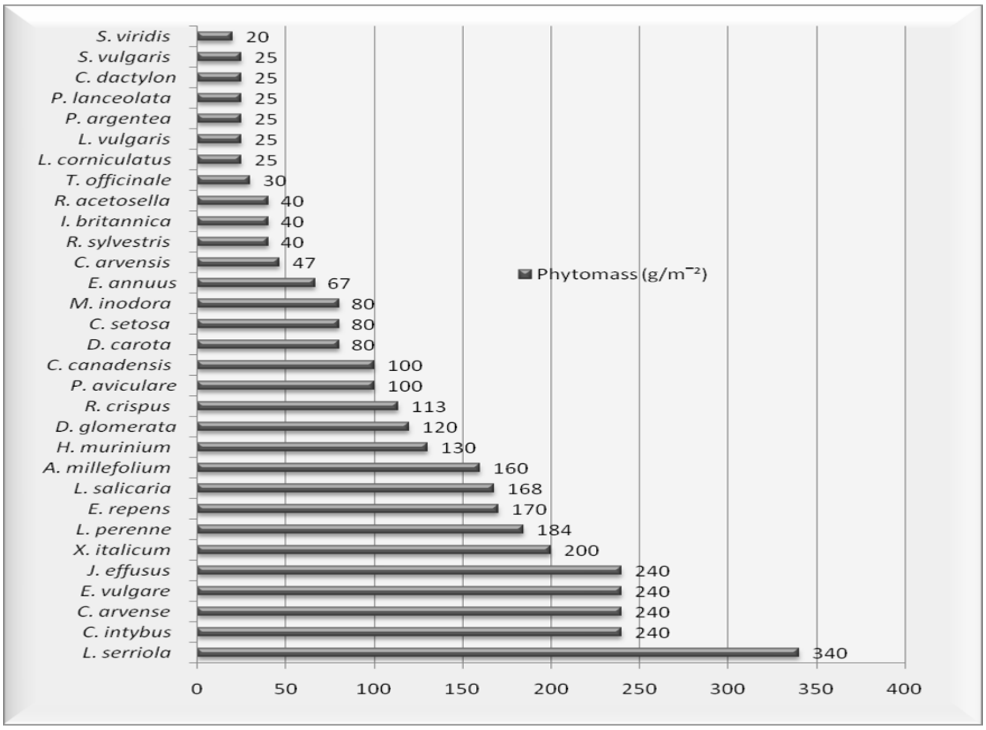

Fig. 9. Phytomass variation averages for fresh above-ground plant species

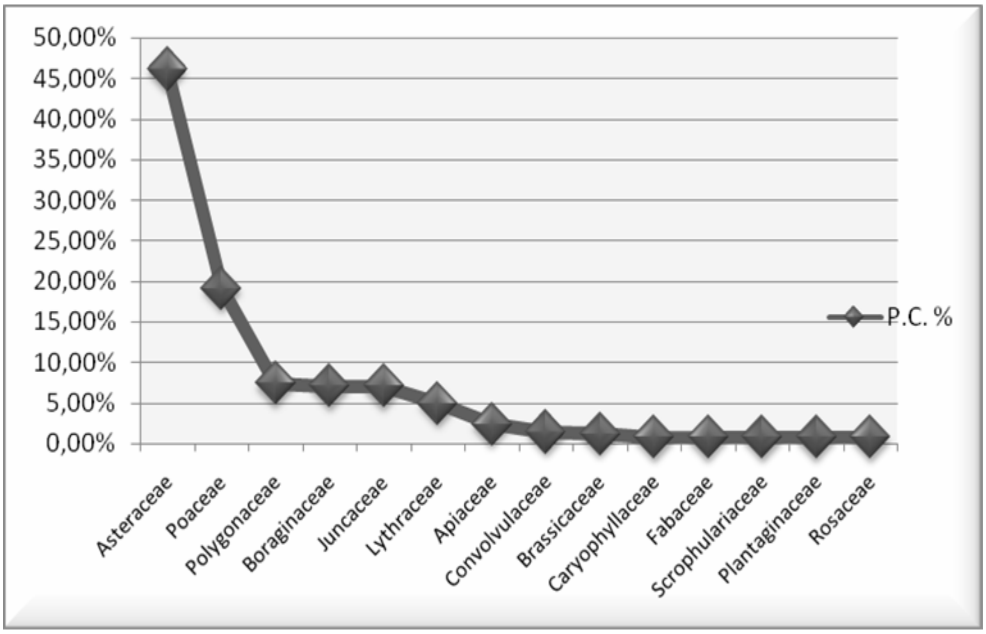

Fig. 10. Percental phytomass variation averages for fresh above-ground plant species grouped by family

Contributions to the knowledge of species composition volatile oil from the leaves of *Juniperus sabina L. and Juniperus virginiana L.*

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Keywords: Juniperus, volatile oil

ABSTRACT

Volatile oil content varied according to species season, the largest amount being determined in leaves of species *Juniperus sabina*, in August. Volatile oil extracted from leaves of *Juniperus sabina* was characterized by the presence of significantly higher bornil acetate, which had an annual average of 36.73% of all components identified, with the share in the period from November – May. Characteristic of the volatile oil of *Juniperus sabina* species is the presence of β-thujone, which held from 10.40 to 11.70% of all components identified during noienbrie - February. Volatile oil extracted from leaves of *Juniperus virginiana* was characterized by the presence of significantly higher and lower seasonal variations of Safrol and Eugenol methyl, and elemol, with a maximum accumulation in the summer.

INTRODUCTION

Fournier and others (1990) stated the chemical composition of volatile oil extracted from leaves of *Juniperus sabina* from Belgium. 21 components were determined quantitatively, of which the share was held by: cis - sabinil acetate (53.10%), sabinene (8.30%) and mircene (3.50%). Pages etc. (1999) found that the main components identified in the volatile oil extracted from *Juniperus sabina* species; it is sabinil acetate, which owns 50% of all components identified. Kitchens etc. (1971) analyzed the volatile oil extracted from leaves of *Juniperus virginiana* in which determined the presence: cedrol (31.60%), α -cedrene (20.00%), thujopsene (18.90%), 3–thujopsanone (13.30%) , β-cedrene (6.60%) şi a widrol (4.80%).

MATERIALS AND METHODS

The investigations were carried out with leaves from species: *Juniperus sabina L*. and *Juniperus virginiana L*, from the Botanical Garden of the University of Agronomic Sciences and Veterinary Medicine of Bucharest. Volatile oils were extracted from leaves of conifers by hidrodistilstion, using for this purpose a device type Cleverger. Separation of components was performed with an AGILENT gas chromatography with a detector masspectometric with quadrupol. used a capillary column type DB 5 having a length of 25 m and diameter 0.25 mm, using helium as carrier gas, and the initial temperature of the oven was 50° C, isothermal 4 minute and increased to 280° C, with a gradient 4°C/minute.

Also were used to confirm the Kovats retention indices of drip exact position in the chromatogram, using a series of n-alkanes as references.

RESULTS AND DISSCUSION

The content of volatile oil from the leaves of the two conifer species varies by species and season. Thus, the data presented in Table 1 shows that average annual value in volatile oil content of leaves was 3.4 times higher in species *Juniperus sabina*, compared with Juniperus virginiana, although the leaves of both species is found only one secret channel (Ivănescu others, 2007).

Measured by dynamic stated that the greatest amount of volatile oil was determined in leaves harvested in August, when warmer temperatures have, stimulated the activity of enzymes involved in synthesis of these substances. Volatile oil content of leaves decreased during autumn and winter, for-as in May, leaves, new formats contain a very small amount of volatile oil, which was unquantifiable.

Analysis of volatile oil extracted from the leaves of these two species of conifers, a GC-MS, has identified a number of 53 components in the volatile oil extracted from leaves of *Juniperus sabina* and 39 components, as derived from *Juniperus virginiana*. Of these, 5 components were present in greater quantity and only two components were common to both species: sabinene and β-pinene.

Volatile oil extracted from leaves of *Juniperus sabina* was characterized by the presence of significantly higher bornil acetate, which had an annual average of 36.73% of all components identified. Share this substance was determined in the period from November - May and the smallest amount was determined in August. The second compound with a share of the volatile oil extracted from the leaves of this species was sabinene, which had an annual average of 15.75% of all components identified with a share in August (34.50%). An annual average of less than found for limonene (9.87%) and β-pinene (6.34%) both substances being weighted in August.

Characteristic species *Juniperus sabina* volatile oil is present in the volatile oil extracted from the leaves of this species β-thujone, which held from 10.40 to 11.70% of all components identified during noienbrie - February. The presence of this substance was not identified in the volatile oil extracted from leaves harvested in August.

Volatile oil extracted from leaves of *Juniperus virginiana* was characterized by the presence of significantly higher Safrol, elemol and Methyl Eugenol. Safrole has an annual average content of 26.33% of all components identified; content that was relatively constant throughout the year. Elemole represented 14.64% of all components identified, having a share in August. Methyl Eugenol was present in less than: 12.23% of all components and has large seasonal variations (10.80% in February and 13.20% in August).

CONCLUSIONS

1. Volatile oil content varied depending on the species, the largest amount being determined in leaves of species *Juniperus sabina*.
2. The largest quantity of volatile oil was determined in August when high temperatures have stimulated synthesis in leaves terpene, two species of conifers.
3. The volatile oil extracted from leaves of two species of *Juniperus* to result in significantly higher 5 components, only two components were common to both species: sabinene and β-pinene.
4. Volatile oil extracted from leaves of *Juniperus sabina* was characterized by the presence of significantly higher bornil acetate, which had an annual average of 36.73% of all components identified, with the share in the period from November - May.
5. Characteristic species *Juniperus sabina* volatile oil is present in the volatile oil extracted from the leaves of this species β-thujone, which held from 10.40 to 11.70% of all components identified during noienbrie – February.
6. Volatile oil extracted from leaves of *Juniperus virginiana* was characterized by the presence of significantly higher Safrol elemol and Methyl Eugenol.

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TABLES AND FIGURES

Table 1. The amount of volatile oils extracted from leaves of coniferous species (ml/100g)

Species	May	August	November	February	Average
Juniperus sabina	nc	0,40	0,30	0,24	0,24
Juniperus virginiana	nc	0,10	0,10	0,08	0,07

nc- unquantificable

Table 2. The main components determine the volatile oil extracted from leaves of Juniperus sabina and Juniperus virginiana

Species	Substance	May	August	November	February	Average
Juniperus sabina	**Sabinene**	13,40	**34,50**	7,12	7,97	**15,75**
	β-Pinene	5,90	**7,22**	5,80	6,44	6,34
	Limonene	5,00	**23,00**	5,43	6,03	9,87
	β-Thujone	4,60	0	**10,40**	**11,70**	6,68
	Bornyl acetate	**45,10**	5,90	**47,40**	**48,50**	**36,73**
Juniperus virginiana	**Sabinene**	9,95	10,90	0	**11,10**	7,99
	β-Pinene	0,70	0,80	**10,50**	0,20	3,05
	Safrol	**24,70**	**23,90**	**27,50**	**29,20**	**26,33**
	Metil eugenol	**12,10**	**13,20**	**12,80**	**10,80**	**12,23**
	Elemol	8,75	**21,40**	16,00	12,40	**14,64**

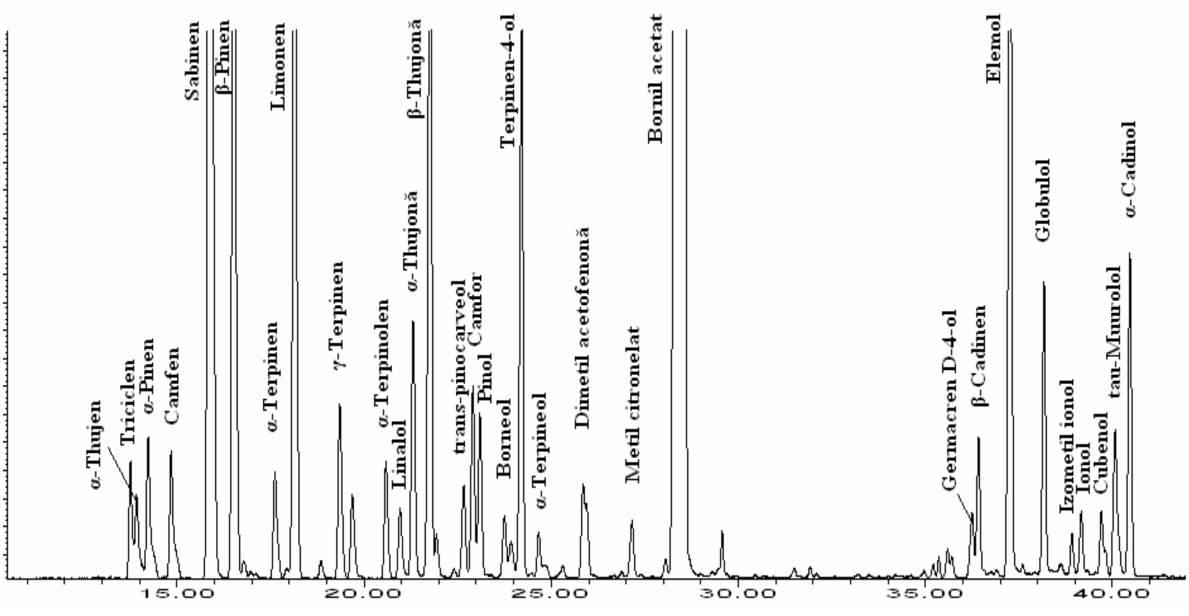

Fig 1. Gas chromatogram of Juniperus Sabina

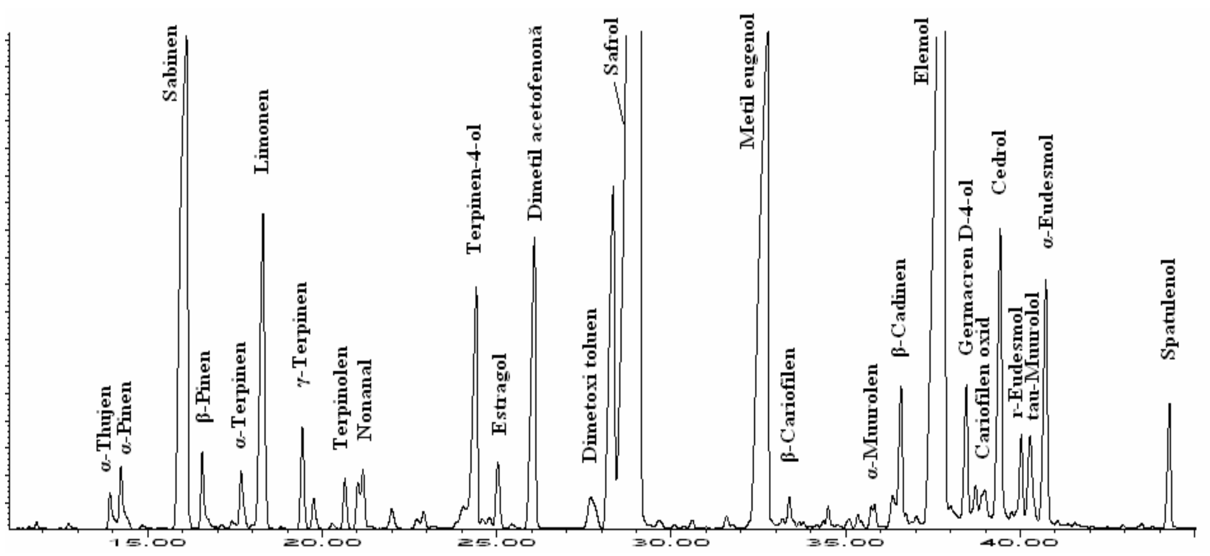

Fig 2. Gas chromatogram of Juniperus virginiana

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Biochemical research on fresh *Herba* of *Artemisia Vulgaris* L. and *Artemisia Absinthium* L. (*Asteraceae*)

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Keywords: *Artemisia absinthium, Artemisia vulgaris, Asteraceae,* flavonoids, polyphenols, fresh *herba*

ABSTRACT

The family *Asteraceae* is very distinctive in its chemical attributes and several classes of plant compounds are characteristic of this family. Many of these substances are toxic or show significant physiological activity. Several secondary metabolites, like terpenoids and flavonoids, characterize the chemical composition of the genus *Artemisia*. This article presents a comparative study on dry matter content, water, ash, flavonoids and total phenols content of *Artemisia absinthium* L. and *Artemisia vulgaris* L. (Asteraceae). These species are considered medicinal herbs and are used in therapy in various diseases. The flavonoid and total phenolic contents of these studied species revealed a significant variation depending on the ecotype and species. The flavonoid content from *herba* of *Artemisia absinthium* L. is in inverse ratio to the total phenolic content, while the flavonoid content from *herba* of *Artemisia vulgaris* L. varies like the total phenolic content.

INTRODUCTION

Asteraceae is a natural family, with well established limits and a basic uniformity of floral structure, represented in all its members by the common possession of characters such as aggregation of the flowers into capitula and production of achene's (cypselae) as the typical fruits of the family (Heywood et al., 1977). On a global scale the family has cca. 23.000 species (Bremer, 1994), almost 10% of the total Angiosperm flora of the world (Wilson 1986).

The family is very distinctive in its chemical attributes and several classes of plant compounds are characteristic of this family. Many of these substances elaborated by the family are toxic or show other significant physiological activity (Heywood et al., 1977). Several secondary metabolites characterize the chemical composition of the genus Artemisia. A survey of the literature indicates that almost all classes of compounds are present in the genus, with particular reference to terpenoids and flavonoids (Wright, 2002).

The rich accumulation of essential oils and other terpenoids in certain *Asteraceae* is responsible for the use of various members such as tansy (*Tanacetum vulgare*) and wormwood (*Artemisia absinthium*) for flavouring foods or liqueurs. Terpenoids and certain phenolic compounds are also responsible for the value of many species of *Asteraceae* in pharmacy and medicine (Wagner, 1977).

Artemisia absinthium L. and *Artemisia vulgaris* L. are considered medicinal herbs and are used in therapy in various diseases. When fresh, these plants has strong aromatic odour and the taste is described as spicy and bitter (Burzo et. al., 2005). This paper presents a comparative study on dry matter content, water, ash, flavonoids and total phenols content of *Artemisia absinthium* L. and *Artemisia vulgaris* L. (Asteraceae), two spontaneous species collected from few different Romanian regions.

MATERIALS AND METHODS

The biological material was represented by fresh herba - (main and secondary stems, young and mature leaves, flowers) of *Artemisia absinthium* L. (Figure 1) and *Artemisia vulgaris* L. (Figure 2). The plants were collected from different Romanian areas and considered as ecotypes: *Artemisia absinthium* L. from Dragoslavele –Argeş, Corbii Mari - Dâmboviţa and Ulmeni – Teleorman, and *Artemisia vulgaris* L. from Paşcani - Iaşi, Corbii Mari – Dâmboviţa and Vităneşti – Teleorman. The determination of total dry matter plant material was done by weighing fresh plant material, by 24 hour drying at 105˚C, cooling in exicator and weighing again dried plant material. The results were expressed as a percentage (%). Determination of ash was made by weighing plant material dry for 4 hours at 105˚C, calcinations at 560˚C, cooling in exicator and gray reweighing.

Total phenolic compounds were extracted from fresh *herba* (stems, flowers and leaves) using methanol/water extracts (4:1; v/v) were evaporated under vacuum, the dry residue was resuspended in 10 ml distilled water, and centrifuged for 2 min at 12 000 g. Total phenolic content was estimated by the Folin-Ciocalteu method adapted from Dicko et al. (2002). Assays were performed in duplicate for each extract by mixing 0.2 ml sample, 1 ml reagent Folin-Ciocalteu, 0.8 ml sodium carbonate 7.5%. The mixture was incubated for a further 30 min at room temperature and absorption at 765 nm was determined using a Cecil 1011 spectrophotometer. A calibration curve was obtained with freshly prepared solutions of gallic acid. Results were calculated as mg gallic acid equivalents per 100 g fresh matter.

Soluble flavonoids were extracted from 4 g of fresh *herba* by boiling the sample in 100 ml of methanol 50%. 10 ml extract was precipitated with 15 ml methanol 100%, filtered or centrifuged; the supernatant was used to flavonoid determination. Assays were performed in duplicate for each extract by mixing 5 ml supernatant, 5 ml sodium acetate 10%, 3 ml aluminum chloride 2.5%, 12 ml methanol 100% and one blank by mixing 5 ml filtered, 8 ml of distilled water and 12 ml methanol 100%. After 15 min incubation at room temperature, the absorption at 430 nm was determined against the blank using a Cecil 1011 spectrophotometer. A calibration curve was obtained with freshly prepared solutions of rutin. Results were calculated as mg rutin equivalents per 100 g fresh matter.

RESULTS AND DISCUSSION

While comparing (Table 1) the water content of the *herba* (stem, leaf, and flower) on studied *Artemisia* ecotypes, it could be see that the limit of variation is between 60.51% (*Artemisia vulgaris* L, Corbii Mari, Dâmbovița ecotype) and 67.80% (*Artemisia absinthium L*, Dragoslavele, Arges ecotype), because of their less demanding in humidity.

High accumulation of dry matter was recorded in *Artemisia vulgaris* L, Vităneşti, Teleorman ecotype (43.03%) and the *Artemisia vulgaris* L, Corbii Mari ecotype (39.49%). The lowest quantity of dry matter occurred in *Artemisia absinthium* L, Dragoslavele, Arges ecotype (32.20%) and in *Artemisia absinthium* L, Corbii Mari, Dâmbovița ecotype (34.65). Due to the pubescent of stems and leaves, the transpiration rate of plants is lower, which gives them a greater resistance to drought (Wright, 2002).

A high mineral content (expressed as total ash of fresh substance) was found at *Artemisia vulgaris* L, Paşcani, Iaşi ecotype (3.50%). Accumulation of mineral elements is mainly dependent on the concentration of soil solution and the interactions among these elements (Burzo et al., 2005).

The largest quantity of flavonoids occurred in *Artemisia vulgaris L*, Vităneşti, Teleorman ecotype (5.546%) (Figure 3), followed by *Artemisia absinthium*, Ulmeni, Teleorman ecotype (4.291%) (Figure 5). These *Artemisia* ecotypes grow in a droughty area and probably the high content of flavonoids is related with their drought resistence. The lowest amount of flavonoids from *Artemisia absinthium* was performed at ecotype from Corbii Mari River (0.446 mg/100g), followed by *Artemisia vulgaris L*, Paşcani, Iaşi ecotype (0.538 mg/100g).

Regarding the total phenolic contents, the *Artemisia vulgaris L*. species, Vităneşti and Teleorman ecotypes, registered the highest amount (29.22 mg/100g) (Figure 6), followed by *Artemisia absinthium L,* Corbii Mari ecotype (29.13 mg/100g) (Figure 4). The lowest quantity of total phenols occurred in *Artemisia absinthium L*. species, Ulmeni and Teleorman ecotypes (15.75 mg/100g). The comparative study of *Artemisia absinthium L*. and *Artemisia vulgaris L.* species from 6 ecotypes shows differences in amount of flavonoids and total phenols, their synthesis being great influenced by abiotic factors.

CONCLUSIONS

The flavonoid content from *herba* of *Artemisia absinthium* L. is in inverse ratio to the total phenolic content, while the flavonoid content from *herba* of *Artemisia vulgaris* L. varies like its total phenolic content.

The flavonoid and total phenolic contents from *herba* of *Artemisia vulgaris* L. depend on their dry matter contents, while for *Artemisia absinthium* L. ecotypes didn't observed same corelations.

A high mineral content (expressed as ash from total fresh substance) was found at *Artemisia vulgaris* L., Paşcani, Iaşi ecotype (3.50%).

Analyzing the 2 species, it was found that the largest amount of dry matter (43.03%), polyphenols (29.22 mg/100g) and flavonoids (5.546 mg/100g) was recorded at *Artemisia vulgaris* L., Vităneşti, Teleorman ecotype due to its droughty area.

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TABLE AND FIGURES

Table 1. The water, dry weight and minerals content of *Artemisia* sp. *herba*.

Species	Ecotype	Water (%)	Dry weight (%)	Minerals (%)
Artemisia absinthium L.	Corbii Mari - Dâmbovița Ecotype	65,35	34,65	2,69
	Dragoslavele - Argeş Ecotype	67,80	32,20	2,76
	Ulmeni – Teleorman Ecotype	64,16	35,84	2,99
Artemisia vulgaris L.	Corbii Mari - Dâmbovița Ecotype	60,51	39,49	3,06
	Paşcani – Iaşi Ecotype	62,29	37,71	3,50
	Vităneşti - Teleorman Ecotype	56,97	43,03	3,35

Fig. 1. *Artemisia absinthium* L.- herba

Fig. 2. *Artemisia vulgaris* L.- herba

Fig.3. The flavonoid content of Artemisia vulgaris herba

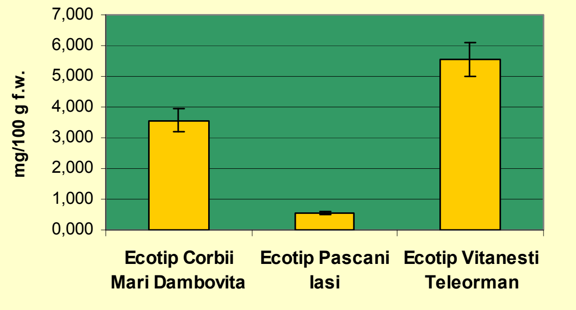


Fig.4. The polyphenols content of Artemisia absinthium herba

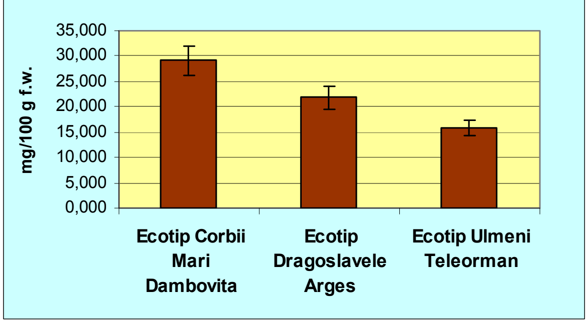


Fig. 5. The flavonoid content of Artemisia absinthium herba

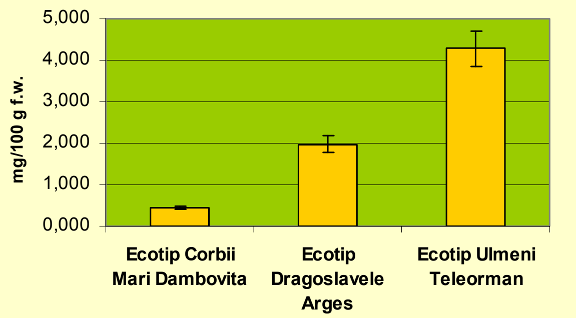
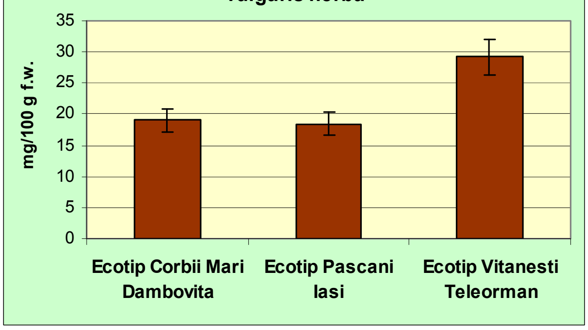


Fig.6. The polyphenols content of Artemisia vulgaris herba



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The physiological monitoring of biotic stress on strawberry plants during the treatments with immunostimulator extracts

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Keywords: *Fragaria x ananassa*, photosynthesis, transpiration, respiration, Elsanta, Marmolada

ABSTRACT

Strawberries represent one of the most widely grown fruit crops and *Botrytis cinerea*, the fungal agent causing gray mould or fruit rot is one of the most important fungi causing losses in strawberry production, also lead to a very limited post harvest live of strawberries. So, control of diseases is a subject of great importance for biotechnologists and the future of sustainable agriculture will increasingly rely on the integration of biotechnology with traditional agricultural practices. Therefore, the aim of the present study was to investigate the physiological changes in 2 strawberry cultivars (Elsanta and Marmolada) induced by chemical treatments with some contact and systemic fungicides, as well as the treatments with 4 extracts with immunostimulator properties, codified E1, E2, E3, E4.

INTRODUCTION

Strawberries represent one of the most widely grown fruit crops and *Botrytis cinerea*, the fungal agent causing grey mould or fruit rot is one of the most important fungi causing losses in strawberry production, also lead to a very limited post harvest live of strawberries.

Traditional methods used to protect crops from diseases have been largely based on the use of chemical pesticides, but, develop a new fungicide into a registered plant protection product means to end with a product which is good in controlling the fungal diseases, but also safe for the user, the environment and the consumer. To start such procedures, many generally physiological biotic stress impact characteristics feature on plants are necessarily to know (Delian, 2006).

Nowadays, diseases management requires the use of techniques in transgenic technology, molecular biology, and genetics (Hanhineva, 2008). These include: genes that express proteins, peptides, or antimicrobial compounds that are directly toxic to pathogens or that reduce their growth in situ, gene products that directly inhibit pathogen virulence products or enhance plant structural defence genes, that directly or indirectly activate general plant defence responses, and resistance genes involved in the hypersensitive response and in the interaction with a virulence factor. So, control of diseases is a subject of great importance for biotechnologists and the future of sustainable agriculture will increasingly rely on the integration of biotechnology with traditional agricultural practices (Legard et al., 2002; Cota et. al, 2008; Haggag, 2008; Abril et. al, 2009).

As Ju et al. (2007) and Vinale et al. (2008) reported, one of the promising means to achieve this goal is by use of new tools based on biocontrol agents (BCAs) for disease control alone, or to integrate with reduced doses of chemicals and from this view point a better understanding of the principles regulating the interaction between fungal pathogens, host plants and BCAs such as *Trichoderma* would enhance the practical application of these beneficial microorganisms for plant disease control.

Therefore, the aim of the present study was to investigate the physiological changes in 2 strawberry cultivars induced by chemical treatments with some contact and systemic fungicides, as well as the treatments with 4 extracts with immunostimulator properties, codified E1, E2, E3, E4.

MATERIAL AND METHODS

Plant material and experimental conditions

The study was carried out in 2008 at the greenhouse and Plant Physiology Department, Faculty of Horticulture of the USAMV Bucharest, Romania.

Seedling of strawberry (*Fragaria x ananassa* Duch.) the cultivars Elsanta (a resistant cv. to the pathogen) and Marmolada (a sensible cv. to the pathogen) were grown in plastic pots with a capacity of 1, filled with peat and compost, under greenhouse conditions. The experiment was set up using a randomized block design and replicated 3 times. There was 1 plant in each pot, with 10 pots in each replicate. When plants had developed 6 leaves (45 days after transplanting), application of treatment were started as follows:

A. Chemical treatments with the followings contact and systemic fungicides: Captan 50 WP (captan 50%) 0.2%; Teldor 500 SC (fenhexamid 500 g/l) 0.08 %; Topsin M 70 (tiofanat metil 70 %) 0.07%; Rovral 500 SC (iprodinone 500 g/l) 0.1 %.
   1. treatments with the contact fungicides by fine pulverization of plants with Rovral 500 SC and teldor 500 SC;
   2. soil treatment with systemic fungicides using Topsin M 70 and Captan 50 WP.

B. Treatments with 4 extracts with immunostimulator properties (codified E1, E2, E3, E4) by fine pulverization of plants or by soil treatment, exactly like the chemical treatments with fungicides.

C. Plants inoculation with the pathogen (*Botrytis cinerea*) was 1 day after the chemical treatments and the treatments with extracts, on 19.07. 2008.

During 24-25.07.2008 (so, 5-6 days after inoculation) plants physiological and biochemical responses was evaluated in Plant Physiology Department, Faculty of Horticulture, USAMV Bucharest.

The analyzed physiological parameters

Gas exchange rate (photosynthesis - µmol CO_2 $m^{-2}s^{-1}$, transpiration- mmol H_2O $m^{-2}s^{-1}$ and respiration- µmol CO_2 $m^{-2}s^{-1}$) was measured using the LC4, a portable photosynthesis system and condition in the leaf chamber during the measurements (temperature, carbon dioxide concentration, photon flux density) were set to be near to ambient values. Measurements were taken between 07^{00} and 10^{00} h, chamber air temperature was not controlled during the measurements, so generally ranged between 28 and 33 °C and photosynthetic photon flux density (PPFD) was corresponding with naturally conditions. Values presented are the means of five leaves from five plants per sampling period.

RESULTS AND DISCUSSION

Photosynthesis rate

Thus, as we can see in **Figure 1**, for Elsanta cv. there was noticed a decreasing of the net photosynthesis rate, both for mixture of chemical substances treatments and those treated with extracts, excepting the case of extract E3 (foliar treatment). Comparing plants responses to the applied treatments, there was emphasized that a higher impact had the soil applied treatment, as regard as the photosynthesis rate decreasing, possible due to a longer time necessarily for plants adaptation. Also, there was noticed an exception in the case of E2 application – the photosynthesis rate was double in the case of soil application, as against to the foliar application.

In the case of Marmolada cv. (**Figure 2**) photosynthesis rate was rapidly changed, thus, in the case of the foliar treatment with the contact fungicides or E3, as well as in the situation of E3 application to the soil, photosynthesis rate intensification was registered, as compared with the control variant.

Similarly to the previous data, E2 extract determined a significantly photosynthesis rate increasing in the case of the soil application, even if the value is situated under the control registered value.

If we compare these two strawberry cultivars, it can be remarked that the photosynthesis rate was higher in the case of the resistant cv., so, a better assimilation it was registered in this case.

Transpiration rate

According to data presented in **Figure 3**, leaves transpiration rate of Elsanta cv. was higher for all the experimentally variants, with only one exception – soil treatment with E3 extract – the transpiration rate was lower than the control. The transpiration rate increases is related also to a higher water and minerals substances absorption (induced by the foliar aspiration force intensification), as it can be remarked also as regard as plants response to the soil applied treatment, more evident than in the case of photosynthesis process. It can be mention that for Elsanta cv., using E3 extract as a foliar treatment, it was determined an intensification of both photosynthesis and transpiration physiologically processes.

The comparatively analysis of the transpiration process at Marmolada cv. (**Figure 4)** emphasized an increasing of this physiologically process rate only in the case of the systemic fungicides and E3 treatments to the soil.

Respiration rate

First of all, it can be mentioned that all applied treatment conducted to an intensification of respiration rate, so, in the same time an increasing of the biochemical energy for all metabolic processes performed into leaves. For instance, at Elsanta cv. (**Figure 5**), an increasing of respiration rate of 7.5-8.5 times as against to the control was noticed in the case of E3 treatment (applied to soil or foliar). Thus, E3 extract treatment determined an intensification of the analyzed processes, independently of its application procedure.

In the case of Marmolada cv., respiration rate increased only when the contact fungicides and extract E3 have been applied on leaves, as well as the extract E1 was applied to the soil. All these experimentally variants emphasized lower respiration rate than the control (**Figure 6**).

Assimilatory pigments content

The obtained data demonstrate that all experimentally treatments induced assimilatory pigments content changes.

Therefore, for Elsanta cv. (**Table 1**), it can be noticed that systemic and contact fungicides treatment determined an increasing of the chlorophyll, while the carotenoids content decreased. As a consequence, there was also registered both an increasing of the Chl a/Chl b ratio, and Total Chl/Carotenoids ratio. The imunomodulator extract E1 determined an increasing of Chl a, Chl b and Total Chl content independently to the application procedures (foliar or to the soil), as well as a decreasing of the carotenoids content, a similarly effect as that induced by the chemical treatment. For the others experimentally variants, chlorophyll content was lower as compared the controls, but, Chl a/Chl b; Total Chl/Carotenoids ratios surpassed the control values.

In the case of Marmolada cv. (**Table 2)** the systemic and contact fungicides treatments determined an increasing of both chlorophyll and carotenoid pigments content. The leaves chlorophyll content increasing determined an increasing of the Chl a/Chl b ratio and Total Chl/Carotenoids ratios, too. The foliar application of the imunomodulator extract E1 and a soil treatment with E4 determined a higher content of Chl a, Chl b and Total Chl, independently to the application tools (foliar or to the soil), concomitantly with a decreasing of the carotenoids content, similarly with the chemical treatments effects. In the case of the others variants, the chlorophyll content was lower as compared with the controls, but, Chl a/Chl b and Total Chl/carotenoids ratios values surpassed the controls values.

ACKNOWLEDGEMENTS

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TABLES

Table 1. Treatment influence on assimilatory pigments content of Elsanta strawberry leaves

Parameter		Chlorophyll a *mg/100g*		Chlorophyll b *mg/100g*		Total chlorophyll *mg/100g*		Chl a/Chl b ratio		Carotenoids *mg/100g*		Total Chl/ Carotenoids ratio	
Variants		**foliar**	**soil**	**foliar**	**soil**	**foliar**	**soil**	**foliar**	**soil**	**foliar**	**soil**	**foliar**	**soil**
Martor		131,33		73,20		204,53		1,79		9,28		22,05	
Chemical treatments		155,86	157,19	78,85	77,54	234,7	234,73	1,98	2,03	8,51	8,63	27,59	27,21
Extracts treatments	**E1**	156,71	146,13	81,23	67,36	237,94	213,49	1,93	2,17	7,50	8,43	31,73	25,31
	E2	122,81	126,77	57,78	53,24	180,59	180,02	2,13	2,38	7,20	6,70	25,07	26,88
	E3	124,07	122,27	54,35	51,87	178,43	174,14	2,28	2,36	6,43	6,67	27,76	26,12
	E4	141,44	116,09	60,26	49,90	201,70	165,99	2,35	2,33	7,30	6,63	27,65	25,05

Table 2. Treatment influence on assimilatory pigments content of Marmolada strawberry leaves

Parameter		Chlorophyll a *mg/100g*		Chlorophyll b *mg/100g*		Total chlorophyll *mg/100g*		Chl a/Chl b ratio		Carotenoids *mg/100g*		Total Chl/ Carotenoids ratio	
Variants		**foliar**	**soil**	**foliar**	**soil**	**foliar**	**soil**	**foliar**	**soil**	**foliar**	**soil**	**foliar**	**soil**
Martor		140,37		86,74		227,11		1,62		10,09		22,51	
Chemical treatments		246,45	241,96	122,35	113,29	368,80	355,25	2,01	2,14	15,62	14,5	23,61	24,50
Extracts treatments	**E1**	127,68	133,44	55,13	54,53	182,81	187,97	2,32	2,45	6,56	6,58	27,88	28,55
	E2	179,50	126,77	72,16	53,24	251,66	180,02	2,49	2,38	6,13	6,70	29,04	26,88
	E3	124,07	122,27	54,35	51,87	178,43	174,14	2,28	2,36	6,43	6,67	27,76	26,12
	E4	110,09	203,08	43,83	100,83	153,92	303,91	2,51	2,01	5,59	6,92	27,56	25,49

FIGURES

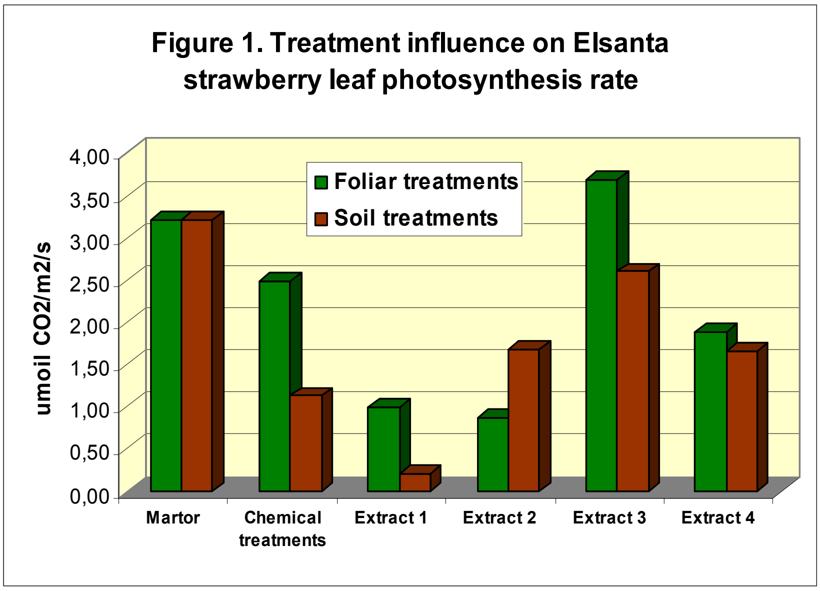
Figure 1. Treatment influence on Elsanta strawberry leaf photosynthesis rate
umoil CO2/m2/s
4,00
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
Foliar treatments
Soil treatments
Martor
Chemical treatments
Extract 1
Extract 2
Extract 3
Extract 4

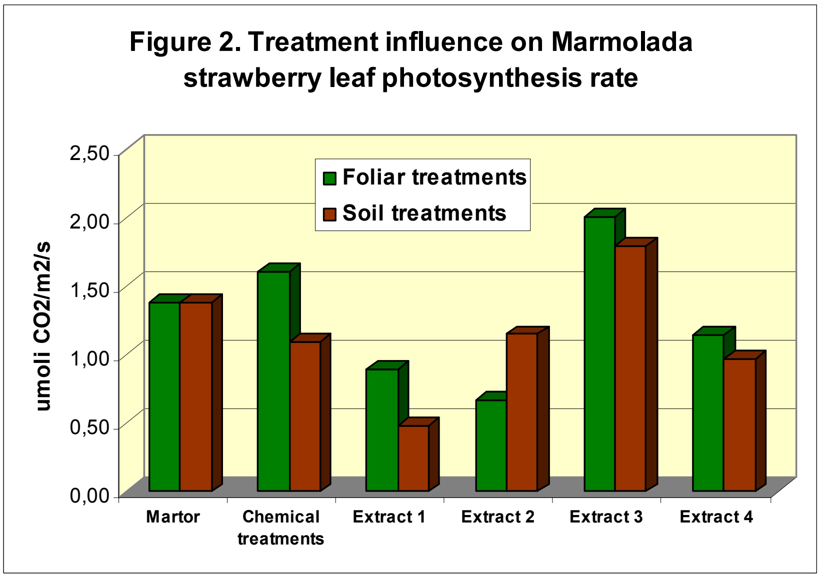
Figure 2. Treatment influence on Marmolada strawberry leaf photosynthesis rate
umoli CO2/m2/s
2,50
2,00
1,50
1,00
0,50
0,00
Foliar treatments
Soil treatments
Martor
Chemical treatments
Extract 1
Extract 2
Extract 3
Extract 4

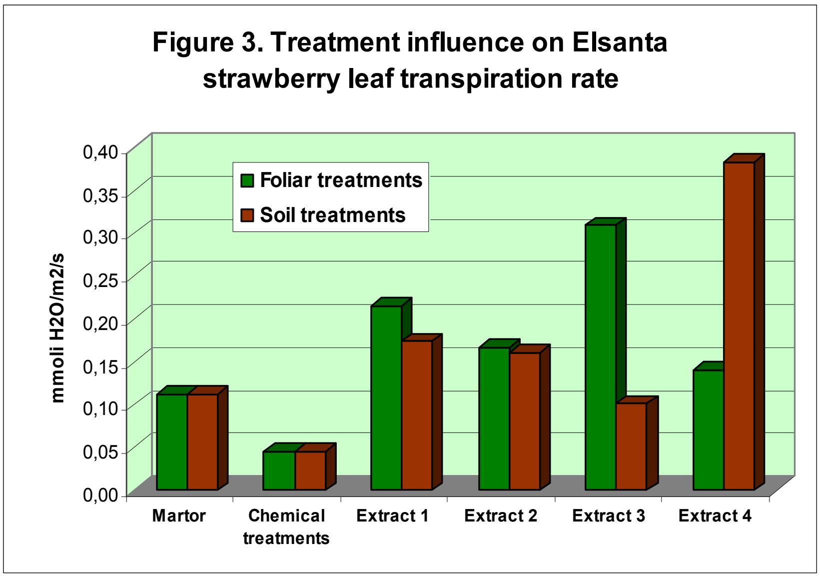
Figure 3. Treatment influence on Elsanta strawberry leaf transpiration rate
mmoli H2O/m2/s
0,40
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0,00
Foliar treatments
Soil treatments
Martor
Chemical treatments
Extract 1
Extract 2
Extract 3
Extract 4

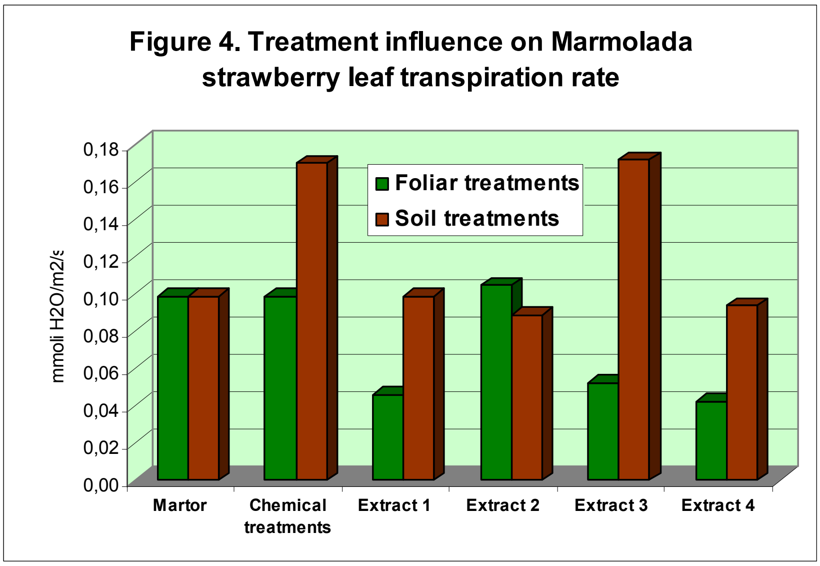
Figure 4. Treatment influence on Marmolada strawberry leaf transpiration rate
mmoli H2O/m2/s
0,18
0,16
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
Foliar treatments
Soil treatments
Martor
Chemical treatments
Extract 1
Extract 2
Extract 3
Extract 4

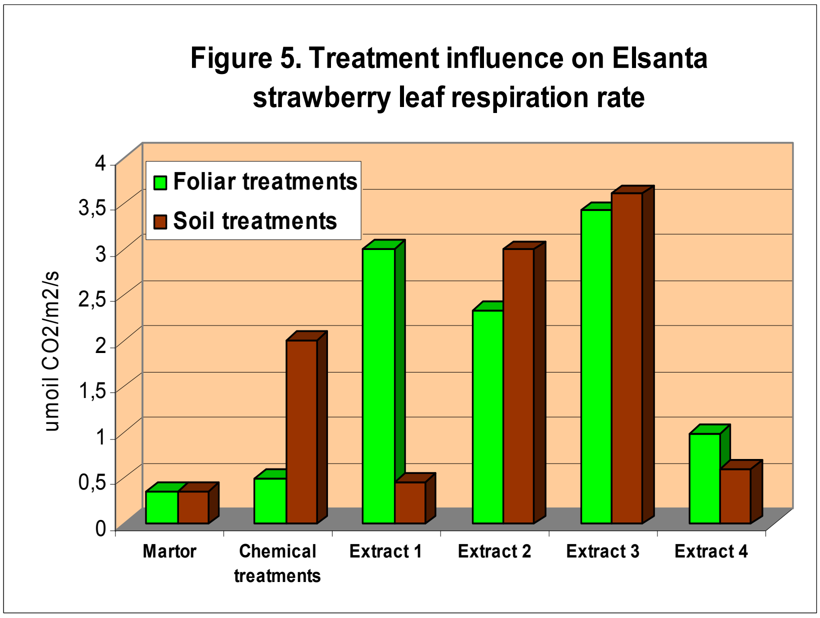
Figure 5. Treatment influence on Elsanta strawberry leaf respiration rate
umoil CO2/m2/s
4
3,5
3
2,5
2
1,5
1
0,5
0
Foliar treatments
Soil treatments
Martor
Chemical treatments
Extract 1
Extract 2
Extract 3
Extract 4

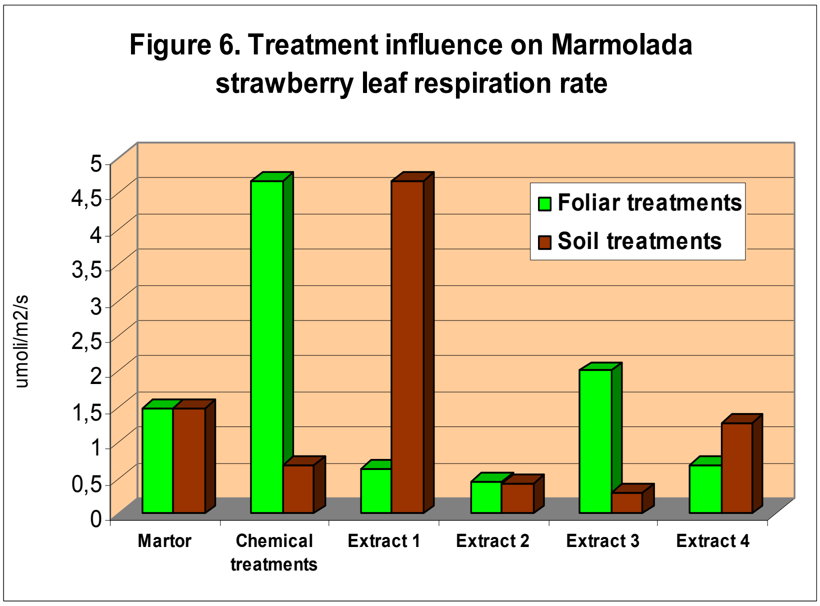
Figure 6. Treatment influence on Marmolada strawberry leaf respiration rate
umoli/m2/s
5
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
Foliar treatments
Soil treatments
Martor
Chemical treatments
Extract 1
Extract 2
Extract 3
Extract 4

Diagnosis possibilities of water stress in synanthropic plants

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ABSTRACT

The water stress indicator (crop water stress index, CWSI) is a measure of the transpiration rate of a plant, influenced by the leaf and air temperature difference from the plant's vicinity and the air pressure deficit of the water vapors from the atmosphere. The experiments were realized in July-August 2008 and 2009 for six species in the cities Pitesti, Mioveni and Maracineni: *Cichorium intybus* L., *Conyza canadensis* (L.) Cronq., *Erigeron annuus* L. (Pers.), *Lactuca serriola* Torn., *Polygonum aviculare* L. şi *Echinochloa crus-galli* (L.) Beauv. For those species we calculated the CWSI to estimate the water stress on the selected plants in the urban environment conditions. The detached leaf's transpiration intensity was determined in order to explain the adaptation mechanism through which the plants control their water loss. The analyzed species were exposed to a less accentuated water stress while vegetating in the soil and to a more intense one they were grown in the asphalt cracks. *Cichorium intybus* had the smallest CWSI value (0.26) while *Lactuca serriola* the highest one (0.44). The correlation between the transpiration intensity and the time elapsed from the leaf's separation from the plant for the analyzed plant species is graphically illustrated in the form of regression polynomial curves and the R^2 determination coefficient has also been determined. The species that has high level of transpiration rate in one hour after excision was *Polygonum aviculare* (665 mg dm^{-2} h^{-1}). The highest water loss through transpiration (883 mg dm^{-2} h^{-1}) was recorded during the first 15 minutes after the leaf's excision from the plant – the value was significantly higher than the loss recorded in any other recorded stage. After 30 minutes the transpiration intensity differences between species disappeared. The highest percentage of water loss (11% of total initial water content) was recorded on *Polygonum aviculare*. The percentage of water loss was significantly higher during the first 15 minutes from the water quantity lost in any other moment of the experiment (one hour).

INTRODUCTION

The water stress indicator (CWSI) is a measure of the transpiration rate of a plant, influenced by the leaf and air temperature difference from the plant's vicinity and the pressure deficit of the water vapors from the atmosphere. As the water level in a plant decreases, the stomata close and the transpiration rate decreases, while the temperature of the leaves exposed to direct solar radiation increases. When a plant is well supplied with water from the soil, the transpiration intensity is higher; the leaf temperature level is that much lower than the surrounding temperature (1-8°C) as plant's water vapor saturation deficit from the atmosphere is higher (5-6 kPa), in which case the CWSI value is getting closer to 0. When the transpiration intensity decreases, the leaf temperature is increasing and it can surpass by 4-6°C the air temperature. When a plant is reducing its transpiration, the CWSI tends to move towards the value 1. The crop water stress index (CWSI) is used predominantely in agriculture as it is one of the best indicators for the management and irrigation programing (Jackson et al., 1981, Pinter and Reginato, 1982; Reginato, 1983; Howell et al., 1984; O'Toole et al., 1984; Reginato and Howe, 1985; Reginato and Garrot, 1987; Waujura et al., 1990; Irmak et al., 2000; Paltineanu et al., 2008, quoted by Paltineanu et al., 2008) and for crop production estimates (Idso et al., 1981, Walker and Hatfield, 1983; Smith et al., 1985, Paltineanu et al., 2008, quoted by Paltineanu, 2008).

MATERIAL AND METHODS

The experiments were realized in July-August 2008 and 2009 for six species in the cities Pitesti, Mioveni and Maracineni: *Cichorium intybus* L., *Conyza canadensis* (L.) Cronq., *Erigeron annuus* L. (Pers.), *Lactuca serriola* Torn., *Polygonum aviculare* L. and *Echinochloa crus-galli* (L.) Beauv., which are dominant species in unmanaged lands in the cities Pitesti, Mioveni and Maracineni. The plant's leaf temperature was measured with a thermo-hygrometer and a infrared thermometer (Mannix EM8857PI) oriented at a 45° from the plant at a 15-20 cm distance, recording 10 readings between the hours of 12:00-14:00, in the sunny days of July-August. To arrive at the CWSI first the low base line (LBL) and the upper base line (UBL) was calculated according to Idso et al., 1981 and Jackson et al., 1981. LBL was determined in July 2009, on sunny skies, when the air temperature recorded the maximum of 35.6°C (on plants well watered for 48 hours before the experiment) between the hours 8:00-14:00. The water vapors pressure deficit from the atmosphere (V_{pd}) was calculated using the ecuations from http://weather.nmsu.edu/Teaching_Material/soil698/CWSI.html.

The difference between the leaf (T_c) and air (T_a) temperature respectively, T_c-T_a was subsequently presented graphically against the water vapors presure (Vpd) and the basal line was obtained through a liniar regression (Y=a+bx) a T_c-T_a (Y) towards Vpd (x) using the method of the smallest squares. UBL was obtained by cutting the plant and obstructing it at the separation point; a day later, point at which the plant stoped transpiring, was measured the temperature difference specific for this line. The indicator for the plant's water stress was calculated by determining the relative distance between the LBL, which represents the non-stress water conditions, and the UBL which represents the absence of transpiration. Each measured temperature was calculated as the rapport between: a – distance between a point's location (representing a pair of values T_c-T_a, Vpd) and LBL and b – distance between LBL and UBL such that the CWSI is equal with a/b (Idso and al., 1981). The transpiration intensity was determined with the help of a torsion balance and the air temperature and humidity were recorded with an electronic data logger of the Mannix DL8829 type. The leaf surface was calculated with the help of an image processing and analyzing program (Image J 1.40g, National Institutes of Health, USA). The transpiration intensity was expressed in g dm^{-2} h^{-1} and respectively as a percentage of the water quantity existent in the plant at the separation time. The correlation between the transpiration intensity and the time elapsed from the leaf's separation for the researched plant species was graphically represented through regressive polynomial curves and the coefficient R^2 has also been determined. The statistics method applied to convert the experimental data was the variance analyze for the polyfactorial experiences and the test for establishing the statistical significance was Duncan for the confidence level of α=0,05.

RESULTS AND DISCUSSION

The 310 values of the sample represent the total number of CWSI determinations. The average value for the sample was 0.3613, a value which indicates a low water stress level. Outside the average, to determine the general tendency, the median was also calculated (the value of a statistical series which divides the series terms in two parts) –0.3054 and the module (the value with the highest frequency) – 0,025. The maximum amplitude of the variation was 1 (the minimum 0.00 and the maximum 1.00). The average square variation was 0.2622 and the variation coefficient was 72.57% which indicate a non-homogenous sample. The asymmetry coefficient was 0.915 which indicates a positive asymmetry, to the right, with the predominant values smaller than the average and the presence of values higher than the average. The kurtosis coefficient (the excess) was 0.069 which means that the leptokurtic distribution (excess numbers near the average and far from it) with empty spaces on the distribution flanks. The average is representative for the sample only if the homogeneity principle is accepted. The Shapiro-Wilk W indicator value was 0.913, which reject normality. Figures 1 and 2 graphically represent the results obtained following the CWSI determination. Analyzing figure 1, by the experience average, were found three homogenous classes and the highest value of the CWSI (0.44) was computed for *Lactuca serriola*, which indicates a significant water stress more pronounced than for the species *Echinochloa crus-galli* and

Cichorium intybus; with the latest, registering the smallest CWSI value (0.26). The remaining species had homogenous CWSI values. By studying the interaction between the plant species and their environment we conclude that in Pitesti, in asphalt, the highest CWSI value (0.81) was recorded for *Erigeron annuus* (this species was rarely found in this environment) which indicates that, under such conditions, this species is strongly affected by the water stress. The same situation was found in the case of the plants *Erigeron annuus* in Mioveni, in asphalt, were *Conyza canadensis* had the highest CWSI value (0.90), although on the experience average had recorded an average water stress level. In the soil conditions for the cities Pitesti and Mioveni, the species respect the experiment's average. In Maracineni (soil conditions) the computed CWSI values for the six researched synanthropic species form three homogenous groups, with the highest value of this indicator being recorded for the species *Echinochloa crus-galli* (0.40) and *Polygonum aviculare* (0.35), significantly different from the other species, with the exception of *Cichorium intybus.* Analyzing figure 2, on the species average, we identified the existence of two homogenous classes of CWSI values, with the highest CWSI values being computed for Pitesti, in asphalt, (0.56) and Mioveni, in asphalt, (0.57), significantly different from the values for Pitesti soil (0.20), Mioveni soil (0.21) and Maracineni soil (0.25). For the soil vegetation, it was found that species react uniformly regardless of the location. This conclusion shows that the analyzed plant species were exposed to a lower water stress when were located in soil than in asphalt, regardless of their location/city. The average temperature values recorded on the asphalt surface were higher with 4.7°C in Pitesti (35.5 vs. de 30.8°C) and with 4.4°C at Mioveni (34.2 vs. 29.8°C), and the air humidity inferior with 4.8% in Pitesti (43.2 vs. 48%) and with 11.5% at Mioveni (33.9 vs. 45.4) over the values obtained on the soil surface. For the species *Conyza canadensis* the CWSI value in Mioveni, in asphalt, (0.90) was significantly different over the CWSI value computed for Pitesti asphalt (0.46). For *Cichorium intybus*, in Mioveni, asphalt conditions, the recorded values are the same with the soil conditions Mioveni and Maracineni. The species also appeared less stressed in Pitesti, soil conditions, (0.30). For *Echinochloa crus-galli*, the Maracineni soil conditions are as unfavorable as the asphalt conditions from Pitesti and Mioveni. The Mioveni asphalt conditions do not have as strong of an influence in the negative sense; for *Erigeron annuus* the CWSI values were the same as those for the plant's soil vegetation in the analyzed locations. At the *Lactuca serriola* and *Polygonum aviculare* was observed a strong interaction between the environment and the species through the presence of four homogenous classes for the CWSI values. *Lactuca serriola* had a lower water stress level in the asphalt conditions in Pitesti (0.54) and soil conditions in Mioveni (0.08). In the case of *Polygonum aviculare*, the Pitesti and Mioveni soil conditions were more advantageous than those offered by the other tested environments. With respect to the transpiration intensity, this was computed in mg dm^{-2} h^{-1} and, respectively, in % for the initial leaf water content at the leaf's separation point. The normality was tested using the Shapiro-Wilk test. The "W" indicator was 0.875, respectively 0.811, values which determined to reject the normality. Figures 3 - 6 graphically show the results obtained after determining the transpiration intensity. Analyzing figure 3, on the experience average, we found three homogenous classes of the transpiration intensity. The species that transpire the most intense was *Polygonum aviculare* (665 mg dm^{-2} h^{-1}). The water quantity lost by this species is significantly different from that lost by the species *Cichorium intybus* (387 mg dm^{-2} h^{-1}) and *Erigeron annuus* (354 mg dm^{-2} h^{-1}). The other three species have a uniform behavior. Atanasiu, 1984, shows that the plant's ability to tune and control the closing and opening of their stomata gives them the possibility to regulate the transpiration level according to their internal water necessities. The reaction response time, speed and efficiency of the plant's system varies by species. In the first 15 minutes from the leaf's excision from the plant, the tendency of the average experience is maintained, the *Polygonum aviculare* species showing the highest transpiration intensity value (1,443 mg dm^{-2} h^{-1}). At this species the plant's capacity to retain water is lower either because of the higher number of stomata or because the plant does not manage to close its stomata in such a short period of time. The average tendency is also kept for the 6-31 minutes interval from the leaf's separation from the plant. In the following intervals, the water quantity was uniformly lost for all species. After 30 minutes from the leaf's excision, all species differences related to the water lost through transpiration disappeared which indicates a strong interaction between the species and the time of the experiment (the differences are considered experimental error and are not supported statistically). Analyzing figure 4, we found that, on species average, there are two homogenous classes, the highest quantity of water lost through transpiration (883 mg dm^{-2} h^{-1}) being recorded during the first 15 minutes from the leaf's excision from the plant, significantly different from the water quantity lost in any other moment of the experiment. The average tendency was kept for the species *Conyza canadensis*, *Cichorium intybus* and *Erigeron annuus*. For the species *Echinochloa crus-galli* and *Lactuca serriola* the water losses through transpiration were uniform, the plants managing to retain more efficiently their water. Generally, the higher water retention capacity can be explained either through the presence of a smaller number of stomata or through other morphological particularities such as the cuticles thickness. For *Polygonum aviculare,* the time factor is accentuated as there were found significant diferences between water quantities lost in the first and the following 15 minutes and the last 30 minutes. Analyzing figure 5, we found, on the experience average, the existence of three homogenous groups. The species which lost the highest water percentage of water (11%) was *Polygonum aviculare*, and the species that best retained water, loosing the smallest percentage (3.97%), was *Cichorium intybus*, with the differences between the two species being significant. During the first 15 minutes after the leaf's excision from the plants, the species order is maintained on average (differences existed between species with respect to the percentage of the water lost through transpiration), over the following 15 minutes the differences between plants became less significant (we have only two homogenous classes with *Polygonum aviculare* keeping the first position). In the interval 31-45 minutes, there were no more statistical differences except for the species *Lactuca serriola* and *Cichorium intybus*; finally, in the last interval disapeared due to a strong interaction between the species and the time factor. Analyzing figure 6, we learned that, on species average, the transpiration intensity values make two homogeneous classes with the biggest lost water percentage being recorded in the first 15 minutes, significantly different than the percentages of water lost in the other moments of the experiment. After 15 minutes, the percentages of water lost through transpiration dropped on average over all analyzed species. In the cases of *Echinochloa crus-galli* and *Lactuca serriola*, the percentages of water lost were uniform, with no differences regardless of the testing point while in the case of *Polygonum aviculare,* the water losses through transpiration was accentuated in line with the elapsed time for the leaf's separation from the plant. The average effect of the factor time was also kept for the species *Conyza canadensis, Cichorium intybus* and *Erigeron annuus.*

CONCLUSIONS

CWSI is frequently used to estimate water stress in different plant species. For the analyzed species, the CWSI had values contained between 0.26 (for *Cichorium intybus* which was the least affected by water stress) and 0.44 (for *Lactuca serriola* which had suffered the most from the water stress). The highest CWSI values were calculated for Pitesti, in asphalt, (0.56) and at Mioveni, in asphalt (0.57), significantly different from the CWSI values calculated for the plants grown in soil – in which case the plants had uniform values across the locations. The species with the most intense transpiration was *Polygonum aviculare* (665 mg dm^{-2} h^{-1}). The water quantity lost by this plant is significantly different from that lost by the species *Cichorium intybus* (387 mg dm^{-2} h^{-1}) and *Erigeron annuus* (354 mg dm^{-2} h^{-1}). In the first 30 minutes from the leaf's excision from the plant differences were recorded with respect to the water loss through transpiration but those differences had subsequently disappeared. The highest water loss was recorded for *Polygonum aviculare* (11% in the first 15 minutes after the leaf excision from the plant).

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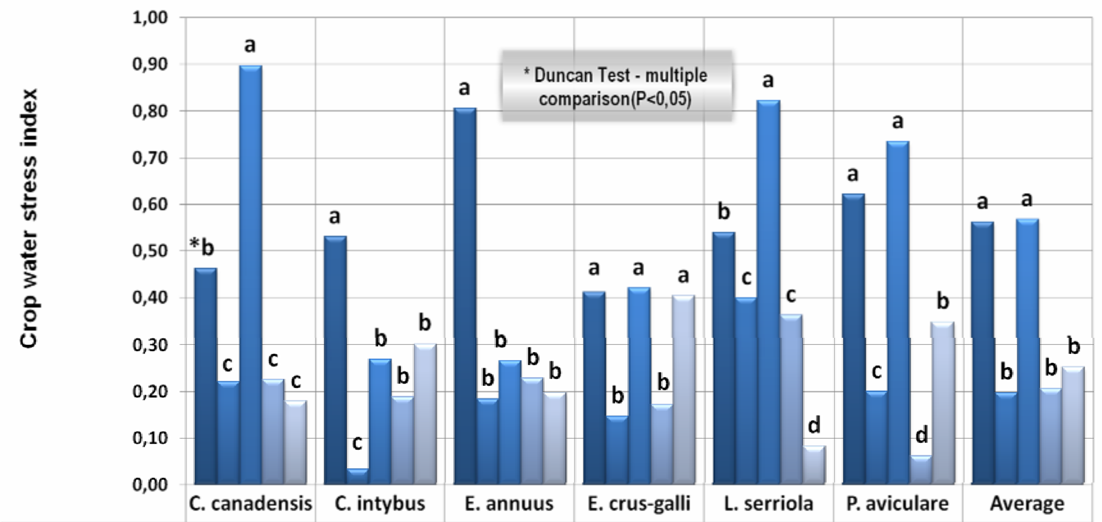
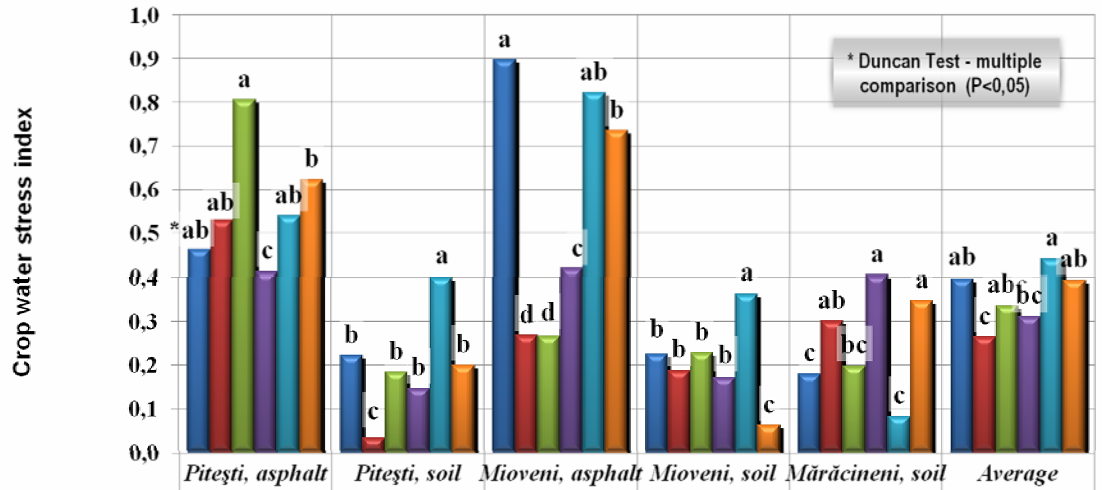
FIGURES



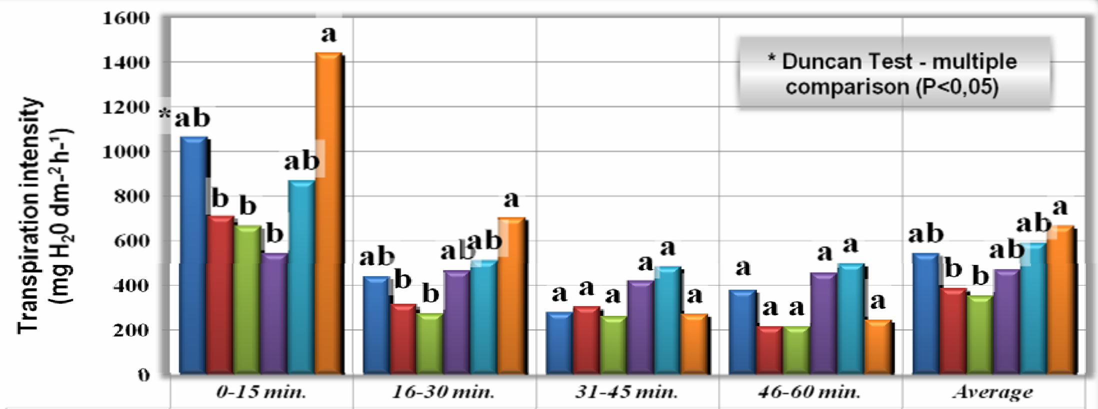
	C. canadensis	C. intybus	E. annuus	E. crus-galli	L. serriola	P. aviculare	Average
Piteşti, asphalt	0,46	0,53	0,81	0,41	0,54	0,62	0,56
Piteşti, soil	0,22	0,03	0,18	0,15	0,40	0,20	0,20
Mioveni, asphalt	0,90	0,27	0,27	0,42	0,82	0,74	0,57
Mioveni soil	0,23	0,19	0,23	0,17	0,36	0,06	0,21
Mărăcineni, soil	0,18	0,30	0,20	0,40	0,08	0,35	0,25

Fig. 1. CWSI variation by species on constant environment



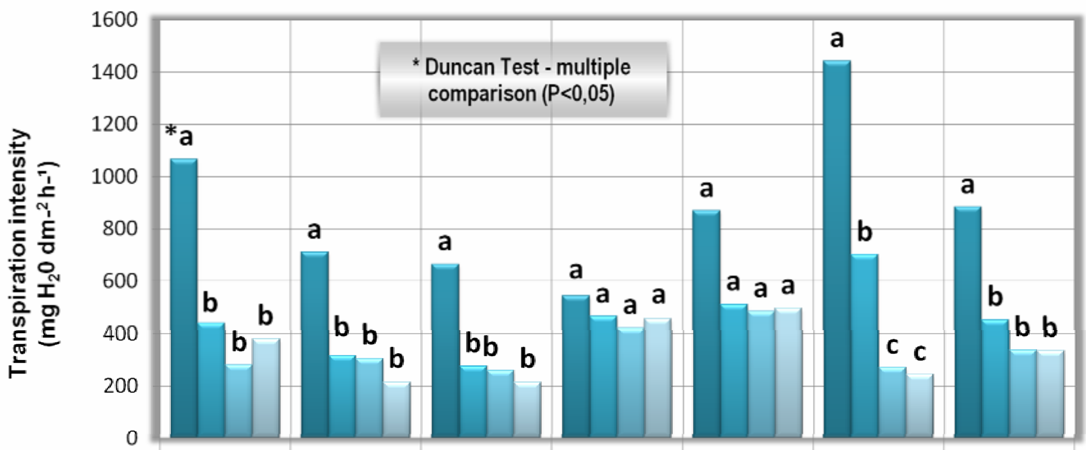
	Piteşti, asphalt	*Piteşti, soil*	*Mioveni, asphalt*	*Mioveni, soil*	*Mărăcineni, soil*	*Average*
C. canadensis	0,46	0,22	0,90	0,23	0,18	0,40
C. intybus	0,53	0,03	0,27	0,19	0,30	0,26
E. annuus	0,81	0,18	0,27	0,23	0,20	0,34
E. crus-galli	0,41	0,15	0,42	0,17	0,40	0,31
L. serriola	0,54	0,40	0,82	0,36	0,08	0,44
P. aviculare	0,62	0,20	0,74	0,06	0,35	0,39

Fig. 2. CWSI variation by the testing environment on constant levels for species



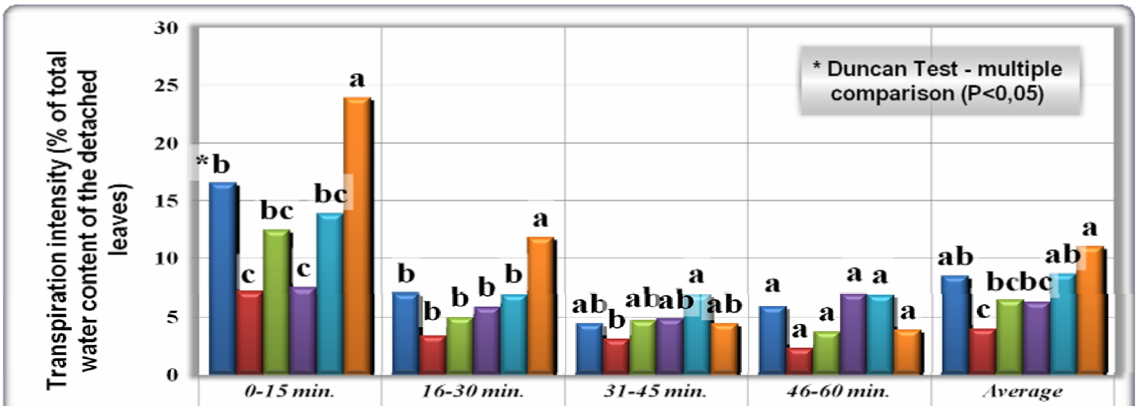
	0-15 min.	16-30 min.	31-45 min.	46-60 min.	Average
C. canadensis	1067	440	280	380	542
C. intybus	710	316	305	215	387
E. annuus	665	275	260	215	354
E. crus-galli	542	465	421	456	471
L. serriola	869	510	484	496	590
P. aviculare	1443	701	271	244	665

Fig. 3. Transpiration intensity variation by species on constant elapsed time levels from the leaf's separation from the plant



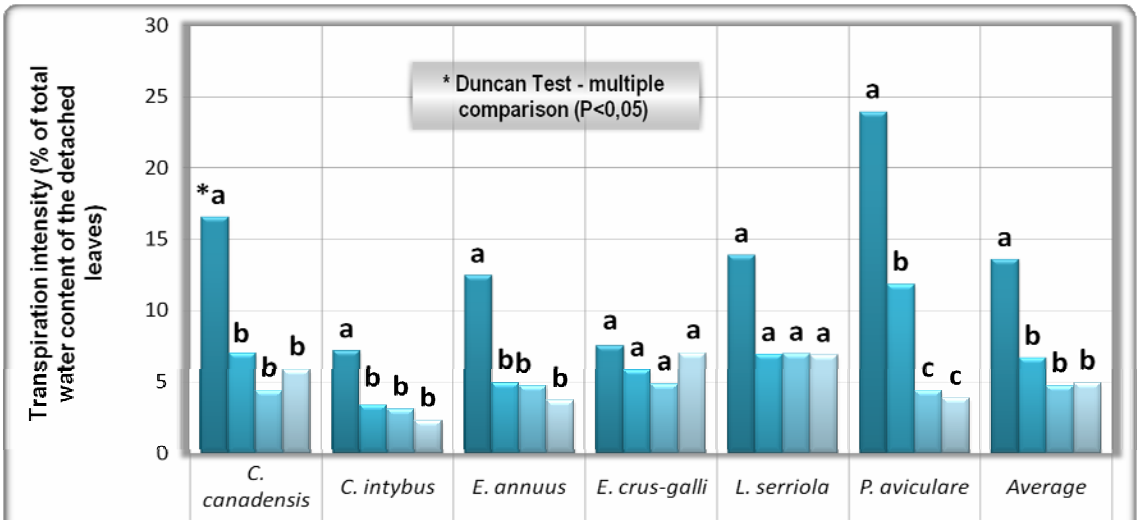
	C. canadensis	*C. intybus*	*E. annuus*	*E. crus-galli*	*L. serriola*	*P. aviculare*	Average
0-15 min.	1067	710	665	542	869	1443	883
16-30 min.	440	316	275	465	510	701	451
31-45 min.	280	305	260	421	484	271	337
46-60 min.	380	215	215	456	496	244	335

Fig. 4. Transpiration intensity variation by the elapsed time from the leaf's separation on constant species levels



	0-15 min.	16-30 min.	31-45 min.	46-60 min.	Average
C. canadensis	16,54	6,99	4,40	5,86	8,45
C. intybus	7,14	3,36	3,09	2,29	3,97
E. annuus	12,43	4,94	4,71	3,71	6,45
E. crus-galli	7,47	5,84	4,85	6,97	6,28
L. serriola	13,85	6,90	6,94	6,86	8,64
P. aviculare	23,94	11,82	4,39	3,86	11,00

Fig. 5. Transpiration intensity (%) variation by species on constant elapsed time levels from the leaf's separation from the plant



	C. canadensis	*C. intybus*	*E. annuus*	*E. crus-galli*	*L. serriola*	*P. aviculare*	Average
0-15 min.	16,54	7,14	12,43	7,47	13,85	23,94	13,56
16-30 min.	6,99	3,36	4,94	5,84	6,90	11,82	6,64
31-45 min.	4,40	3,09	4,71	4,85	6,94	4,39	4,73
46-60 min.	5,86	2,29	3,71	6,97	6,86	3,86	4,92

Fig. 6. Transpiration intensity (%) variation by the elapsed time from the leaf's separation on constant species levels

The influence of gibberellic acid treatments on *Paeonia Tenuifolia* seeds germination, under controlled temperature conditions

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Keywords: peony, seeds, dormancy, germination, stimulators

ABSTRACT

Two distinct experiments took place in different controled temperature conditions. In the first experiment, with preliminary warm stratification of seeds (28°C), the gibberellic acid treatment did not have any effect on seeds germination, not even after 13 weeks, as well as the control. Only the transfer of seeds to low constant temperature of 8°C determined seeds germination, after only 3 weeks, both in case of the control and of the gibberellic acid treatments. In the second experiment, when seeds were directly put into cold controled temperature of 8°C, the gibberellic acid treatment had an overwhelming influence. The maximum germination percentage (80%) was registered at V_3 (300 mg/l), comparated to the control, where only 35% of the seeds germinated. This fact demonstrates that the gibberellic acid can replace the warm stratification in case of seeds germination, but can not replace the cold stratification.

INTRODUCTION

Paeonia tenuifolia L. is a globally, European and national endangered specie (Sarbu Anca and colab., 2007), growing naturally in Romania.

This specie is very appreciated by the landscapers in the rock gardens, due to its low high (10-50 cm), beautiful red petal flowers contrasting with the yellow stamens, as well as its attractive fern leaves. This is why the generative reproduction of the specie by horticultural means seems to be a major task.

The biology of *Paeonia* seed germination is interesting due to the type of dormancy these seeds present: **epicotyl dormancy**, which means the germination process takes place in two distinctive steps. In the first step, the radicle release from dormancy occurs during a warm period of 1 to 3 months, while, in the second step, the epicotyl dormancy is overcome by a subsequent chilling period of 1 to 3 months (Baskin C.C. and Baskin J.M., 1998; Geneve L.R., 2003). But, the results of the germination process in *Paeonia* genus highly varies with the specie, with the seeds harvesting period, with the temperature conditions, etc. (American Peony Society, 2001).

MATERIALS AND METHODS

The seeds were harvested from a population of *Paeonia peregrina* specie located in ”Dimitrie Brandza” Botanical Garden from Bucharest, at the end of June 2006 and 2007.

In the first experiment started on October 13th 2006, two hundred seeds were used, while in the second experiment started on January 5th were used one hundred seeds. Five experimental variants were set: 4 different concentrations of gebberellic acid (GA_3) to stimulate germination, plus the control. The 5 variants were as following:

V_1= Control (Mt)
V_2= 150 mg/l GA_3;
V_3= 300 mg/l GA_3;
V_4= 500 mg/l GA_3;
V_5= 1000 mg/l GA_3;

The seeds were soaked in GA_3 for 24 hours, at room temperature.

After this period, seeds of each variant were put into plastic bags filled with wet peat (Professional Cultivation Peat Substratum II), in order to keep it moist. In the first experiment, the bags were preliminary put into a germinator, set on 28°C constant temperature. After 14 weeks the seeds were transferred to a refrigeratore with a constant temperature of 8°C. In the second experiment, the bags were directly put into a refrigeratore with a constant temperature of 8°C, without preliminary warm stratification.

The germination process was kept under weekly observations.

From the moment the radicle emerged, biometrical measurements were taken.

RESULTS AND DISCUSSIONS

The influence of temperature on seed germination (radicules emergence) and epicotyls emergence

Phenology of radicules emergence. In the first experiment, under preliminary conditions of warm constant temperature (28°C), the seeds did not germinate even after 13 weeks. After this time, the seeds were transferred to a refrigeratore with a constant temperature of 8°C. Soon after this, the first radicules started to emerge only after 3 weeks and in most of the seeds the radicules emerged after 5 weeks. The maximum germination percentage was 80%.

In the second experiment, when the seeds were directly set under cold constant temperature (8°C), only 35% of the seeds germinated after 12 weeks of cold stratification.

Phenology of epicotyls emergence. In the first experiment, with preliminary warm stratification, the epicotyls began to emerge after 4 weeks since most of the seeds had germinated. But the maximum percentage was low (17.5%), obtained after 15 weeks since most of the seeds had germinated and after 33 weeks since the begining of the experiment.

In the second experiment, without preliminary warm stratification, no epicotyls emerged (Table 1).

The influence of both temperature and treatments with stimulation substances on seed germination and epicotyls emergence

In the first experiment, with preliminary warm stratification of seeds (28°C), the gibberellic acid treatment did not have any effect on seeds germination, not even after 13 weeks, as well as the control. Only the transfer of seeds to low constant temperature of 8°C determined seeds germination, after only 3 weeks, both in case of control and of treatments with different gibberellic acid concentrations (Table 2, Fig. 1-2).

But in case of the experiment without preliminary warm stratification, when the seeds were directly put into cold controlled temperature of 8°C, in all the four variants treated with GA_3 the germination reached 70%, while in the control germination reached only 35% (Table 3, Fig. 3-4).

This proves that the gibberellic acid can replace the warm stratification, in case of the germination process, but it can not replace the cold stratification..

CONCLUSIONS

Preliminary warm stratification, followed by cold stratification are needed so that the radicules and the epicotyls to emerge in seeds of *P. tenuifolia*.

The gibberellic acid treatment can replace the warm stratification, in case of the germination process, but it can not replace the cold stratification. In case of its influence on epicotyls emergence more studies are needed.

Controled constant temperatures might not be suitable for overcoming epicotyls dormancy in seed of *P. tenuifolia*. Natural alternating temperatures or controlled alternating temperatures should be studied because it might lead to higher percentage of epicotyls emergence.

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TABLES

Table 1. The influence of temperature on seed germination and epicotyls emergence

	Constant Temperature (ºC)	**Germination**		**Germinated seeds with emerged epicotyls**	
		Maximum %	**Time (weeks)**	**Maximum %**	**Time (weeks)**
First exp. (with WS[1])	28	0	14	-	-
	28→8	80	14+5	17.5	14+5+14
Second exp. (without WS[1])	8	35	12	-	9

Legend: WS[1] = Warm Stratification

Table 2. The influence of both temperature and treatments with stimulation substances on seed germination and epicotyls emergence, in case of preliminary warm stratification

Variant	**Treatment on seed**	**Seed no./ variant**	**Germination**		**Germinated seeds with emerged epicotyls**	
			No. of germinated seed	**% of germinated seed**	**No. of epicotyls**	**% of epicotyls**
V_1	Control	40	32	80	7	17.5
V_2	150 mg/l GA_3	40	35	87.5	3	7.5
V_3	300 mg/l GA_3	40	35	87.5	4	10
V_4	500 mg/l GA_3	40	36	90	4	10
V_5	1000 mg/l GA_3	40	26	65	10	25
Average	-	-	32.8	82	5.6	14

Table 3. The influence of both temperature and treatments with stimulation substances on seed germination and epicotyls emergence, without preliminary warm stratification

Variant	**Treatment on seed**	**Seed no./ variant**	**Germination**		**Germinated seeds with emerged epicotyls**	
			No. of germinated seed	**% of germinated seed**	**No. of epicotyls**	**% of epicotyls**
V_1	Control	20	7	35	-	-
V_2	150 mg/l GA_3	20	15	75	-	-
V_3	300 mg/l GA_3	20	16	80	-	-
V_4	500 mg/l GA_3	20	14	70	-	-
V_5	1000 mg/l GA_3	20	14	70	-	-
Average	-	-	13.2	66	-	-

FIGURES

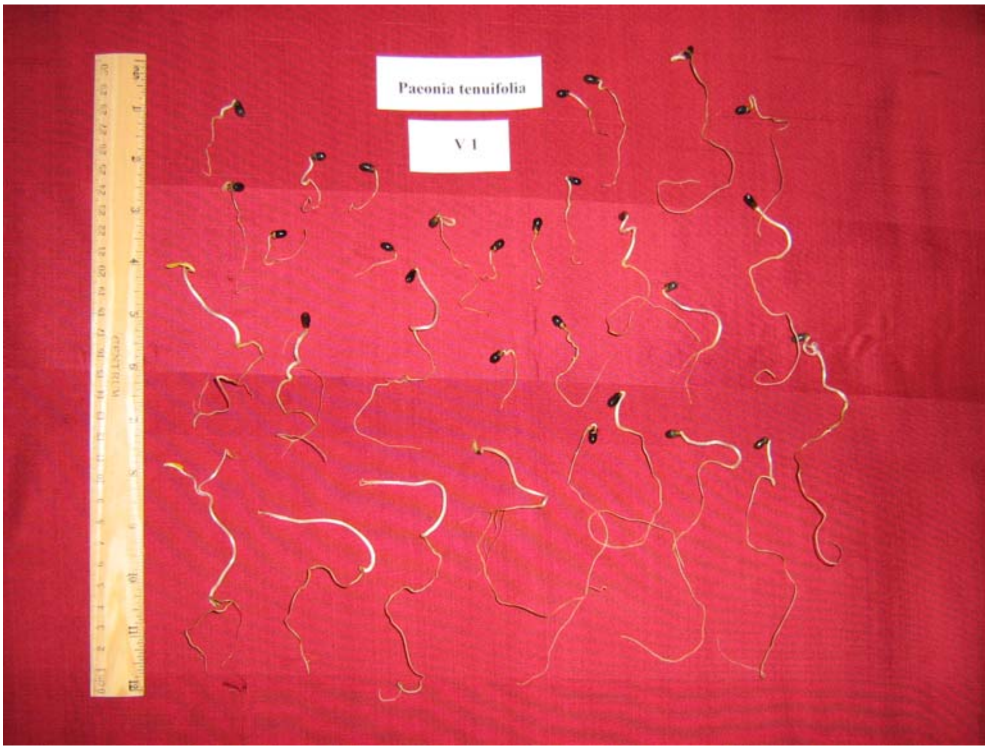

Fig. 1. The moment of maximum germination percentage (80%) and epicotyls emergence (17.5%) in the control (V_1), in case of preliminary warm stratification

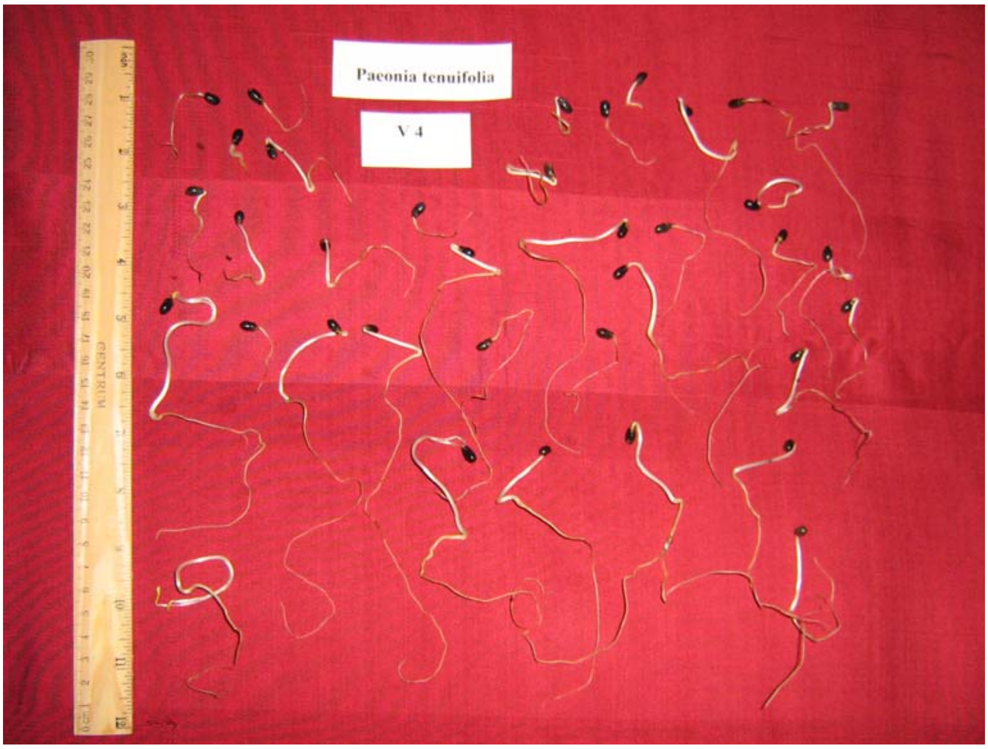

Fig. 2. The moment of maximum germination percentage (90%) and epicotyls emergence (10%) in V_4 (500 mg/l GA_3) , in case of preliminary warm stratification

Fig. 3. The moment of maximum germination percentage (35%) in the control (V_1), in the experiment without preliminary warm stratification

Fig. 4. The moment of maximum germination percentage (80%) in V_3 (300 mg/l GA_3), in the experiment without preliminary warm stratification

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The influence of both petal thickness and ecological conditions on some peony cultivars flower resistance on plant

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Keywords: *Paeonia*, petal structure, temperature, flower resistance

ABSTRACT

Four cultivars of two *Paeonia* species were studied in order to see if there is any connection between the flowers resistance on plant and the petal thickness, on the one hand, and between the flowers resistance on plant and the temperature recorded in the flowering period, on the other hand. The study was conducted by means of visual, phenological and microscopic observations. It was observed a positive correlation between the flowers resistance on plant and the petal thickness, as well as between the flowers resistance on plant and the temperature recorded in the flowering period.

INTRODUCTION

Peony flowers (*Paeonia sp.*) are very appreciated in the landscape designs as well as for the cut flower production. Some peony cultivars are more weather resistant on plant then the others and some peony cultivars have a longer vaselife then the others. There are cultivars recommended for each of the two production directions.

In peony, flower resistance is also related to the flower type: single, double, semi double, Japanese, anemone. As a general rule, double flowers last longer then the other flower types.

From the specialty literature it is well known the influence of the ecological conditions of the year on flower resistance on plant. The raised temperatures determine earlier flowering periods, shorter harvesting periods or lower flower resistance on plant (Evans and colab., 1990; Holloway and colab., 2003, 2004).

The purpose of this study was to observe if there is any connection between petal thickness and flower resistance on plant, and the relation between this and the ecological parameters.

MATERIALS AND METHODS

Flowers of 2 species of *Paeonia* (*Paeonia lactiflora* and *Paeonia officinalis*) and 4 cultivars (*P. lactiflora 'Jacorma'*, *P. lactiflora 'General MacMahon'*, *P. lactiflora 'Douchesse de Nemours'* and *P. officinalis 'Alba Plena'*) were collected from the Floriculture Department of Faculty of Horticulture, Bucharest. All the cultivars in study here are double flowers type.

Provisional microscopic preparations were made, using very thin transverse fragments of petals. This was done by using common elderberry (*Sambucus nigra*) spinal. In order to study the cellular wall nature, the sections clarification was done using chloral hydrate and after this the coloration was made using alum carmine, maintained 24 hours at room temperature and then washed with distilled water.

For the microscopic observations was used an optical microscope – Optika, and the microscopic photos were took with a digital Panasonic – DMC-LZ7 camera.

RESULTS AND DISCUSSIONS

The average temperature in the flowering period ranged from 19 to 20.2ºC (Table 1). Also, the average monthly precipitations that might have had influenced flower resistance on plant were 62.2 mm in May and 47.2 mm in June (Romanian Statistical Yearbook).

The microscopic observations on petal structure (Table 2, Fig. 3-6) confirm the visual observation on flowers (Table 1, Fig. 7-10).

In the two studied species, the total petal thickness ranged from a minimum of 222 µ (*Paeonia officinalis 'Alba Plena'*, Fig. 3) to a maximum of 478.4 µ (Paeonia *lactiflora 'Jacorma'*, Fig. 4) and the flowers resistance on plant ranged from only 5 days in cv. '*Alba Plena*' of *Paeonia officinalis* specie to 8 days in cv. '*Gen. MacMahon*' of *Paeonia lactiflora* specie. Although the temperature recorded in cv. '*Alba Plena*' flowering period (19 ºC) was lower then that recorded in cv. '*Jacorma*' (20.2 ºC), cv. '*Alba Plena*' lasted only 5 days due to its thin petal structure as well as the absence of collenchymas, reveled both at visual level (Fig. 8) and at microscopic level (Table 2).

Among the cultivars of the same specie (*Paeonia lactiflora*), the total thickness of the petals ranged from a minimum of 448 µ (in cv. 'Gen. MacMahon') and a maximum of 478.4 µ (in cv. '*Jacorma*'), but it was observed a longer resistance of cv. '*Gen. MacMahon*' flowers (8 days) compared to cv. '*Jacorma*' (7 days), although the petal thickness of the first one was smaller. This longer resistance of cv. '*Gen. MacMahon*' can be explained by the lower temperature recorded in its flowering period (19.1 ºC), compared to that recorded in cv. 'Jacorma' flowering period (20.2 ºC).

The cultivar '*Douchesse de Nemours*' had the same resistance on plant as cv. '*Jacorma*' (7 days), although the last one had thicker petals and the difference in temperature was of only 0.1 ºC (20.2-20.1). But cv. '*Douchesse de Nemours*' had 4 layers of collenchymas under superior epidermis (1 layer more than all the other cultivars) and the vessel bundles were grouped by twos. These characteristics might confer a superior mechanical resistance.

A positive significant correlation it was observed between the flower resistance on plant and the total petal thickness (r = 0.838), as well as between the flowers resistance on plant and temperature (r = 0.718) (Table 3). The greatest value of the accuracy indicator (R^2 = 0.7018) is equivalent to 70,18% from the total dispersion (Table 4, Fig. 2). This means that 70,18% of the flower resistance dispersion can be explained by the petal thickness modification through a linear regression.

CONCLUSIONS

Generally speaking, the flowers of the cultivars with thicker petals have a longer resistance on plant.

In some cases, the lower temperatures compensate the smaller petal thickness (cv. 'Gen. MacMahon', 'Douchesse de Nemours').

The simultaneous action of petal thickness and temperature led to the longest flower resistance on plant (8 days, in cv. 'Gen. MacMahon).

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TABLES

Table 1. Phenology of flowering with influence on flower resistance on plant

CrtNo.	Specie/Cultivar	Year	Flowering Period	Average Temp. in Flowering Period (ºC)*	Average Fl. Resistance/ pl.(days)	Visual Observation on Flowers
1.	*P. lactiflora 'Jacorma'*	2006	31may-3June	17.5	7	Thick petals, pink color
		2007	24-26 may	22.9	7	
		Average	-	20.2	7	
2.	*P. lactiflora 'Gen. MacMahon'*	2006	27-30 may	18.9	9	Thick petals, deep pink color
		2007	18-24 may	19.1	7	
		Average	-	19	8	
3.	*P. lactiflora 'Douchesse de Nemours'*	2006	28 may	18.7	8	White petals, pink splashed, no transparence
		2007	21-26 may	21.5	6	
		Average	-	20.1	7	
4.	*P.officinalis 'Alba Plena'*	2006	15-19 may	17.4	6	Thin white transparent petals
		2007	11-14 may	20.7	4	
		Average	-	19	5	

*Source: Titu Meteorological Station (52 km from Bucharest); data based on a daily obs.

Table 2. The microscopic observations on the studied cultivars petal structure

Crt. No.	Specie/ Cultivar	Superior epidermis (μ)	Mesophyll (μ)	Inferior epidermis (μ)	Total petal thickness (μ)	Observations
1	*P. lactiflora 'Jacorma'*	48	374,4	56	478,4	3 collenchymas layers under sup. epid. and 2 under inf. epid.
2	*P. l. 'Gen. MacMahon'*	48	352,0	40	440	3 collenchymas layers under sup. epid. and 2 under inf. epid.
3	*P. l. 'Douchesse de Nemours'*	40	366,0	40	446	4 collenchymas layers under sup. epid. and 2 under inf. epid.
4	*P.officinalis 'Alba Plena'*	38	152,0	32	222	Without collenchymas

Table 3. Values of simple correlation coefficient (r)

Studied element	Flower resistance (days)	Total petal thickness (μ)	Average temperature (ºC)
Flower resistance (days)	1	0.838**	0.718**
Total petal thickness (μ)	0.838**	1	0.485
Average temperature (ºC)	0.718**	0.485	1

Table 4. Values of the accuracy indicator (R^2)

Studied element	Flower resistance (days)	Total petal thickness (μ)	Average temperature (ºC)
Flower resistance (days)	1	0.7018	0.5158
Total petal thickness (μ)	0.7018	1	0.2354
Average temperature (ºC)	0.5158	0.2354	1

FIGURES

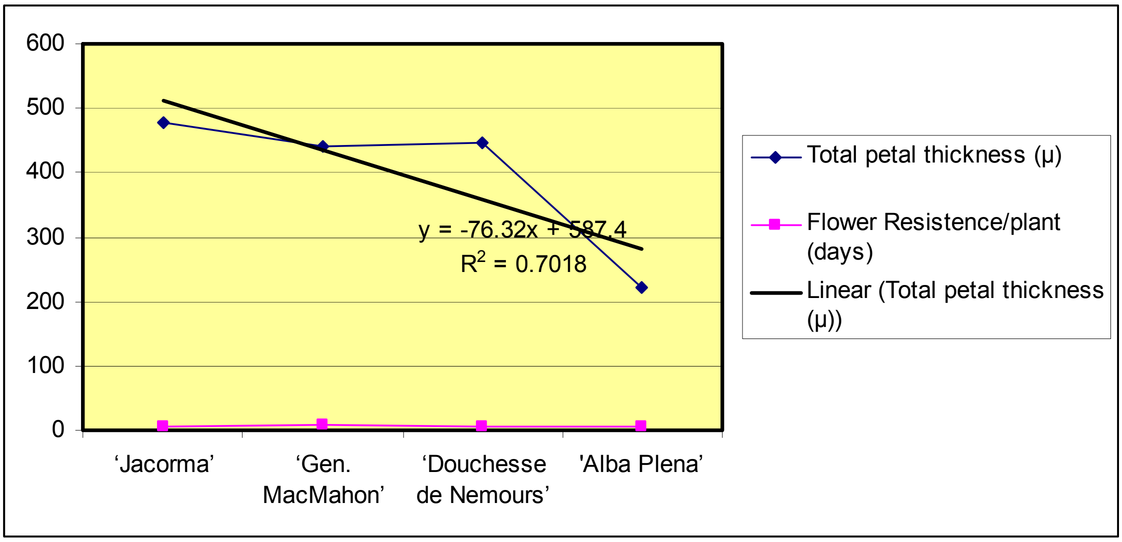

Fig. 1. Variation of flowers resistance on plant related to total petal thickness

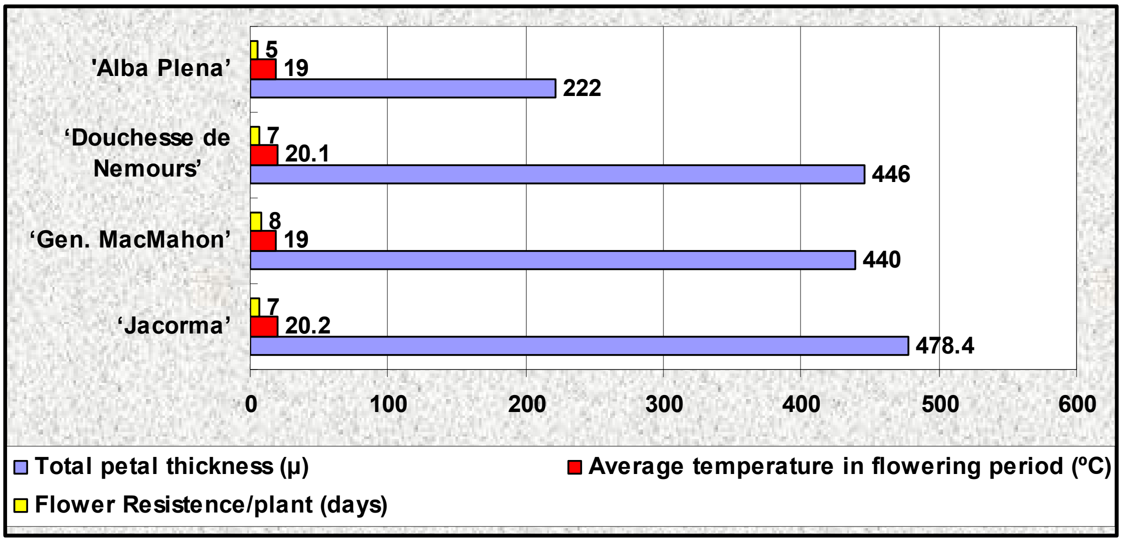

Fig. 2. Flower resistance on plant related to temperature and petal thickness

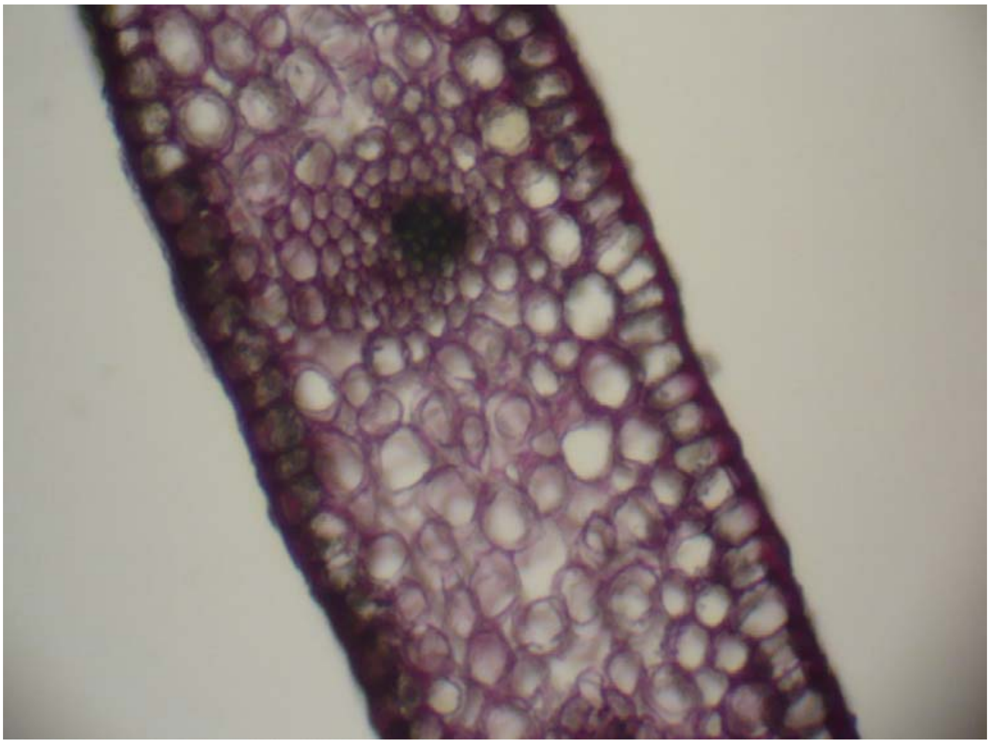
Fig. 3. The smallest petal thickness (222 μ) in cv. 'Alba Plena' (4x ob.)

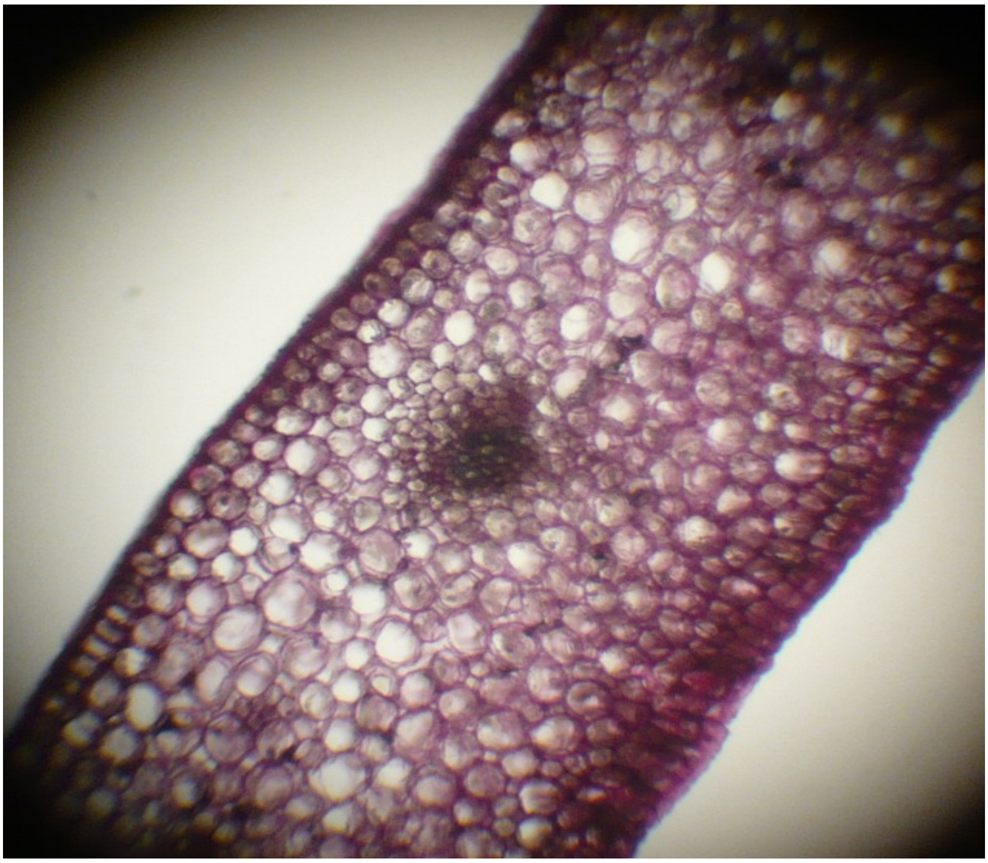
Fig. 4. The greatest petal thickness (478.4 μ) in cv. 'Jacorma' (4x ob.)

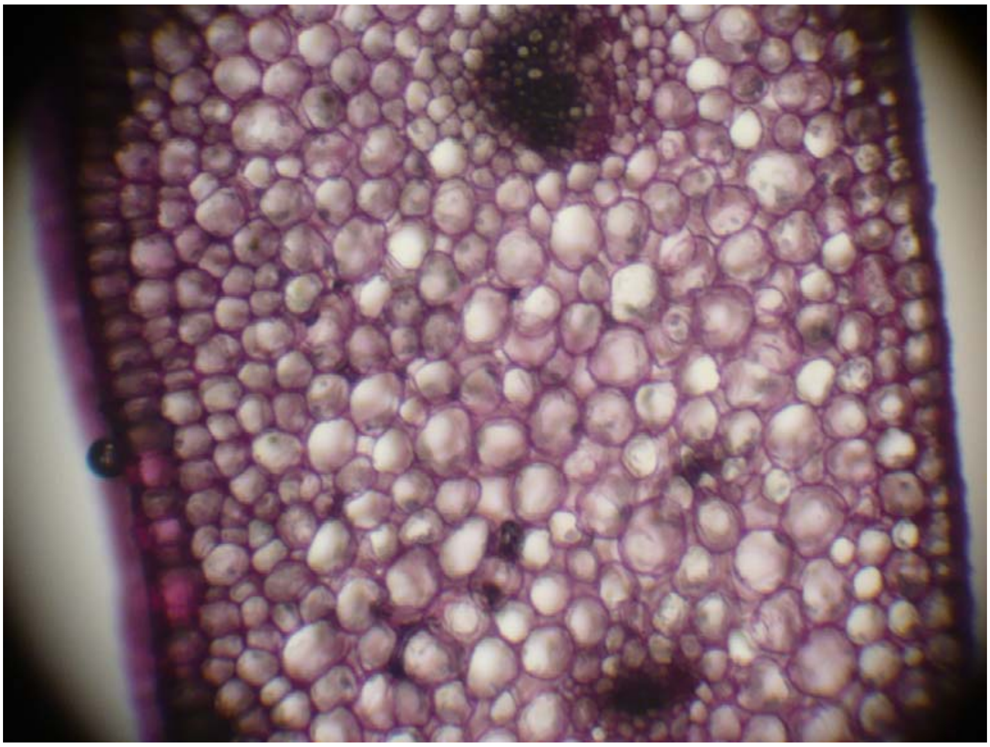

Fig. 5. The petal thickness (440 µ) in cv. 'Gen. MacMahon' (6 x ob.)

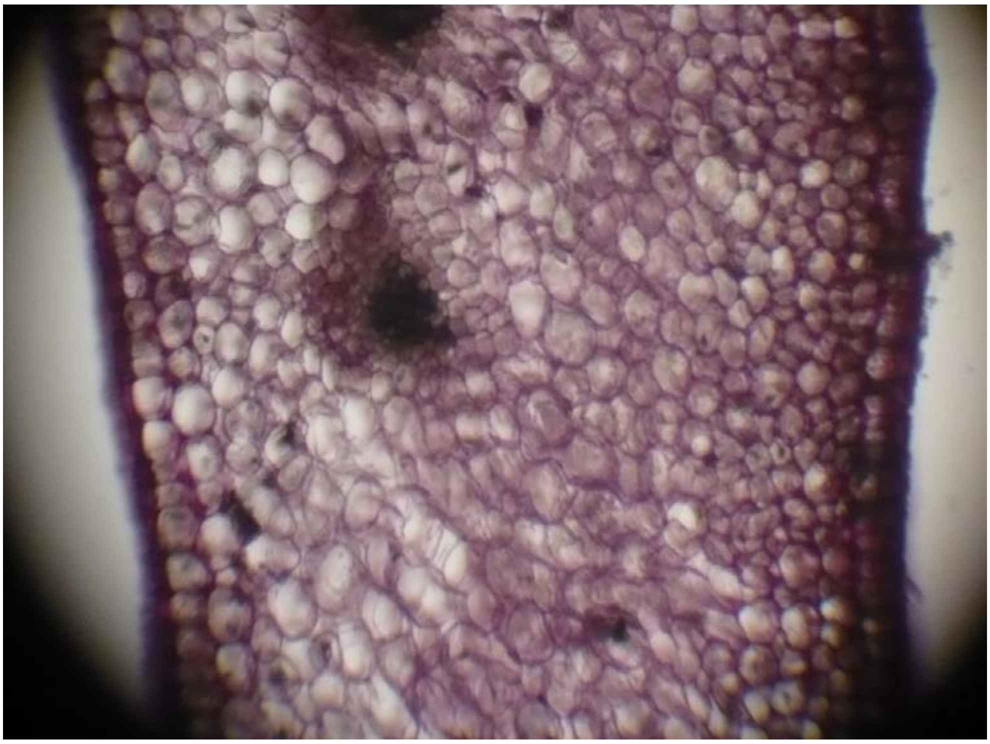

Fig. 6. The petal thickness (446 µ) in cv. 'Douchesse de Nemours' (6 x ob.)


Fig. 7. Visual observation on cv. 'Douchesse de Nemours'


Fig. 8. Visual observation on cv. 'Alba Plena'

Fig. 9. Visual observation on cv. ‘Gen. MacMahon’

Fig. 10. Visual observation on cv. ‘Jacorma’

Performance of the highbush blueberry cuttings in relation to the growth substrata conditions

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Keywords: *Vaccinium corymbosum*, planting material, physiological parameters, vigour

ABSTRACT

Physiological behaviour of highbush blueberry cuttings was studied in 2008, in a pot experiment under natural orchard conditions of the experimental field of the Faculty of Horticulture Bucharest. The plants were transferred a year before in pots containing different percent of peat, manure, sawdust, litter, and distillation residues. Leaf dry matter, water and ash levels, leaf gas exchange responses and assimilatory pigments related to substrata composition was examined. Physiological indicators have been positively affected with organic substrata presence, as it was emphasised especially at V3 (75.00 % peat, 25.00 % manure), V6 (50.00 % peat, 50.00 % litter) and V8 (50.00 % peat; 50.00 % distillation residues). At the opposite pole there was situated V4 (50.00 % peat, 50.00 % sawdust). Plant growth and development was modified by substrata, ramification and branches length, also fructification was particularly affected.

INTRODUCTION

Blueberries (family *Ericaceae*, genus *Vaccinium*) are interesting fruit for potential health benefits due to their bioactive compounds (anthocyanins, flavonoids, polyphenols and ascorbic acid) (Sinelli et al., 2008). Highbush blueberries (*Vaccinium corymbosum* cv. *Blueray*) are the most planted blueberry species in the world (Strick and Yarborough, 2005), introduced also in Romania (Bădescu, 1985), and recognised for relatively large fruit and excellent fruit quality.

In the last years, many scientists have carried out extensive studies for new cultivars of blueberries (Erb, 1993; Claussen and Lenz, 1999; Morikawa and Saigusa, 2004; Szwonek, 2004; Wojcik, 2005; Clapa and Fira, 2006; Bădescu et.al. 2008; Ochmian et. al. 2008; Tetsumura et al. 2008; Xie and Wu 2009). Thus, it can be mentioned: testing the most effective propagation system, the substrata composition impact, mineral soil adaptability or soil-foliar supply with fertilisers etc.

The purpose of these research was to positively influence the plants growth and development, increase plants productivity and improve the yield quality Also, there is evidence that others environmental factors such as carbon dioxide enrichment had a positive effect on the growth of blueberry softwood cuttings (Prokaj et al., 2004).

Low-quality soils especially as a result of mine exploitation are the major constrains for agricultural exploitation in most submontaine areas, where climatic conditions for production are favourable. As previously mentioned, propagation methods exert significant influence on nursery and field performances of blueberries, and as recently Yadong et al. (2006) reported, the addition of organic materials ameliorates the adverse effects of mine soil on plant behaviour.

That is why our present study purpose was to ascertain the physiologically behaviour of highbush blueberry hardwood cuttings cv. Blueray, exposed to different substrata composition. The response in terms of: dry matter accumulation, photosynthesis, transpiration, respiration rates and chlorophyll content dynamics was evaluated, in order to elucidate the contributions of changes in the studied parameters to the differences in plant behaviour.

MATERIALS AND METHODS

a) Plant material and growing conditions

The experiment was conducted in 2008 at the Faculty of Horticulture Bucharest U.S.A.M.V.Bucharest, Romania, with highbush blueberry (*Vaccinium corymbosus* L. cv. Blueray) (hardwood cuttings of three years old). Plants were transferred a year before in 4 L plastic pots filled with different percent of peat, manure, sawdust, litter, and distillation residues (*Table 1*). Groups of 5 uniform plants of each of 16 variants were used in the experiment. The plants were grown out, temperature being variable as well as relative humidity or solar radiation, as natural conditions.

b) Analysed parameters

The following determinations were carried out - water (%), dry matter (%) and ash (%) levels in the blueberry leaves by three determinations (May 8; June 17; July 25). Also, net photosynthesis (A: µmol $m^{-2}s^{-1}$), transpiration (E: mmol H_2O $m^{-2}s^{-1}$), respiration rate (mg CO_2 $kg^{-1}h^{-1}$) and assimilatory pigments (mg 100 g^{-1} FW) content have been g evaluated (for 4 months: from May 8 - 30 days after flowering - DAF, to August 2008).

The fresh leaves have been weighted using a 10-g sample and drying in an oven (Heraeus Instruments) at 105° to a constant weight. By the mass differences there were obtained dry matter (%) and water (%) content. Then the material was ashed at 550^0C (Nabertherm oven) and white ash content (%) was calculated.

Photosynthesis and transpiration rate were measured in dynamics, three times during the growing period using an infrared gas analyser (IRGA; LCA-4, Analytical development Company -ADC- Ltd. U.K.), a portable photosynthesis system.

The first determination period of gas exchange was recorded on May 14 (36 DAF), the second one on June 17 (70 DAF) and the third on July 30 (113 DAF). The leaves were marked in order to use the same ones in all evaluations. Measurements were taken between 09^{00} and 11^{00} h, chamber air temperature was not controlled during the measurements, so generally ranged between 28 and 33 ^{o} C and photosynthetic photon flux density (PPFD) was corresponding with naturally conditions, in bright sunlight on a clear, cloudless day. Values presented are the means of five leaves from five plants per sampling period. Respiration rate has been measured three times also, May 8, June 17 and July 25 using a CO_2 analyser (RIKEN) taking mean leaves samples from the mid portion of the one-year old branches and results were expressed as mg CO_2 $kg^{-1}h^{-1}$.

Pigments were determined two times, on June 20 and July 25, extracted by grinding leaves in 80% acetone. Absorbency of the resulting extracts was measured at three wavelengths: 663, 646 and 470 nm at the spectrometer CECIL-1011. Assimilatory pigment levels (chlorophyll and carotenoids) were expressed as mg 100 g^{-1} FW using the equations of Lichtenthaler and Wellburn (1983).

Using Statgraphics software on a confidence interval of 10% probability, there were compared the obtained data.

RESULTS AND DISCUSSION

1. Dynamics of blueberry leaves water, dry matter and ash content.

As regard as moisture, dry matter and ash of the blueberry leaves, the result synthesis is due in *Figure 1*, *Figure 2* and *Figure 3*. As we can see in *Figure 1*, the leaves moisture content ranged from a low value of 46,68% (V 11 – June 17) and a higher value 68,12% (V 1 – May 8). In the same time it can be noticed a nearer values in the case of the young leaves and of course slowly higher values, then, for the followings determinations some variation from one to another experimental variant, without to register remarkably differences between them. Of course, in relation with the water content there are also values regarding dry matter content (*Figure 2*). So, in the case if the younger leaves values are lower (the lowest value of

V1 – 31,87%), then for the second and the third determination there was registered a larger variability.

Concerning the ash content our results emphasised a larger variability (*Figure 3*), ranging from 2,8%, at V4 – May 8 (young leaves), to 4,14 % at V6 – the same determination moment. A similarly trend have been noticed for the other determination times. Depending with the leaf age, the youngest leaves had the highest moisture content, followed by a decreasing in the case of fully mature expanded leaves, then a remarkably decreasing in the senescent leaves. According to this evolution, there was registered an increasing of the dry matter and ash content. The dynamics of these indicators is in a close relation with the used grown substrata, especially referring to the absorption and accumulation of minerals, as previously others researchers also demonstrated (Morikawa and Saigusa, 2004; Ochmian and al., 2008).

2) Gas exchange dynamics

During the literature review, it becomes evident: dry matter accumulation and plants vigour is also related to others physiological parameter levels.

Photosynthesis rate dynamics is presented in *Figure 4*, and as we can see net photosynthesis increased as compared to plants grown without organic materials addition. Considerable changes in net photosynthesis were noticed and generally, values are low first of all in relation with plant age and leaves ageing, too. Also, there are larger variations between variants (in relation with the used substrata), with higher value registered in May, then the photosynthesis rate diminished for the both determination moments. So, the registered values are related to the experimentally variant, possible also, to the environmentally conditions of the year. As Hancock et al. (1992) reported, significant reductions in CO_2-assimilation rate as leaf temperatures were raised from 20 to 30° C. In the case of the last determination, for some variants as for instance V8, there were noticed values near to the previously values, while at the others the diminishing continued, values being even negative (V7, V14, V16). For these variants leaves presented the senescence signs. The negative values demonstrated that in the case of these variants the respiration rate surpassed the net photosynthesis rate.

Previous research reports on changes in photosynthesis in blueberry leaves have focused on water stress impact, as well as on biotic stress influence caused by *Septoria* pathogen (Lee et al., 2006; Roloff et al.(2004). After Roloff et al. (2004) the net carbon dioxide assimilation rate ranged between 6,9- 12,4 μmol $m^{-2}s^{-1}$, being near to zero in the case of the necrotic leaves, affected by *Septoria*. The light saturation point was situated at a photon density flux of 500-800 μmol $m^{-2}s^{-1}$.

Lee et al. (2006) noticed that in the case of water stressed "Rancocas" blueberry leaves, photosynthesis rate was 3-5 μmol $m^{-2}s^{-1}$ depending on photosynthetic photon flux density (PPFD) as compared with well watered plants, with a maximum CO_2 assimilation rate of 8.8 μmol $m^{-2}s^{-1}$.

As regard as valuable means to obtain a qualitatively planting material, results obtained by Projak et al. (2004) showed that, carbon dioxide enrichment had a positive effect on the growth of softwood cuttings, effect manifested by improving rooting ratio and survival ratio, earlier root induction, longer roots and increased growth. On the other hand, Clapa and Fira (2006) have been done research for the micropropagation of some highbush blueberry cultivars, as for instance, Bluecrop cv. and Litwińczuk et al. (2005) demonstrated that the micropropagated plants were more uniform, grew more vigurously and produced significantly more and longer shoots than cutting-derived plants.

From data presented in *Table 2* it can be observed higher values *of respiration rate* (near to 150 mg CO_2 kg^{-1} h^{-1}) for the first decade of May (30 days after flowering), with the maximum values that surpassed 200 mg CO_2 kg^{-1} h^{-1} (V2, V6, V9, V16). In fact this is a normally situation for an intense metabolic activity of leaves at this age stage. The registered variability of this indicator can be explained by the substrata influence on plants vegetation start, respectively the differences of the vegetation stage of this determination moment. Then, it was noticed a respiration rate diminishing according to leaf age progress, so, at the second determination time registered values were near to de 54,91 mg CO_2 kg^{-1} h^{-1}. At the end of July values had a larger variability, from very low values: 18,91 mg CO_2 kg^{-1} h^{-1} (as the case of V15) related to a poor plants vigour, to high values as the case of V10 (172,85 mg CO_2 kg^{-1} h^{-1}).

3. Assimilatory pigments content

Leaf assimilatory pigments content is one of the most important factors in determining the rate of photosynthesis and dry matter production. The obtained data (mg 100 g^{-1}FW) are presented in *Table 3*.

There are large variations between variants, with a mean value 98,57 mg 100 g^{-1} in the case of *Chl a*, with variations from 62,83 mg 100 g^{-1} (V3); 66,5 mg 100 g^{-1} (V4), to 129,14 66,5 mg 100 g^{-1} (V15); 124,24 mg 100 g^{-1} (V8) on June 20 (at some variants there were fruits at the maturation phase), and for *Chl b* the mean value 77,44 mg 100 g^{-1}, with a minimum of 24,98 mg 100 g^{-1} (V10), and a maximum one 195,66 mg 100 g^{-1} (V2). For carotenoids, the mean value was 6,94 mg 100 g^{-1}, and ranged from 3,85 mg 100 g^{-1} (V5) to 12,76 mg 100 g^{-1} (V14). *Chlorophyll a* to *chlorophyll b* ratio has been situated around to the value of 1,32. For the second determination time, for the *chlorophyll a* the values were slowly increased, and as a consequence the *ratio chl a/chl b* had a mean value of 1,58, so, a slightly increasing. It can be remarked a higher chlorophyll content in the case of V6, V8, in fact in relation with the photosynthesis rate values, while at V13, V16 and especially at V4 the chlorophyll content was very low.

1. *Transpiration rate*

The obtained results are presented in *Table 4*.

It can be noticed that generally values are low, with a dynamic from a mean value of 0,21 mmol H_2O m^{-2} s^{-1} (May 14) to 0,60 mmol H_2O m^{-2} s^{-1} (June 17). Then, as leaves have been increased in area, as well as their maturation degree progress, the transpiration rate decreased at a mean value of 0,10 mmol H_2O m^{-2} s^{-1} (July 30) and respectively 0,08 mmol H_2O m^{-2} s^{-1} (August 27). Next to the substrata composition, of course, this evolution is closed to blueberries leaves characteristic feature (age, cuticle thickness and its chemical nature, stomata number and their opening degree etc.) as well as to 2008 year environmental conditions (water supply, temperature, sunny of cloudy days etc.).

5. Vegetative and generative growth

Observations about plant vigour have been performed in dynamics, thus, for the first decade of April there were remarked as vigurously plants those from V1, V2 and V3. These also had a higher inflorescence number, even fruits at the first growing stages (to obtain a qualitatively planting material these characteristics are not advantageous). On the other hand, plants of V4, V13, V14, V15 and V16 had a low vigour. There was observed a larger variability as regard as plants development stages, so, as a consequence, at the first decade of August, V1-plants appeared exhausted (fruits presence was not benefit). For V8 and V6 bush vigour was generally the best, grew more vigorously and produced significantly more and longer shoots than those of V4 (*Figures 6,7* and *8* - data are not shown).

In contrast with our results, as Xie and Wu (2009) reported, peat and sawdust as components of the mix, increased the number of plant leaves, average leaf area, shoot length, and shoot thickness in the case of two-year old 'Northblue' half-high blueberries.

CONCLUSIONS

1. Water leaves content varied between variants, with higher values at the younger leaves, then these level decrease, while mineral substances dynamics was opposite as trend, with the maximum values on mature leaves.
2. Photosynthesis rate had generally low values, in relation with plants age, leaves age and substrata too, and maximum value have been emphasised on the beginning of May, then process intensity diminished at the end of July (maybe related to the temperature stress impact - higher temperature values), being even negative.
3. Respiration rate had higher value at the beginning of May (near to 150 mg CO_2 kg^{-1} h^{-1}) (30 DAF) even surpassing 200 mg CO_2 kg^{-1} h^{-1} (V2, V6, V9,V16), a normal situation for this vegetation stage. As leaves become mature, respiration rate decreased, and a larger variability from the end of July can be explained by plants vigour and leaves status.
4. Assimilatory pigments content varied with the determination moment and experimentally variants. A higher total chlorophyll content have been determined at V6, V8, while at V13, V16 and V4 these was low, in relation with lower values for photosynthesis rate too.
5. Transpiration rate had generally low values, starting from a mean value of 0,21 mmol H_2O m^{-2} s^{-1} (May 14) and being 0,60 mmol H_2O m^{-2} s^{-1} (June 17). As leaves become mature or even at the senescence beginning stage, values decreased at a mean value of 0,10 mmol H_2O m^{-2} s^{-1} (July 30), 0,08 mmol H_2O m^{-2} s^{-1} (August 27), respectively.
6. As regard as plant vigour and fructification there was remarked V8 and V6 by a better vigour based also on missing the fructification, as compared with V1, V2 where the fructification process practically determined plant exhaustion. The most reduced growing has been noticed at V4.

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TABLES

Table 1. The blueberry grown media composition for the used experimentally variants

Variants	Grown media composition
1	50.00 % peat, 50.00 % manure
2	66.70 % peat, 33.30 % waste
3	75.00 % peat, 25.00 % manure
4	50.00 % peat, 50.00 % sawdust
5	50.00 % peat; 25.00 % manure; 25.00 % sawdust
6	50.00 % peat, 50.00 % litter
7	50.00 % peat; 25.00 % manure; 25.00 % litter
8	50.00 % peat; 50.00 % distillation residues
9	50.00 % peat; 25.00 % manure; 25.00 % distillation residues
10	50.00 % peat; 12.50 % manure; 12.50 % sawdust; 12.50 % litter; 12.50 % distillation residues
11	50.00 % peat; 12.50 % manure; 25.00 % sawdust; 12.50 % litter;
12	50.00 % peat; 12.50 % manure; 12.50 % sawdust; 25.00 % litter;
13	57.10 % peat; 14.30 % manure; 14.30 % sawdust;14.30 % distillation residues
14	57,10 % peat; 14.30 % manure; 28.60 % sawdust
15	57.10 % peat; 14.30 % manure; 14.30 % litter; 14.30 % distillation residues
16	50.00 % peat; 12.50 % manure; 25.00 % litter; 12,50 % distillation residues

Table 2. Blueberry leaves respiration dynamics (mg CO_2 kg^{-1} h^{-1})

Variants	May 18	June 17	July 25
1	90,15	44,99	60,21
2	231,35	44,96	80,94
3	119,13	39,68	112,39
4	177,44	42,74	116,71
5	142,60	44,78	41,83
6	231,83	46,84	39,96
7	160,22	52,43	139,12
8	134,33	28,72	117,61
9	222,81	45,58	63,38
10	163,91	52,36	172,85
11	153,02	41,21	148,16
12	185,38	54,31	148,80
13	184,85	74,08	28,66
14	148,80	99,18	103,71
15	190,98	72,96	18,91
16	270,08	93,83	16,30

Table 3. Bluberry leaves assimilatory pigments (mg 100 g^{-1} F.W.)

Var.	June 20				July 25			
	Chl.a	Chl.b	C+X	a/b	Chl.a	Chl.b	C+X	a/b
1	83,08	72,59	8,81	1,14	116,26	102,84	8,92	1,13
2	123,92	105,66	5,97	1,17	113,61	103,87	8,76	1,10
3	62,83	48,68	5,16	1,29	121,57	46,68	3,85	2,60
4	66,65	52,61	4,37	1,27	71,74	48,71	8,50	1,47
5	86,72	71,28	3,85	1,22	114,88	33,97	16,75	3,38
6	116,10	89,53	5,88	1,30	151,45	63,02	18,40	2,40
7	105,44	95,09	6,45	1,30	110,46	95,75	1,13	1,15
8	**124,24**	**97,21**	**7,40**	**1,31**	**128,19**	**91,57**	**9,83**	**1,40**
9	114,28	74,20	4,35	1,18	101,39	76,62	13,13	1,32
10	90,68	24,98	6,11	1,22	99,38	67,96	16,55	1,46
11	60,96	67,76	12,44	2,44	79,00	82,05	7,75	0,96
12	81,91	93,66	5,49	1,21	86,88	69,70	7,61	1,25
13	118,98	93,66	9,12	1,27	59,46	47,22	12,22	1,26
14	103,98	75,36	12,76	1,38	82,21	71,43	0,85	1,15
15	129,14	101,23	6,16	1,28	111,83	59,99	14,63	1,86
16	108,29	87,82	6,77	1,23	63,61	47,60	7,85	1,34

Table 5. Blueberry leaves transpiration rate dynamics (mmol H_2O m^{-2} s^{-1})

Variants	May 14 - 2008	June 17 - 2008	July 30 - 2008	August 27 - 2008
1	0,28	0,53	0,08	0,07
2	0,23	0.26	0,08	0,05
3	0,33	0,22	0,12	0,10
4	0,17	0,48	0,15	0,14
5	0,12	1,04	0,14	0,07
6	0,24	0,67	0,08	0,07
7	0,11	1,33	0,10	0,03
8	0,14	0,32	0,12	0,11
9	0,29	1,00	0,15	0,13
10	0,04	0,59	0,10	0,07
11	0,19	0,29	0,09	0,06
12	0,42	0,36	0,11	0,10
13	0,28	0,44	0,10	0,07
14	0,12	1,06	0,09	0,05
15	0,23	0,49	0,09	0,08
16	0,23	0,56	0,05	0,03

FIGURES

Fig. 1. Dinamics of the dry matter (%) in the highbush blueberry leaves

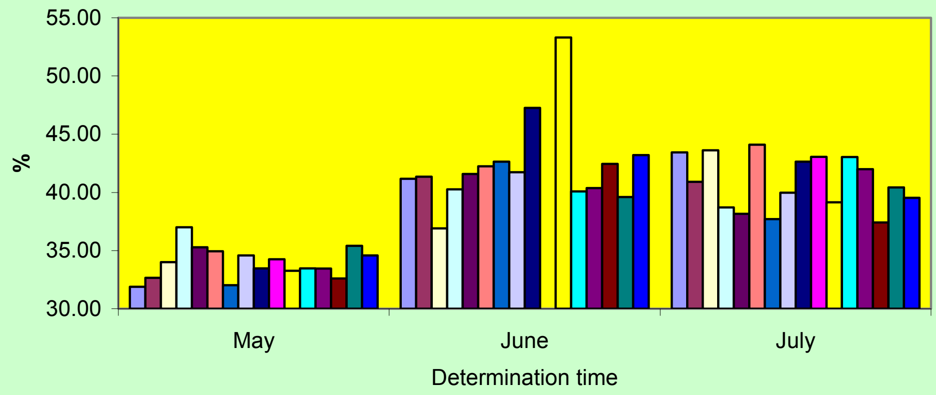


Fig. 2. Water content (%) dinamics in highbush blueberry leaves

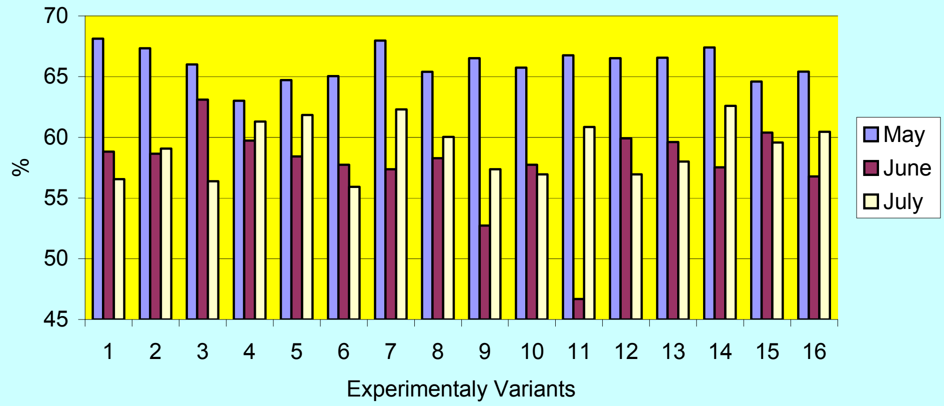
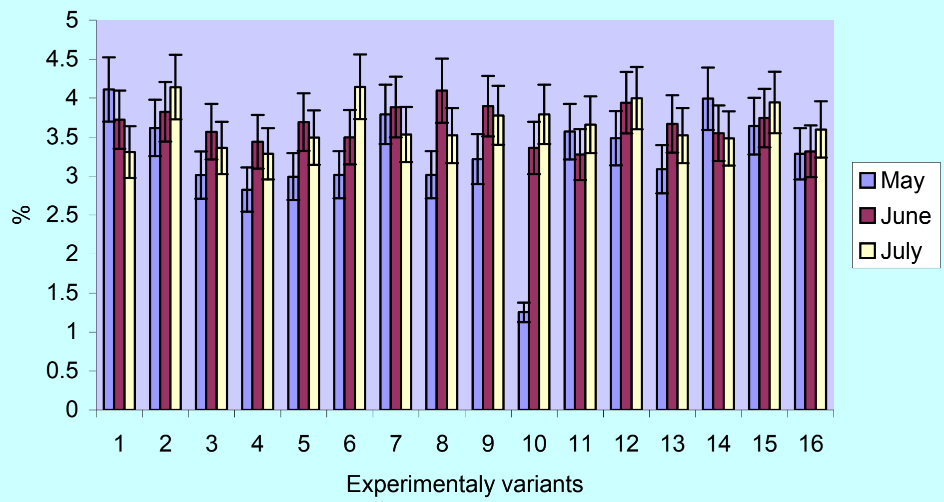


Fig. 3. Ash (%) levels in highbush blueberry leaves



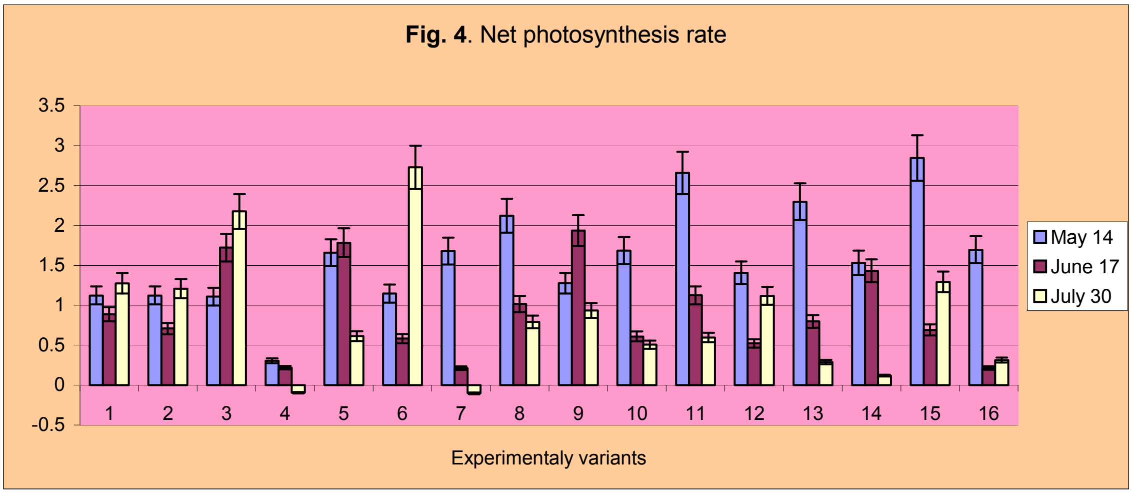


Fig. 4. Net photosynthesis rate

Fig.5. Blueberry bush aspect at the first decade of August 2008

The chemical composition of essential oils from some Romanian spontaneous species of *Lamiaceae* and their taxonomic significance

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Keywords: volatile compounds, medicinal and spicy plants

ABSTRACT

The essential oils of ten Romanian spontaneous species of *Lamiaceae* family were compared in order to determine the main and the specific compounds of these aromatic plants and their taxonomic significance. There were 116 compounds identified by GC/MS in the hydrodistillates of the whole aerial parts of *Acinos alpinus* L., *Calamitha einseleana* F.W.Schultz, *Mentha piperita* L., *Marrubium peregrinum* L., *Marrubium vulgare* L., *Nepeta musimii* L., *Phlomis pungens* L., *Phlomis tuberose* L., *Salvia nutans* L. and *Melissa officinalis* L. All species contain, with a single exception (melissa), and with a great variability α-pinene, β-pinene, linalool, β-caryophyllene, germacrene D, α-cadinol. *Melissa officinalis* is an exception of this "*Lamiaceae*" rule, because of its volatiles: α-, β-citronellol, α-, β-citral, methyl citronellol. The other studied species contain particular volatiles as a species specificity: *Acinos alpinus*-germacrene D (29.33%), carvacrol, β-cariophyllene, *Calamitha einseleana*-piperitone (29.05%), eucarvone, *Mentha piperita*-piperitone oxide (61,93%), eucalyptol, *Marrubium peregrinum*-germacrene D(40.02%), germacrene B, *Marrubium vulgare*-γ-elemene (35.34%), β-cariophyllene, *Nepeta musimii*-germacrene D (26.71%), *cis* β-ocimene, nepetalactone, *Phlomis pungens*-germacrene D (79.54%), *Phlomis tuberose*-germacrene D (42.45%), β-caryophylene, *Salvia nutans*-germacrene D (66.56%), β-caryophyllene. A taxonomical dendrograme based on the principal component was designed and discussed.

INTRODUCTION

The ***Lamiaceae*** includes both the medicinal and spicy plants, erbaceous (sometimes wooden) [Ciocarlan, 2000]. Thanks to their volatiles content, the most *Lamiaceae* cultivated species hold a great economical importance (Burzo et. al., 2006).

The spontaneous species with medicinal and aromatic potential differ substantially from those cultivated (where botanical and chemical descriptors are available) due to their content and high variability of secondary metabolites in different environments. Their characterization is only possible when descriptors (at the genus level) are defined, especially those chemicals, like the volatiles content.

The *Global Strategy for Plant Conservation* developed in 2002 established that no species of wild flora to be endangered by international trade; 30% of plant-based products derived from sources that are sustainably managed; the decline of plant resources, and associated local and indigenous knowledge, innovations and practices that support sustainable livelihoods, local food security and health care, to be halted. These goals were further elaborated at the European level through the Planta Europa Network in the *European Plant Conservation Strategy* (2002) which deals with specific regional aspects, going in some cases beyond global goals, setting clear goals and targets. Target 3.1 is specially related to conservation and use of plants: *"Best practice for the conservation and sustainable use of medicinal plants (and other sociologically important plants) identified and promoted to relevant policy-makers."*

MATERIALS AND METHODS

The plants were collected from May − August 2007, from the Carpatian Mountains and Dobrudja. The species were identified by Prof. dr. Vasile Ciocarlan, from the Department of Botany of the University of Agronomical Sciences and Veterinary Medicine Bucharest.

The volatiles were obtained by hydrodistillation using a Singer-Nickerson apparatus, and analyzed by GC-MS. The components of essential oils were separated by GC-MS Agilent using the follow system: a capillary column DB 5 (25m x 0.25 mm), gas carrier He, the gradient temperature 60 ºC - 280 ºC and a rate of 4 ºC. The components were identified using the NIST databank and Kovats index.

Facilities: The determinations were achieved using the infrastructure of the *Research Center of Horticultural Products Quality Studies and the Useful Substances from Plants.*

RESULTS AND DISCUTION

The volatile compounds from essential oils of some Romanian *Lamiaceae* sp. *herba* were presented comparatively in the *Table 1.* Their presence was identified more than 93% and it could be observed the presence of some common volatile compounds like: α-pinene, β-pinene, linalool, β-caryophyllene, germacrene D, etc.

The studied Romanian *Lamiaceae* species could be divided into two groups:

- some with predominant low volatiles:*Melissa officinalis* (Figure 1) – citronellol 38.59%, β-citral 11.42%, *Mentha piperita* (Figure 2) – piperitone-oxide 61,93%, eucaliptol 7,61%, β-pinene 2,09% ; *Calamintha einseleana* (Figure 3) – limonene 17.05%, piperitone 29.05%, eucarvone 20.75%, minthfuranone 24.19%.
- others with predominant heavy volatile compounds: *Acinos alpinus* (Figure 4) – germacrene D 29,03%, β-caryophyllene 13.23%, germacrene 4-ol 4,07%, cadinene and cadinol;, *Nepeta musimii* (Figure 5) – germacrene D 26.71%, β-caryophyllene 5.80%, nepethalactone 4.43%, γ-elemene 3.11%; *Phlomis pungens* (Figure 6) – germacrene D 79.54%, β-farnesene 3.66%, γ-elemene 1.9%.

The presence of great quantities of germacrene D, β-caryophyllene, limonene, with a well-known chemo preventive activity against cancers [Crowell, 1999] recommends the *Marrubium peregrinum, Phlomis pungens, Phlomis tuberose, Nepeta musimii, Acinos alpinus* or *Calamintha einseleana* as potential medicinal plants.

The presence of great quantities of volatiles like: α-, β-citronellol, α-, β-citral, methyl citronellol, eucalyptol, piperitone, α-pinene, β-pinene confirms the aromatic character of the ecotypes *Melissa officinalis* and *Mentha piperita*.

The biological characteristics like antibacterial, antimicrobial, antioxidant, anti-inflammatory, analgesic, antiseptic activities, due to the presence of their volatile compounds, could be used to develop new pharmaceuticals for internal and external uses.

To analyze of principal compounds of essential oils of the studied *Lamiaceae* sp. (figure 7), it was used to construct for the first time in Romania the chemodendrograme of these spontaneous species (figure 8).

CONCLUSIONS

All studied species contains, with a single exception (melissa), and with a great variability: α-pinene, β-pinene, linalool, β-caryophyllene, germacrene D, α-cadinol

There is a great species specificity: *Acinos alpinus*-germacrene D (29.33%), carvacrol, β-cariophyllene, *Calamitha einseleana*-piperitone (29.05%), eucarvone, *Mentha piperita*-piperitone oxide (61,93%), eucalyptol, *Marrubium peregrinum*-germacrene D(40.02%), germacrene B, *Marrubium vulgare*-γ-elemene (35.34%), β-cariophyllene, *Nepeta musimii*-germacrene D (26.71%), *cis* β-ocimene, nepetalactone, *Phlomis pungens*-germacrene D (79.54%), *Phlomis tuberose*-germacrene D (42.45%), β-caryophylene, *Salvia nutans*-germacrene D (66.56%), β-caryophyllene.

The chemodendrograme of these spontaneous romanian *Lamiaceae* sp. was designed in order to identify the potential aromatic and medicinal plants and to propose them for conservation in Protected Area or sustainable use in medicine or gastronomy.

ACKNOWLEDGEMENTS

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FIGURES

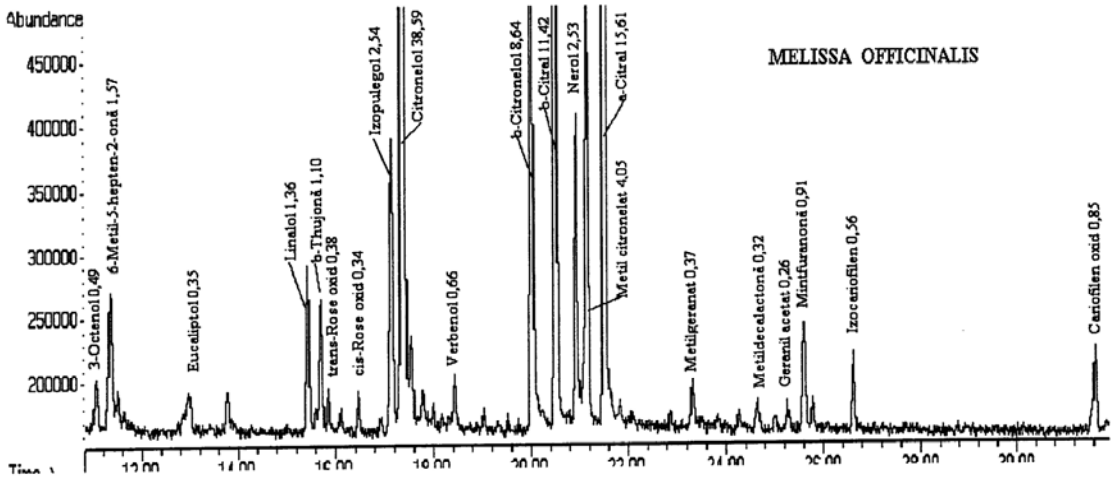

Fig. 1. The chromatograms of essential oils extracted from Romanian population of *Melissa officinalis*

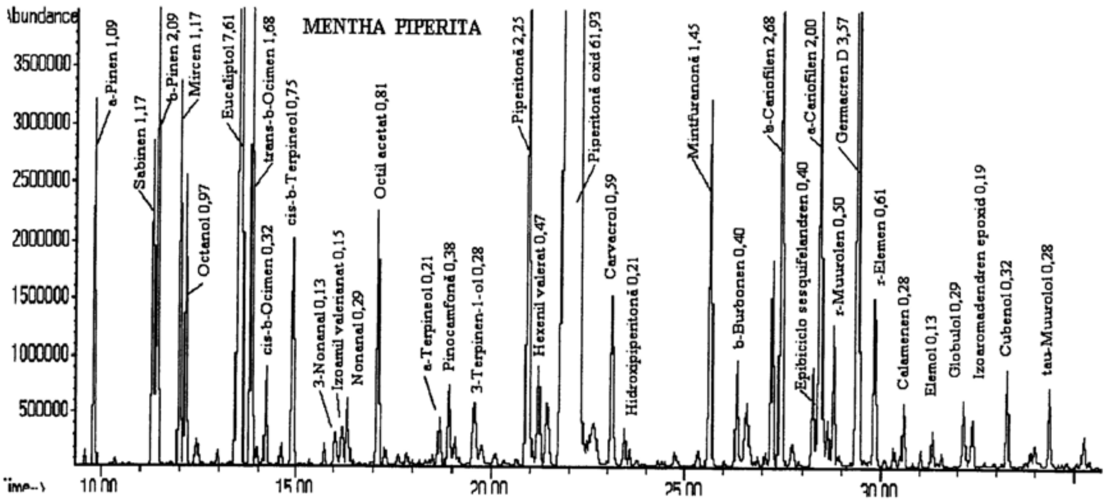

Fig. 2. The chromatograms of essential oils extracted from romanian population of *Mentha piperita*

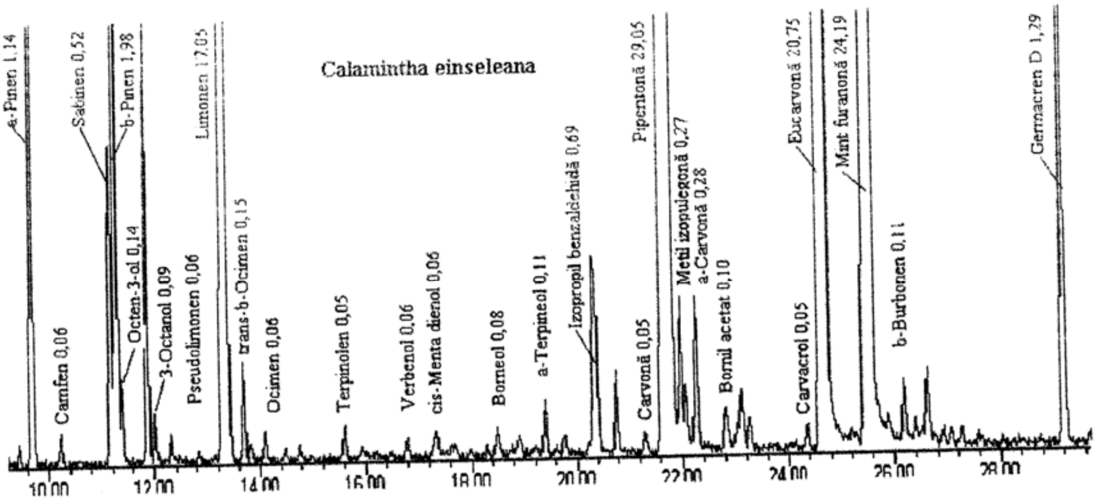

Fig. 3. The chromatograms of essential oils extracted from romanian population of *Calamintha einseleana*

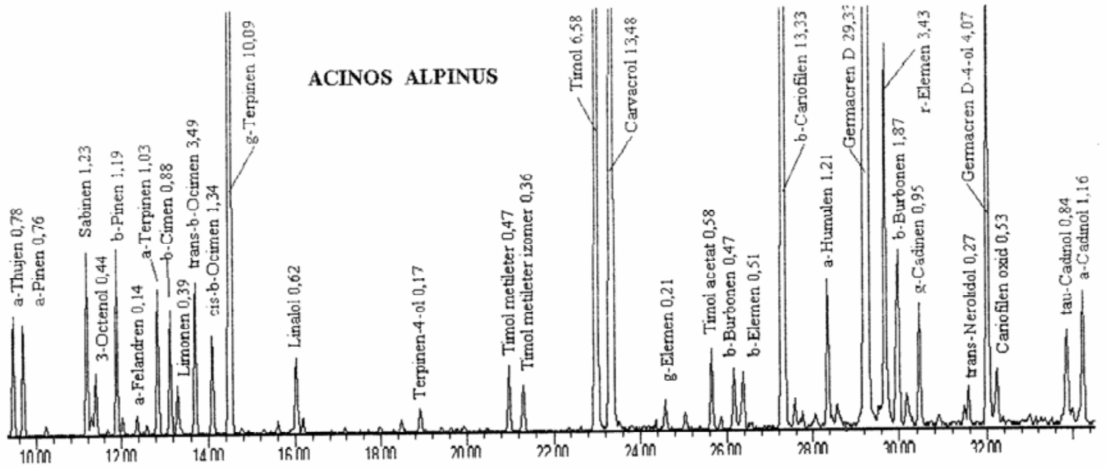

Fig. 4. The chromatograms of essential oils extracted from romanian population of *Acinos alpinus*.

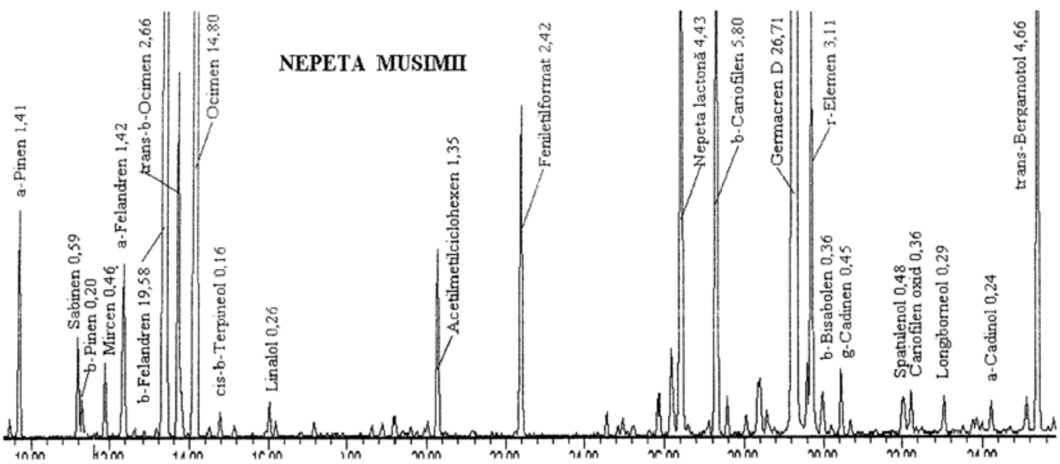

Fig. 5. The chromatograms of essential oils extracted from romanian population of *Nepeta musimii*.

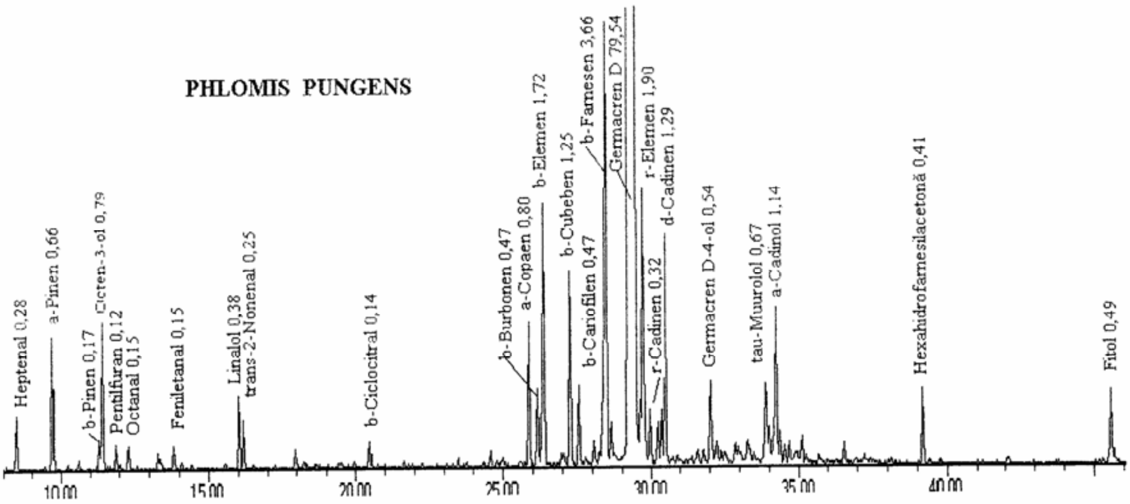

Fig. 6. The chromatograms of essential oils extracted from romanian population of *Phlomis pungens***.**

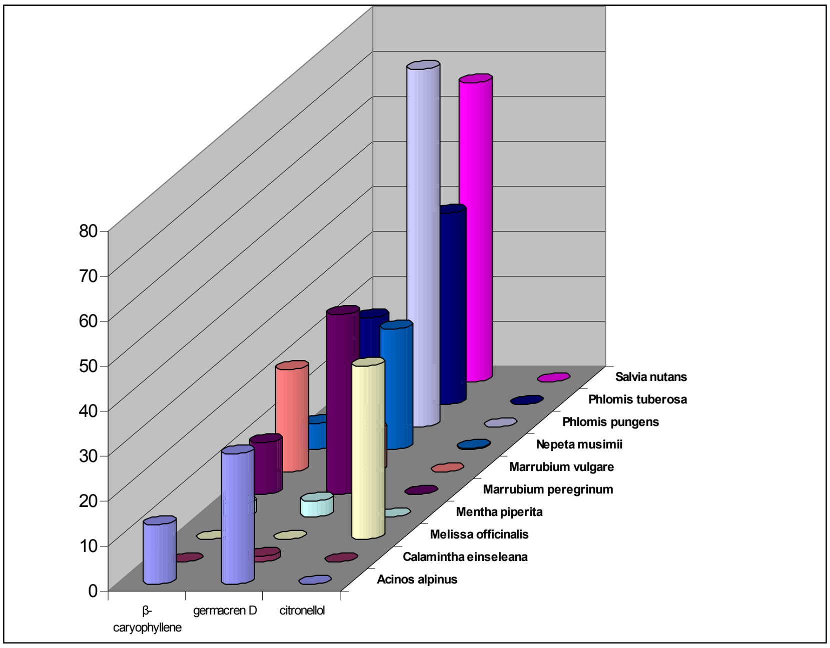

Fig. 7. The principal compound analyze of essential oils of *Lamiaceae* sp.

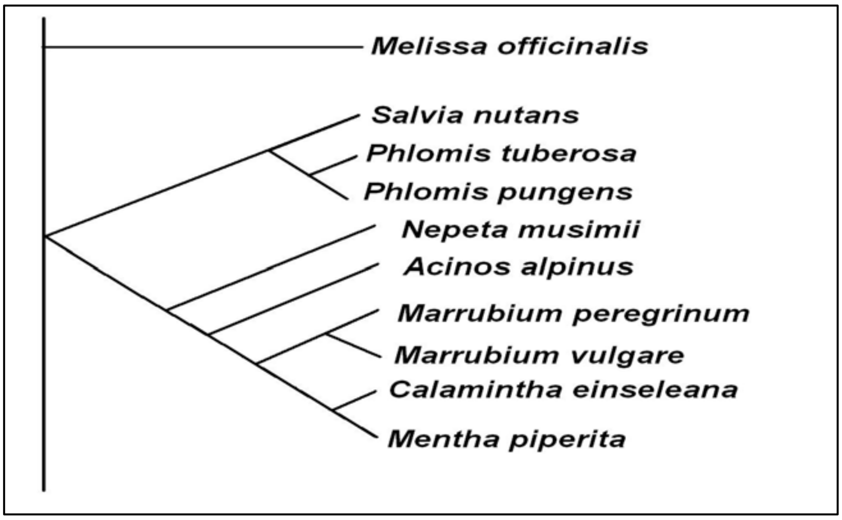

Fig. 8. The chemodendrograme of some *Lamiaceae* sp.

Table 1 The volatile compounds from essential oils of some Romanian *Lamiaceae* sp. *herb.*

	Volatil compound	*Acinos alpinus*	*Calamintha einseleana*	*Melissa officinalis*	*Mentha piperita*	*Marubium peregrinum*	*Marubium vulgare*	*Nepeta musinii*	*Phlomis pungens*	*Phlomis tuberosa*	*Salvia nutans*
1	2-hexenal	nd	nd	nd	nd	nd	nd	nd	nd	2.37	nd
2	heptanal	nd	nd	nd	nd	nd	nd	nd	0.28	0.42	nd
3	α-thujene	0.68	0.02	nd	0.02	nd	nd	0.08	nd	nd	0.09
4	α-pinene	0.66	1.14	nd	1.09	1.16	0.52	1.41	0.66	5.07	1.26
5	camphene	0.03	0.06	nd	nd	nd	nd	nd	0.01	0.01	nd
6	sabinene	1.23	0.52	nd	1.17	nd	nd	0.59	0.02	0.02	1.43
7	octen-3ol	0.44	nd	nd	nd	4.84	2.7	nd	nd	nd	nd
8	β-pinene	1.09	1.98	nd	2.09	nd	nd	0.2	0.17	3.22	4.66
9	octan-3ol	nd	0.14	0.49	0.97	0.57	0.71	nd	0.79	5.33	0.78
10	myrcene	0.02	0.85	1.57	1.17	nd	nd	0.46	0.12	0.39	0.47
11	octanal	nd	0.09	nd	nd	nd	nd	nd	0.15	nd	nd
12	α-phellandrene	0.14	nd	nd	0.02	nd	nd	1.42	nd	nd	nd
13	α-terpinene	1.03	nd	nd	0.02	nd	nd	nd	nd	nd	0.1
14	β-cimene	0.88	nd	nd	nd	nd	nd	0.02	nd	nd	nd
15	eucaliptol	0.05	nd	0.35	7.61	nd	nd	nd	nd	nd	nd
16	β-phellandrene	nd	nd	nd	nd	nd	nd	1.42	nd	nd	nd
17	pseudolimonene	nd	0.06	nd	nd	nd	nd	nd	nd	nd	nd
18	limonene	0.39	17.05	nd	nd	1.74	0.59	nd	nd	0.52	4.01
19	trans β ocimene	3.39	0.15	0.03	1.68	0.18	nd	2.66	nd	1.2	0.92
20	phenylethanal	nd	nd	nd	nd	nd	nd	nd	0.15	nd	nd
21	cis β ocimene	1.24	0.06	nd	0.32	nd	nd	14.8	nd	0.29	0.22
22	γ-terpinene	10.09	0.02	nd	nd	nd	nd	0.16	nd	nd	0.12
23	α-terpinolen	0.03	0.05	nd	0.75	nd	nd	nd	nd	0.25	0.37
24	linalool	0.62	nd	1.36	nd	0.35	0.58	0.26	0.38	0.39	nd
25	β-thujone	0.02	nd	1.1	nd	0.51	0.05	nd	nd	nd	nd
26	trans2nonenal	nd	nd	nd	0.13	nd	nd	nd	0.25	0.43	nd
27	trans-rose oxide	nd	nd	0.38	nd	nd	nd	nd	nd	nd	nd
28	nonanal	nd	nd	nd	0.29	1.12	0.39	nd	nd	nd	nd
29	cis-rose oxide	nd	nd	0.34	nd	nd	nd	nd	nd	nd	nd
30	octylacetate	nd	nd	nd	0.81	nd	nd	nd	nd	nd	nd
31	isopulegol	nd	nd	2.54	nd	nd	nd	nd	nd	nd	nd
32	citronelol	nd	nd	38.59	nd	nd	nd	0.12	nd	nd	nd
33	*cis* -menta dienol	nd	0.06	0.06	nd	nd	nd	nd	nd	nd	nd
34	verbenol	nd	0.06	0.66	nd	nd	nd	nd	nd	nd	nd
35	3nonen2one	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.11
36	borneol	nd	0.08	nd	nd	nd	nd	nd	nd	nd	nd
37	methylvinilciclohexane	nd	nd	nd	nd	2.44	0.41	nd	nd	nd	nd
38	terpinen 4-ol	0.17	nd	0.03	nd	nd	nd	nd	nd	nd	0.11
39	α-terpineol	0.02	0.11	nd	0.21	nd	nd	nd	nd	nd	0.09
40	pinocamphone	nd	nd	nd	0.38	nd	nd	nd	nd	nd	nd
41	acethylmethylciclohexane	nd	nd	nd	nd	nd	nd	1.35	nd	nd	nd
42	3-terpinene-1-ol	nd	nd	nd	0.28	nd	nd	nd	nd	nd	nd
43	β-citronellol	nd	nd	8.64	nd	nd	nd	nd	nd	nd	nd
44	β-citral	nd	nd	11.42	nd	nd	nd	nd	0.14	0.09	nd
45	isopropil benzaldehide	nd	0.69	nd	nd	nd	nd	nd	nd	nd	nd
46	thymol methyleter	0.47	nd	nd	nd	nd	nd	nd	nd	nd	nd
47	thymol methyleter isomer	0.36	nd	nd	nd	nd	nd	nd	nd	nd	nd
48	hydroxipiperitone	nd	nd	nd	0.21	nd	nd	nd	nd	nd	nd
49	α-carvone	nd	0.31	nd	nd	nd	nd	nd	nd	nd	nd
50	nerol	nd	nd	2.53	nd	nd	nd	nd	nd	nd	nd
51	piperitone	nd	29.05	nd	2.25	nd	nd	nd	nd	nd	nd
52	methyl isopulegone	nd	0.27	nd	nd	nd	nd	nd	nd	nd	nd
53	hexenyl valerate	nd	nd	nd	0.47	nd	nd	nd	nd	nd	nd
54	phenylethylformiate	nd	nd	nd	nd	nd	nd	2.42	nd	nd	nd
55	piperitone-oxide	nd	nd	nd	61.93	nd	nd	nd	nd	nd	nd
56	thymol	6.48	nd	nd	nd	nd	nd	nd	nd	nd	nd
57	carvacrol	13.38	0.05	nd	0.59	nd	nd	nd	nd	nd	nd
58	bornil acetate	nd	0.1	nd	nd	0.12	0.04	nd	nd	nd	nd
59	methyl citronellol	nd	nd	4.05	nd	nd	nd	nd	nd	nd	nd
60	α-citral	nd	nd	15.61	nd	nd	nd	nd	nd	nd	nd
61	methyl geraniol	nd	nd	0.37	nd	nd	nd	nd	nd	nd	nd
62	ethyldivinilciclohexane	nd	nd	nd	nd	1.29	nd	nd	nd	nd	nd
63	δ-elemene	nd	nd	nd	nd	0.86	0.38	nd	nd	nd	0.43
64	eucarvone	nd	20.75	nd	nd	nd	nd	nd	nd	nd	nd
65	terpinyl acetate	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
66	citronellyl acetate	nd	nd	nd	nd	nd	nd	0.22	nd	nd	nd
67	methyl decalactone	nd	nd	0.32	nd	nd	nd	nd	nd	nd	nd
68	geranyl acetate	nd	nd	0.26	nd	nd	nd	nd	nd	nd	nd
69	mynthfuranone	nd	24.19	0.91	1.45	nd	nd	nd	nd	nd	nd
70	thymol acetate	0.58	nd	nd	nd	nd	nd	0.53	nd	nd	nd
71	α-copaen	nd	nd	0.03	nd	0.48	nd	nd	0.8	nd	0.59
72	nepetalactone	nd	nd	nd	nd	nd	nd	4.43	nd	nd	nd
73	β-bourbonene	0.47	0.11	nd	0.4	0.74	1.76	nd	0.47	nd	0.27
74	β-elemene	0.51	nd	nd	0.1	1.33	nd	nd	1.72	nd	1.4
75	α-selinene	nd	nd	nd	nd	nd	1.37	nd	nd	nd	nd
76	β-cubebenene	nd	nd	nd	0.15	nd	nd	nd	1.25	1.85	nd
77	δ-copaene	nd	nd	nd	nd	nd	nd	nd	0.5	0.88	nd
78	isocaryophyllene	nd	nd	0.56	nd	nd	nd	nd	nd	nd	nd
79	β-caryophyllene	13.23	nd	nd	2.68	11.39	22.71	5.8	0.47	19.14	7.99
80	γ-cadinene	nd	nd	nd	nd	nd	0.42	0.36	nd	nd	0.28
81	α-amorphene	nd	nd	nd	nd	0.35	nd	nd	nd	0.4	0.11
82	β-farnesene	nd	nd	nd	nd	nd	nd	nd	3.66	3.01	nd
83	epi-biciclo-sesquiphellandrene	nd	nd	nd	0.4	nd	nd	nd	nd	nd	nd
84	α−caryophyllene	1.21	nd	nd	2	1.01	1.74	0.47	nd	nd	nd
85	γ-muurolene	nd	nd	nd	0.5	nd	nd	nd	nd	nd	nd
86	allo-aromadendren	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.48
87	germacren D	29.03	1.29	nd	3.57	40.02	9.36	26.71	79.54	42.45	66.56
88	germacren B	nd	nd	nd	nd	19.29	nd	nd	nd	nd	nd
89	γ-gurjunene	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.83
90	α-himalachene	nd	nd	nd	nd	nd	0.6	0.46	nd	nd	nd
91	γ-elemene	3.33	nd	nd	0.61	0.02	35.34	3.11	1.9	4.04	nd
92	cadinol	nd	nd	nd	nd	nd	0.71	nd	nd	nd	nd
93	β-bourbonen	1.77	nd	nd	nd	0.03	nd	0.11	nd	nd	nd
94	β-bisabolen	nd	nd	nd	nd	nd	nd	0.36	nd	nd	nd
95	α-farnesen	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
96	δ-cadinen	0.95	nd	nd	0.04	nd	nd	0.45	1.29	0.4	0.79
97	β-cadinene	nd	nd	nd	nd	0.82	nd	0.16	0.32	nd	nd
98	trans-nerolidol	0.27	nd	nd	nd	nd	1.54	nd	nd	nd	0.2
99	calamene	nd	nd	nd	0.28	nd	nd	nd	nd	nd	nd
100	elemol	nd	nd	nd	0.13	nd	0.42	nd	nd	nd	nd
101	germacren 4-ol	4.07	nd	nd	nd	nd	nd	nd	0.54	0.46	nd
102	spatulenol	nd	nd	nd	nd	2.03	2.36	0.48	nd	nd	nd
103	caryophyllene-oxide	0.53	nd	0.85	nd	1.93	4.01	0.36	nd	0.51	nd
104	globulol	nd	nd	nd	0.29	nd	nd	nd	nd	nd	0.23
105	viridiflorol	nd	nd	nd	nd	nd	0.83	nd	nd	nd	nd
106	isoaromadendrene epoxide	nd	nd	nd	0.19	nd	nd	nd	nd	nd	nd
107	cubenol	nd	nd	nd	0.32	nd	nd	nd	nd	nd	0.1
108	tau-muurolol	nd	nd	nd	0.28	0.57	1.12	nd	0.67	0.25	0.62
109	longiborneol	nd	nd	nd	nd	nd	nd	0.29	nd	nd	nd
110	γ-cadinol	0.84	nd	nd	nd	nd	nd	nd	nd	nd	nd
111	α-cadinol	1.16	nd	nd	nd	1.09	2.44	0.24	1.14	0.54	1.07
112	trans-bergamotol	nd	nd	nd	nd	nd	nd	4.66	nd	nd	nd
113	ledene oxide	nd	nd	nd	nd	nd	1.31	nd	nd	nd	nd
114	hexayidrofarnesilacetone	nd	nd	nd	nd	0.19	nd	nd	0.41	0.59	nd
115	phytol	nd	nd	nd	nd	nd	nd	nd	0.49	0.48	nd
	Total	**98.86%**	**99.31%**	**93.05%**	**97.83%**	**96.47%**	**94.18%**	**92.57%**	**98.29%**	**95.01%**	**96.93%**

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Morphological peculiarities of the species *Polygala amara* L.

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Keywords: bitter leaf, inflorescence branched, local form

ABSTRACT

Commonly found in calcareous grassland to 2,000 m, the *Polygala amara* populations have a variability of morphological characters in the corolla, wings and fruit, which determined its division into 2 subspecies: *P. amara* subsp. *amara*, and *P. amara* subsp. *brachyptera* (Chod.) Hayek. We found that plants of *P.amara,* occurred at 1650 m altitude on the eastern slope of the Furnica Mountain (Prahova district), are belonging to *brachyptera* subspecies, but them differ from the originating species by the presence of secondary axes of inflorescences, formed in upper third of the stem. This population was considered by some authors as *Polygala alpina* species (Poiret) Steudel (Kral, 1974).

INTRODUCTION

Polygala amara is a perennial herbaceous plant with numerous stems arising from the centre of a basal rosette (Tutin, 1968). The steam is unbranched to slightly branched (Răvăruţ, 1958) with all the leaf glabrous, entire and bitter. Inflorescence with 8-25 blue, violet, and pink or with flowers is a terminal raceme (Ciocârlan, 2000). There are 2 subspecies, divided by morphological characters of the corolla, capsule and wings: subsp. *amara* and subsp. *brachyptera* (Chod.) Hayek (Tutin, 1968; Ciocârlan, 2000). The basal rosette is a morphological character for *P. alpina* too, but their leaves are not bitter and there are lateral flowering stems arising from basal leaf-rosette. There is, at 1650 m altitude on the Furnica Mountain, a *P. amara* population which morphological characters present similarities with *P.alpina* that some authors have included that population to *P.alpina* (Kral, 1974).

MATERIALS AND METHODS

The comments included in this study were conducted on plants from the population located on the eastern slope of Mount Furnica (Bucegi - Prahova county), at an altitude of 1650 m. The plants were harvested in July, when basal fruits have reached maturity.

Measurements and photographs were taken to point out the following morphological characters: leaf shape and size; wing features in relation to flower and to fruit, the fruit and seed size and appearance.

The material used in this paper to illustrate differences comes from the Cheile Bicazului and the Herbarium of the Department of Botany and Plant Physiology, UASVM Bucharest.

The photographs were taken with a digital camera Panasonic DMC-LZ7.

RESULTS AND DISCUSSION

The *Polygala amara* population of the eastern slope of Mount Furnica (Bucegi Mountains and Prahova) consists of perennial herbs, with horizontal rhizome (Fig. 1). Aerial stems are many, erect or ascending, reaching at the maturity 15 to 20 cm.

Leaves glabrous, entire, and have a bitter taste. The basal ones, arranged in rosettes (Fig. 2), are obovate, rounded or slightly pointed to the top, basal cuneate; length: 13 to 17 mm and width: 5.3 to 7 mm (Fig. 3). Stem leaves are lanceolate, with maximum width in the middle; they are 20 to 22 mm in length and 4 to 6 mm in width (Fig. 4).

In the terminal part, stem can form a single raceme or 2-3 inflorescences are formed on secondary axes (Fig. 1, 2).

Flowers accompanied by bracts, may have pink or blue corolla (Fig. 5, 6) with the crest of keel strongly fimbriate. The 3 external sepals are as long as half of the corolla; they have a main vein and two lateral ones, shorter than the main one, all of them being green. Wings (internal sepals) are equal to or slightly longer than the corolla; when the fruits are mature, they reach 4.5 to 5 mm in lenght and 2 to 2.1 mm in width; they have a main, unbrunched vein, and secondary, not anastomosing, independent veins (fig.7).

The fruit is an obcordate capsule with membraneous wing edges; it is slightly shorter than the wings (length: 4.1 to 4.5 mm), but obviously wider than they (width: 4 mm) (Fig. 8).

Seeds, 2 in each fruit, are ovoid, rounded at the apical pole, with a three-lobed, whitish, hairy strophiole at the basal pole (Fig. 9). The seed-coat is smooth, brown, covered with whitish hairs.

Comparing the morphological features of the corolla, fruit and wings with data found in literature (Ciocârlan, 2000; Răvăruț, 1958, Tutin et al., 1968) we can say that plants encountered on Furnica Mountain are belonging to the subspecies *brachyptera* (Chod.) Hayek.

Differences in morphological characters may be observed by comparing the population of Mount Furnica with those of Cheile Bicazului (Fig. 10) or of Braşov district (Fig. 11): these have not a branched inflorescence.

In the literature there are references to an existing population of *Polygala alpina* in the zone researched by us (Kral, 1974).

We consider that the morphological features of the population of Mount Furnica are the expression of local conditions and it represents a form of species *P.amara* L. subsp. *brachyptera* (Chod.) Hayek.

CONCLUSIONS

Because of morphological characters of leaves, flowers and fruit, the population of Mount Furnica belonging to the *Polygala amara* L. subsp. *brachyptera* (Chod.) Hayek.

The population of Mount Furnica is a form of *Polygala amara* L. subsp. *brachyptera* (Chod.) Hayek. due to local conditions of the biotope.

ACKNOWLEDGEMENT

The author is grateful to Prof. Vasile Ciocârlan for the bibliographic material provided.

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FIGURES

Fig. 1. *Polygala amara* subsp. *brachyptera* from Mount Furnica

Fig. 2. *Polygala amara* subsp. *brachyptera* – branched inflorescence

Fig. 3. Basal rosette leaves

Fig. 4. Lanceolate steam leaves

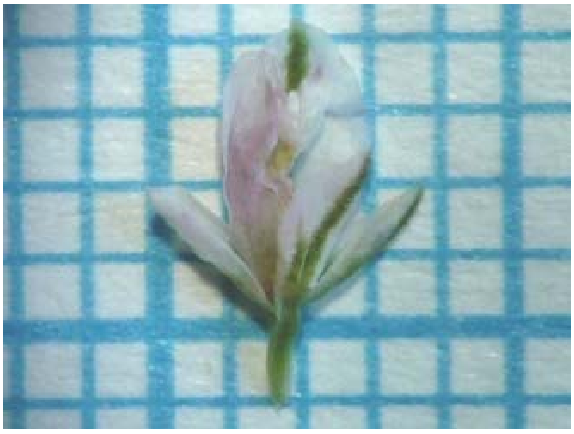

Fig. 5. Pink flower

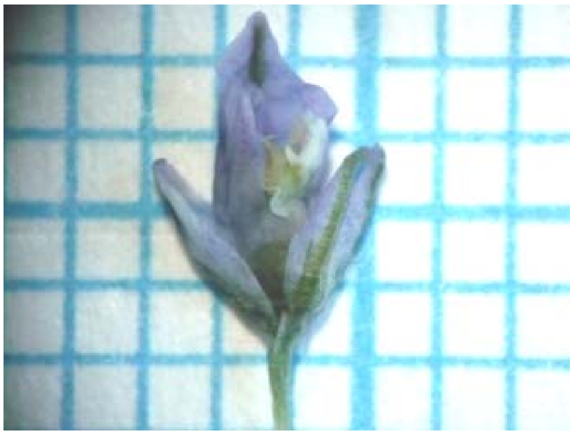

Fig. 6. Blue flower

Fig. 7: The wing and external sepals

Fig. 8: The fruit with the wing and external sepals

Fig. 9: The seed

Fig. 10. *Polygala amara* from Cheile Bicazului

Fig. 11. *Polygala amara* from Braşov

The influence of the substratum on the blueberry leaf structure

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Keywords: upper and lower epidermis, mesophyll, type of substratum

ABSTRACT

To provide the role of the substratum on the blueberry structure of the leaves were used 16 mixture types, *Blueray* cultivar – two years hardwood cuttings. The anatomical observations, conducted on cross-sections of the blade to the optical microscope, emphaciced that: the 16 combinations used for making the substratum had different effects on the structural components of the foliar limb, both from the point of view of their dimensions and of the structure of the tissue and the data can be compared by grouping the variants by the recipe of the mixture used.

INTRODUCTION

Vaccinium corymbosum – called *highbush blueberry* in English, is a shrub with falling, elliptical, whole-edged leafs, slightly arched branches, small, white or pink flowers and edible fruits (*crown berries*) – blue-blackish berries, of 7- 10 mm diameter (Ciocârlan, 2000).

The leafs' limb has a structure similar to the one described for the *V. myrtillus* specie (Toma şi Bonini, 1996), encountered spontaneously in our country, from the beech layers until the subalpine one: hypostomatous leaf (stomata present only in the inferior epidermis), with bifacial mesophyll, made of palisadic unistratose tissue, oriented towards the superior epidermis and the gap-tissue made of several rows of cells with spaces between them, oriented towards the inferior epidermis. The epidermises are made of unequal cells, with thickened external walls, covered by the cuticle. The stomata are of paracytic type, with two guard cells parallels with the somatic ones. The main vein is slightly prominent on the inferior part of the limb, and on the superior side it has pluricelular secreting hair.

In specialty literature there are some works about the leaf's anatomy and quantitative and qualitative changes suffered by tissues and cells under the influence of various factors: irrigation, mineral fertilization (Koszanski and al., 2008), in and ex vitro growth (Noe şi Bonini, 1996).

MATERIALS AND METHODS

A 2 years field study, established in 2007, was conducted at Agronomic University on 16 type's combinations of substratum. For each variant were harvested mature leaves for anatomical observations. They were made cross sections on the blade. The sections were 24 h clarified with chloral-hydrat, washed in tape wather and coloried with jod-grun and alaun-carmine.

The anatomical measurements and observations were conducted on light microscope – OPTIKA. The photo were taken with digital camera – Panasonic DCM-L27

RESULTS AND DISCUSSION

The 16 combinations used for making substratum had different effects over the structural components of the foliar limb, both from the point of view of their dimensions and of the structure of the tissues.

As it can be seen from table 1, the data can be compared by grouping the variants by the recipe of the mixture:

The first group includes the 1-3 variants grown on a two-component substratum, peat and stable garbage, in different proportions. It can be seen that V3 registers big values of the mesophyll's thickness -184, 00µ in contrast with V1 where the mesophyll reaches 170, 80µ thickness. On the other hand, at V1 it can be seen that the epidermis's cells are bigger than those of other variants. The decreasing of pH due to the presence of peat, leaded to a better development of the mesophyll.

In the second group, with variants 4 and 5, the nutritive elements brought by the stable garbage (V5) leads to the increase in thickness of the mesophyll, while at V4, with the recipe of the substratum formed only of peat and sawdust, the epidermis's cells are bigger.

The third group records a record value of the mesophyll's thickness at V7, where the mixture of bedding and stable garbage together with the peat allows a good development of the tissues. The growth in thickness of the mesophyll takes place on the basis of the formation of an extra row added to the palisadic tissue, made of shorter cells. The superior epidermis has close values in the case of the two variants, while the cells of the inferior epidermis in variant 6 are bigger.

The forth group is formed by the variants 8 and 9. In the case of the first variant of the group, the distil residues added to the peat have beneficial effects over the thickness of the leaf, both the mesophyll and the epidermises recording relatively large values. From the general aspect of the section it can be seen in figure nr.1 that the median vein prominences obviously on the inferior face of the limb. Variant 9 registers the smallest dimensions of the tissues' thickness. The palisadic tissue is formed by a single layer of cells (fig.2).

The fifth group includes the variants 10-12 cultivated on a mixture formed of all components used until the present (V10) or with one of the absent components and increasing the doze of another component, while keeping constant the peat percentage (V11, V12). The highest values of the mesophyll were registered at V10, and the smallest ones at V12, where the stable garbage is equal in proportion to the sawdust and the bedding is in a higher percentage.

The sixth group is formed by the variants 13-15 cultivated on a substratum with a higher weight of peat. Again very high values of the mesophyll's thickness are registered at V13, comparable to V7, and also V15. At V14, the mesophyll's thickness is comparable to the one recorded at variants 1 and 12. It can also be seen in both V15 (fig.3) and V14 (fig. 4) that the palisadic tissue is formed by two layers of prolonged cells, the second one having shorter cells.

The last variant, no. 16, can be compared with those from the 5^{th} group (V10-V12) due to the mixture of soil used. The limb's dimensions at the mesophyll's level are higher than those of its group, and the thickness of the epidermis's cells is equal with the one in variant 12.

CONCLUSIONS

The 16 combinations used for making the substratum had different effects on the structural components of the foliar limb, both from the point of view of their dimensions and of the structure of the tissue.

The data can be compared by grouping the variants by the recipe of the mixture used.

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Table 1. Data of the foliar limb structure at the blueberry bush variants grown in different types of substratum

Variant	Upper epidermis (μ)	Mesophyll (μ)	Lower epidermis (μ)
V_1 (peat-50%; stable garbage -50%)	18,80	170,80	16,00
V_2 (peat-66,7%%; garbage-33,3%)	16,00	174,00	12,00
V_3 (peat-75%; garbage -25%)	16,00	184,00	12,00
V_4 (peat- 50%; sawdust-50%)	17,20	176,40	13,20
V_5 (peat- 50%; stable garbage- 25%; sawdust-25%)	16,00	179,20	12,00
V_6 (peat- 50%, bedding- 50%)	19,20	177,60	15,20
V_7 (peat- 50%; stable garbage- 25%; bedding- 25%)	19,00	208,00	13,00
V_8 (peat-50%; distil residues- 50%)	17,50	205,00	12,50
V_9 (peat-50%; stable garbage- 25%; distil residues- 25%)	15,00	145,50	12,00
V_{10} (peat- 50%; garbage- 12,5%; sawdust- 12,5%, bedding- 12,5%; distil residues- 12,5%)	16,50	185,50	13,00
V_{11} (peat- 50%; stable garbage- 12,5%; sawdust- 25%, bedding- 12,5%; distil residues- 0,00%)	16,00	173,00	12,00
V_{12} (peat- 50%; stable garbage- 12,5%; sawdust- 12,5%, bedding- 25%; distil residues- 0,00%)	17,00	171,00	12,50
V_{13} (peat- 57,1%; stable garbage- 14,3%; sawdust- 14,3%; distil residues- 14, 3%)	17,25	208,00	14,00
V_{14} (peat- 57,1%; stable garbage- 14,3%; sawdust- 28,6%;)	16,50	171,00	12,50
V_{15} (peat- 57,1%; stable garbage- 14,3%; bedding- 14,3%; distil residues- 14, 3%)	16,50	201,00	12,00
V_{16} (peat- 50,0%; stable garbage- 12,5%; bedding- 25,0%; distil residues- 12, 5%)	17,00	188,00	12,50

FIGURES

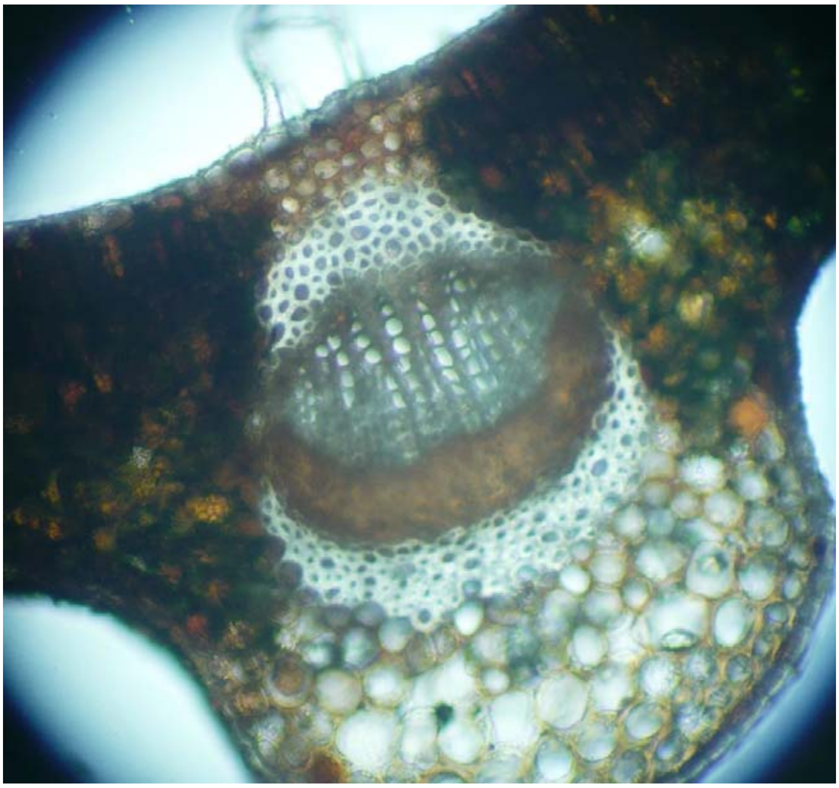

Fig. 1. V_8 – median vein

Fig. 2. V_9 – median vein, palisadic unistratificat tissue

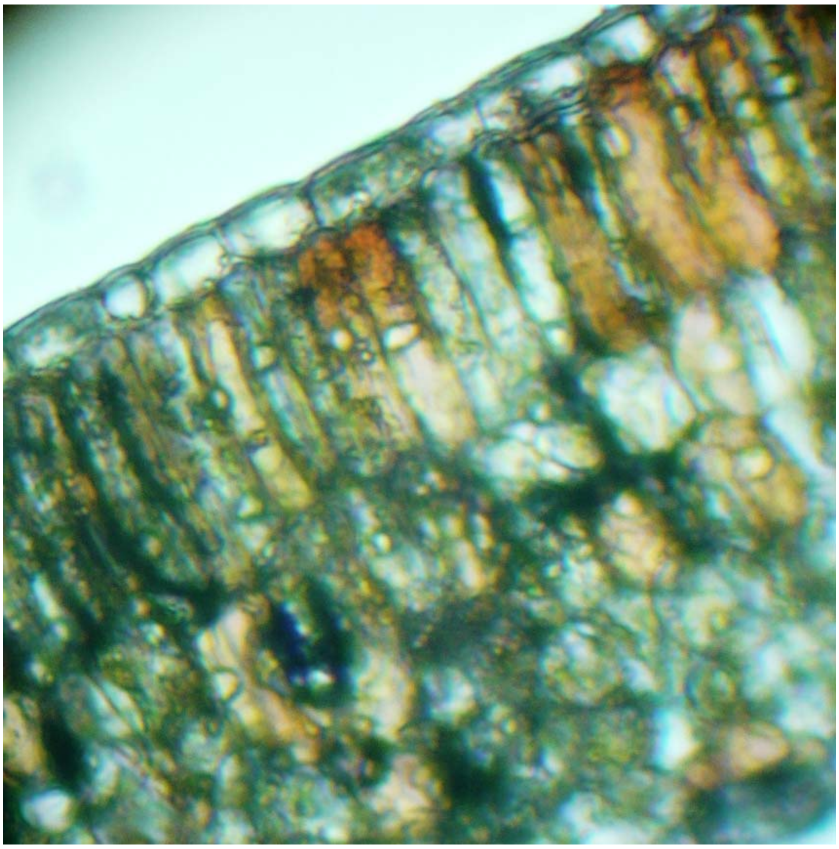

Fig. 3. V_{15} – detail of epidermis and palisadic tissue

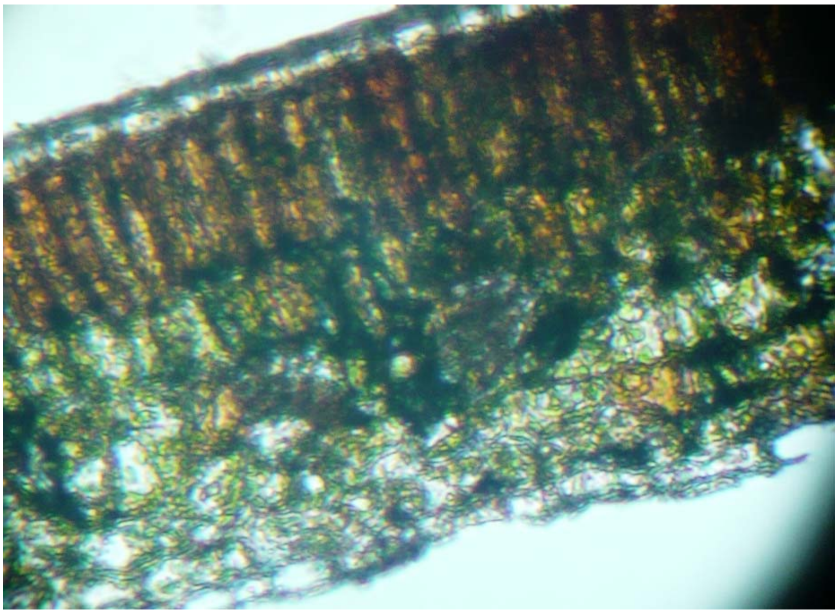

Fig.4. V_{14} – palisadic bistratificat tissue

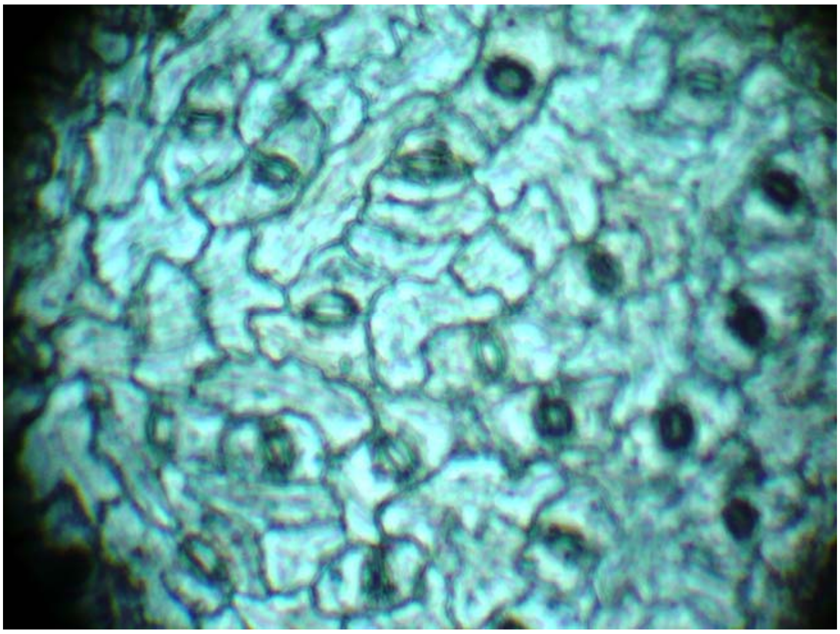

Fig.5. V_7 – stomate type paracitic

Contributions to the knowledge of physiological and biochemical processes of the tobacco cultivar Virginia 180

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Keywords: *Nicotiana tabacum,* chemical composition, respiration, transpiration, photosynthesis

ABSTRACT

This paper presents data concerning evolution of physiological and biochemical processes of the tobacco cultivar Virginia 180. A determination were made during vegetative growth and generative period, the analysed organs being the root, stem, leaves from the superior half of the plant, basal leaves and flowers. It has been determined the content of assimilating pigments from leaves, the intensity of the photosynthesis and transpiration, variance of respiration process in different organs, water content, total dried substance and mineral substances, also content of mineral elements of the tobacco plant organs. The chlorophyll quantity from leaves varied between 45,11mg /100 g and 151,48 mg/100 g and the carotenes varied between 10,03 mg/100g and 29,86 mg/100g. Intensity of the photosynthesis process and transpiration varied between 1,27 µmoles $CO2/m^2/s$, respectively 1,52 mmoles $H2O/m^2/s$ in the basal leaves and 3,66 µmoles $CO2/m^2/s$, respectively 2,88 mmoles $H2O/m^2/s$ in the leaves from the top of the plant. Respiration intensity varied between 312,09 mgCO2/kg/h for the top leaves and 32,12 mg CO2/kg/h for roots. The highest content in water was found in top leaves (86,85%), the total dried substance in roots and the highest amount of mineral substance was found in basal leaves. Among the mineral elements the most resulted was calcium, which content varied between 1157 mg/100g fresh substance (in the leaves from the base of the plant) and 148,68 mg /100 g (in flowers), potassium, which varied between 532, 59 mg /100g (in the flowers) and 350 mg/100g (in basal leaves) and magnesium with a maximum of 195,68 mg in basal leaves and a minimum of 69,11 mg in root.

INTRODUCTION

Virginia is by far the most popular tobacco type used today. About 60% of the nation's tobacco crop is Virginia. Virginia is mildest of all blending tobaccos and has the highest level of natural dextrose, which basically gives it a light sweet taste. Virginia is used in virtually all blends, is a good burner and aids in lighting.

At world level, there has been a high concern for the study of physiological and biochemical processes of this species. The purpose of this study is to complete existing data also making a characterization of one specific cultivar regarding physiological and biochemical processes.

MATERIALS AND METHODS

It has been studied the tobacco cultivar Virginia 180. The vegetable material needed for physiological and biochemical determinations were obtained from seedling that was planted in the field. The analytic samples were taken during vegetative growth and when flowery began, and consisted in leaves from the top and the bottom of the pea plant, stem, root and flowers

The chlorophyll pigments from leaves were determined in 80% acetonic extract, colorimeter at wave length of 663 nm, 646 nm and 470 nm. Results were calculated using Mackiney formulas and values were reported to 100 mg vegetable material.

Intensity of photosynthesis and transpiration were determined in the field, using automatic analyzer LCA-4. Results were expressed in µmoles $CO_2/m^2/s$ respectively mmoles $H_2O/m^2/s$.

Determination of respiration intensity was made using the CO_2 RIKEN analyzer for the following organs: root, stem, basal leaves, and leaves from the top half of the plant and flowers. These results were expressed in mg CO_2/kg/h.

The total dried substance, water and mineral elements were determined for leaves, stem and root. The fresh vegetable material was dried for 24 hours at 105°C, was cooled in the dryer, that was weighed after that, to determine the total dried substance and water, and then was calcinated at 550 ºC. After cooling in excicators, mineral substances were determined gravimetrically. They were dissolved in 1ml nitric acid, and put with bidistilated water in a 50ml quoted recipient. The aqueos solution obtained was used to determine mineral elements with the ICP spectrometer

RESULTS AND DISCUSSION

Interpretation of analysed data from tables, showed that intensity of physiological and biochemical processes are conditioned by the analyzed organ and by the period when determinations were done.

The leaves content in chlorophyllian pigments varied with leaf position on plant and those maturity stages. The chlorophyll content decrease at top leaves after flowering in a smaller proportion and in a bigger proportion at the basal leaves (DeJong şi Woodlief, 1978).

Davtyan and Babakhnanyan (1979) affirm that at the start of vegetative period the content in chlorophyll **a** and **b** is 91 respectively 24 mg/100g fresh weight, its growing in flowering period until 105 respectively 35 mg/100g and decrease when the fruits appear until 53 respectively 12 mg/100g. At the Virginia 180 cultivar the quantity of assimilated pigments, represented by the Total Chlorophyll, varied between 45,11 mg/100g in the basal leaves at the beginning of the flowery, and 151,48 mg/100g in the leaves from the top during the vegetative growing period (Table 1). The maximum of chlorophyll **a** and chlorophyll **b** was achieved in the leaves from the top off tobacco plants in the vegetative growth period.

Davtyan şi Babakhanyan (1979) finde that during vegetative period the carotenoids content of tobacco leaves decrease from 32 mgr/100g fresh weight until 28 mg/100 g.

On the study cultivar the quantity of carotenes was higher during the vegetative growing (29,86 mg/100g) in the top leaves, followed by a decreasing evolution.

Intensity of photosynthesis and transpiration were determined in the field, using the LC-4 analyzer, and results are presented in the table 2. It can be noticed that the intensity of the processes varied related to the age of the analyzed leaves, the mature ones having a photosynthesis intensity (1,27 µmoles $CO_2/m^2/s$) and transpiration (1,52 mmoles $H_2O/m^2/s$) smaller than the young leaves (3,66 µmoles $CO_2/m^2/s$ respectively 2,88 mmoles $H_2O/m^2/s$). On specialized literature the intensity of photosynthesis found on tobacco cultivar Mammoth, varied between 0,05 (1,13 µmoli $CO_2/m^2/s$) and 0,90 mg $CO_2/m^2/s$ (20,45 µmoli $CO_2/m^2/s$) (Rawson şi Haskett, 1974, Rawson şi Woodlief, 1978). Rawson and Hacket (1974) say that the maximum of photosynthesis intensity realizes when the leaves achieved 37% from their maximum area.

At the same cultivar intensity of respiratory process is higher at the top leaves and decreases to the basal leaves (Rawson and Hackett, 1974). Anitia and Marinescu (1992) found at the young tobacco leaves respiratory intensity 2-10 times higher than one found on old leaves. Determination made by Volodarsky and Bykovskaia (1954) specify that at 20°C temperature the tobacco leaves have a respiratory intensity of 265 mg CO_2/kg/h.

The Virginia 180 tobacco cultivar variation of the respiration process was determined to different organs and results are presented in table no.3. Intensity of the respiration process varied related to the organ type and to its age. It was established that the organs with the highest intensity of respiration are the top leaves (312,09 mg CO_2/kg h) and the lowest respiration was found at roots (32,12 mg CO_2/kg/h). Related to the organs age it was noticed that, at the same time with the increase of age, intensity of respiration decreases. During the vegetative period, there were determined higher values of intensity of respiration (312,09 mg.CO_2/kg/h) at top leaves, 293,75mg at basal leaves and 229 mg in the roots. At the beginning of the flowery the intensity of respiration was 280 mgr CO_2/kg/h, 200,34 mgCO_2/kg/h at the top leaves, 181,5 mg at basal leaves and 64,52 mg in the stems. The roots where characterized by a very low respiration (32,12 mg CO_2/kg h).

From data presented in the table 4 it resulted that the organs with the highest content of water were the flowers (95,85%), and the top leaves (86,85%) and the lowest water content was found in the root (70,48%). The quantity of total dried substance varied between 29,52% in the root and 14,5% in the flowers.

The highest quantity of mineral substances was found in the plants basal leaves (2,42%). Smaller quantities of mineral elements were found in top leaves (1,98%), root (1,80%), in stem (1,32%) and flowers (1,20%)

The lowest quantities were determined in the pods

Qualitative determinations of mineral elements using ICP spectrometry are presented in the table 5. A number of 12 mineral elements from tobacco cultivar Virginia 180 were identified; who content variation was related to the organ type.

Comparison of content in mineral elements, the most amount was registered for calcium (1157,38 mg/100g FW), potassium (532,59 mg/100g), magnesium (195,68 mg/100g) and natrium (6,81 mg/100g).

Analysis of variation of principal mineral elements from the tobacco Virginia 180 cultivar showed the followings:

The root of tobacco plants had a high content in aluminium (24,56 mg./100g), and iron (19,86 mg/100g),

The basal leaves has the highest content in mineral elements (2,4%). The most found was calcium (1157, 38 mg/100g), magnesium (195,68 mg/100g fresh weight) manganese (0,84 mg./100g.), zync (2,22 mg/100g) and barium (2,01 mg/100g).

In the **top leaves,** the most found mineral was boron (0,64 mg/100g) and copper (0,63 mg/100g).

In the **flowers** the most was potassium (532,59 mg/100g fresh substance), sodium (13,67 mg /100g) and chrom (0,48 mg/100g.)

The **stem** had the lowest content in mineral elements

CONCLUSIONS

The leaves of the Virginia tobacco 180 cultivar were characterized by a content in total chlorophyll that varied between 45,11mg/100g and 151,48 mg/100g., intensity of photosynthesis that varied between 1,27 $CO_2/m^2/s$ and 3,66 µmoles $CO_2/m^2/s$ and a transpiration intensity that varied between 1,52 and 2,88 mmoles $H_2O/ m^2/s$.

The organs with the highest respiration intensity are the top leaves (312,09 mgr. CO_2/kg /h). As regard as the organs age it was noticed that once increasing the age, respiration intensity decreases.

The total dried substances and mineral substance were found mostly in the roots (29,52% respectively 1,80%) and basal leaves (23,46% respectively 2,4%) the lowest quantity of the total dried substance and mineral substances being found in the flowers (14,15% respective 1,20 %).

The highest quantity of mineral substances was determined in the basal leaves (2,42%), mostly, being found: calcium (1157,381 mg/100g fresh substance), potassium (350 mg /100g), magnesium (195,68 mg/100g), sodium (6,81 mg/100g).

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TABLES

Table 1 - Content in assimilating pigments from leaves of the tobacco cultivar Virginia 180 (mg/100g)

Date	Leaf type	Chl a (mg/100g)	Chl b (mg/100g)	Total Chl (mg/100g)	Chl a/ chl b	Carotenes (mg/100g)	Total chl/ carotenes
26.07	Top leaves	109,84	41,64	151,48	2,64	29,86	5,07
	Basal leaves	40,18	9,34	49,53	4,30	13,43	3,69
13.09	Top leaves	86,72	31,07	117,79	2,79	23,54	5,00
	Basal leaves	33,48	11,63	45,11	2,88	10,03	4,50

Table 2 - Intensity of photosynthesis and transpiration process on 26.07.2007

Leaf type	Light intensity (µmoles m²/s)	Temperature (ºC)	Photosynthesis (µmoli CO2/m²/s)	Transpiration (mmoles H_2O/m²/s)
Basal leaves	1743	27,12	1,27	1,52
Top leaves	1784	29,34	3,66	1,88

Table 3 - Variation of the respiration process of the Virginia 180 cultivar organs

Date	Organ type	Respiration (mgr./CO2/kg/h)
26.07	Root	229
	Stem	94,04
	Basal leaves	293,75
	Top leaves	312,09
13.09	Root	32,12
	Stem	64,52
	Basal leaves	181,5
	Top leaves	200,34
	Flowers	280

Table 4 - The water content, total dried substance and mineral substances in the organs of tobacco cultivar Virginia 180

Organ type	Water (%)	Dried substance (%)	Mineral substances (%)
Root	70,48	29,52	1,80
Stem	73,37	26,63	1,32
Basal leaves	76,40	23,6	2,42
Top leaves	86,85	22,52	1,98
Flowers	85,85	14,15	1,20

Table 5 - Variance of the mineral elements content in the organs of tobacco cultivar Virginia 180 mg /100g fresh weight

Element	Root (mg./100g)	Stem (mg/100g)	Basal leaves (mg/100g)	Top leaves (mg/100g)	Flowers (mg/100g)
Al	**24,56**	3,54	5,15	5,79	10,29
B	0,18	0,12	0,45	**0,64**	0,31
Ba	0,89	1,03	**2,01**	1,31	0,51
Ca	489,63	341,24	**1157,381**	712,59	148,68
Cr	0,19	0,17	0,27	0,40	**0,48**
Cu	0,35	0,35	0,26	**0,63**	0,62
Fe	**19,86**	1,85	2,72	3,18	4,33
K	372,47	347,61	350,00	524,25	**532,59**
Mg	69,11	96,68	**195,68**	158,02	132,04
Mn	0,67	0,29	**0,84**	1,42	0,83
Na	10,75	7,03	6,81	7,41	**13,67**
Zn	0,63	0,99	**2,22**	2,03	1,43

The correlation between chlorophyll quantity and the intensity of the photosynthesis process of some *Pisum sativum* cultivars during vegetation period

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Keywords: dry pea, photosynthetic pigments, croquetout, mangetout, afila

ABSTRACT

This paper presents data concerning intensity of the photosynthesis process and the amount of assimilating pigments from leaves of some *Pisum sativum* cultivars also it was made a correlation between the obtained data. The analyzed cultivars were: Oregon Sugar Pod („mangetout" cultivar type), Sugar Snap („croquetout" cultivar type), afila pea cultivar Dora and Diana cultivar. Determinations were made during the phenophases mentioned in literature. First one is the phenophases of vegetative growth that ends at the start of flowering; second one is between flowering and the final stage of seed abortion, the third period is equivalent of the time period between the final stage in seed abortion and the moment when the last pod on the plant contains one seed bigger than 6 mm. The final phenophases last until physiologic maturity of the seeds. The Total Chlorophyll quantity from leaves varied between 203,3 mg/100 g and 69,3 mg/100 g and the intensity of the photosynthesis varied between 18,74 µmoli CO2/m²/s and 6,34 µmoli CO2/m²/s. At the analyzed *Pisum sativum* cultivars Diana and Dora we found between intensity of photosynthesis ant chlorophyll amount a very strong correlation.

INTRODUCTION

The process whereby the autotrof plants converts carbon dioxide into organic compounds, especially sugars using the energy from the sunlight in the chlorophyll is called photosynthesis.

The dry pea leaves have a C 3 photosynthetic type which characterized plants from the temperate climate, with a maximum of photosynthetic activity when they have maximum size, after that decreasing rapidly (Smillie, 1962). During the decrease of photosynthesis in the basal leaves of the plants in the top leaves is realised the maximum value of this process. The photosynthesis is maintained at the highest value for almost 30 days (Flinn and Pate, 1970).

At two days from the pea leaves appearance the photosynthesis varied between 0,25 (5,68 µmoli CO2/m²/s) and 0,69 mg $CO_2/m^2/s$ (15,68 µmoli CO2/m²/s) realized a maximum of 0,65-1,36 mg $CO_2/m^2/s$ (14,71-30,90 µmoli CO2/m²/s) and decrease after 70 days (Bethlenfalvay and Phyllips, 1977). Flinn (1974) says that dry pea plants have more moments of high intensity of photosynthetic process witch corresponds to leaves formation, flowering and pod growth.

Leaf represents the specialized organ in wich take place the photosynthesis. This have a specific structure adapt to this process the most important being the presence of some specialized organelles named cloroplasts. The adaptation of cloroplasts is the big area of tilacoid membranes and the presence of chlorophyllin pigments

The decreasing of photosynthesis intensity and chlorophyll biodegradation take place at the same time but the rate of chlorophyll bidegradation is slower than the photosynthesis rate (Burzo et al., 1999).

The purpose of this study is to complete existing data about the photosynthesis intensity and total chlorophyll content of *Pisum sativum* plants during the vegetation period and bring specificic information regarding the studied cultivars.

MATERIALS AND METHODS

It has been studied the afila type cultivar Dora, Diana cultivar also the "mangetout" and "croquetout" pea cultivars Oregon Sugar Pod respectively Sugar Snap native from Grand

Britain who differs from cultivated cultivars in our country because edible organs are represented by pods in which peas are 4-5mm dyameter (Atanasiu, 2000).

The vegetative material needed for physiological and biochemical determinations were represented by leaves of the studied cultivars.

The annalytic samples were taken during vegetative period's wich are mentioned previously.

The chlorophyll pigments from leaves were determined in 80% acetonic extract, colorimetered at wavelength of 663 nm, 646 nm and 470 nm. Results were calculated using Mackiney formulas and values were reported to 100 g vegetable material.

Intensity of photosynthesis was determined in the field, using automatic analyzer LCA-4. Results were expressed in µmoles $CO_2/m^2/s$.

RESULTS AND DISCUSSIONS

Interpretation of analysed data from Figure 1, showed that intensity of photosynthesis process is conditioned by the analysed cultivar and by the period when determinations were done. The smaller intensity of photosynthesis process was found for the four analyzed cultivars at the start of vegetation period in the vegetative growth phenophases. She varied between 9 şi 6,34 µmoli $CO2/m^2/s$.

The cultivar with the highest photosynthetic activity on the first phenophases was Diana followed by the croquetout cultivar type Sugar Snap (7,67 µmoli $CO2/m^2/s$), mangetout cultivar Oregon Sugar Pod (6,87 µmoli $CO2/m^2/s$) and afila cultivar Dora.

The cultivar with the highest photosynthetic activity found on the phenophases between start of the flowering and the final stage in seed abortion was Sugar Snap (16,53 µmoli $CO2/m^2/s$) followed by Oregon Sugar Pod cultivar(15,3 µmoli $CO2/m^2/s$), Diana (15,3 µmoli $CO2/m^2/s$) and Dora cultivar (7,34 µmoli $CO2/m^2/s$).

For the all analyzed cultivars the highest photosynthetic intensity was determined after the final stage in seed abortion and until the moment when the last pod on the plant contains one seed bigger than 6 mm. This varied between 18,74 (Sugar Snap) and 9,61 µmoli $CO2/m^2/s$ (Dora). At the Oregon Sugar Pod and Sugar Snap cultivars was found a photosynthetic activity of 17,62 respectively 16,96 µmoli $CO2/m^2/s$.

On the last phenophases that last until physiologic maturity of the seeds the intensity of photosynthesis start decreasing. The values found varied between 13,03 (Diana) şi 8,38 µmoli $CO2/m^2/s$ (Dora).

Oregon Sugar Pod and Sugar Snap cultivars have chlorophyll quantity increasing until intensity of photosynthesis achieved the highest value 175,9 mgr/100gr respectively 203,3 mgr/100gr, compared with them Diana and Dora cultivars registered high values of this parameter until the last phenophases (Figure 2). The obtained data confirms the fact that in the same time with decreasing photosynthetic activity take place clorophyllian pigments biodegradation from leaves but the rate of photosynthesis decreasing process is faster than chlorophyll biodegradation.

At the *Pisum sativum* analyzed cultivars between intensity of photosynthetic process and chlorophyll content it was realized a very strong correlation for Diana (r=0,9783) and Dora (r=0,8988) cultivars (Figures 5 and 6). The periods with a high photsynthetic intensity coincides with a high content in chlorophyllian pigments. The correlation coefficients of this indicators varied between 0,113 at Sugar Snap cultivar and 0,9783 at Dora cultivar.

CONCLUSIONS

All analyzed cultivars have registered a maximum of intensity of photosynthetic process in period between the final stage of seed abortion and the moment when the last pod on the plan contains one seed bigger than 6 mm

The cultivar with the highest photosynthetic intensity was Sugar Snap cultivar (18,74 µmoli $CO2/m^2/s$) and the lowest one at the afila cultivar Dora.

The highest clorophyll amount was found at the „croquetout” type cultivar Sugar Snap on the phenophases with the highest photosynthetic intensity.

Comparing with cultivars Sugar Snap and Oregon Sugar Pod, Diana and Dora cultivars show a slightly increase of chlorophyll amount even after the intensity of photosynthesis process start decreasing

The correlation coefficient of the two indicators varied between 0,113 at the Sugar Snap cultivar and 0,978 at the Dora cultivar

Between intensity of the photosynthesis process and the quantity of chlorophyll pigment was found a high correlation for the Diana (r=0,8988) and Dora cultivar (r=0,9783)

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FIGURES

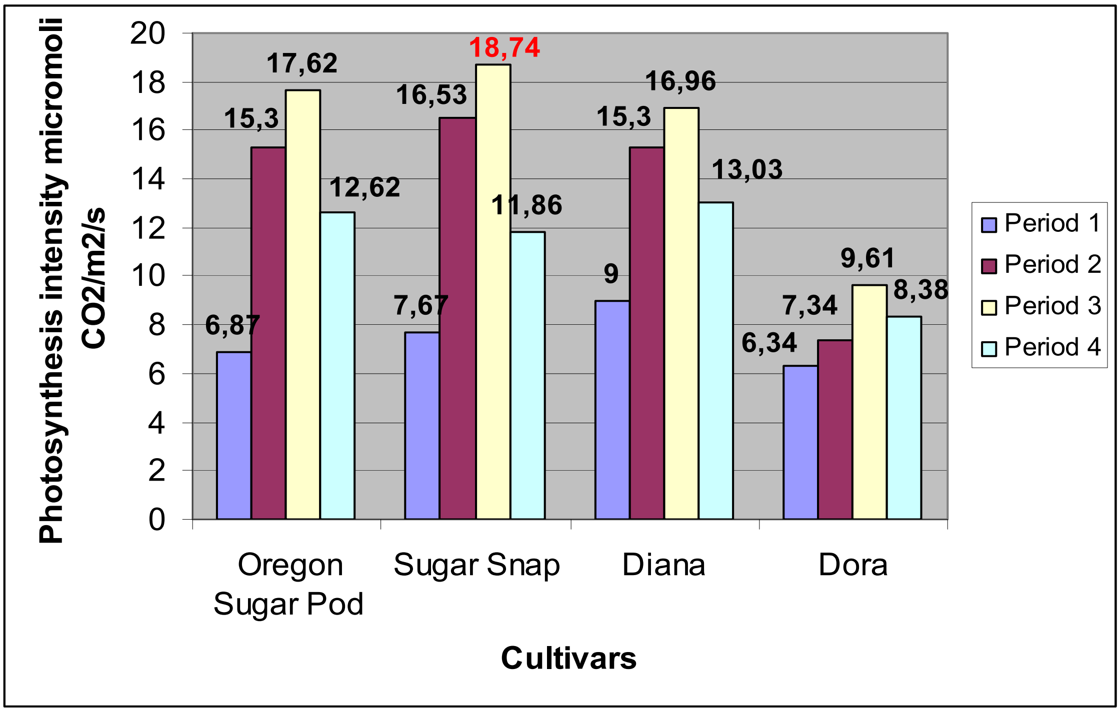

Fig. 1. Variation of photosynthetic process intensity from *Pisum sativum* leaves

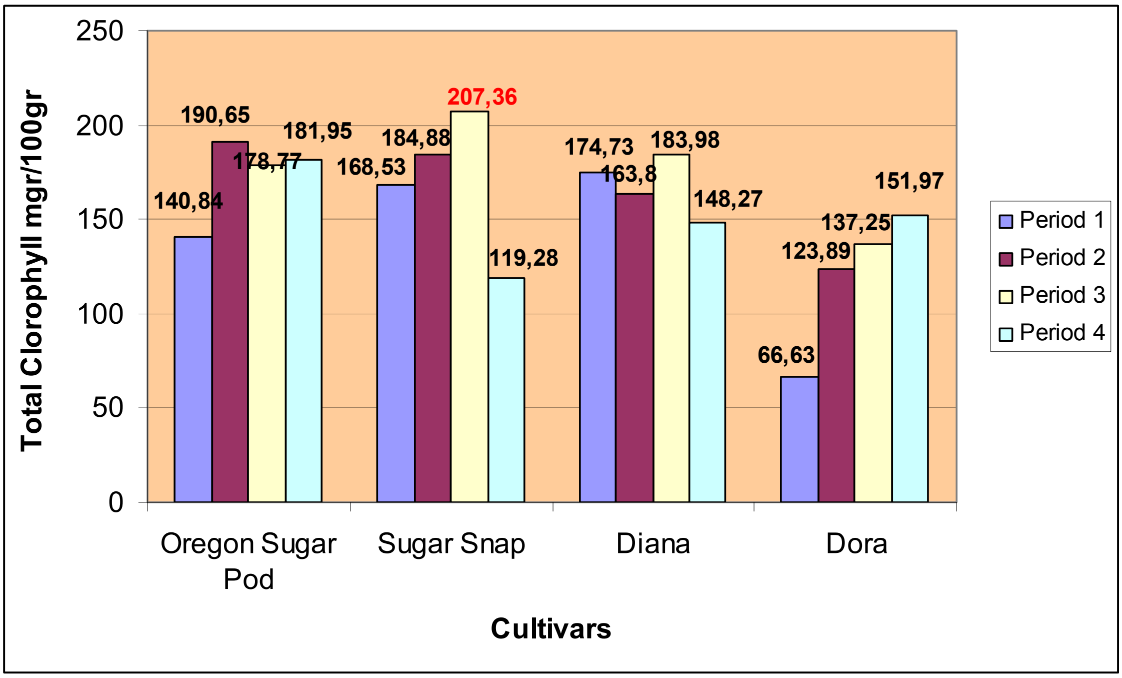

Fig. 2. Variation of Total Chlorophyll from leaves

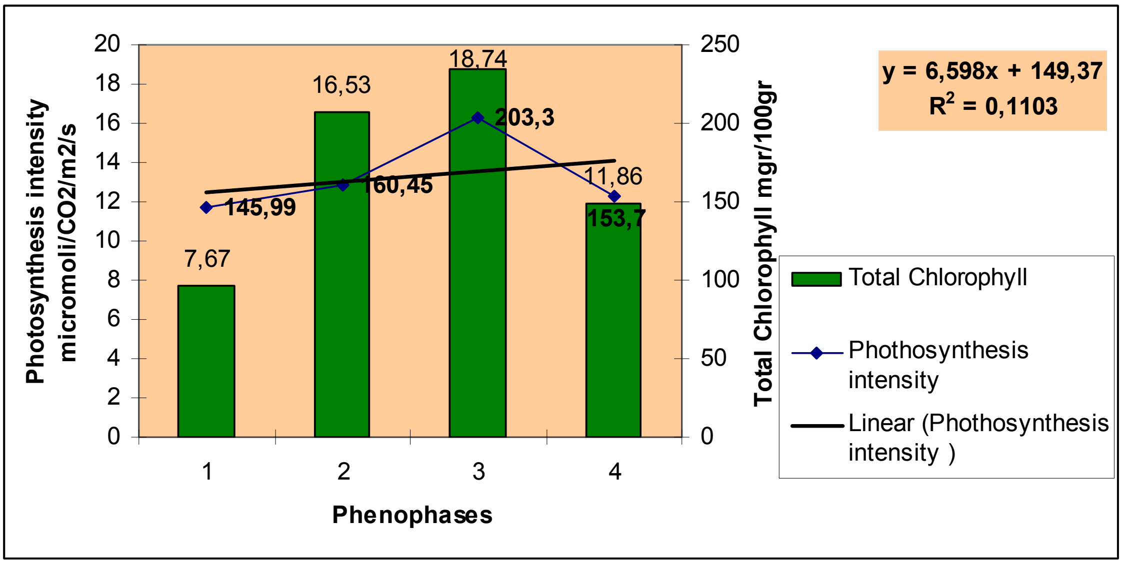

Fig. 3. Dynamics of photosynthesis process and Total Chlorophyll content of Sugar Snap cultivar leaves

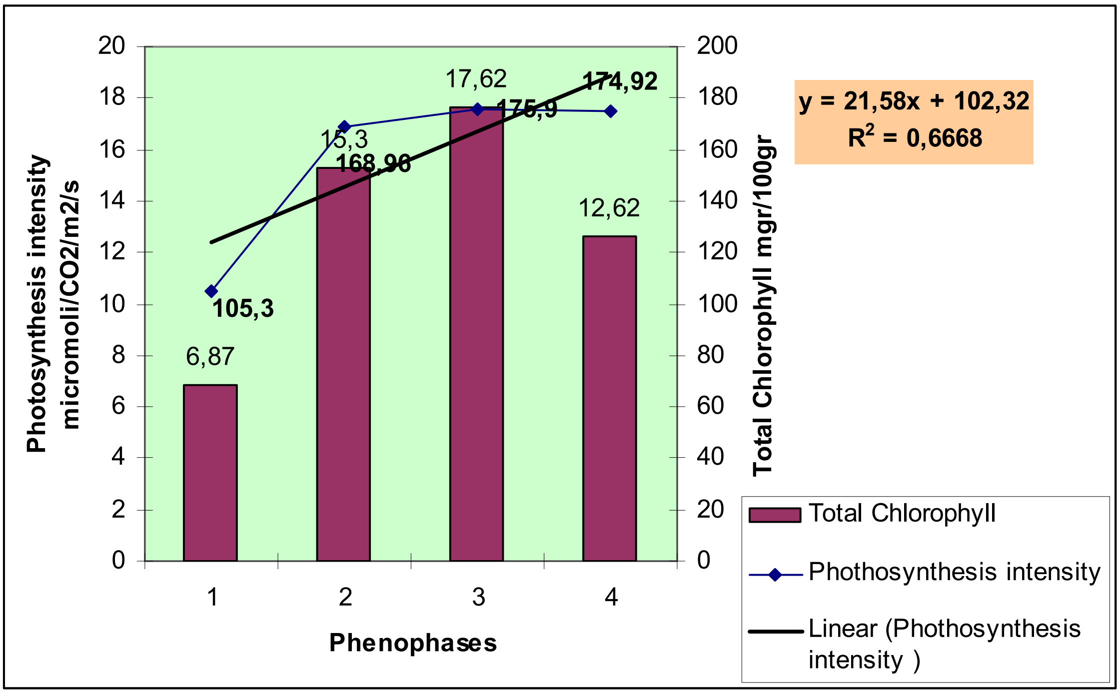

Fig. 4. Dynamics of photosynthesis process and Total Chlorophyll content of Oregon Sugar Pod cultivar leaves

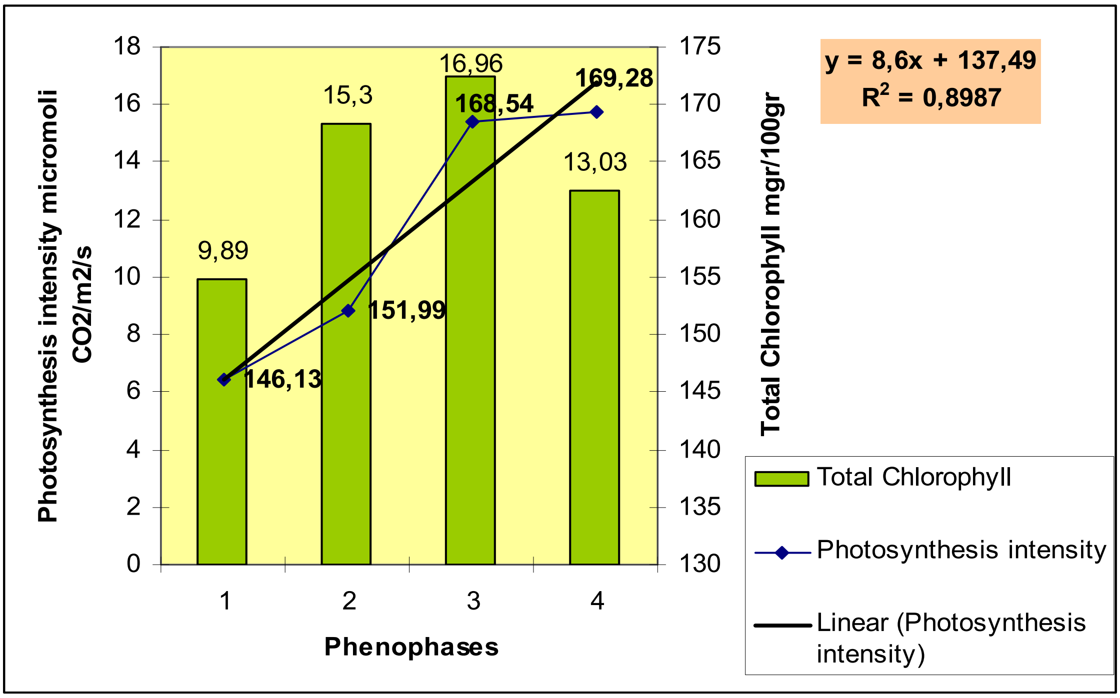

Fig. 5. Dynamics of photosynthesis process and Total Chlorophyll content of Diana cultivar leaves

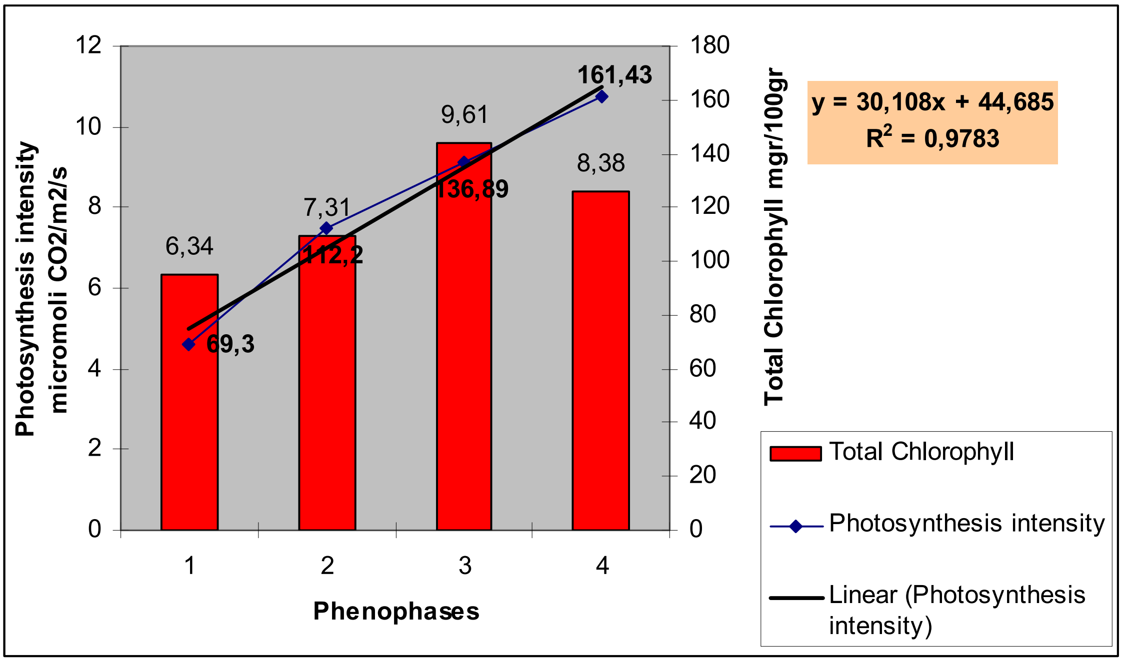

Fig. 6. Dynamics of photosynthesis process and Total Chlorophyll content of Dora cultivar leaves

Morpho-anatomical changes in *Quercus rubra* L. leaf under pollution conditions

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Keywords: Red Oak, pollution, leaf changes

ABSTRACT

Atmospheric pollution differentially affects some plant species. Besides resistant species to this abiotic stress factor there is *Quercus rubra* due to a specifically leaf cito-hystological configuration. For this specie, matured leaves were randomly collected from polluted and non-polluted habitats in Bucharest City and cross-sections have been carried out in leaf and petiole. Followings the microscopically observations and specifically measurements it can be noticed that: A higher stomata number on leaves epidermal of samples from polluted area. Leaf mesophyll was thinner in the case of polluted leaves. Leaf presents secondary formations in the principal limb nervure and in the petiole there are collateral-open type floem-xilem vascular fascicles. At some polluted leaves, in the median nervure there are two vascular fascicles, as opposite to others samples which had only one vascular fascicle. At some unpolluted leaves, in the median nervures there was observed lenticels, an uncharacteristic formation for leaves. There were not registered significantly differences between polluted and unpolluted leaves, as regard as leaf area.

INTRODUCTION

Air pollution, even known centuries ago, nowadays becomes one of the major preoccupations, not only because adversely affects humans health, but it causes damage to plants and animals, also (Ionescu et al., 1992; Dejeu et al., 1997; Visan et al., 2000, Chira, 2005; Bolea et al., 2006).

Using plants to control the air pollution can be one plausibly means if it will be possible to have a large variety of resistant plants and adapted plants to different climate and soil conditions, as the specific areas imply. So, it is necessary to know plants intoxication mechanism with air pollutants and the degree to which leaf anatomy can adapt to stress, with a view to easily select the resistant species (Jenks and Hasegawa, 2005; Delian, 2006; Ungurean et al., 1998). If we refer to the urban area, the withering of street trees in cities is not only caused be the negative influence of environmental factors, but also by their improper selection.

Quercus rubra, a semi-determinate broadleaf species is a very appreciated tree in parks and street alignments, due to its pollution resistance, leaves color in autumn, from yellow to red and their long time persistence (Borecka et al., 2008).

MATERIAL AND METHODS

Mature leaves of *Quercus rubra* (harvested at the middle of July) trees from non-polluted (Botanical Garden of U.S.A.M.V. Bucharest) and polluted areas due to vehicles circulation (trees from the street alignments) have been analysed.

The cross-sections have been performed in the middle part of the leaf, also in petiole, cleared in chloral-hydrate and stained with iodine green reagent (Georgescu et. al., 2003). Leaf structure examination, measurements and photos were performed by MC-7, using the objectives 20 x, 40 x and ocular 10 x.

On the exfoliated epidermis using collodion, the stomata number was counted under microscope. Leaf area has been determined using the millimetre paper. The leaf length and width have been used to estimate the leaf area.

RESULTS AND DISCUSSION

The registered cito-histological changes *Quercus rubra* leaves, in polluted and non-polluted conditions are especially quantitatively (table 1).

The obtained values are near to those previously reported (Kozlowski and Pallardy, 1997: Nikolić et al., 2005).

The upper epidermis of *Quercus rubra* leaf is thicker as against the lower one, with a medium value of 14 μm, in the case of polluted leaf and 16 μm for those non-polluted. The epidermis is covered by a thick cuticle (a medium 6,2 μm at polluted, respectively 7,2 μm at non-polluted leaves). The lower epidermis registered values have been around a mean of 12,3 μm, at the polluted leaves and 3,5 μm, for non-polluted leaves, with a thinner cuticle, too: a mean of 4,5 μm, in the case of polluted samples and 6,8 μm, for non-polluted ones. According to the literature data, cuticle thickness in the case of different species ranges between 1-10 μm (Grintescu, 1985). As against to these values, *Quercus rubra* leaf cuticle is considered a thick one, a characteristic feature that explains this specie tolerance to pollution, in fact, cuticle being a noxious barrier (Ungurean et al., 1988).

In the upper epidermis there were not stomata, leaves being hypostomatic.

In the case of the pollutes samples, the mean stomata number was 359 mm^{-2}, as compared with the non-polluted samples - 221 stomata mm^{-2}. The higher stomata number for the polluted leaves emphasise the capacity to adapt to pollution conditions, maybe by transpiration rate decreasing, if the "edge effect" appears.

As it is well known (Esau, 1965), leaf mesophyll is bifacial type (fig. 1) consisting from the palisade parenchyma, with 1-3 layers of elongated cells, with many chloroplasts and the spongy tissue, made by 2-4 rows of isodiametric cells, with a reduced chloroplasts number. In the case of the polluted leaves, mesophyll medium thickness value was of 105 μm, 65 μm represented by the palisade tissue and 45 μm by the spongy tissue. For the non-polluted leaves, the mesophyll thickness was nearly twice, with a medium value of 185 μm: 113 μm the palisade tissue, respectively 72 μm the spongy tissue.

As regard as leaf anatomical changes of *Quercus rubra* exposed to enhanced ultraviolet-B radiation, Nagel et al. (1998) reported a significantly thicker palisade parenchyma in the 2 x and 3 x levels as compared to controls, opposite to our obtained data, of course, the abiotic stress factor being known.

In the leaf mesophyll there were observed many phloem-xylem fascicles, coated with sclerenchyma layers.

In the median vein there was observed an open collaterally transporting fascicle type, between phloem and xylem being a cambium generation area

For the non-polluted leaves median veins there were noticed formations resemble to lenticels presence, a non leaf characteristic (fig. 2). This process was observed in the case of leaves with a lower stomata number, as compared with the collected leaves from urban air polluted exposing areas.

For some polluted leaves, in the middle vein there were emphasised two vascular fascicles, these being separated by the parenchyma (fig. 3). These changes can be determined by the adaptation capacity of this specie to the air pollution and high temperature values.

Analysing the petiole structure as a cross- section (fig. 4), this is egg-shaped and as it is known, at the surface there is an epidermis, similarly to those of leaf, under this there is situated a colenchyma consisting by 2-3 rows of thicker cells, then the parenchyma - 5-6 rows of isodiametric cells, inside demarcated by the endoderm. In the parenchyma central part there is collaterally opened phloem-xylem vascular, bounded by the sclerenchyma arches. Between phloem and xylem there is cambium, a secondary tissues generation site. The vascular fascicles are separated by the parenchyma zones. Phloem medium thickness was 30 μm, at polluted samples and 70 μm at non-polluted ones, while in the case of xylem, the medium thickness values were 65 μm (polluted), respectively 160 μm (non-polluted).

There were no registered leaf significantly morphological changes, as leaf area determination results demonstrated.

Estimating the correlation between the directly determination of leaf area and the calculated area to multiply the leaf length with its width, the conclusion was that to evaluate the leaf area it can be used the formula L x l x 0.64 (fig. 5). There was an insignificantly variation of the coefficient between the air pollution exposed variants (fig. 6) and those non-polluted (fig. 7). It can be mentioned that canopy leaf area index (LAI) (defined as the one-sided area of green foliage projected onto a unit area of ground, as a measure of vegetation density, expressed in units m^2 m^{-2}) is an important structural parameter of the vegetation controlling pollutant uptake by terrestrial ecosystems (Nikolov and Zeller, 2006).

CONCLUSIONS

The leaf epidermis, both for polluted and non-polluted samples are thick, covered with a thick cuticle, as one of its characteristic feature resistance to pollution.

Polluted leaves had a higher stomata number.

Secondary formations on leaves have been present, because in the main vein and in the petiole there were detected collaterally type of phloem-xylem vascular fascicles.

In some polluted leaves, in the main vein there are two conducting fascicles.

For the non-polluted leaves, in the principal vein there were lenticels, to facilitate the gas exchange.

Correlation data results demonstrate that there were not emphasised significantly changes as regard as leaf area.

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TABLE AND FIGURES

Table 1. *Quercus rubra* leaf structural characteristics variation

Leaf sample	Upper epidermis			Mesophyll		Lower epidermis		
	Cuticle µm	Epidermis µm	Stomata /mm^2	Palisade tissue µm	Spongy tissue µm	Cuticle µm	Epidermis µm	Stomata /mm^2
Polluted	6,2	14,0	0	65,0	40,0	4,5	12,3	359
Non-polluted	7,2	16,0	0	113,0	72,0	6,8	13,5	221

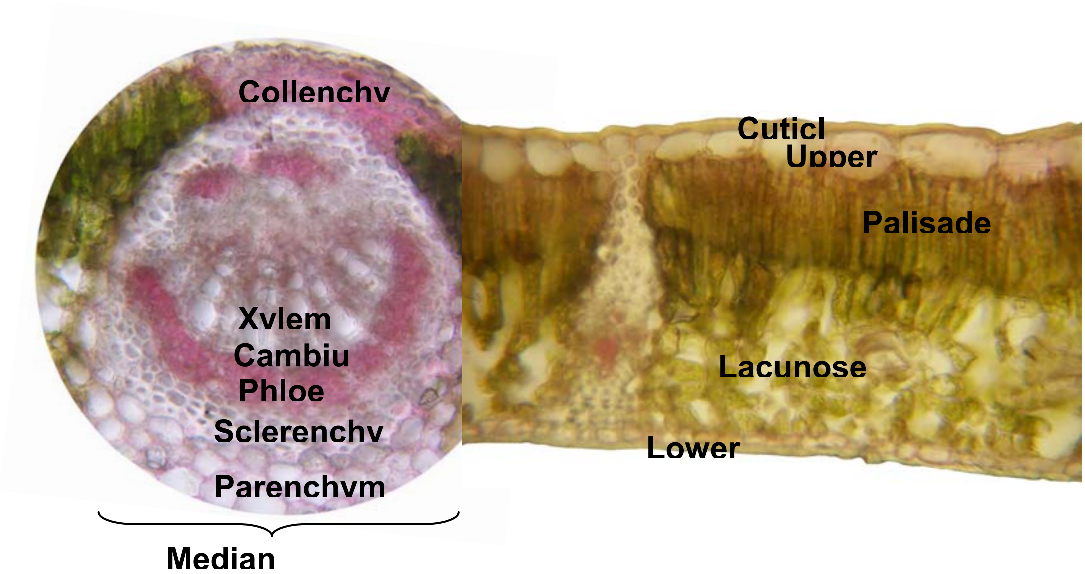


Fig. 1. *Quercus rubra* leaf cross-section

Fig. 2. *Quercus rubra* cross-section on the median nervure of leaf from unpolluted air conditions

Fig. 3. *Quercus rubra* cross-section on the median nervure of leaf from polluted air conditions

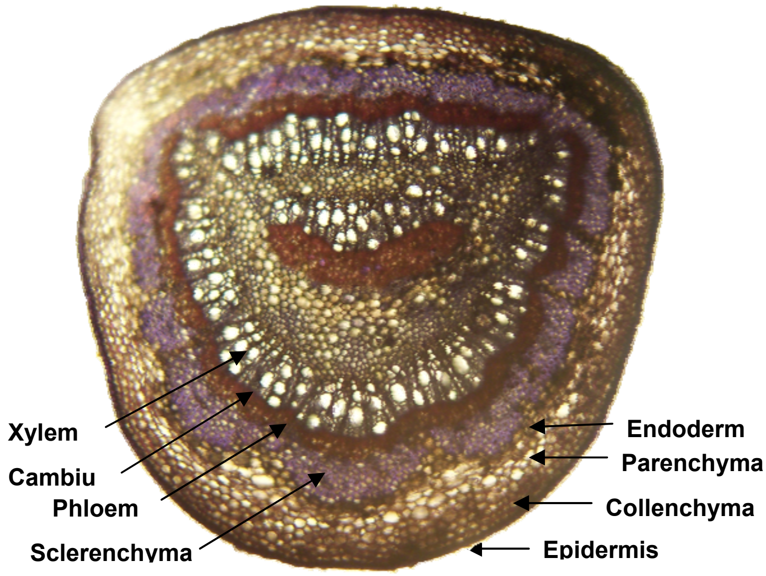


Fig. 4. Cross-section in the petiole of *Quercus rubra* leaf

Fig. 5. Correlation between estimated and real leaf area of *Quercus rubra* (polluted and nonpolluted)

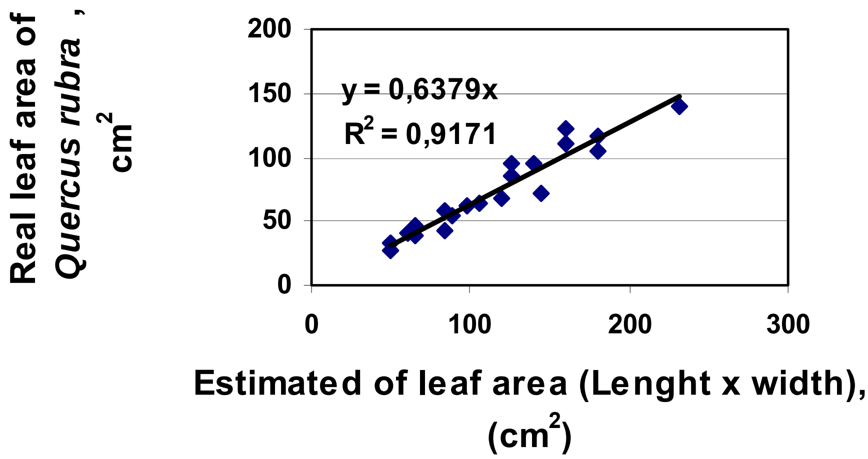


Fig. 6. Correlation between estimated and real leaf area of *Quercus rubra* - polluted

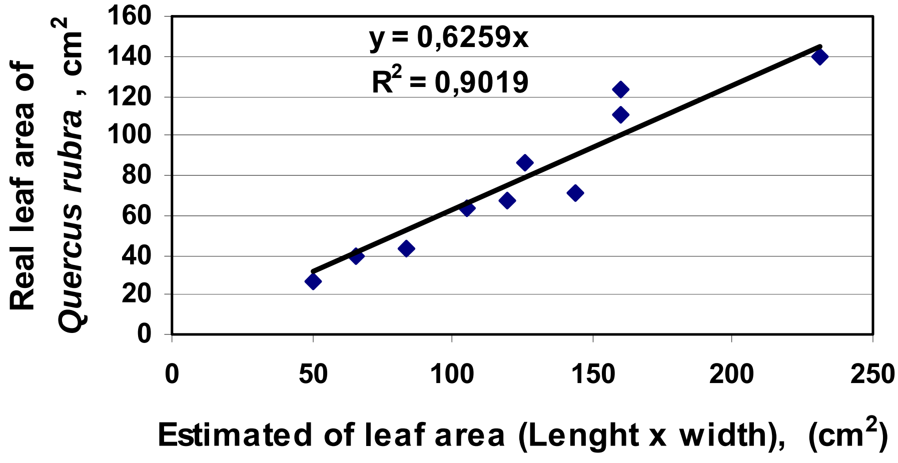
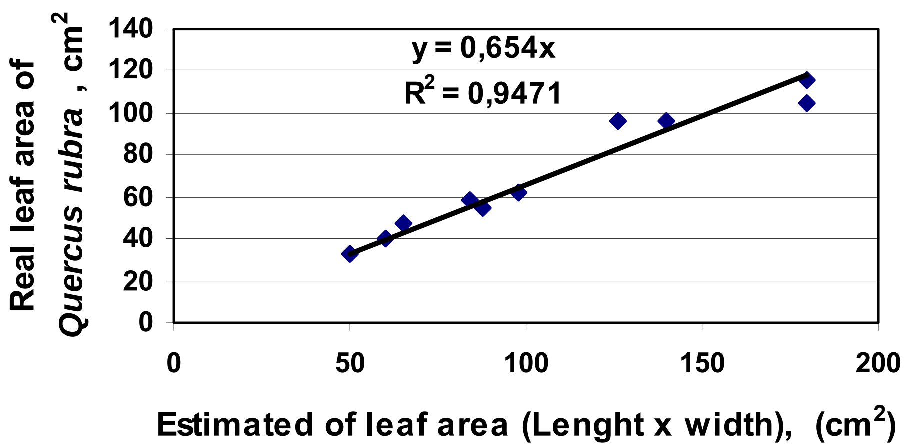


Fig.7. Correlation between estimated and real leaf area of *Quercus rubra* - nonpolluted



Anatomical peculiarities of the vegetative organs in the species *Kleinia repens*

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Keywords: stem, phylloclade, cortical bundles, xerophily

ABSTRACT

Kleinia repens is a succulent perennial plant having medicinal properties, which is cultivated in Romania as an ornamental plant. Both the stem and the phylloclades present a number of anatomical peculiarities that represent adaptations to the xerophyte environment. The well-developed cortex of the stem, made up of over 20 cell layers, is mostly constituted of aquiferous tissue. The vascular cortical bundles, which are characteristic of other xerophilous plants, too, have an important part in providing water for the very thick rind. The epidermis of the phylloclade is covered by the cuticle and a thick layer of wax, and the stomata are situated a little below the level of the epidermis, a location typical of all xerophilous plants. The central cylinder of the phylloclade exhibits collateral bundles that have the xylem strand is oriented towards the centre of the phylloclade, very much as in the stem; this proves the fact that this leaf-like organ is in fact a metamorphosed assimilating stem.

INTRODUCTION

Kleinia repens L. (*Senecio serpens* G.D. Rowley) (family *Asteraceae*), known by the popular name of Blue Chalk Fingers, is a succulent perennial plant, having a height of up to 30 cm. The stems, and especially the phylloclades, are glaucous and covered by a thin layer of wax. Its origin can be found in South Africa; in Romania, it is cultivated as an ornamental plant. In Madeira and the Islands of Porto Santo, it is used as a medicinal plant (Rivera and Obon, 1995).

MATERIALS AND METHODS

The vegetative material, represented by fragments of above-the-ground vegetative organs of the species *Kleinia repens*, was cut transversally, treated with Javel water and coloured with Geneva reagent. The microscopic examination of the botanic lamellas prepared, as well as the photos, was realized by means of an Optika microscope fitted with a digital Canon camera. Part of the vegetable material was examined and photographed before being treated with Javel water and coloured.

RESULTS AND DISCUSSION

The anatomy of the stem. Examined in the cross-section through the stem, the plant exhibits tissues organized in epidermis, outer cortex and a central cylinder, which is an anatomy characteristic of dicotyledonous plants (Andrei, 1978; Şerbănescu-Jitariu and Toma, 1980; Niță et al., 2004). The epidermis is mono-stratified and covered by the cuticle. In the more mature areas of the stem, the epidermis is replaced by the suberum, which is formed out of the secondary meristem, called phellogen, which is differentiated under the epidermis. The outer cortex is well-developed, and made up of over 20 cell layers (fig. 1). The first cell layers of the cortex are collenchymatous (fig. 2-4), with a collenchyma of an angular type. The next 3-4 cell layers contain chloroplasts, which represent an assimilating tissue (fig. 2). Except for the outer strata, which are turned into collenchymatous tissue, the remainder of the rind is parenchymatous. The cortex growing between the chloroplastic area and the central cylinder represents an aquiferous parenchyma, characteristic of xerophilous plants, where the cortex and the pith are aquiferous tissues (Fahn, 1982). In the inner part of the cortex, next to the vascular bundles in the central cylinder, there are a number of secretory canals (fig. 1, fig. 5-6). The latter are lined with a variable number of secretory cells. The presence of the cortical bundles is equally to be noted in the inner part of the cortex (fig. 5), a situation that can also be met with in numerous genera of *Cactaceae* (Mauseth, 2006); these bundless, too, are accompanied by secretory canals. The central cylinder is of a eustelic type, exhibiting collateral vascular bundles situated in the shape of a circle. The vascular bundles belong to the open collateral type (fig. 6). Between the bundles are the primary medullary rays. Both the xylem, and the phloem strands are poorly developed, at least in the young areas of the stem. The pith located in the middle of the central cylinder is parenchymatous and well developed. The cells of the medullary parenchyma contain few chloroplasts (fig. 7).

The anatomy of the phylloclade. The vegetative organs on the plant's stem, which look like leaves, are the phylloclades. Even though, initially, these organs were considered to be leaves, judging by their aspect, their structure is characteristic of an actual stem. Examined in the cross-section, the phylloclade has a semicircular shape, the upper side being flat, and the lower side convex. On the outside, the phylloclade is protected by a one-layered epidermis, covered by the cuticle (fig. 8) and a thick layer of wax (fig. 9). The cellular walls of the epidermic cells are thickened, and the stomata are situated a little below their level, a positioning typical of xerophilous plants (Grinţescu, 1985). The wax situated on the surface of the phylloclade limits the gas exchanges between the plant and the environment, thus increasing the plant's resistance to dryness (Andrei, 1978; Samdur et al., 2003; Toma and Anghel, 1985).

Under the epidermis there is a one-layered, hyaline hypodermis. The tangential inner walls of the hypodermic cells and the hypodermic layer are turned into a collenchymatous tissue, making up an angular collenchyma similar to the one in the stem (Fig. 9). There follows an assimilating area, formed of 3-4 cell layers, which contain numerous chloroplasts, so that the phylloclade may accomplish its function of photosynthesis. In places, the assimilating tissue is interrupted by a hyaline parenchyma, where the secretory canal is located (Fig. 10).

The central cyilinder of the phylloclade is a eustel having the vascular bundles situated in a single circle. The bundles of a collateral type are poorly developed. The xylem strand of the bundle is oriented towards the centre of the phylloclade (Fig. 11), just like in the stem, which proves the fact that this organ looking like a leaf is actually a metamorphosed stem, with a role in photosynthesis. At the centre of the phylloclade there is well-developed pith (Fig. 10), which represents an aquiferous parenchyma, characteristic of xerophilous plants.

The fleshy phylloclades, accountable for by the well-developed aquiferous parenchyma, lend the plant a habitus recalling that of the *Cactaceae*, *Euphorbiaceae* or other plants which vegetate in arid regions, owing to the convergence of the forms (Şerbănescu-Jitariu and Toma, 1980).

CONCLUSIONS

The stem presents a number of anatomical peculiarities that constitute adaptations to the plant's xerophytous environment. The well-developed cortex is mostly made up of aquiferous tissue. The vascular cortical bundles, characteristic of other xerophilous plants such as the *Cactaceae* and some *Euphorbiaceae*, play a major part in adducing water to such a thick cortex. The leaf-like vegetative organs on the stems of the plant are the phylloclades. Although these organs were initially considered to be leaves, based on their aspect, their structure is characteristic of stems. The outer part of the phylloclade is protected by a one-layered epidermis, covered by a cuticle and a thick layer of wax. The stomata are situated a little below the level of the epidermis – a positioning typical of xerophilous plants. The wax on the surface of the phylloclade limits the gas exchanges between the plant and its environment, thus increasing the plant's resistance to dryness. Within the cortex of the phylloclade can be found an assimilating region, the central cylinder of the phylloclade presents bundles that are reduced, and belong to the collateral type. The xylem strand of the bundle is oriented towards the centre of the phylloclade, very much as it happens in the stem, which proves the fact that this leaf-life organ is actually a metamorphosed stem playing a major role in photosynthesis. At the centre of the phylloclade is situated a well-developed pith, which constitutes an aquiferous parenchyma, typical of xerophilous plants. The mechanic tissues are poorly developed in both the phylloclades and the stem, being represented only by the sub-epidermic collenchyma.

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FIGURES

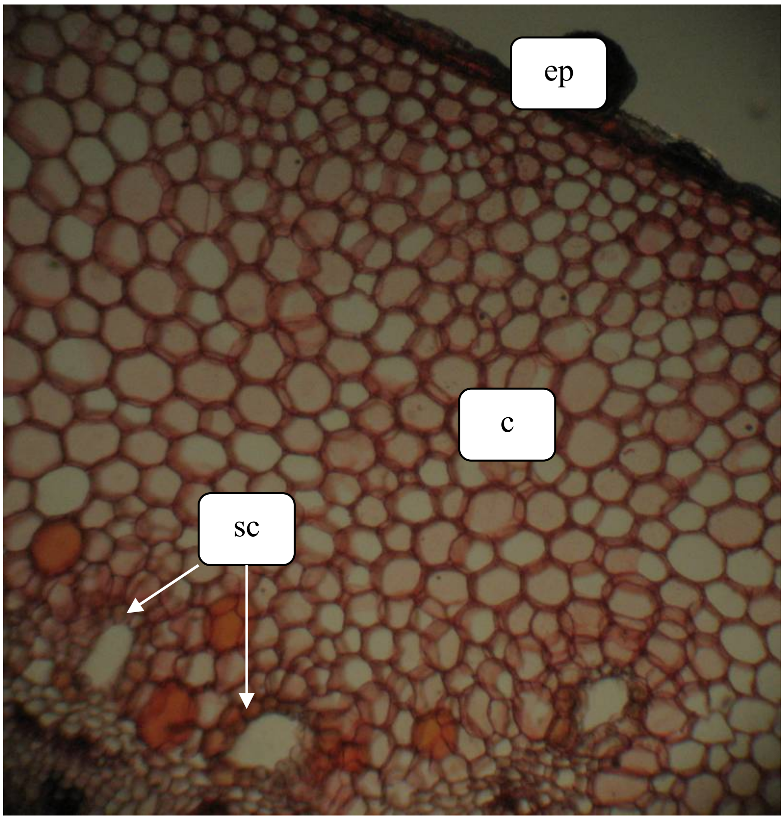

Fig. 1. *Kleinia repens*-cross-section through the stem: c-cortex, ep-epidermis, sc-secretory canal (oc. 10x, ob. 4, zoom 4, orig.).

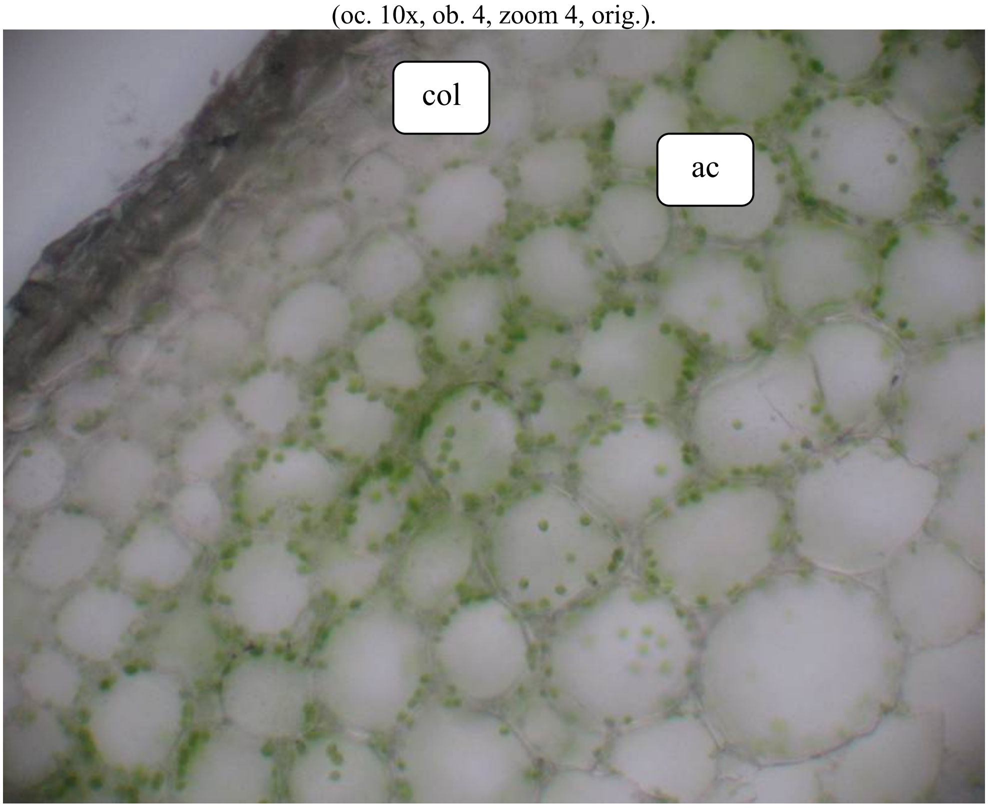

Fig. 2. *Kleinia repens*-cross-section through the stem: epidermis and cortex: ac-assimilatory cortex, col-angular collenchyma (oc. 10x, ob. 10, zoom 4, orig.).

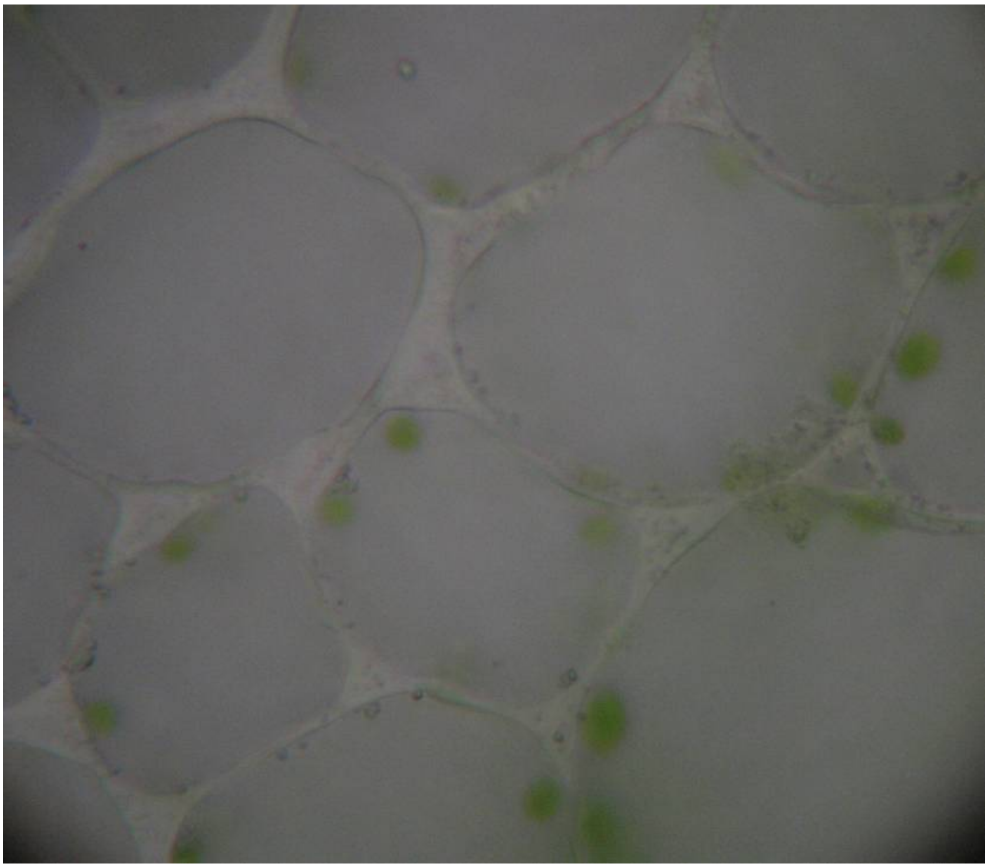

Fig. 3 *Kleinia repens*-cross-section through the stem: angular collenchyma (oc. 10x, ob. 40, zoom 4, orig.).

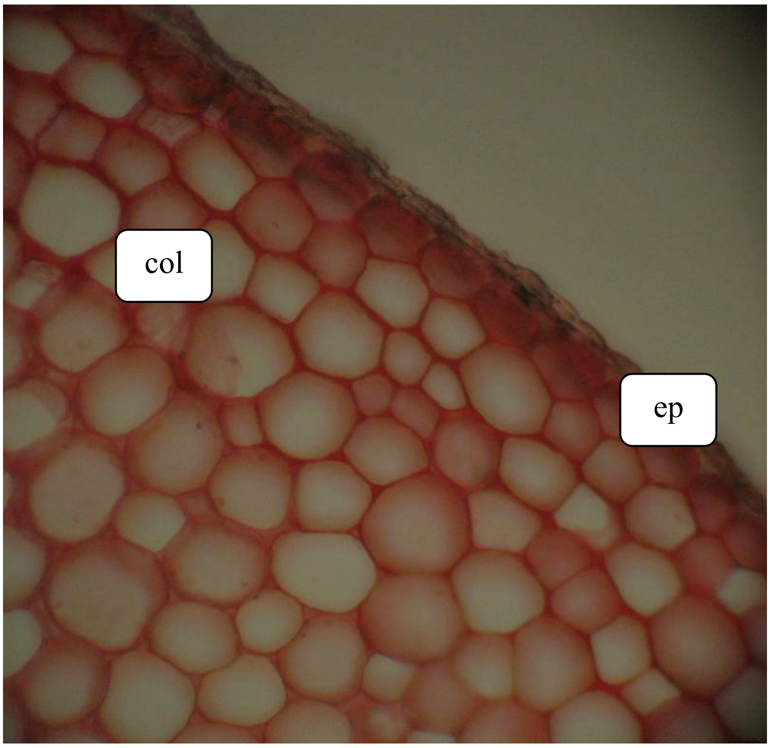

Fig. 4 *Kleinia repens*-cross-section through the stem: epidermis (ep) and angular collenchyma (col) (oc. 10x, ob. 10, zoom 4, orig.).

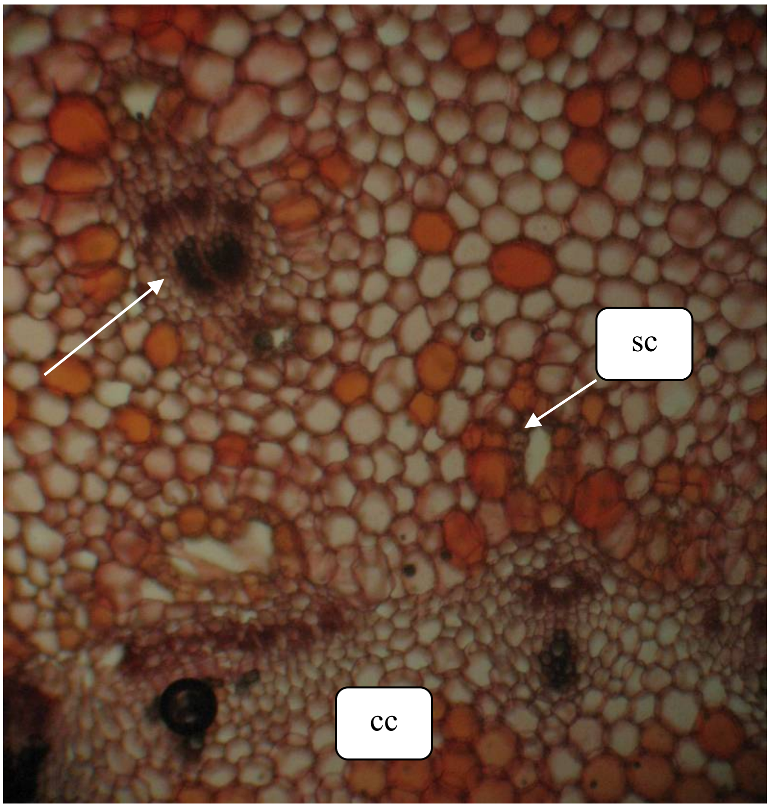

Fig. 5 *Kleinia repens*-cross-section through the stem: cortical bundle (arrow), secretory canal (sc) and central cylinder (cc) (oc. 10x, ob. 4, zoom 4, orig.).

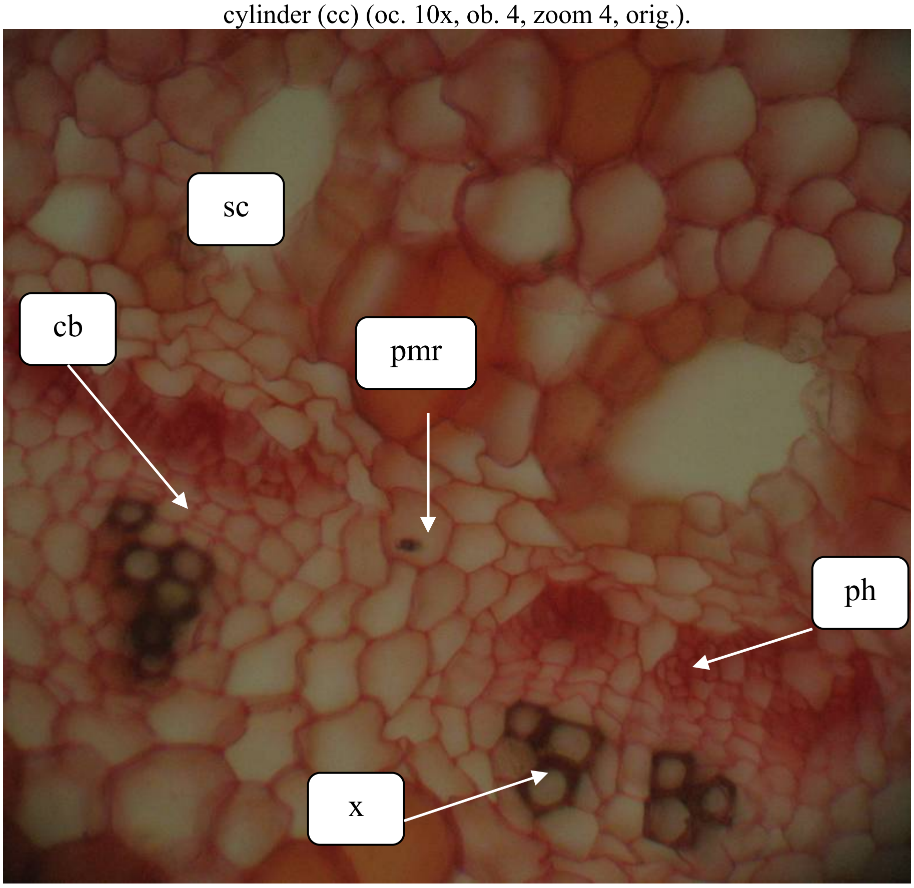

Fig. 6 *Kleinia repens*-cross-section through the stem: two vascular bundles and two secretory canal (sc); cb-cambium, ph-phloem, pmr-raze primary medullary rays, x-xylem (oc. 10x, ob. 10, zoom 4, orig.).

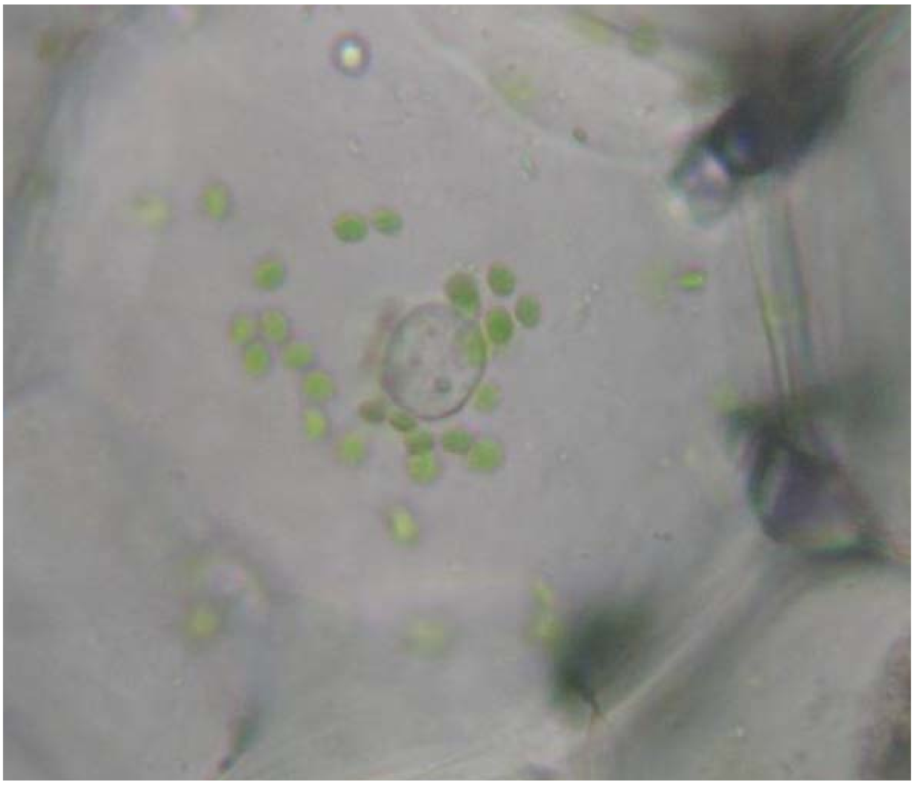

Fig. 7 *Kleinia repens*-cross-section through the stem: cell with chloroplasts from pith (oc. 10x, ob. 40, zoom 4, orig.).

Fig. 8 *Kleinia repens*-epidermis of the phylloclade (oc. 10x, ob. 4, zoom 4, orig.).

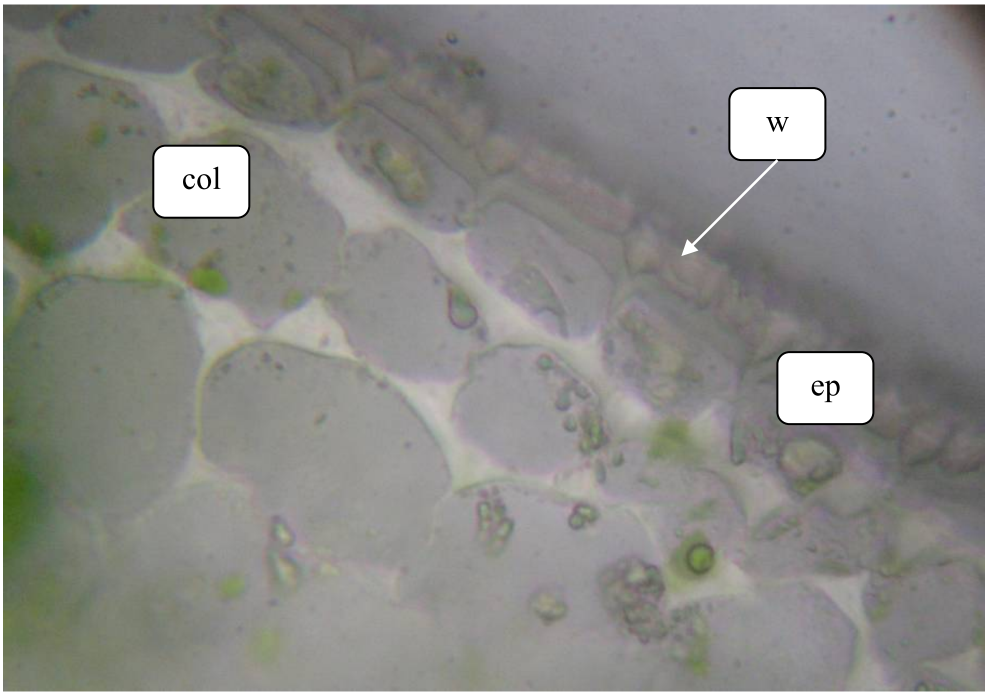

Fig. 9 *Kleinia repens*- cross-section through the phylloclade: col-collenchyma, ep-epidermis, w-wax (oc. 10x, ob. 10, zoom 4, orig.).

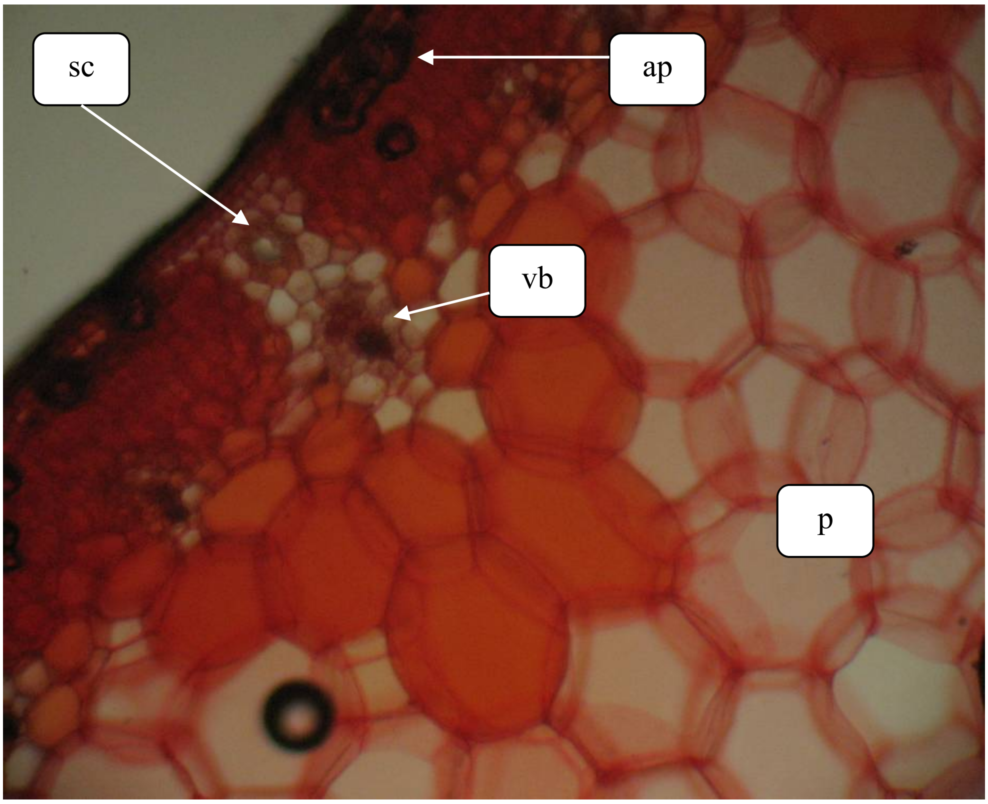

Fig. 10 *Kleinia repens*- cross-section through the phylloclade: ap-assimilatory parenchyma, p-pith, sc-secretory canal, vb-vascular bundle (oc. 10x, ob. 4, zoom 4, orig.).

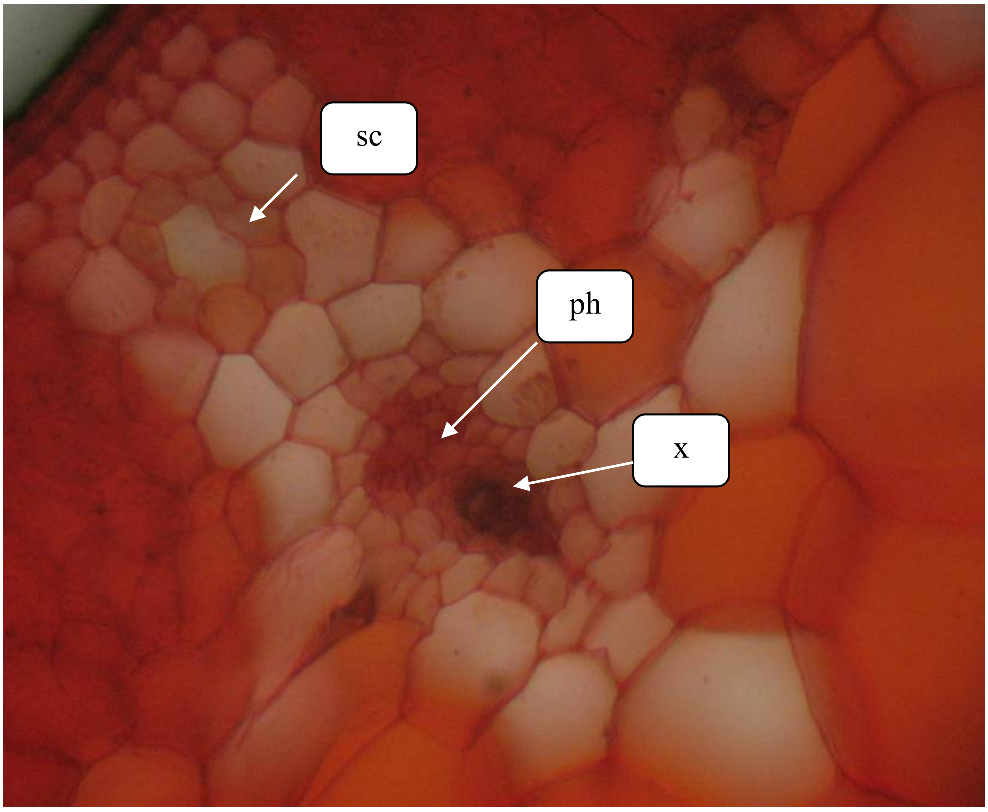

Fig. 11 *Kleinia repens*- cross-section through the phylloclade: ph-phloem, sc- secretory canal, x-xylem (oc. 10x, ob. 10, zoom 4, orig.).

OTHER FIELDS

Assessment of oxidases activities in different parts of cereals

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Keywords: superoxide dismutase, peroxidase, wheat, rye, oxidative stress

ABSTRACT

The human activities influence the soils in many industrial regions by contamination with various pollutants and affect the cultivated plants. In order to improve the plant's protection it is important to understand the mechanisms contributing to the stress tolerance. The molecular defense systems of the plants are composed of different metabolites and oxidative enzymes.

The purpose of this paper was to reveal the particularities of the activity of some oxidases in plants subjected to a stress treatment. Therefore samples of cereals harvested from heavy metals contaminated fields were analyzed in order to assess the activities and the distribution of these enzymes in different parts of the plants. The activities of superoxide dismutase and peroxidase and the content in proteins were measured in grains, stalks and roots of wheat and rye.

The obtained results showed that the specific activity of superoxide dismutase was higher than the peroxidase activity in the analyzed plants, both in grains, stalks and in roots.

The comparative study of the enzymatic activities in different parts of the cereals demonstrated that both superoxide dismutase and peroxidase were more active in roots than in the other analyzed parts. Moreover, the peroxidase registered very small values both in the stalks and in the grains of wheat and rye.

INTRODUCTION

Plants need flexible means for acclimation to changing environmental conditions because they have limited protection mechanisms for stress avoidance (Cumming and Tomsset, 1992).

A common consequence of the biotic and abiotic stress is the increased production of reactive oxygen species of (Polle and Rennenberg, 1993). Successive reduction of molecular oxygen to H_2O produces the intermediates $O_2^{\bullet -}$, $HO^{\bullet}$ and H_2O_2, which are potentially toxic, because they are relatively reactive compared with O_2. Reactive oxygen species may lead to some unspecific oxidation of proteins and membrane lipids and may cause DNA injury.

The aerobes organisms adapted oneself to the toxicity of oxygen by building an antioxidants system in order to control the level of the oxidation state. These protection mechanisms are located on different levels, but it can be observed that almost entire compounds involved in the toxicity of oxygen mean substrate for some enzyme, which catalyze its neutralization (Olinescu, 1982). The control of oxidant levels is achieved by antioxidative systems. These protection systems are composed of metabolites such as ascorbate, glutathione, tocopherol etc. and enzymatic scavengers of activated oxygen such as superoxide dismutases, peroxidases and catalases.

The purpose of this paper was to reveal the particularities of the activity of some oxidases in plants subjected to a stress treatment. Therefore samples of cereals harvested from heavy metals contaminated fields were analyzed in order to assess the activities and the distribution of these enzymes in different parts of the plants. The specific activities of superoxide dismutase (SOD) and peroxidase (POD) and the content in proteins were measured in grains, stalks and roots of wheat and rye.

MATERIALS AND METHODS

There were analyzed samples of plants harvested from heavy metals contaminated fields. The samples consisted in roots, stalks and grains of wheat and rye.

In order to estimate the oxidative stress occurred on cell level, characteristic parameters were analyzed, such as: proteins content, specific activities of superoxide dismutase and of peroxidase using proper methods.

- ***The proteins content*** was determined by Lowry method, which is based on the reactivity of the peptide nitrogen[s] with the copper [II] ions under alkaline conditions and the subsequent reduction of the Folin-Ciocalteu phosphomolybdicphosphotungstic acid to heteropolymolybdenum blue by the copper-catalyzed oxidation of aromatic aminoacids (Iordachescu and Dumitru, 1988).
- ***The activity of peroxidase*** was determined by spectrophotometric measuring of the speed of colour achievement at 436 nm and 25^{o}C in the decomposition reaction of hydrogen peroxide with guaiacol as hydrogen donor, which is catalyzed by peroxidase (Bergmayer, 1974).

$$4 \text{ guaiacol} + 4\, H_2O_2 \xrightarrow{\text{peroxidase}} \text{tetraguaiacol} + 8H_2O$$

One enzymatic unit: the amount of enzyme which catalyzed the transformation of one micromole of hydrogen peroxide/minute at 25^{o}C.

- ***The activity of superoxide dismutase*** was determined with method described by Winterbourn et al. (Iordachescu and Dumitru, 1988). This method is based on the superoxide dismutase power of inhibition of tetrazolium salt (Nitro Blue Tetrazoliu–Nitro BT) reduction with superoxide radicals. The superoxide radicals are generated by reducing o riboflavin in the reaction medium.

One enzymatic unit: the amount of enzyme which produces 50% inhibition under standard conditions.

RESULTS AND DISCUSSIONS

There were analyzed samples of wheat and rye plants harvested in July from three areas of heavy metals contaminated field. Each average sample was obtained by mixing of five individual plants provided by each studied area. The determinations were made on roots, stalks and grains of wheat and rye.

The data obtained for the analyzed samples (table 1) allow a general view of the determined parameters, but its average is more useful for an efficient comparative assessment of these values.

The obtained data show that the proteins content in wheat samples varied between 1,06 g% and 1,19 g% in root, between 1,67 g% and 2,13 g% in stalk and in grains between 1,70 g% and 2,05 g %.

In the rye samples were registered values of the proteins content comprised between 0,84 g% and 2,59 g% in root, between 1,45 g% and 2,34 g% in stalk and between 1,77 g% and 2,17 g% in grains.

Superoxide dismutase registered at wheat values of specific activity comprised between 2,58 and 3,23 U/mg protein in root, between 2,04 and 2,79 U/mg protein in stalk and between 0,67 and 1,20 U/mg protein in grains.

At the rye specific activity of superoxide dismutase varied between 1,26 and 4,96 U/mg protein in root, between 1,25 and 2,60 U/mg protein in stalk and between 1,28 and 3,22 U/mg protein in grains.

Specific activity of peroxidase registered notable values in roots, both in the wheat samples (0,81-2,21 U/mg protein) and in the rye (0,75-1,95 U/mg protein). In the wheat and rye stalks was registered no values of peroxidase activity under the performed experimental conditions. Only in the grains was determined some peroxidasic activity, reaching low comparable values in wheat and in rye.

The average values of the analyzed parameters were calculated in order to allow a comparison between the species and an estimating of the distribution of the specific enzymatic activities in the different organs of the plants.

A comparison between the two analyzed plant species reveals that rye registered a higher content of proteins in all the organs than wheat (fig. 1). Also the superoxide dismutase is more active in rye than in wheat; as for the peroxidasic activity, is higher in the wheat grains than in the rye grains.

Concerning of the content in proteins of the analyzed plant organs (fig. 2), the rye grains reached the highest value (2 g%). In roots and in stalk, the content in proteins registered comparable values at wheat and rye, but higher in the stalks than in the roots.

The highest values of the activity of superoxide dismutase and peroxidases can be observed in the roots of both analyzed plants. A probable explanation is that the concentration of heavy metals is higher in the roots, because of its absorption from the soil, so the enzymes involved in the defense system must be more active in this zone.

However, the activity of peroxidase is very law or even null in the stalks and also in the grains, both in the sample of wheat and rye.

CONCLUSIONS

The content in proteins registered higher values in the analyzed plant organs of the rye than at the wheat.

Superoxide dismutase was more active than peroxidase in the analyzed plant organs, both at the wheat and rye.

Both superoxide dismutase and peroxidase are more active in the roots than in stalks and grains at the analyzed plant species.

The specific activity of peroxidase registered low or even null values, both in the stalks and in the grains at the tested plants.

The results presented in this paper represents preliminary data registered at plants harvested from heavy metals contaminated fields, but its will be verified and confirmed in further studies performed on higher number of species planted under controlled conditions in greenhouse and in lisimeters.

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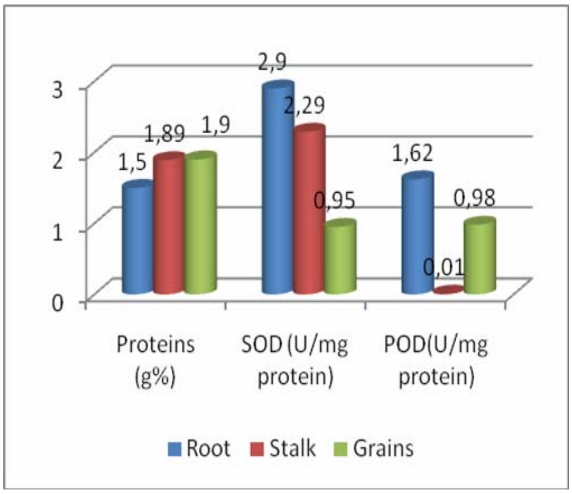
TABLE

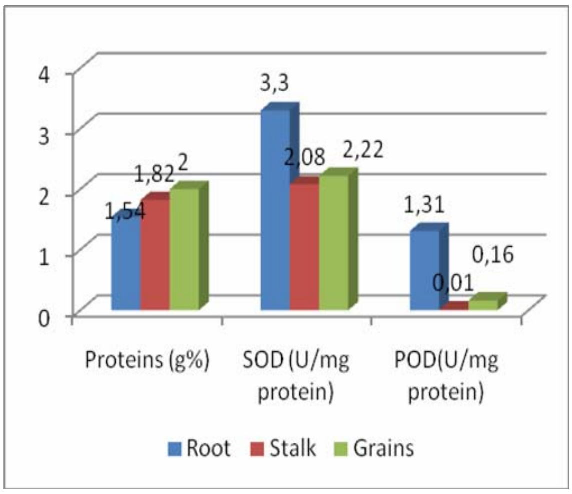
Table 1. Values of the studied parameters

Plant species	Plant organ	Analyzed parameters		
		Protein content (g %)	Superoxide dismutase specific activity (U/mg protein)	Peroxidase specific activity (U/mg protein)
WHEAT	Root	1,15	3,23	0,81
		1,06	2,90	1,86
		1,19	2,58	2,21
	Stalk	1,67	2,79	<0,01
		2,13	2,04	<0,01
		1,88	2,06	<0,01
	Grains	1,70	0,67	1,10
		1,97	0,99	0,91
		2,05	1,20	0,94
RYE	Root	0,84	3,68	1,95
		2,59	1,26	1,23
		1,19	4,96	0,75
	Stalk	1,45	2,41	<0,01
		1,67	2,60	0,01
		2,34	1,25	<0,01
	Grains	2,06	2,17	0,23
		2,17	1,28	0,11
		1,77	3,22	0,15

FIGURES

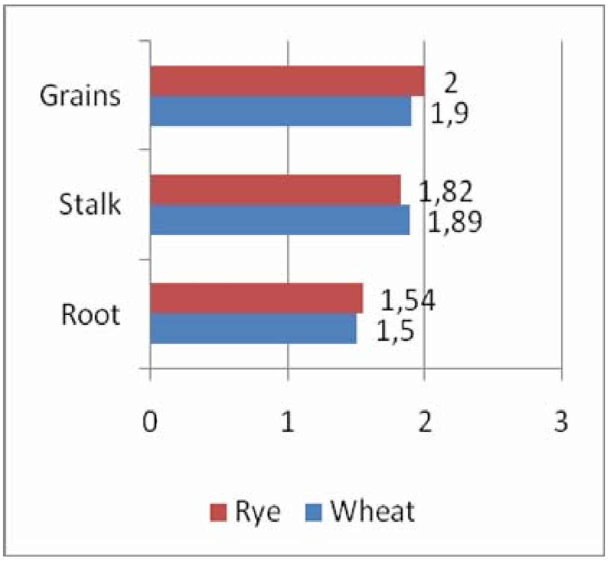


Wheat

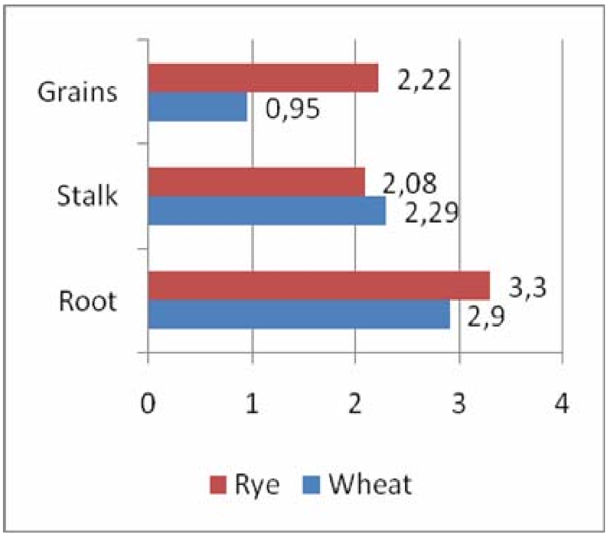


Rye

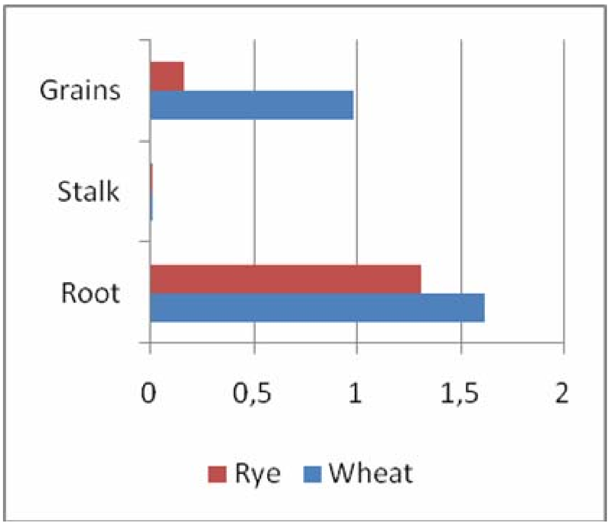
Fig. 1. Comparison between the plant species
(from the point of view of average values of the studied parameters)



Proteins content (g%)



Activity of SOD (U/mg protein)



Activity of POD (U/mg protein)

Fig. 2. Comparison of plants organs
(from the point of view of average values of the studied parameters)

Long term effects of mineral fertilization upon Preluvosol and crop productivity at Sanandrei area

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Keywords: bulk density, humus content, crop yields.

ABSTRACT

Paper is showing data obtained in long-term experiments set-up more than 30 years ago in area of the country related to specific local conditions. The experiment has two mineral fertilizer treatments: N and P doses, in a split plot design. The experiment is under main crop rotations: winter wheat – barley – maize –soybeans, cultivated in conventional tillage. Is located in vest part of the country with dominant Preluvosol soils types, medium-fine texture, moderate to reduced contents of available nutrients, moderate climatically conditions with a relatively good distribution during the year. Soil sampling has done in summer 2007 under significant mineral fertilization doses according to yield obtained. Crop yields, as well as climatically conditions had annually recorded. Different data related to crop yield were obtained and a few relevant physical (soil compactness, soil water permeability, water retention and availability, soil structure aggregates hydro-stability) and chemical (reaction-pH in water, total nitrogen, available phosphorus and potassium content) properties under different main mineral fertilization treatments, at a few suggestive soil layers into soil profiles.

INTRODUCTION

Soils, on large areas, are affected by many limiting factors, of which: low humus content (accounting for almost 50% of the arable land), acidity (30%), and low macronutrients contents as phosphorus, total nitrogen and potassium (60%), and other physical factors and processes. The soils are not very well supplied with macronutrients as humus and phosphorus. Chemical fertilizers have applied at very large rates in between 30–120 kg·ha^{-1}. There are two main agricultural systems: conventional and survival, and on about 1% of arable land conservative system. Now, an average sized farm is only 3.2 ha, around 60% of land is managed by small farmers and 40 % are large and very large farms. A net-work of long-term (more than 30 years) field experiments with many different mineral fertilizer (N, P, including K and organic materials) doses all over the country have been organized under various natural conditions (soil and climate); winter wheat and maize being references crops. Numerous data have been publish, through of which: by Borlan and Hera 1984 showing the optimum soil fertilization related to crops yield and soil nutrient content; by Hera 1996, showing the importance of mineral fertilization and its management for our soils. Hera et al., 2006 presented part of the net-work of the long-term experiments in the country, and consequences upon soil, crop development and crop yield obtained; Canarache et al., 1983, presented positive effects on Cambic Chernozem at Fundulea, Dumitru et al., 2001 presented yields and soil chemical and physical properties modifications under fertilizers on different soil types.

MATERIALS AND METHODS

Experiment is set-up in vest part of the country in the High Banat Plain, on Preluvosol formed on loess deposit (in the first 50 cm it has: clay 38–42 %, silt 33 % and sand 29–25 %), water table > 15 m. Climate is continental to temperate (858 mm; 10.7 ^{o}C).

Crop rotation in use: winter wheat – barley – maize – soybeans.

The experimental layout has two main factors: N and P with different doses (in active substance kg·ha^{-1}) and a combination between them. These are as follow, for P: 0, 50, 100 and 150 (factor A) and for N: 0, 50, 100, 150 and 200 (as factor B). Type of the experiment is 2×4×5, having 20 treatments. Both experiments have been organized in split plot design with four replicates. Ammonium nitrate and super-phosphate have annually used as mineral fertilizers. Intensive agronomic conventional cropping system has annually been used: ploughing (25–30 cm depth) with total inversion and other secondary operation for seedbed preparation (disking, spring – time cultivator) and one to three inter-row mechanical cultivators for grain maize and sunflower. Other chemical treatments to keep crops free of weeds, pests and diseases have annually applied. Crop harvesting has mechanically done, except the central part of plots were handling harvest has used to get accuracy appreciation of yields obtained in small plots. Soil sampling, under main treatments related to the crop response, from both sites has been done on July 2007. Small pits have dug in respectively plots, at different levels according to the depth of tillage works: 5, 15, 25 and 35 cm, in 3 replicates of the experiment, 6 undisturbed samples (200 cm^3) and 3 undisturbed samples for each depth. Disturbed samples have used for laboratory measurements: texture, soil water aggregate stability and dispersion, water storage and availability, organic carbon content, pH (in water), content of available phosphorus and potassium and total nitrogen. Undisturbed soil samples have been used for measurement and calculated: bulk density, saturated water hydraulic conductivity, total porosity and degree of soil compactness. Crop yields have annually recorded and are presenting for different period. ANOVA statistical procedure for data obtained has applied; Student and Tukey tests have used in both experiments. Only parts of the data are presented in the present paper.

RESULTS AND DISCUSSION

For the World as a whole, there is a general need to develop a differentiated system for soil management, and the greatest treats to sustainability are intensive cultivation and mineral fertilization. Considering the long-term effects of different soil management systems, these may show up slowly in temperate climate. Therefore, long-term experiments still represent the base of planning a sustainable agricultural management. At present and even in the next future, without proper sets of data for inputs, will be difficult to judge slowly modification in soils, particularly for main physical properties, organic matter content and variation in crop yield with time, different consequences on the environment, establish the tendencies in soil modification processes, and introduce a good agronomic practice related to soil suitability and other local specific conditions.

As can be see, data presented in table 1 and table 2 are showing a slightly positive modification of some soil physical and chemical properties. Bulk density and water permeability have improved manly as an indirect consequence of the crop and root better development. Humus content and particularly available phosphorus content increased according to fertilizers doses applied. Under nitrogen fertilization as nitrate fertilizer, on both soil types has observed a moderate increasing of soil acidification in the first 15 cm depth, amendments being necessary. In the mean time, at the first site, it was also observed reduced potassium content fertilizers based on K (data are not presented in the paper).

In addition, at both sites, it was clear that tillage applied had a significant effect, particularly on soil physical properties, the increasing of bulk density and decreasing of water permeability into soil profile proved this. Soil porosity was modified usually with many of largest pores disappearing first, which can have significant effects on rootability with consequences for crop development and yields but also for the ability of subsoil to transmit water and gases. At the second site formed on swelling clay, the flow of water through preferential pathways can have a marked influence on leaching, if the fertilizer has just applied as nitrate to the soil surface there a risk that if heavy rain falls it will dissolve the fertilizer and carry it straight down through the soil, again by-passing the main soil matrix.

Positive response of maize crop development and yields obtained along the years at the both sites were particularly obtained in favourable years (table 3).

CONCLUSIONS

In generally speaking, soil structure as a very complex property soil or as a global entity can't be defined; therefore, different quantitative simple soil measurements related to the main soil process, and/or studies objectives are still necessary.

Long-term experiments, still remain, probably for even long period of time, the best tool in soil environment characterization, and in establish the critical values for simple soil properties, as well as in extrapolated the data to a large area, in spite of the fact they are not perfectly.

Only very slightly, soil changes on main soil physical and chemical properties have been detected during a long period, over 30 years, in the both sites. Tillage has had a high influence, as showed physical properties into soil profile.

The increase in crop yields have particularly related with chemical state due to the immediate effects mineral fertilization with nitrogen and phosphorus.

ACKNOWLEDGEMENTS

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TABLES

Table 1. Physical properties of Preluvosol in long-term experiment with mineral fertilization under crop maize

Property/ depth (cm)	Mineral fertilizers doses applied						Statistical tests	
	N_0P_0	$N_{100}P_0$	$N_{100}P_{50}$	N_0P_{100}	$N_{100}P_{100}$	$N_{200}P_{100}$	$Student_{5\%}$	$Tukey_{5\%}$
Bulk density (mg·m^{-3})								
0–5	1.23	1.23	1.23	1.23	1.23	1.23	0.03	0.04
5–15	1.46	1.43	1.43	1.43	1.43	1.43	0.02	0.04
15–25	1.56	1.56	1.56	1.56	1.56	1.53	0.02	0.03
25–35	1.59	1.59	1.59	1.60	1.60	1.60	0.01	0.02
Saturated hydraulic conductivity (lg mm·h^{-1})								
0–5	2.0	2.0	2.0	2.1	2.1	2.1	0.1	0.2
5–15	1.5	1.5	1.5	1.6	1.6	1.6	0.3	0.4
15–25	1.1	1.3	1.3	1.3	1.3	1.4	0.2	0.4
25–35	1.0	1.1	1.1	1.0	1.0	1.1	0.1	0.2
Degree of compactness (%v/v)								
0–5	**-3**	-5	-5	-5	-5	-5	1	2
5–15	**12**	10	10	10	10	10	2	3
15–25	**20**	20	20	20	20	18	2	3
25–35	**22**	21	22	22	22	22	1	2
Amount of macroaggregates stable (%w/w)								
0–5	18	19	18	19	24	24	4	6
5–15	18	20	19	19	24	23	2	3
15–25	20	22	22	19	25	24	3	4
25–35	36	36	38	37	30	37	3	5
Amount of microaggregates instable (dispersoin) (%w/w)								
0–5	11	9	9	9	9	9	1	1
5–15	11	10	10	9	10	10	1	2
15–25	11	11	12	10	10	11	1	1
25–35	11	11	10	10	10	10	1	2

Table 2. Chemical properties of Preluvosol in long-term experiment with mineral fertilization under crop maize

Indicator/ Depth	Mineral fertilizers doses applied						Statistical Test	
	N_0P_0	$N_{100}P_0$	$N_{100}P_{50}$	N_0P_{100}	$N_{100}P_{100}$	$N_{200}P_{100}$	DL5%	W5%
pH								
0–5	6.00	5.60	5.70	6.10	5.70	5.40	0.20	0.40
5–15	6.20	6.00	6.00	6.20	6.00	5.50	0.20	0.30
15–25	6.20	6.00	6.10	6.30	6.00	5.70	0.20	0.30
35–45	6.40	6.20	6.40	6.40	6.40	6.30	0.30	0.40
Humus content (%)								
0–5	2.73	2.93	2.99	2.96	2.98	2.99	0.10	0.15
5–15	2.80	2.98	2.91	2.97	2.90	2.96	0.10	0.15
15–25	1.88	1.93	1.92	1.94	1.93	1.92	0.11	0.16
35–45	1.61	1.65	1.65	1.69	1.70	1.75	0.18	0.22
Total Nitrogen (%)								
0–5	0.134	0.144	0.151	0.136	0.167	0.174	0.19	0.23
5–15	0.136	0.146	0.163	0.136	0.160	0.165	0.13	0.14
15–25	0.141	0.153	0.153	0.140	0.149	0.148	0.13	0.14
35–45	0.120	0.135	0.132	0.120	0.132	0.135	0.12	0.13
Mobile Phosphorus ($mg \cdot kg^{-1}$)								
0–5	15	11	19	38	25	25	13	21
5–15	11	10	18	35	24	25	11	17
15–25	9	8	15	27	19	22	11	17
35–45	4	4	10	6	6	4	5	8
Mobile Potassium ($mg \cdot kg^{-1}$)								
0–5	138	146	135	138	145	143	12	18
5–15	125	125	124	128	130	133	10	14
15–25	118	114	115	115	121	122	12	18
35–45	113	114	112	112	117	114	10	15

Table 3. Crop yields obtained on different soil types, in vest and south part of the country under long-term experiments based on N and P mineral fertilization

Crop yield ($kg \cdot ha^{-1}$)	Mineral fertilizers doses applied						Statistical tests	
	N_0P_0	$N_{100}P_0$	$N_{100}P_{50}$	N_0P_{100}	$N_{100}P_{100}$	$N_{200}P_{100}$	$Student_{5\%}$	$Tukey_{5\%}$
Maize Crop yields obtained (long term average last 10 years) in vest part of the country								
Sanandrei	3637	5008	5279	4057	5436	5797	174	195

Achievement of some fruit-based concentrated products, with high nutritional value, destined to diet-therapy of iron deficiencies population

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Keywords: fortified, iron salts, apricots, plums

ABSTRACT

In this paper are presented the results of performed researches for achievement of two fruit-based concentrated products (apricots, plums) fortified with iron. As fortification agents, they were used ferrous sulfate, ferrous lactate and ferrous gluconate, and the fortification levels were 4 mg/100 g end product and 6.5 mg/100 g end product, respectively. Increasing of iron bio-availability in the human body and, in the same time, assurance of an optimal acidity of fruit-based concentrated products had be done by adding of ascorbic acid in their composition. Fruit-based concentrated products fortified with iron were analysed from sensorial, biochemical and microbiological point of views. The used fortification agents do not modify product sensorial characteristics (appearance, colour, taste and smell), in comparison with control sample (jams non-fortified with iron).

INTRODUCTION

In Romania, according to studies achieved by U.N.I.C.E.F., Health and Family Ministry, Institute of Mother and Child Care "Alfred Rusescu", about 50% of children aged to 2 years and about 30% of those aged to 5 years have ferriprive anemia (determined by iron deficiency). Also, according to the same studies about 25% of pregnant women and about 32% of those who suckle, have iron deficiencies and ferriprive anemia.

Enrichment of food products with micro-nutrients it is an essential element of strategies against nutritional deficiencies, of iron deficiency, especially, of population within developing countries. Adding of one micro-nutrient has to be done based on scientific researches, so that its concentration in product to be optimal for correction of nutritional deficiency, but, in the same time to keep the sensorial properties of product (appearance, taste, smell, colour) (Berger, 2003).

At the international level, they were achieved important researches for development of iron fortification technologies of food products (Mehansho, 2006).

Although, comparative with meat products, processed fruits have lower iron content, nutritionists recommend them in diet-therapy of iron deficiencies. Researches achieved by nutritionists underline that, the value of a food product, as iron source, is influenced more much by chemical state of this element than of its total iron content. High solubility, easy ionization and ferrous valence are properties which increase iron assimilation grade. In case of fruits, due to ascorbic acid content, trivalent iron is reduced to bivalent iron, which favors its bio-availability in human body (Mogoş, 1997).

MATERIAL AND METHODS

Experiments performed for achievement of fruit-based concentrated products, fortified with iron, were done within the micro-production pilot plant of the Institute of Food Bioresources.

In the performed experiments were used the following raw materials and materials: apricots (*Cea mai bună de Ungaria* variety), plums (*Stanley* variety), sugar, nut, ascorbic acid, ferrous sulfate, ferrous gluconate, ferrous lactate, glass jars with 370 mL capacity (Twist – off closing system).

For achievement of fruit-based concentrated products fortified with iron, were covered the following phases:

- analysis of studied fruits (sensorial and biochemical characteristics);
- achievement, in more experimental variants, of products *"Apricots jam with nut, fortified with iron"* and *"Plums jam fortified with iron";*
- microbiological, sensorial and biochemical analyses of fruit processed products, fortified with iron;
- finalization of manufacturing recipes and selection of optimal variant, from sensorial and nutritional point of views.

For analysis of quality of raw materials and fruit processed products, fortified with iron, were used specific methods, standardised.

Within the achieved experimental variants, the variable factors have been:

- iron fortification agent;
- iron fortification level;
- ascorbic acid fortification level.

Both in control sample and experimental variants for achievement of fruit-based concentrated products, fortified with iron, was the following technological flow: raw materials, materials and packaging reception, sorting, washing, cleaning - division, product preparation, packaging preparation, dosing, closing, pasteurisation, cooling, conditioning of full jars, storage.

RESULTS AND DISCUSSION

In food industry, for achievement of fortified products, the big companies well-known in the field follow two main directions:

- ✓ Use of some raw materials with high content in nutritive principles and applying of some optimal processing technologies, in order to preserve in the end product of high rate of them
- ✓ Fortification of the end product through adding of vitamins (A, C, E, etc.) and minerals (iron, calcium, magnesium)

Because the iron deficiency and feriprive anemia have an increased incidence among the vulnerable population groups (children, teen-agers, pregnant women, etc.), achievement of some fruit-based processed products, fortified with iron, represents a necessity.

Taking into consideration all these aspects, in our researches performed at laboratory level there were achieved two fruit-based processed products, fortified with iron:

- *"Apricots jam with nut, fortified with iron"*
- *"Plums jam fortified with iron"*

In the same time, were achieved *control samples* of fruit-based processed products (products unfortified with iron).

Fruit varieties used in the experiments have superior sensorial characteristics (appearance, taste, flavor) and have a complex biochemical composition, excelling through glucides, vitamin C, minerals and ß – carotene content (only apricots).

Fortification of food products is legislate through *REGULATION (EC) no. 1925/2006 of EUROPEAN PARLIAMENT AND COUNCIL*, on 20 December 2006. Also, *Directive 2006/125/EC of European Community Commission* on 5 December 2006, concerning cereal-based preparations and food products for children, destined suckers and infants, imposes a maximum limit for iron adding in order to fortify: 3 mg Fe/100 kcal. Taking into consideration this recommendation, in the case of the two products *"Apricots jam with nut, fortified with iron"* and *"Plums jam fortified with iron"* were achieved the following fortification levels:

- 4 mg Fe/100 g end product

- 6.5 Fe mg/100 g end product

For increasing of iron bio-availability in the human body and, concomitantly, for assurance of an optimal acidity of fruit-based concentrated products, fortified with iron, in their composition was added ascorbic acid, in the following concentrations:

- 70 mg ascorbic acid/100 g product, 95 mg ascorbic acid/100 g product (in case of product *"Apricots jam with nut, fortified with iron"*)
- 90 mg ascorbic acid/100 g product, 125 mg ascorbic acid/100 g product (in case of product *"Plums jam fortified with iron"*)

For each fruit-based concentrated product fortified with iron were achieved, alongside control samples (concentrated products, unfortified with iron), 12 experimental variants (3 iron fortification agents, 2 iron and ascorbic acid fortification levels). All of them were analysed from sensorial, biochemical and microbiological point of views.

Sensorial analysis of products *"Apricots jam with nut, fortified with iron"* and *"Plums jam fortified with iron"* proved that in the case of all experimental variants, the used fortification agents (ferrous sulfate, ferrous lactate, ferrous gluconate) do not determine modification of sensorial characteristics (appearance, colour, taste and smell), in comparison with control sample (jams unfortified with iron). Thus, the two fruit-based concentrated products, fortified with iron (fortification agents: ferrous sulfate, ferrous lactate, ferrous gluconate) are in conformity with provisions of SR 3183:1990 „Jams” from sensorial point of view.

According to biochemical analysis, product *"Apricots jam with nut, fortified with iron"* achieved in 12 experimental variants has high nutritional value, excelling through content of soluble glucides, minerals, ß – carotene and ascorbic acid.

Iron content of product *"Apricots jam with nut, fortified with iron"* is in the range 4.48 – 7.05 mg/100 g, and those of ascorbic acid in the range 21.58–32.75 mg/100 g. After assessment of sensorial and nutritional characteristics of this product they were selected, as optimal variants, for each fortification agent, the following:

- V4 (fortification agent ferrous sulfate)
- V8 (fortification agent ferrous gluconate)
- V12 (fortification agent ferrous lactate)

According to biochemical analysis, product *"Plums jam fortified with iron",* achieved in 12 experimental variants has high nutritional value, excelling through content of soluble glucides, minerals and ascorbic acid. Iron content of product *"Plums jam fortified with iron"* is in the range 4.27 – 6.80 mg/100 g, and those of ascorbic acid in the range 28.95 – 40.15 mg/100 g. After assessment of sensorial and nutritional characteristics of this product they were selected, as optimal variants, for each fortification agent, the following:

- V4 (fortification agent ferrous sulfate)
- V8 (fortification agent ferrous gluconate)
- V12 (fortification agent ferrous lactate)

Microbiological analysis shown that fruit-based concentrated products, fortified with iron, achieved in 12 experimental variants and control samples, are in conformity with legislation in force from microbiological point of view.

CONCLUSIONS

They were achieved, at laboratory level, two fruit-based processed products, fortified with iron: *"Apricots jam with nut, fortified with iron"* and *"Plums jam fortified with iron"*. As fortification agents they were used ferrous sulfate, ferrous gluconate and ferrous lactate, and fortification levels were 4 mg Fe/100 g end product, 6.5 mg Fe/100 g end product, respectively.

Sensorial analysis of fruit-based processed products, fortified with iron, shown that the used fortification agents do not determine modification of sensorial characteristics (appearance, colour, taste and smell), in comparison with control samples (apricots jam, plums jam, respectively, unfortified with iron).

Biochemical analysis shown that the two achieved products *"Apricots jam with nut, fortified with iron"* and *"Plums jam fortified with iron"* have a complex composition, excelling through content of simple glucides, easy assimilable, vitamin C and iron.

ACKNOWLEDGEMENTS

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TABLES

Table 1 - Biochemical analysis of product *"Apricots jam with nut, fortified with iron"*, comparative with control sample

Biochemical characteristics	Control	V4 (fortification agent – ferrous sulfate)	V8 (fortification agent – ferrous gluconate)	V12 (fortification agent – ferrous lactate)
Dry soluble solids (°Brix)	68.0	68.0	68.0	68.1
Titratable acidity (g malic acid/100 g)	1.32	1.44	1.46	1.42
Soluble glucides (%)	65.10	64.14	64.00	64.27
Proteins (%)	0.60	1.35	1.29	1.30
Lipids (%)	0.07	2.24	2.14	1.94
Pectic substances (%)	0.38	0.30	0.28	0.25
ß–carotene (mg/100 g)	1.60	1.60	1.51	1.42
Ash (%)	0.49	0.608	0.622	0.603
Iron (mg/100 g)	0.44	6.98	7.01	7.05
Potassium (mg/100 g)	252.75	271.85	250.15	267.15
Calcium (mg/100 g)	10.90	12.60	12.15	13.03
Magnesium (mg/100 g)	5.98	10.03	9.42	10.21
Ascorbic acid (mg/100 g)	21.18	30.42	31.67	32.75

Table 2 - Biochemical analysis of product *"Plums jam fortified with iron"*, comparative with control sample

Biochemical characteristics	Control	V4 (fortification agent – ferrous sulfate)	V8 (fortification agent – ferrous gluconate)	V12 (fortification agent – ferrous lactate)
Dry soluble solids (°Brix)	68.0	68.15	68.00	68.10
Titratable acidity (g malic acid/100 g)	1.40	1.57	1.50	1.55
Soluble glucides (%)	64.80	64.92	64.65	64.83
Proteins (%)	0.48	0.51	0.55	0.44
Lipids (%)	0.128	0.14	0.10	0.13
Pectic substances (%)	0.60	0.57	0.61	0.53
Ash (%)	0.372	0.405	0.416	0.400
Iron (mg/100 g)	0.28	6.80	6.75	6.70
Potassium (mg/100 g)	149.85	153.15	152.28	154.45
Calcium (mg/100 g)	10.25	11.10	10.85	11.42
Magnesium (mg/100 g)	7.95	8.42	8.31	8.18
Ascorbic acid (mg/100 g)	28.55	39.55	40.15	39.27

FIGURES

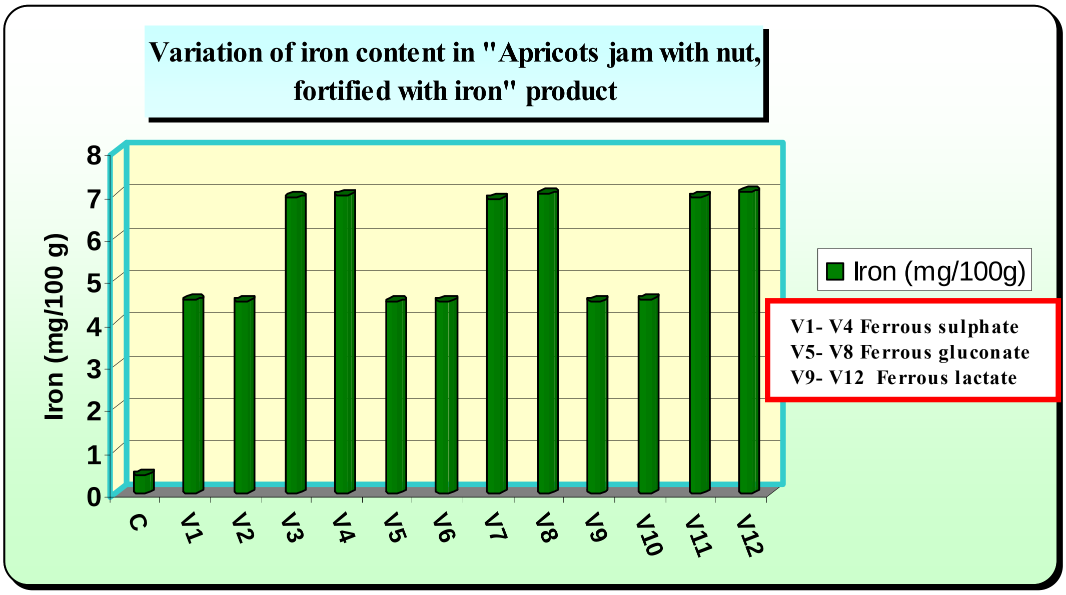

Fig. 1. Variation of iron content in *"Apricots jam with nut, fortified with iron"* product

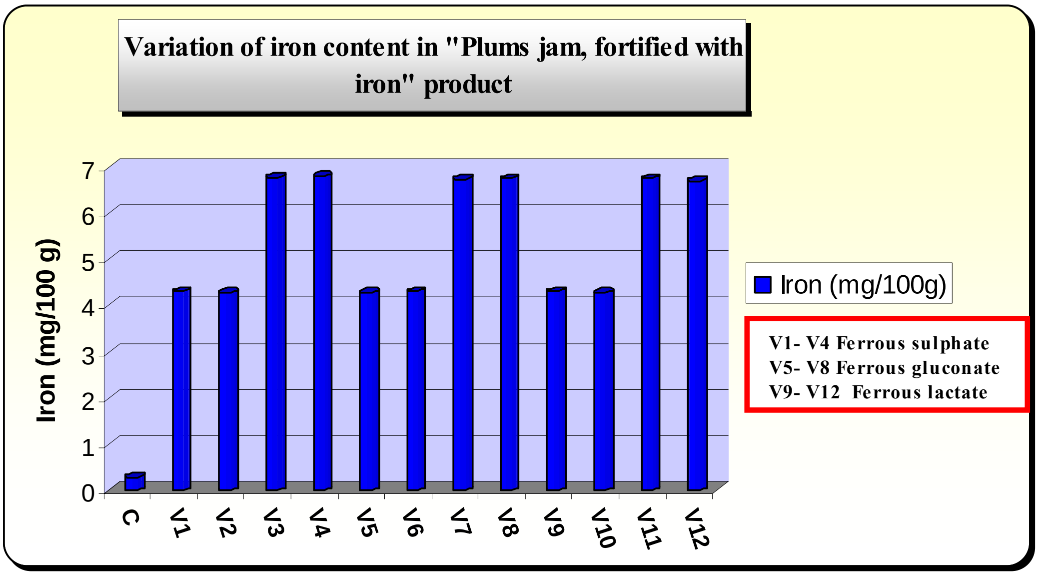

Fig. 2. Variation of iron content in *"Plums jam fortified with iron"* product

Achievement of some bakery products fortified with iron, beneficial in nutrition of individuals with ferriprive anemia

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Keywords: fortified, iron salts, poppy sticks, rolls

ABSTRACT

In this paper are presented the results of performed researches for achieving of two bakery products fortified with iron: rolls with sun flower and sesame seeds and poppy sticks. As fortification agents, they were used ferrous sulfate, ferrous lactate and ferrous gluconate, and the fortification levels were 20 mg Fe/kg flour, 40 mg Fe/kg flour, 60 mg Fe/kg flour and 80 mg Fe/kg flour, respectively. Taking into consideration the phytase role into phytates hidrolysis and increasing of iron bioavailability in human body, in bakery products composition it was added standardized fungal phytase. Also, because ascorbic acid is a promoter of iron absorption in human body, it was used in the composition of bakery products fortified with iron. Bakery products fortified with iron were analysed from sensorial, physic-chemical and microbiological point of views. The used fortification agents do not modify product sensorial characteristics (appearance, colour, taste and smell), in comparison with control sample (bakery products, non-fortified with iron).

INTRODUCTION

In Romania, according to studies achieved by U.N.I.C.E.F., Health and Family Ministry, Institute of Mother and Child Care “Alfred Russescu”, about 50% of children aged to 2 years and about 30% of those aged to 5 years have ferriprive anemia (determined by iron deficiency). Also, according to the same studies about 25% of pregnant women and about 32% of those who suckle, have iron deficiencies and ferriprive anemia.

Enrichment of food products it is an essential element of nutrition strategies for correction of micro-nutrient deficiencies. In generally, fortification of food products is acceptable from social point of view and it is not necessary to change food habits, it is not modify the qualitative characteristics of the product, it can be easy introduce and it has nutritional advantages for task groups, it is safe from nutritional point of view and it is economical (Marin et al., 2007).

Because bakery products have a special place within the nutrition of population in our country, it is obviously that all of these have a special interest for iron fortification. Iron compounds used for fortification have to have a relative high bio-availability grade, have to be stable and do not cause adversely sensorial modification of products (Ciobanu, 2007).

Iron salts (ferrous sulfate, ferrous gluconate, and ferrous lactate) soluble in water determine a high bio-availability of iron in human body, and then they are used as fortification agents of food products (Hurrell, 1997).

MATERIAL AND METHODS

Experiment performed for achievement of bakery products fortified with iron, were done within micro-production pilot plant of the Institute of Food Bioresources.

In the performed experiments were used the following raw materials and materials: wheat flour 650, wheat flour 1250, powder milk, margarine, oil, whole egg powder, yeast, sun flower, sesame and poppy seeds, salt, standardized fungal phytase, fungal α – amylase, ascorbic acid, ferrous sulfate, ferrous gluconate, ferrous lactate, polypropylene bags.

For achieving of bakery products fortified with iron, they were covered the following phases:

- quality analysis of the used wheat flour in experiments (sensorial and physic-chemical characteristics, farinogram);
- achievement, in much more experimental variants, of product *"Roll with sun flower and sesame seeds, fortified with iron"* and *"Poppy sticks fortified with iron";*
- microbiological, sensorial and biochemical analyses of bakery products, fortified with iron;
- finalization of manufacturing recipes and selection of optimal variant, from sensorial and nutritional point of views.

For quality analysis of raw materials and bakery products, fortified with iron, they were used specific standardised methods.

Within the achieved experimental variants, the variable factors have been:
- iron fortification agent;
- iron fortification level.

For preparation of bakery products fortified with iron it was used bi-phasic method, because this method assures a higher content of soluble iron, bio-available in human body. In the same time, preparation of bakery products fortified with iron, through bi-phasic method, has comparative with the mono-phase one, the following advantages (Ciobanu, 2007):
- technological flexibility; a lower yeast consumption;
- superior porosity and elasticity of product crumb;
- product specific taste and flavour.

Thus, both in the case of control sample and of the experimental variants, for achieving of fortified bakery products, it was covered the following technological flow: preparation of raw materials and materials, sponge mixing, sponge fermentation, dough mixing, dough fermentation, division, modelling, final proofing, finishing, baking, cooling, packaging.

RESULTS AND DISCUSSION

Fortification of food products is legislate through *REGULATION (EC) no. 1925/2006 of EUROPEAN PARLIAMENT AND COUNCIL*, on 20 December 2006. In this document are specified: requirements concerning adding of vitamins and minerals, restrictions concerning adding of vitamins and minerals and vitamins and minerals sources which can be added in food products.

In the case of wheat flour fortification, in order to achieve bakery products with high nutritional value, it has to take into consideration two aspects. The first one refers to the establishment of an iron level low enough, thus through consumption of some important bread quantities it is not the risk for adversely effects in the human body (gastro-intestinal undesired effects, especially). In the same time, the iron level in wheat flour has to be high enough, so that it will be meet the nutritional benefit followed: prevention and diet-therapy of iron deficiencies, of vulnerable population groups. In this sense, it is used the tolerable superior limit of iron intake, that is the biggest daily iron intake which determines not a risk or adversely effects on the health of population majority.

In European Union, consultations concerning the superior limit of iron intake, they are not finished. In 1992, the Scientific Committee concerning Food (S.C.F.) has shown that the secondary effects at adults can appear, already, at levels of only 30 mg elementary iron; nevertheless, they were tolerated unique doses of 100 mg.

Food and Nutrition Board in U.S.A. has established in 2002 a tolerable superior limit of 40 mg iron in the case of patients with ages until 13 years and 45 mg iron, in the case of those with ages higher than 14 years, respectively. The tolerable superior limit of 45 mg iron it is applied also in the case of pregnant women and of those who suckle. As critical final point of iron intake, it was choose moment of gastro-intestinal disorders appearance.

Flour quantity daily consumed by a person it is very much variable according to food habits. For that a caloric intake of 2000 kcal/day to be achieved exclusively from flour, a person has to consume 540 g flour/day. Taking into consideration this aspect and the tolerable superior limit of iron intake (45 mg/day), nutritionists established *the safe maximum limit of iron in flour at 83 mg Fe/kg.*

Within the Institute of Food Bioresources, they were achieved, at laboratory level, two bakery products, fortified with iron:

- *"Roll with sun flower and sesame seeds, fortified with iron"*
- *"Poppy stick fortified with iron"*

Taking into consideration of *safe maximum limit of iron in flour (83 mg Fe/kg*), within the performed experiments, they were used the following fortification levels with iron: 20 mg Fe/kg flour, 40 mg Fe/kg flour, 60 mg Fe/kg flour, 80 mg Fe/kg flour

Considering phytase role in hydrolysis of phytates and increasing of iron bio-availability in human body, in the composition of bakery products it was added standardized fungal phytase (0.1 g/kg flour). Also, because ascorbic acid is a promoter of iron absorption in human body, it was used in the composition of bakery products fortified with iron (0.25 g/kg flour).

For each bakery product, fortified with iron, they were achieved alongside control sample (bakery product unfortified with iron), 12 experimental variants (3 iron fortification agents, 4 fortification levels with iron and ascorbic acid). These were analysed from sensorial, biochemical and microbiological point of views.

Sensorial analysis of products *"Roll with sun flower and sesame seeds, fortified with iron"* and *"Poppy stick fortified with iron"* shown that in the case of all experimental variants, the used fortification agents (ferrous sulfate, ferrous lactate, ferrous gluconate) do not lead to modification of sensorial characteristics (appearance, colour, taste and smell), in comparison with control sample. Thus, rolls with sun flower and sesame seeds, fortified with iron and poppy sticks fortified with iron, are in conformity with the provisions of the SP 1489 – 97 „Bakery products from wheat flour" from sensorial point of view.

In the case of 12 experimental variants, the volume of rolls with sun flower and sesame seeds, fortified with iron is in the range 350 – 389 cm^3/100 g, and acidity is in the range 1.42 - 1.56 degrees, being in conformity with the provisions of the SP 1489 – 97 „Bakery products from wheat flour". Also, within experimental variants achieved, the iron content of rolls with sun flower and sesame seeds, fortified with iron, is in the range 3.20 – 7.53 mg Fe/100 g.

In the case of those 12 experimental variants, the volume of poppy sticks fortified with iron, is in the range 309 – 390 cm^3/100 g, and acidity is in the range 1.67 - 1.92 degrees, being in conformity with the provisions of the SP 1489 – 97 „Bakery products from wheat flour". Also, within experimental variants achieved, the iron content of poppy sticks fortified with iron is in the range 3.08 – 7.50 mg Fe/100 g.

After assessment of sensorial and biochemical characteristics of those two bakery products fortified with iron, they were selected as optimal variants, for each fortification agent, the following:

- V3 (fortification agent ferrous sulfate)
- V7 (fortification agent ferrous lactate)
- V11 (fortification agent ferrous gluconate)

After microbiological analysis, it was concluded that the bakery products fortified with iron are in conformity with the provisions of legislation in force from microbiological point of view.

CONCLUSIONS

They were achieved, at laboratory level, two bakery products, fortified with iron: *"Roll with sun flower and sesame seeds, fortified with iron"* and *"Poppy stick fortified with iron"*. As fortification agents they were used ferrous sulfate, ferrous gluconate and ferrous lactate, and the fortification levels were 20 mg Fe/kg flour, 40 mg Fe/kg flour, 60 mg Fe/kg flour, 80 mg Fe/kg flour.

Sensorial analysis of bakery products fortified with iron, shown that the used fortification agents do not determine modification of sensorial characteristics (appearance, colour, taste and smell), in comparison with control sample.

Iron content of achieved bakery products *"Roll with sun flower and sesame seeds, fortified with iron"* and *"Poppy stick fortified with iron"* is in the range: 3.08-7.53 mg Fe/100 g.

Bakery products fortified with iron are destined to nutrition of individuals with ferriprive anemia: children, teen-agers, pregnant women, elders, etc.

ACKNOWLEDGEMENTS

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TABLES

Table 1 - Physic-chemical analysis of product *"Roll with sun flower and sesame seeds, fortified with iron",* in comparison with control sample

Physic-chemical characteristics	Control	V3 (fortification agent – ferrous sulfate)	V7 (fortification agent – ferrous lactate)	V11 (fortification agent – ferrous gluconate)
Volume, cm^3/100 g	352	376	370	370
Acidity, degrees	1.35	1.46	1.49	1.54
Moisture, %	42.75	42.63	42.42	42.65
Ash, % d.m.	1.44	1.48	1.47	1.50
Proteins, % d.m.	14.54	14.65	14.58	14.29
Lipids, % d.m.	6.12	6.10	6.01	6.19
Glucides, % d.m.	77.58	77.50	77.68	77.81
Cellulose, % d.m.	0.32	0.27	0.22	0.30
Iron, mg/100 g	1.78	6.05	6.01	6.08

Table 2 - Physic-chemical analysis of product *"Poppy stick fortified with iron",* in comparison with control sample

Physic-chemical characteristics	Control	V3 (fortification agent – ferrous sulfate)	V7 (fortification agent – ferrous lactate)	V11 (fortification agent – ferrous gluconate)
Volume, cm^3/100 g	402	357	386	341
Acidity, degrees	1.93	1.79	1.89	1.82
Moisture, %	23.19	22.48	22.85	22.90
Ash, % d.m.	1.06	1.09	1.08	1.11
Proteins, % d.m.	11.74	11.78	11.65	11.70
Lipids, % d.m.	8.42	8.59	8.53	8.47
Glucides, % d.m.	78.78	78.55	78.68	78.62
Total sugar, % sacharose d.m.	10.07	10.14	10.10	10.00
Iron, mg/100 g	1.62	5.93	6.03	6.07

FIGURES

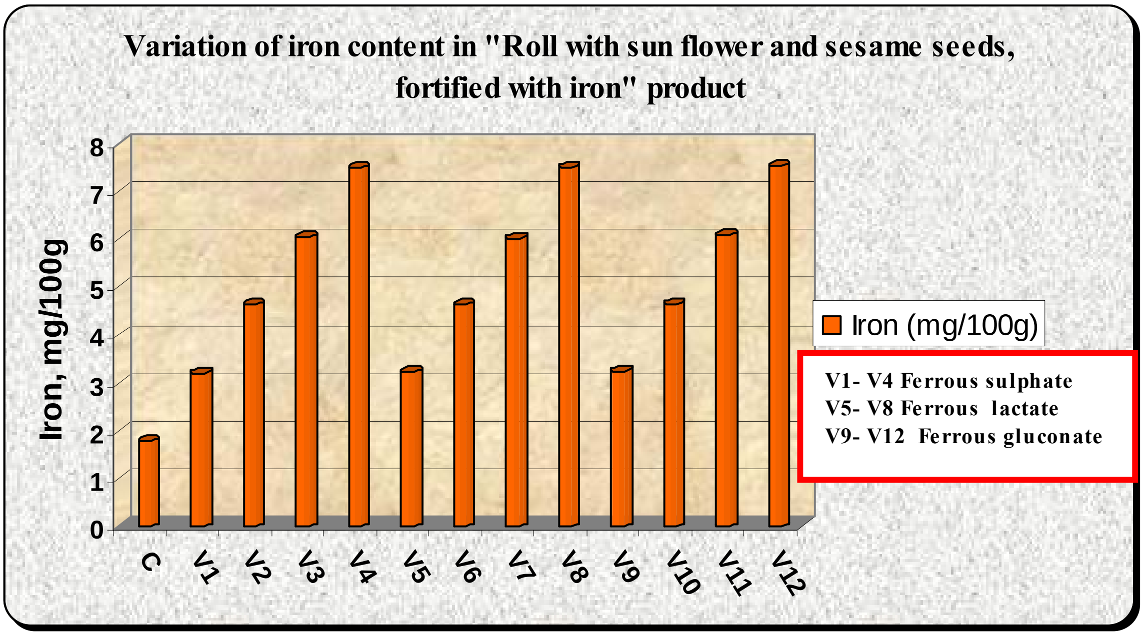

Fig. 1. Variation of iron content in *"Roll with sun flower and sesame seeds, fortified with iron"* product

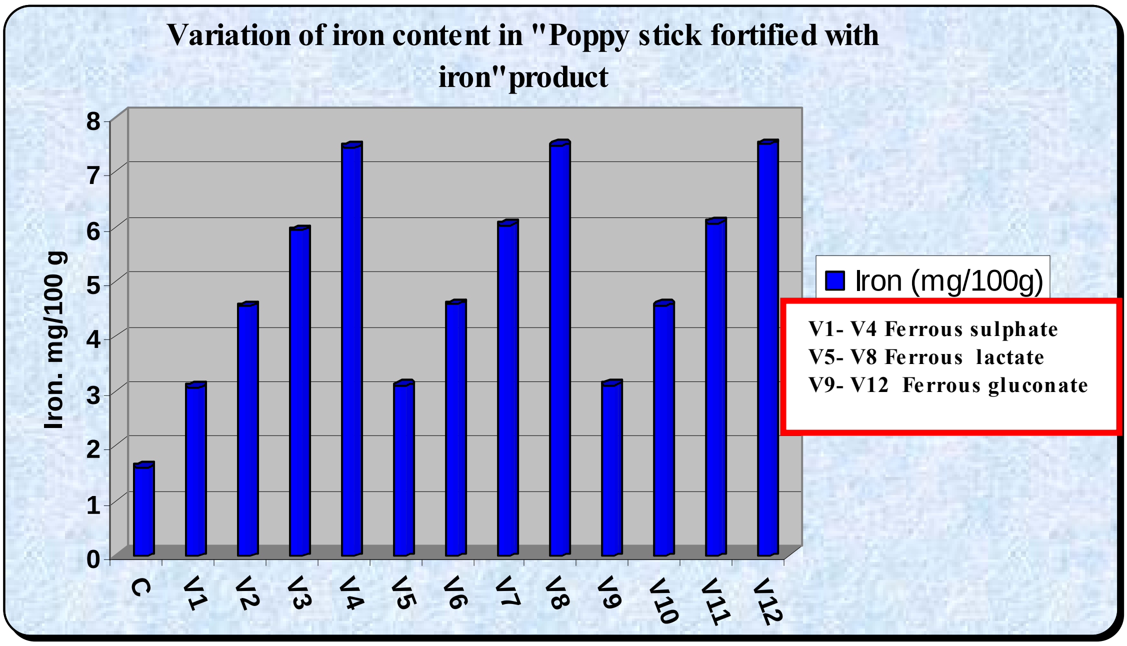

Fig. 2. Variation of iron content in *"Poppy stick fortified with iron"* product

Fig. 3. Iron fortified rolls and poppy sticks

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Evaluation of biochemical changes induced by specific mycoflora in the wheat stored

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Keywords: wheat, store, carbohydrate, protein, lipid.

ABSTRACT

In this work it was intended behaviour in terms of quality of the Dropia variety of wheat during storage in bulk, in the period October 2008 - February 2009 in improper storage conditions (relative air humidity, temperature) and contamination with specific fungi. The study was conducted against a blank of the same variety of wheat, kept in optimal storage conditions (relative air humidity <75% and temperature 6ºC). During monitoring the deposit of wheat from 5 months (October-February) we noticed that although the beginning of monitoring, atmospheric relative humidity found in the normal range (40%), while it increased in some areas retention, leading to a partial degradation of the seed. Following emergence calefaction phenomenon in parts of the storage space was found increased contamination of wheat with specific deposit fungies (*Aspergillus terreus, A. flavus, Penicillium expansum, P. frsquentans, P. reprens, P. patulum, Fusarium graminearum*), which intensified the degradation processes at carbohydrate, protein and lipid of wheat. Thus, during the 5 months of storage monitored carbohydrate content decreased on average by 29%, 4% protein content and lipid level showed the largest decrease in average 60%.

INTRODUCTION

Wheat is kept in silos or large capacity, with facilities for adjusting the storage conditions or in warehouses, barns, in bags or bulk, where conditions are less conducive to maintaining long. On entry into storage, grain straw must have a moisture content of 13-15% seed in a balance of 70-75% relative atmospheric humidity. Artificial ecosystems comprise a mixture of store heterogeneity in terms of content, where populations of pathogenic and saprophytic microorganisms and pests at different stages of development. Physiological and health status of seed are very important for storage, so that a healthy and well cared harvest can withstand longer storage conditions. The importance of using a seed sown or healthy human or animal consumption is widely recognized worldwide (Clarke J.H. şi Hill S.T., 1981). The knowledge of plant health of crops in each year's crop of grain, it can be the destination of each batch and quality to be maintained, during preservation and measures to be taken to extend this period (Deepak, 2003). Basic and applied research on pests and parasitic organisms of stored grain, examining factors abiotic and biotic characteristics agroecosistem products stored in the nature of deposits, condition of the goods placed in storage, changes in ecological factors during storage, biochemical changes occurring in damaged grain, have led to the development of systems for preventing losses caused during storage (Basappa, 1983, Bartov et al., 1986, Anon, 1993; Beratlief C.&Maria Oprea, 1994; Mirela Cîndea Ciurdărescu&Maria Oprea, 2002).

MATERIALS AND METHODS

In assessing the biochemical changes, induced by deposit mycoflora on wheat seeds have carried out research which consisted of quantitative determination of proteins, carbohydrates and total lipids in the samples, compared with a control non-infected with deposit fungi. Biological material used consisted of 12 samples of each Dropia wheat variety. Samples of wheat were taken from different points in a warehouse in Gruiu locality, storing it in the form of bulk and sampling was done from the surface bulk, of the middle and bottom of it (every 4 samples from each zone) from October 2008 - February 2009. Samples were crushed with a laboratory mill; the resulting wheat flour is used to obtain extracts carbohydrate, protein and lipids, needed dosing chemistry of these components in the material taken in the study (AOAC, 1984). Dosages were made using what is based on response carbohydrate present in the extract, the antron reagent and their colorimetry at wavelength of 610 nm against a blank, using a UV-VIS spectrophotometer. In tubes with 3 ml reagent was added antron, flow on the wall, each 1ml carbohydrates extract. Tubes were kept under continuous stirring in ice bath until a blue-green colour obtain. Tubes were then placed in a boiling water bath for 10 minutes and then were colorimetry at a wavelength of 610 nm against a blank. Extinctions values obtained for samples were extrapolated on a calibration curve obtained using serial dilutions of 20% glucose. Determination of total protein was achieved by a method based on reaction with protein extracts Folin Ciocâlteu reagent.

Determination was performed in 2 stages:

- Reaction protein extract with alkaline copper reagent;
- Reducing reagent Folin-Ciocîlteu (fosfomolibdenic-fosfowolframic) by protein complexes with copper ions obtained in the first stage, finally to obtain a blue complex.

To make determinations, the tubes were placed 1 ml protein extract, 1 ml alkaline copper reagent, the mixture was shaken vigorously and left to stand for 10 minutes at room temperature. Added 3 ml reagent Folin-Ciocîlteu. Samples thus prepared were placed in a water bath at 50°C for 10 minutes and then cooled to room temperature. It has been estimated extinction in a spectrophotometer against distilled water at a wavelength of 540 nm. Read values were extrapolated on the standard curve obtained using serial dilutions of BSA (5 mg/ml) (Iordăchescu Dana, 1987).

Determination of lipids was done used the method based on reaction with fosfovanilinic reagent, using as standard solution triolein 40 mg/ml in chloroform, followed by colorimetry. Of lipid extract of each sample was collected a volume of 0.1 ml was treated with 2 ml fosfovanilinic reagent. After the 40 minute, samples were colorimetry at wavelength of 530 nm against blank. Extinctions obtained were extrapolated to a standard curve made with serial dilutions from a standard triolein 10 mg/ml in chloroform (Baret J.L. and all. 2008).

RESULTS AND DISCUSSION

Following tests carried out it has been observed that there were qualitative depreciation of stored wheat, this biochemical and physiological degradation of wheat seed is correlated with excessive humidity in the store. We monitoring the wheat deposit during the 5 months (October-February) and we noticed that although the beginning of monitoring, atmospheric relative humidity found in the normal range (40%), while it increased in some areas retention, leading to a partial degradation of the seed. This phenomenon has occurred where there were differences in temperature between different areas of storage space. Relative air humidity of stored seed was in equilibrium with their water content at the beginning of storage. Subsequently, due to temperature differences in different parts of the deposits, air storage space found in one continuous motion. When warm air from a portion of the mass of seeds arrived in a colder part, he gave some seed and the seed moisture was a condensation of water. The emergence of this phenomenon, mainly in December and January, resulted in the initiation calefaction process in the wheat seeds storage. This phenomenon occurred especially at the edge of wall storage. Correlation between atmospheric humidity values, the emergence calefaction phenomenon and presence of the deposit fungi are presented in Table 1.

A pronounced increase in respiration was observed for seed samples from areas with signs of the calefaction phenomenon.

Seeds have been found contaminated with saprophytic toxicogenic fungi: *A. terreus, A. ochraceus, A. flavus, P. expansum, P. frsquentans, P. reprens, P. patulum, F. graminearum* (Hulea A. and all. 2005). The formation of spores and their germination require atmospheric moisture above 75%, that parameter in the ecosystem represented by warehouse monitored, especially in the second half of the interval (December, January and February).

We mention that the control was taken from a cell to store with the optimal values for product storage, on the relative air humidity (<75%) and temperature (6°C).

Depreciation quality of the carbohydrates began to mid-November, they emphasis is in January and February, as shown in Table 2. The decrease in carbohydrate content was on average 29%.

As the total protein content, following tests carried out it has been observed that there was no major qualitative depreciation of wheat stored, as shown in Table 3. Between early October and late November, there was no loss of quality in the protein. Since December, the strong growth of the moisture from storage, which favoured the development of storage fungi, led to a slight decrease in protein content of wheat, 2% from October, it reached the end of February to 4 %. However, we have found that fungi's deposit and increase humidity in the healer had a direct influence in diminishing the quality of gluten, which significantly reduces the quality of wheat flour.

The lipids content of stored wheat found that lipid hydrolysis occurred much faster than protein or carbohydrates, the process of degradation of their early months starting in November 2008, as shown in Table 4. Seed storage lipids are readily available to split the form of fatty acids under the lipase action, especially where humidity is high. This type of degradation is fuelled by the development of moulds, so that the fat content of stored products is a sensitive index of their damage early.

If the beginning of monitoring (early October), wheat stored in this medium lipids content of 1.83%, while it decreased to average 0.72%, which shows a significant reduction in lipids content of about 60%.

CONCLUSIONS

During the 5 months of monitoring the storage has been a relative air humidity increased from 40% to 82%, which favoured the contamination of wheat with deposit fungi's (*A. terreus, A. ochraceus, A. flavus, P . expansum, P. frsquentans, P. reprens, P. patulum, F. graminearum).*

Metabolic activity of deposit fungi led to deteriorating quality of stored wheat in improper conditions, so that at the end of the storage period there were decreases in carbohydrate content by 29%, 4% in protein and fat by 60%, and gluten quality drops when samples infected with fungi.

Impairment of quality of wheat is closely correlated with the development deposit mycoflora, which is favoured by increasing air relative humidity and the occurrence of the calefaction phenomenon.

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TABLES

Table 1. Influence of atmospheric relative humidity values of contamination of wheat seed

Retention time (days)	Relative air humidity (%)	Calefaction phenomenon	Deposit fungies
0	40	0	0
30	40	+	*Penicillium spp.*
60	62	+++	*Fusarium spp., Penicillium spp.*
90	75	+++	*Penicillium spp., Fusarium spp., Aspergillus spp.*
120	80	+++	
150	82	+++	*Penicillium spp., Fusarium spp., Aspergillus spp.*

+ calefaction phenomenon low;
+++ calefaction phenomenon high.

Table 2. Impairment of quality of wheat in the carbohydrate content

Period	Relative air humidity (%)	Carbohydrate content (%)	
		control	samples (average)
October	40	72,42	72,34
November	62	72,23	67,21
December	75	71,10	60,43
January	80	70,02	54,27
February	82	70,02	51,12

Table 3. Impairment in the quality of wheat protein content

Period	Relative air humidity (%)	Protein content (%)	
		control	samples (average)
October	40	11,38	11,28
November	62	11,37	11,25
December	75	11,29	10,97
January	80	11,27	10,92
February	82	11,11	10,75

Table 4. Impairment of quality of wheat in the lipids content

Period	Relative air humidity (%)	Lipids content (%)	
		control	samples (average)
October	40	1,82	1,83
November	62	1,82	1,38
December	75	1,79	1,26
January	80	1,79	0,81
February	82	1,78	0,72

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Pedogenetical processes from Picior de Munte Field

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Keywords: piemont and field, favourability, clay, freatic level, the human intervention

ABSTRACT

Picior de Munte Field is located in the Central- North part of Romanian field between Sabaru Valley at south, Cobiei at West and Dambovita at EST. Through morphometrical characteristics of that, relief unit represents a continuity of southeast Piemont Candesti from which is different through the mode of formation. The soils from field results of the in time actions of pedogenetical factors which are interpenetrated.

These soils were formatted in the condition of a piemont field, on parental materials rich in clay and in the temperate climate conditions, favourable to the solification process. These pedogenetical conditions follow some human interventions, which are necessary to improve the cultural capacity of soils. Therefore, the principal types of soils from the field are luvisoils, cambisoils, hydrosols, protisoils and pelisoils.

INTRODUCTION

Picior de Munte Field is located in the North-Central part of the Romanian Field, located between Sabaru Valley at South, at Vest Corabia Valley and Dambovita at East. Through morphometric characteristics represent continuity from Southeast of Candesti Piemont, which is different through the formation mode. (Bugă Dragoş şi Ion Zăvoianu,1974)

The research aim of the soils from Picior de Munte Field was to obtain the technico-scientific of pedogenetical processes and to establish the conditions of obtains of soils in the territory (Ispas St., 2001).

MATERIALS AND METHODS

In establishing the limitation of soils from Picior de Munte Field, morfogenetically one necessitated multiple investigations, based on some observations and direct measurements, also the through the interpretation of documentary materials.

Through investigations there were considered the pedogenetical factors, litology, the emplacement, morph metric characteristics, temperature and relative humidity and precipitations. Between pedogenetical factors, an important roll on the formation of soils has the rocks, relief, climate, surface waters, vegetation, animals and time. At that, an important roll is the productive activity of human.

RESULTS AND DISCUSSIONS

Situated between Arges and Dambovita Rivers, Picior de Munte Field represents a continuation of Candesti piemont to South and South-East. From the geomorphologycal point of view that place is a part of Targoviste Field.

Geological view it could be said that field have a vast litology because there are alluvial deposits from the superior terrace development on Dambovita Valley. It is obtained from gravel with diorite sand and sand upon there was formed leossoid deposits from the Pliocene period. The relief is characterized through a accentuate fragmentation because of the longitudinal Valley of Dambovita River. Their valleys are short but deep, with and without a permanent course and are arranged near parallel one in front of other, with a course appreciatively right in the case of Culoarului and Siliste Valleys and a sinuous course in Matasarului Valley (Puiu Stefan Adrian Basaraba, 2001)

Sabaru Valley at South, Cobia Valley at West and Dambovita at East limit Picior de Munte Field and in the interior of that field is Spălătura, Şuţa, Ursoaia rivulets and direct affluent of them. From the altimetric point of view it could be see a decrease in height from North-West to South-East.The relief decrease from over 300m height at Decindeni, in the

North-West till a few meters at Titu and Braniştea, in the contact zone with Argeşului and Dâmboviței waterside.

Dâmbovița forms three terraces. In front of them are erosion phenomenons which determine the apparition of new types of specific soils, erodisoils, regosoils and coluvisoils forms at the basis of sides.

The rocks from which are formed soils from Picior de Munte Field are sedimentary one unconsolidated from proluvio-deluvial origine with different ages and phisico-chemical properties (Puiu Stefan, Stefan Ispas,1997).

The medium annual temperature calculated in the period of 1997-2007 is of 10,4°C.The daily variation of relative humidity is dependent by the air temperature, in an inverse proportional rate with that. In the centre of county the relative humidity of air registered high values in winter mounts (medium: 86%) and small in spring period (medium: 76%). Annual quantity of medium precipitates on the period of years 1976-2007 was of 556.4 mm/m^2.

In the South part, annual speeds on the wind direction are between 3.2 m/s on North-West direction and 2.1 m/s on the North direction.

In Picior de Munte Field in the formation of soils important rolls have some processes like bioaccumulation, elluviation-illuviation, specific alteration, gleization and stagnogleyzation and vertique ones.

1. Bioaccumulation is a general process characteristic of all soils. That process is about the accumulation of organically substances at the superior part of soil where it is formed a bioaccumulativ horizon.

In the studied territory, the precipitation quantity (annual medium value of 556,4 mm) is sufficient favorable of a development of an herbals carpet because of that the bioaccumulation is sufficiently intense and is appeared till 25-30 cm of deep and permit the separation of A horizon well contoured. In the humus content function that horizon could be an A molic (Am) or an A ocric (Ao).

The Am horizon is rich in humus content (3-5%), the colour of that material is dacker, is also well structured (grainy, granulated) and refining. That horizon is present only in the case of molic subtype from the aluvisoils from Dambovita waterside.

Ao horizon is different from Am because of smaller content of humus (1-3%), and so the colour is lighter, the structure is thinner. From a lot of cases the Ao horizon represents a dimension between 18-25 cm. The Am horizons have the dimension of 25-35 cm.

Under forestry vegetation, it is an intense accumulation of organically, waste (leaves, branches and roots) which are transformed harder in humus, humid medium and colder slow that process. In that situation it is formed an organically horizon which is noted by O.

2. Eluviations process represents a washing process under the influence of water and of the components from the superior part of soil and illuviation; process represents the deposition of that materials in deeper parts of soil.

Because of the eluviations phenomenon are formed poor strata, named alluvial horizon, and another horizon, alluvial one richer in different components deposited. So, the manifestation of elluviation-illuviation processes depend in the first place by the precipitations quantity been more intense with the accentuation of the processes.

The precipitations quantity which are on the territory of Lucieni village is sufficient to wash the total quantity of soluble salts, and calcium carbonate is wash till the base of soil profile, where is deposed under small formations and so is formed Cca horizon.

The clay is also influenced by the levigation process, which through eluviations from surface horizon and illuviation in the deep of soil determined the formation of B clay-illuvial horizon or B textural, noted with Bt. That pedogenetic process is specific relief surface with the oldest period and a global drainage very well. The Bt horizon is diagnose to the soils from luvisoils class.

When the migration of the clay is intense, over the Bt horizon is formed an elluvial horizon destitute of colloids and rich in residual grosser particles usually from quartz, with a lighter color, which represents E horizon. In the function of the intensity of elluviation, that horizon may be E lluvic (El), when the elluviation is weaker and E albic (Ea) when the elluviation proces is accentuated. The association of El and Bt horizons is characteristic for albic luvosoils.

3. The alteration is a general process involving the formation of all soils. However, there are cases when the alteration results in the formation of specific horizons as horizons B cambric (Bv).

This horizon is formed by altering the parental material that changes colour and structure, sometimes getting an extra clay without it to be migrated from the upper soil profile, but formed in situ (in place). Another feature this horizon is the total wash water carbonates because of precipitation that runs through the soil profile.

Bv horizon is diagnostic at kind, for eutricambosol, which is better represented in the meadow Dambovita.

4. Gleyfication and stagnogleyfication processes. These processes take place in conditions of excess water from the soil regularly. Excessive groundwater Gleyfication determined processes, where the horizon forms gleyic denoted by G. It can be of two types:

- gleyic reduction (GR), formed under conditions of prolonged excess moisture, which causes a strong reduction of iron oxides resulting colours green, blue, purple, for more than 50% of the surface obtained by cutting soil aggregates;
- gleyic of oxidation-reduction (Go), formed in alternating conditions of excess water and aerobiosis because successive rise and lower the phreatic level, in which iron compounds are in reduced state and therefore the horizon that have green spots, blue, purple, caused by the reduction, but also fox, rust, yellow, due to oxidation processes.

On smooth surfaces, represented by terraces Dambovita, imperfect external drainage and loamy soils, recorded excess rainfall water, which causes all processes to reduce, but which manifests itself in the upper soil profile, which is formed stagnogleyfication horizon, denoted by W.

When the intensity of reduction is lower, with spots and stains appear to reduce oxidation. In this case, it forms a horizon stagnogleyfication, which meets more frequently than horizontal stagnogleyfication and is denoted W.

Gleyfication processes and stagnogleyfication are characterized gleysoils of river valleys and clay soils stagnogley formed on land, with imperfect drainage. Also characterized subtypes stagnogleizate Gleysoil and other types of soils

5. Vertique processes are characteristic of soils formed on clay deposits inflatable character, as the territory sought, are subtypes of soils vertiques luvosils class.

In this situation, the drought periods of the year due to strong contraction of clayey material in the soil mass is forming large cracks, over 1-2 cm., To a depth of 50-70 cm, which favours the emergence of large structural elements .

During wet gonflement occurs, respective the dilatation of structural aggregates and closing cracks. In this process, structural aggregates exert a strong push horizontally and vertically, slide some over others polished their faces and changing their position.

Repeating these processes determine the formation of a specific horizon, called the horizon vertique, which is denoted by y, associated to pedogenetical horizons were, formed specifically for grefing, in this case Bty.

Because of these pedogenetical processes formed aluviosoils specific soil horizons, luvosoils, eutricambosoils, spodosoils and vertosoils.

CONCLUSIONS

In Picior de Munte Plain held various soil processes that led to the formation of specific land area. These processes were:

1. Bioaccumulation the formation of type I horizons, but also where Ao forest vegetation;
2. Illuviation the formation horizons Elluviation-Carbonato-illuviation Ca, B or Bt and if he/she luvosoils or luvosoils Albic;
3. Alteration to form Bv horizon for eutricambosoils (meadow Dambovita);
4. Gleization and which led training stagnogleization process Gr horizons and Go or W to podosoils;
5. Vertique processes to form the horizon verti Bty, respectively vertiquesoils.

These processes are continuous so that soil pedogenetical current Picior de Munte Plain will evolve over time and will still require other actions of monitoring the soil.

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FIGURE

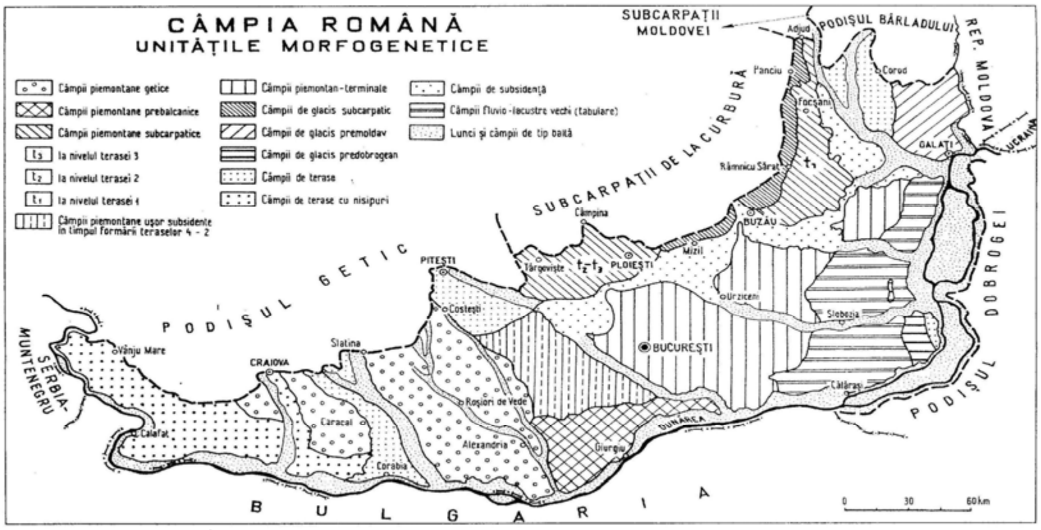

Fig 1. Romanian Field. Morfogenetical Map

PHOTOS

Photo 1. The accumulation of organically waste under forestry vegetation Dragomireşti

Photo 2. Water stagnationfrom precipitations on the soils with external and internal imperfect drainage

Researches regarding the genesis processes of Picior de Munte Field soils

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Keywords: piemont plain, favourability, clay, phreatic level, human intervention

ABSTRACT

Plain Picior de Munte is located in north-central part of the Romanian Plain, between the valleys of south Sabar, Corabiei west and east Dambovita, presumed subunit of Plain Targoviste (Figure 1, Figure 2).

The morphometric characters it has, it is a continuation to the southeast of Piemont Cândeşti of which differ and formation module. So far, Plain Foot of the Mountain, as was defined, not subject to special works of physical geography, geomorphology, geology, and pedology pedogeografie.

The ultimate goal of soil research, to provide technical and scientific basis for improvement methods and measures for rational use of land, requires knowledge and deepen all natural and anthropogenic factors, aimed pedogenetical processes, with significant production, setting the terms of the occurrence and distribution of soils the territory.

Pedogenetical factors with important role in soil formation we have rocks, topography, climate, surface waters and ground waters, vegetation, fauna and time. In their investigation results have substantiated the existence of five types of soils: Luvisoils, Cambisoils, Hydrosoils, Protisoils, Vertiquesoils

INTRODUCTION

Plain Picior de Munte is located in north-central part of the Romanian Plain, between the valleys of south Sabar, Corabiei west and east Dambovita, presumed subunit of Plain Targoviste. (Figure 1, Figure 2) (Bugă Dragoş şi Ion Zăvoianu 1974).

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The ultimate goal of soil research, to provide technical and scientific basis for improvement methods and measures for rational use of land, requires knowledge and deepen all natural and anthropogenic factors, aimed pedogenetical processes, with significant production, setting the terms of the occurrence and distribution of soils the territory.

MATERIAL AND METHODS

Pedogenetical factors with important role in soil formation we have rocks, topography, climate, surface waters and ground waters, vegetation, fauna and time. Each factor was investigated multiple, sought and was based on direct observations and mapping.

RESULTS AND DISCUSSIONS

The landscape is manifested space in which soil formation and evolution. It is characterized by an increased fragmentation of valley longitudinal Dambovita time. The other few valleys that cross approximately northwest to southeast with even originate in its content, failed to widen too much. They are short and deep valleys, with or without a permanent course and are arranged almost parallel to each other, with a rate almost as if colour and Siliştea valley and a winding course, meanders in the valley Waxwing.

In addition to a limited Sabar Valley to the south, west and Cobia Dambovita Valley to the east, crosses the plains within the wash streams, one hundred, Ursoaia Cuparu and their direct tributaries of these streams have a drainage temporarily, the tributaries their direct drainage of these streams is a temporary, sometimes losing the waters of their beds into the base layer of gravel.

On the altimetry is leading to a loss of height of the north-west to southeast. Relief descends from over 320 meters in altitude at Decindeni in the north-west to 170m in Costesti

Hill in the south-east and only a few tens of meters in Titu Braniştea the contact area with meadow Arges and the Dambovita.

River has shape three terraces. On their foreheads, erosion occurs leading to the creation of specific soil types, erodisoils, regosoils and coluvisoils formed the slopes. Of geologically can say that this flat has a large lithologic because there are alluvial deposits belonging to the upper terrace developed Dambovita Valley. Foot of the Mountain Plain consists of gravel and sand interspersed with marl over the deposits was formed loessoide upper Pliocene age (Coteţ Petre, 1973).

The opening can be seen a clay layer of 3-5 meters below which are about the same thickness of deposits of sand and gravel terrace which leads to excess soil moisture and training specific stagnogleyc and stagnogleization. Predominant gravel to sandy clay Cândeşti with insertions, loam and sandy clay. Over loams they are heavy and thick clay of 4-5 meters representing the parent rock and soils of the platform slopes. These materials are poor in bases.

In valleys, rock reinforcement is made up of alluvial deposits colluvial and medium-textured, sometimes easy (Ispas St., 2001).

Meadow Dambovita, younger geological formation, has two parts: one high, which is rarely flooded and a lower area near the active bed of the river, the area is annually affected by the erosion and deposition of materials.

In high meadow, none easily flooded, looking terraced flat, with slight surface irregularities, there were conditions for the formation preluvosoils redheads and eutricambosoils. (Dinu I., 1996).

The meadow itself can act on that river with new submissions in times of floods (floods strong), aluviosoils typical meet-carbonate.

Meadow minor, the flash flood, river consists of coarse material (sand and gravel). Here soils that meet the latest ethnic aluviosoils.

To characterize the region's climate was studied using data from the meteorological station Targoviste (Puiu Stefan, Stefan Ispas, 1997).

Calculated the average annual temperature range 1997-2007, is 10.4°C. The difference between the warmest year (11.5°C in 2000) and since the cool (9.4°C in 1997) was 2.1°C (maximum amplitude) and are due to general underlying climate of our country. Precipitation is one phase of the water cycle in nature that falls in liquid form (rain), solid (snow) or mixed (sleet). The annual quantity of precipitation mediated by the range 1976-2007 was of 556.4 mm/m2.

Annual quantities of precipitation regime in recent years reveal a sharp decrease in their values to the amount multiannual. Exceptions are 2005, when it recorded a double amount of precipitation over a normal period, respectively, and 1228.2 mm in 2007 with an amount more than average, 778.6 mm. The annual average values are higher the greater the amount of precipitation that has stayed at the soil surface, causing soil formation processes stagnogleization and stagnogleyc with proliferation in Picior de Munte Plain.

Surface water and groundwater is of particular importance in the genesis and soil spread by superhumification it causes soil and determining certain processes related pedogenetical alternation in anaerobic conditions and aerobiosys. Intense manifestation of these processes result in hydromorphic soils.

Picior de Munte Plain crossing rivers belong to Mountain Arges emplacements. The network detaches the Dambovita River basin, which he originate in the Carpathian region and is the largest tributary of the river Arges, both the flow and length. Water sources that contribute to feeding the rivers of the region studied are most, likely pluvial (70%), plus a reduced participation of groundwater moving easily through sedimentary rocks (sand and gravel) and come into the Dambovita river (30%), and maximum levels percent in rivers and brook Sabar and Cobia.

Vegetation affects the quality and quantity pedogenetical processes by organic debris deposited on the surface or within the annual soil and how transformation. On the map of vegetation zones of Romania (Atlasul geografic general, 1974), research territory falls in the forest of oak. However, due to human influence, natural vegetation has been replaced in most of the vegetation planted (cereals, industrial crops, vegetables and fodder), which allow different amounts of soil organic remains.

Picior de Munte Plain are getting a very favourable agricultural development: an annual average temperature of 10.4 degrees C, precipitation between 550-600 mm, soils with high fertility but only in certain areas in the southern plains and along the Rivers Dambovita and Cobia. In most of the plain clay soils predominates improvement methods that require measures to obtain richer harvests.

The process of training and development of land is subject to the influence of environmental conditions in a particular place. The influence of these conditions occurs over time, reason and it is regarded as one of the factors of soil formation. Thus ground cover age dependent generally that of that territory, the time when it was formed and came under the influence of agents.

Therefore, the Meadow Dambovita, the newest part of the landscape of the Picior de Munte Plain, is aluviosoils ethnic and aluviosoils, which are young soils in training. Since major meadow is left the Dambovita influence the flooding, soil formation was continuous and very intense, which is why the majority ethnic aluviosoils turned in aluviosoils and slightly raised areas, even eutricambosoils.

Continuing the idea set out above, we can say that the soils on the lower terrace of the Dambovita are younger than the terrace soils of the middle and upper river. The oldest, Albic alluvosoils, rest on the plain themselves.

However, the plain old soil cover Foot Mountain depends on other factors. For example, on the slopes bordering the valleys that cross the landscape unit, in some areas, erosion causes the continued removal of upper soil profile so that soil formation is hindered (although soil formation occurs, and the flat surfaces of nearby, a long time), so that soils remain uninvolved or truncated as appropriate regosoils and erodisoils.

The accumulation of material eroded from the slopes, also stops the process of soil formation, soil covered becoming clogged. If the material deposited has a thickness greater than 50 cm, soils shall be included in aluviosoils coluvic ones, which are less than the soil on which they cover.

Man, through work, exercised and exercises a strong influence on soil development, by removing the original natural vegetation and its replacement by pasture and crop plants, by various measures agrochemical or land reclamation works.

Following the influence of these pedogenetical factors the Picior de Munte Plain were identified following types and subtypes of soils, as shown in Table 1 and figure 2.

CONCLUSIONS

Pedogenetical factors with important role in soil formation we have rocks, topography, climate, surface waters and ground waters, vegetation, fauna and time. In their investigation results have substantiated the existence of five types of soils: Luvisoils, Cambisoils, Hydrosoils, Protisoils, Vertiquesoils

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TABLE

Table1. Classes and type of soils

Classes of soil	Horizon Diagnostic	Type of soil	Subtype of soil
1. Luvosoil	Bt	**Reddish brown** (78,80 ha)	Tipic Stagnic
		Brown luvic (5256,89 ha)	Vertic Stagnogleizat
		Preluvosol (318,6 ha)	Vertic Stagnic
		Albic luvisols (3973,47 ha)	Stagnogleizat Vertic
2. Cambisols	**Bv**	**Brown eumesobasic** (1542,75 ha)	Tipic Gleizat
3.**Hidromorphic soils**	**G**	**Gleic soil** (43,98 ha)	Tipic Eutric
		Stagnosol (8563,69)	Vertic
4. Non-evolved soils	-	**Regosol** (972,82 ha)	Tipic Eutric Litic
		Fluvisol (2884,59 ha)	Calcaric Gleizat
		Aluviosol coluvic (47,66 ha)	Entic
		Lithic soil (304,20 ha)	Tipic
5.Vertiquesoils		**Sol vertique** (694,20 ha)	Stagnogleizat

FIGURES

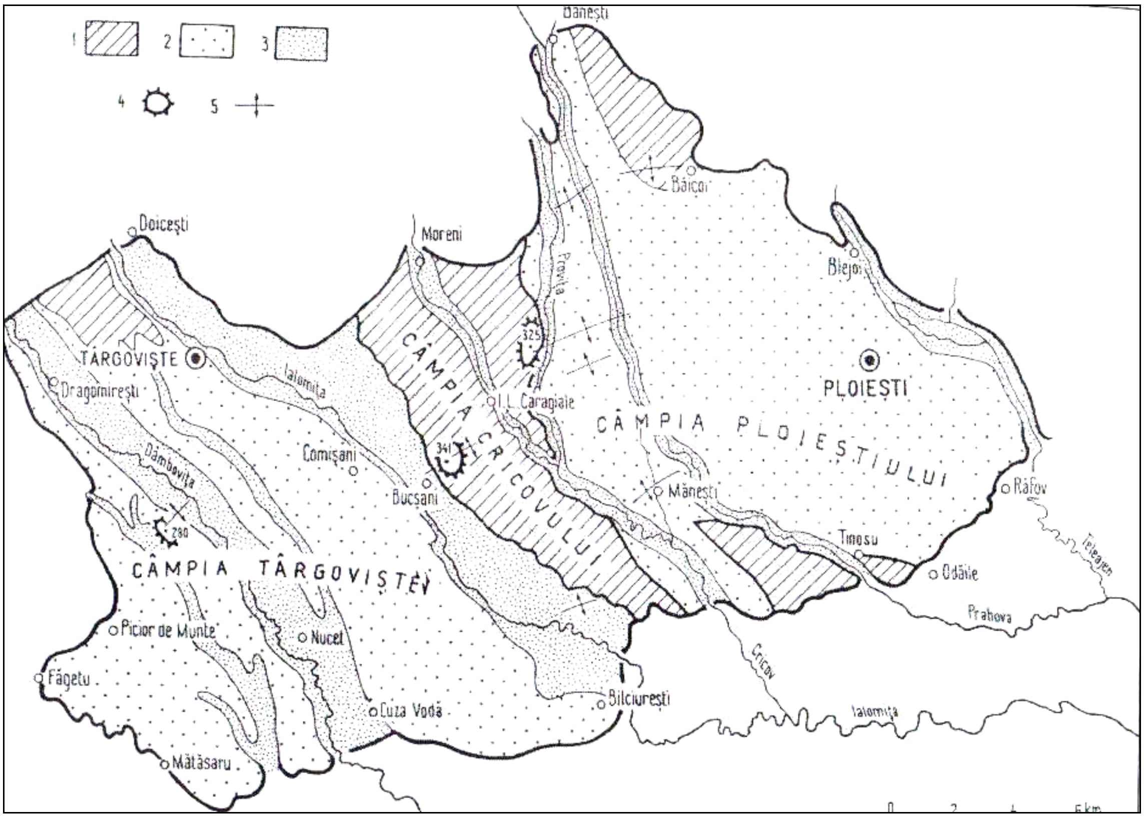

Fig. 1. Plain Târgovişte-Ploieşti (după Geografia României, vol V, 2005)

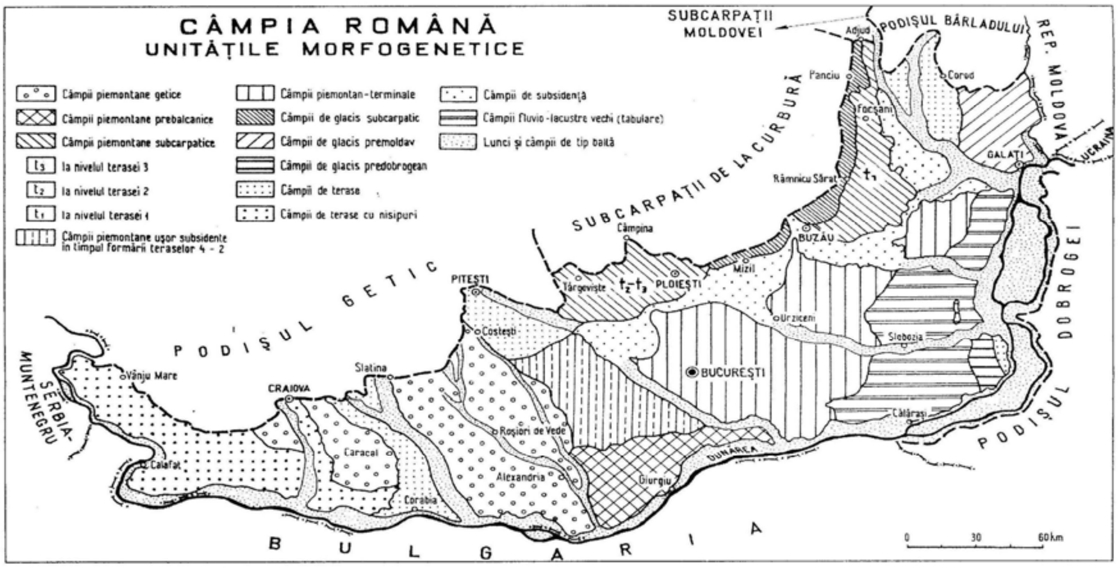

Fig. 2. Romanian field. Map of morphogenetical units (după Geografia României volumul V, 2005)

Research on the systematic monitoring of potato storage losses for industrialization in the form of potato chips

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ABSTRACT

For industrialized processing as potato chips, potato kept in pre-processing a good time at temperatures between 7-10^oC to avoid the hydrolysis process of starch into sugars that can change colour and reducing the quality of the finished product. The research was conducted in 5 varieties of potatoes: Ostara, Desiree, Sante, Roclas, Romano on tubers of the same size (90-100g) and physiological age, therefore having the same potential (capacity) of sprouting, the same effect in 5 repetitions. The early varieties biggest loss recorded in the first months of storage, which requires an earlier processing them. Weight loss of tubers for processing industrialized can keep up only because successive spring during storage at 10-15%. Losses due to large physiological table potatoes for industrial processing that is required within each manufacturing plant to have a storage space where they can be controlled by keeping the main factors. The raw material will be stored at low temperatures and raising temperature for industrial processing will be made only about a month before processing. Losses are extremely serious and brown varieties if keep lasts more than a month.

INTRODUCTION

In the context of European integration, the high-grade agricultural products are among the priority activities. Potato processing by industrialization as-chips finished higher form of recovery is providing economic and financial benefits.) Olteanu, Gh., Muresan, S., 1980, Talburt, W.F., Smith, O., 1967).

For industrialized processing as potato chips, potato kept in pre-processing a good time at temperatures between 7-10^oC to avoid the hydrolysis process of starch into sugars that can change colour and reducing the quality of the finished product. At high temperatures, however, accelerates physiological processes of the tubers, place heavy losses by sprouting potato mass, breathing and sweating. These losses should be monitored in relation to variety, storage period (before or after resting physiological) and during processing. Grison, C., 1983)

MATERIALS AND METHODS

The research was conducted in 5 varieties of potatoes: Ostara, Desiree, Sante, Roclas, Romano on tubers of the same size (90-100g) and physiological age, therefore having the same potential (capacity) of sprouting, the same effect in 5 repetitions. Mass losses were determined separately potato corner and separate physiological processes of breathing-sweating, once each month.

For a correct assessment of losses in industrial processing, research has been divided into two periods: the tubers store for processing since early November to December, immediately after leaving the normal physiological resting (80-90 days after harvest) and a possible treatment in February, during which were kept in cold conditions at 2-4^oC without sprouting, and only then were switched to a high-temperature storage to determine losses. Sprouting losses were determined by breaking tusks once a month, counting their (ability to flush) and weighing the individual and cumulative physiological loss in order to assess breathing-sweating.

RESULTS AND DISCUTIONS

1. Results obtained on the sprouting ability of tubers to keep industrialization

Variants taken at the potato storage in November were assessed after one month storage at temperatures above 10^oC. The first determinations were made in December when, except the Roman variety, with a physiological rest longer, all other varieties have emerged from dormant binding.

The number of tusks start of tubers is low (apical dominance occurs), one at Ostara varieties, Desiree and Roclas-three variety Sante. After removing this first, get, tusks, the determination of the following three months significantly increased the number of tusks to 5.8 per tuber, which means that once triggered germination corner, under conditions of temperature and proper aeration, physiological processes of tubers takes place rapidly.

Period of intense activity in the tuber takes different variety to variety. Some varieties soon deplete their resources germ (by the end of March - Ostara, Santos), although tuber size was relatively equal in all varieties. Other varieties with a capacity greater germination (Desiree, Roclas, Romano) continue to issue tusks by the end of June.

The variations removed from storage in February, after months of storage in aerobic conditions and favourable thermal spring, triggering massive corner is start from the beginning for most cultivars (Table 1). Except Roclas variety, which at first determination after a month after removal from storage started 1.2 tusks per tuber, all other varieties tested was large number of tusks, 5-7-8 or 9. Abundant on tuber sprouting lasted two months and then began to fall during May and June. It seems that as the onset occurs later spring it even more robust.

2. Results obtained on weight loss of tubers due to physiological processes

The loss in weight of tubers as a result of physiological processes reflect a clear distinction between the varieties tested, each species having individual physiological processes differentiated by curves with different pace. Evolution losses in both periods of storage at the 5 varieties are given in Figures 1,2, 3, 4, 5 and calculate statistics, presentation of the form of polynomial equations 2 and 3 degrade the best fit phenomena.

Total weight loss of tubers from the corner and the mass accumulation of weight loss of tubers due to physiological processes of respiration-sweating is described in the graphical representation of curves upward almost linear which shows the speed and severity of weight loss in potato at high temperatures under the tubers for industrial processing of potato chips under a form are at a longer retention time in this way. Losses are extremely serious and brown varieties if keep lasts more than a month.

CONCLUSIONS

The early varieties biggest loss recorded in the first months of storage, which requires an earlier processing them.

Weight loss of tubers for processing industrialized can keep up only because successive spring during storage at 10-15%.

Losses due to large physiological table potatoes for industrial processing that is required within each manufacturing plant to have a storage space where they can be controlled by keeping the main factors. The raw material will be stored at low temperatures and raising temperature for industrial processing will be made only about a month before processing.

Losses are extremely serious and brown varieties if keep lasts more than a month.

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TABLE

Table 1. Sprouting ability of tubers store for industrialization no of tusks/ tuber

Cultivar	Variety period from November to June								Period from February to June				
	19 XII	23 I	20 II	20 III	22 IV	20 V	21 VI	T	12 III	15 IV	15 V	13 VI	T
Ostara	1	6	7	8	2	-	-	**24**	8	8	5	4	**25**
Desiree	1	5	7	8	5	3	2	**31**	7	6	3	2	**18**
Sante	3	5	4	5	-	-	-	**17**	9	6	1	-	**16**
Roclas	1	5	5	8	9	3	2	**33**	1	6	5	5	**17**
Romano	-	4	6	6	6	3	-	**25**	5	6	4	5	**20**

FIGURES

Fig. 1. Weight losses from tubers because of physiologycal processes at Sante variety

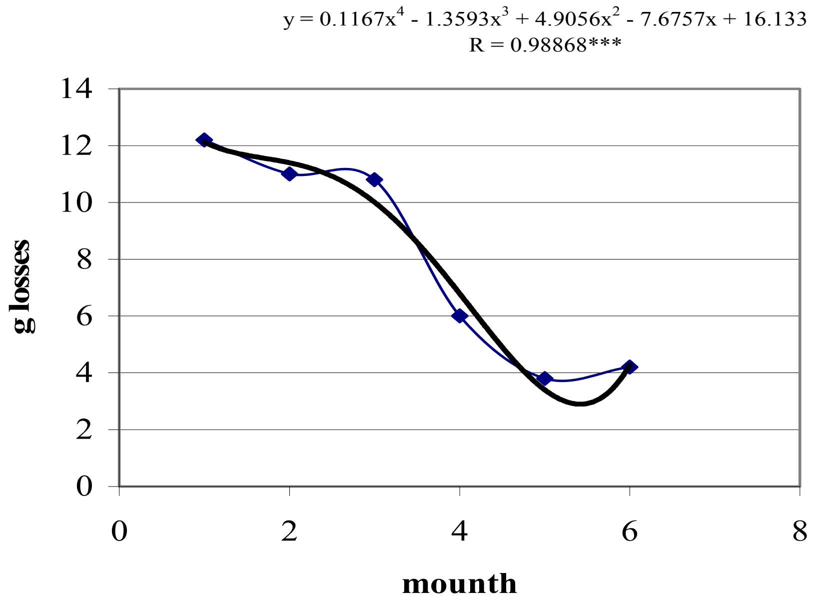


Fig. 2 . Weight losses from tubers because of physiologycal processes at Desiree variety

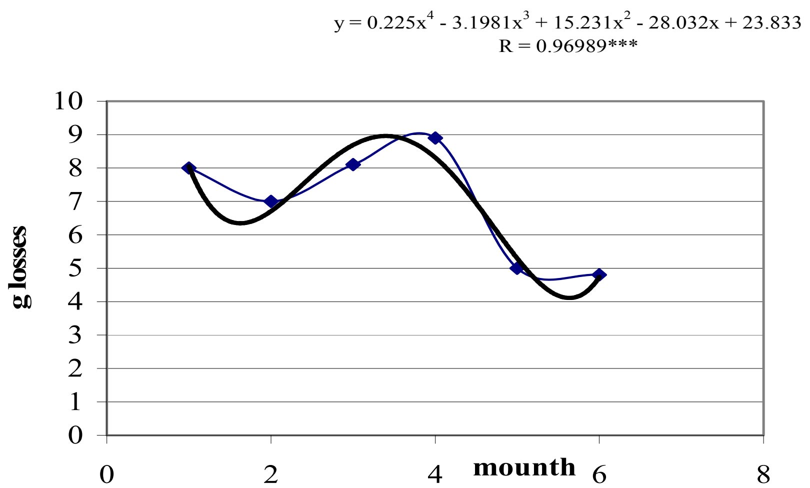


Fig. 3. Weight losses of tubers from physiologycal processes at Romano variety

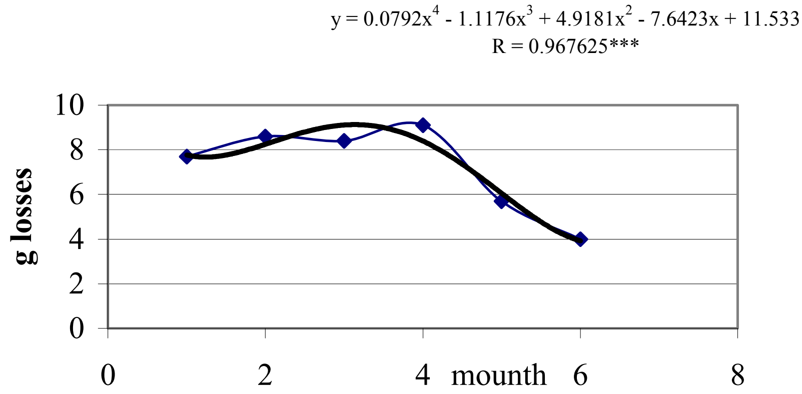


Fig. 4 . Weight losses tubers from physiologycal processes at Roclas variety

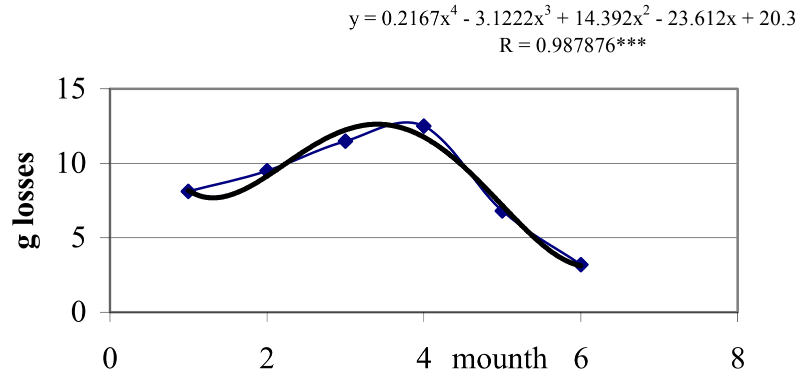
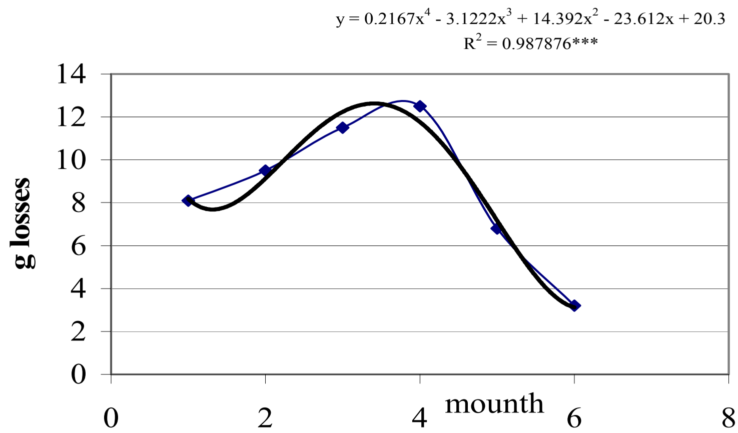


Fig. 5 . Weight losses tubers from physiologycal processes at Ostara variety



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The influence of Reldan 40EC insecticide upon physiological indices in Rana ridibunda

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Keywords: chloropyrifos-methyl, eritrocytes, leukocytes, glicaemia, cholesterol, triglycerides

ABSTRACT

In our experiments we investigated the influence of the insecticide Reldan upon some physiological indices (number of eritrocytes, leokocytes, and glycaemia, cholesterol, triglycerides level) in Rana ridibunda at two thermic intervals (4-6ºC and 22-24ºC). Reldan 40EC is an insecticide from the class of organophosphates. The active substance of this insecticide is chlorpyrifos ($C_7H_7Cl_3NO_3PS$; O,O-Diethyl O-(3,5,6-trichloro-2-pyridyl) phosphorothioate). The animals used in the experiment were divided in four experimental lots: two lots of control individuals (first lot was kept at 4-6ºC, and the second at 22-24ºC) and two experimental lots in which the animals were treated with 0.01 ml/g body weight Reldan 40EC and kept at 4-6ºC, respectively at 22-24ºC. The toxic was administrated with intraperitoneal shots (one shot every two days, in a scheme of three weeks). At the end of the experiment we observe an increase of erythrocytes and glycaemia value, a decrease of leukocytes.

INTRODUCTION

It has long been recognized that animals living in polluted waters are more commonly exposed to continuous or intermittent sublethal levels of poisons than to lethal concentrations (Abel 1980). Populations of many amphibians have declined and some species have disappeared from certain regions around the world, a phenomenon which appears to have accelerated during the last years. The increasing use of pesticides in modern agriculture has been mentioned as one of the reasons for the decline of the amphibian fauna (Phillips, 1990; Berrill et al. 1994). Amphibians are not likely to be killed by normal exposures, due to low concentrations that are likely to occur in aquatic systems. Amphibians are potentially sensitive indicator organisms of environmental stress because of their permeable skins and bi-phasic life cycle (Duellman and Trueb, 1986).

The present work investigated the effects of Reldan 40EC insecticide upon number of erythrocytes, leukocytes, and glycaemia, cholesterol, triglycerides level in Rana ridibunda at two thermic intervals (4-6ºC and 22-24ºC).

MATERIAL AND METHODS

In all the variants, frogs (Rana ridibunda) were captured in the surrounding areas of the city Pitesti (Romania) and were kept in aquaterrarios filled with tap water. The water was changed daily to avoid the accumulation of toxic substances. After 10 days of adaptation in the lab, when they were unfed, the frogs were separated in lots, which were used separately for the following experiments: two lots of control individuals, containing animals kept in laboratory at 4-6^{o}C, respectively at 22-24ºC with no treatment, in running water which was changed everyday, (1) one lot containing animals which were subjected to treatment with Reldan 40EC in a dose of 0.01 ml/g of body weight and kept at 4-6ºC, (2) a second lot containing animals which were subjected to treatment with Reldan 40EC in a dose of 0.01 ml/g of body weight and kept at 22-24ºC. The toxic was administered by intraperitoneal shots, one shot every two days, in a scheme of 3 weeks. The administered dosage of insecticide was not lethal as none of the subjects died through the experiment.

The number of erythrocytes and leukocytes was microscopically determined with a Thoma cells numbering chamber, by using a small amount of blood collected from the heart (Picoş and Năstăsescu, 1988); the glycaemia, cholesterol and triglycerides level has been determinate using an Accutrend GCT.

The toxic substance used was the insecticide commercialized under the generic name „Reldan 40EC" which has as an active substance the chloropyrifos-methyl. Reldan 40EC is an organophosphorous pesticide that is currently registered, or has tolerances pending, for crops and livestock, ornamental plants, turf, household pests, and mosquito control. The most obvious threat to the aquatic environment is its use as a mosquito larvicide's; fish and aquatic invertebrates can also be affected through runoff due to certain terrestrial uses (Cebrián, 1992).

RESULTS AND DISCUSSION

As shown in Figure 1, as compared to the values recorded for the control individuals of frog, the number of erythrocytes increases by 51.14% for the animals which were treated with Reldan 40EC in a dose of 0.01 ml/g of body weight and kept at 4-6ºC, while animals treated with the same concentration of Reldan 40EC but kept at 22-24ºC the number of erythrocytes increases by 76.88%. Increased number of erythrocytes under the action of Reldan 40EC has also been noticed by Ponepal (Ponepal et al, 2009).

The number of leukocytes in the frog individuals subjected for 3 weeks to treatment with Reldan 40EC in a dose of 0.01 ml/g of body weight was also significantly affected as shown in figure 2. The difference between the number of leukocytes which was determined for the control kept at 4-6ºC and the 'treated' lot kept at the same temperature, an average decrease of 53.07% was found in the treated frog individuals. Similar results were obtained at 22-24ºC when the numbers of leukocytes decrease by 68.81% of the control value. Similar effects have been carried out by Ambali Suleiman (2007) studying the effects of chloropyrifos on mice.

Our experiments also recorded a significantly modification upon glycaemia level. Figures 3 show the changes in the average values of blood glucose. Reldan 40EC in a concentration of 0.01ml/g body weight determinate, after three weeks of treatment, an increase of glycemia level with 127.41% as compared to the witness value in the case of animals kept at 4-6ºC and with 173.59% in the case of animals kept at 22-24ºC.

The values of cholesterol have increased by 109.03% as compared to the witness value in the case of animals treated with Reldan 40EC in a dose of 0.01 ml/g of body weight and kept at 22-24ºC (Figure 4); in the cold variant the changes were insensitive. Similar effects were observed in case of triglycerides level (the changes were insensitive) (Figure 5).

CONCLUSIONS

The intraperitoneal administration of Reldan 40EC in a dose of 0.01 ml/g of body weight determines an increase a number of erythrocytes in the flowing blood of the animals kept at 4-6ºC, respectively at 22-24ºC. The study revealed significant leukopenia (number of leukocytes decrease in both lots). The values of glycemia have been modified because a rise by 127.41% occurred in animals treated with Reldan 40EC in a concentration of 0.01ml/g body weight and kept at 4-6ºC and a rise by 173.59% in the case of animals treated with Reldan 40EC in a concentration of 0.01ml/g body weight and kept at 22-24ºC In the case of cholesterol and triglycerides level the changes were insensitive.

The Reldan's toxic effect was proven to be more powerful for variant at 22-24ºC.

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FIGURES

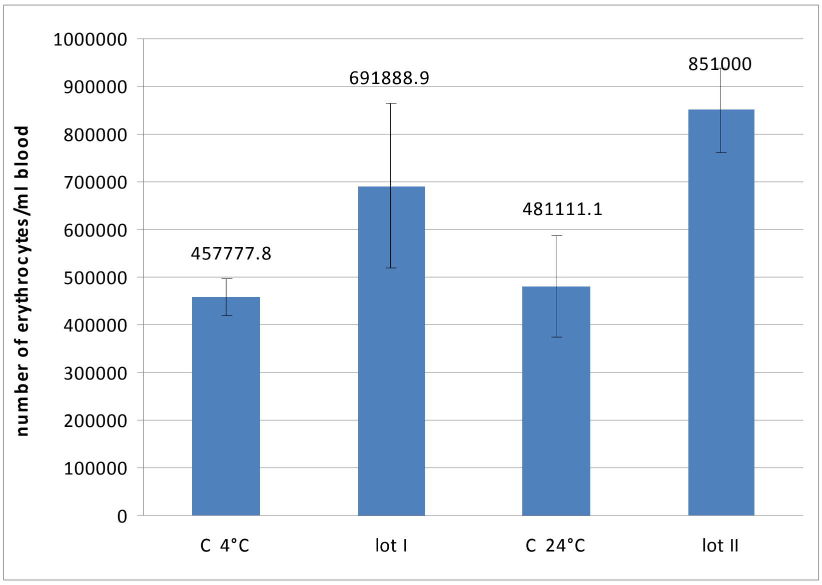

Fig. 1 The influence of Reldan 40EC insecticide upon number of erythrocytes in Rana ridibunda

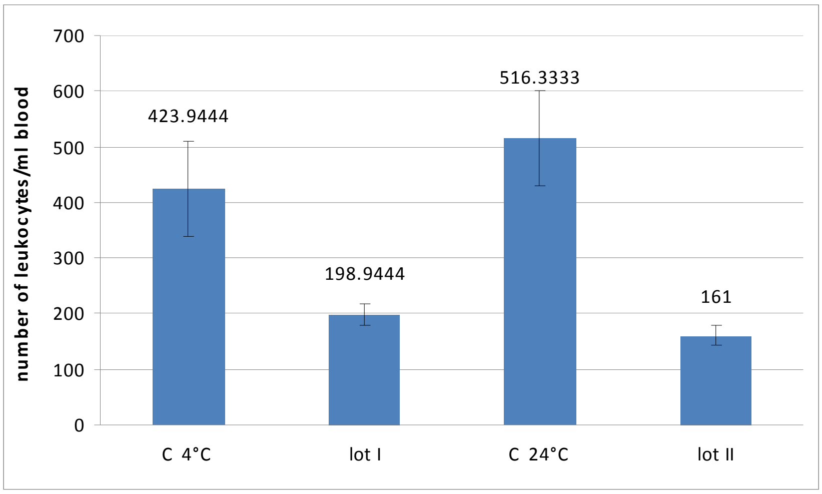

Fig. 2 The influence of Reldan 40EC insecticide upon number of leukocytes in Rana ridibunda

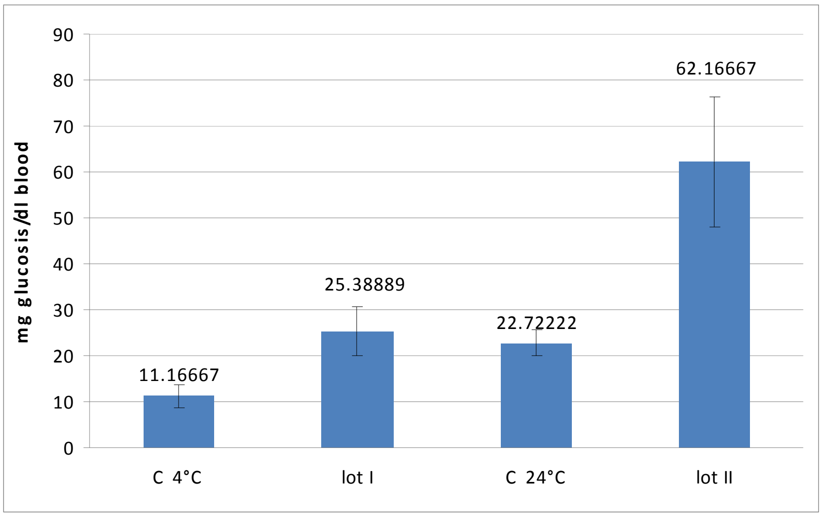

Fig. 3 The influence of Reldan 40EC insecticide upon glycaemia level in Rana ridibunda

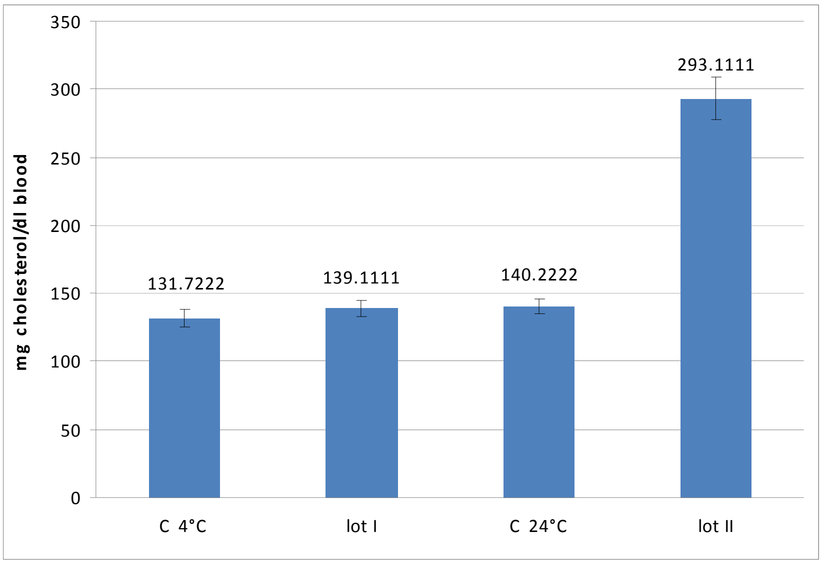

Fig. 4 The influence of Reldan 40EC insecticide upon cholesterol level in Rana ridibunda

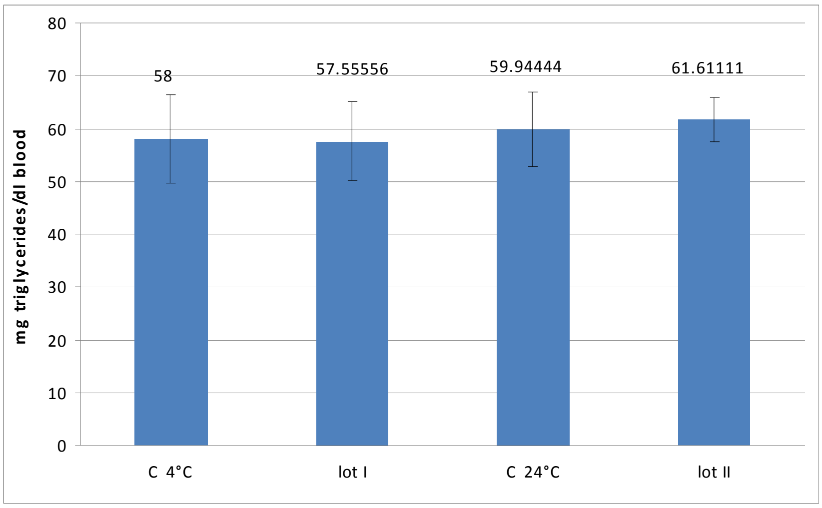

Fig. 5 The influence of Reldan 40EC insecticide upon triglycerides level in Rana ridibunda

Quality and yield potential of eight sunflower hybrids studied at CTS Dîlga during 2007-2008

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Keywords: genetic potential, productivity, yield quality

ABSTRACT

Dîlga region represents the major sunflower growing area, with most favourable pedo-climatic conditions for this crop type. In this study we analyzed by comparison eight sunflower hybrids, four local Romanian and two foreign varieties. The study was conducted at Dîlga Centre for Variety Testing (named CTS Dîlga) and has as objective to identify the most performant and best adapted sunflower hybrids for this region. The results obtained demonstrate the difference in productivity and yield quality amongst the hybrids analyzed. Following this study, local and foreign hybrids have proven high adaptability with regards to pedo-climatic conditions of this region generating high quality and quality yields.

INTRODUCTION

Globally, sunflower is one of the most important oil producing plants and most valuable crop in obtaining oil planted in Romania, representing also a study material for many researchers in Romania and abroad. The vast number of research activities carried out on this crop has allowed for better knowledge of the genetic basis in creating more performant hybrids, along with optimization of crop technology. As with any other crop type, progresses made within the last several decades imposes encouragement of research and positioning of research fields in different climatic areas, and moreover, in different microclimatic zones with the objectives of obtaining higher quality and quantity yields. Within this context have completed this study, under pedo-climatic conditions for CTS Dîlga region (Călăraşi county), for which we have proposed to analyze the yield potential (productivity) and yield quality of eight sunflower hybrids (four Romanian and two foreign varieties). In obtaining concluding results, the study was carried out for two consecutive years (2007-2008), with climatic conditions varying from less favourable in 2007, to favourable in 2008. The meteorological elements that have characterized the weather during the two years of study are presented in table 1.

High temperatures recorded during the months of June, July and August and total precipitation amount of 419,4 mm fallen irregularly during vegetative growth period of 2007 has resulted in low quality and quantity yields. The year of 2007 has shown to be unfavourable for sunflower cultivation. In 2008, precipitation levels and temperatures were more regularly distributed during vegetative growth period resulting in better quality yields. The level of precipitation in 2008 amounted for 585,31 mm whilst the month of April received most precipitation with a total of 140mm. These conditions have ensured uniform development of sunflower crop. The months of June-July have received total of 100 mm precipitation that has contributed in obtaining higher quality and quantity yields. The soil type where the trials were carried out is cernoziom, loam clay, with a content of 32-38% loam, 35-40% sand, middle soil texture, and freatic water level at 6 m depth. Dîlga area is located at 51 meters altitutde, 44°25” latitude and 27°05” longitude. The hybrids studied in the field trials at Dîlga Centre for Variety Testing have shown good adaptability to area specific pedo-climatic conditions. The yield potential of sunflower hybrids presently cultivated in this area is much higher to that of the country average yield values. The lower yield values compared to the yield potential of these hybrids and the variation of yield in time can be explained by the variations of pedo-climatic conditions in these areas and during different years. Moreover, the yield potential of the hybrids is often diminished by less favourable physical and chemical properties of the soil types on which sunflower cultivation has extended in the past years and low soil humidity that can enable better yields only under irrigated conditions. In Romania, an increase in sunflower yield production must take place by cultivating more productive hybrids, with higher oil content and that carry higher genetic resistance to disease, and also by observing cultivation technology, especially crop rotation, fertilization, weed control, disease and pest control, irrigation, controlled pollination by bees. The main elements of productivity for sunflower are: number of plants per surface unit; number of seeds per plant; thousand weight kernels (TWK); seed oil content (main economic interest of sunflower cultivation). Sunflower seed oil content depends first on biologic material (hybrid), crop technology and climatic conditions.

MATERIALS AND METHOD

At Dîlga Centre for Variety Testing, the trials included eight sunflower hybrids for study, four Romanian and two foreign hybrids. The check hybrid used was Favorit that is a representative hybrid for cultivation in Dîlga area. The field trial design and arrangement of hybrids was carried out using randomized block method, with a number of five repetitions. The fifth repetition was used for observations and analysis during entire vegetative growth period. The surface area of each plot (block) was 22,4 sqm, with a number of 116 plants per plot, of which 100 plants used for harvest, 16 representing the plants eliminated at harvest. The sowing density was 44643 plants/Ha, the distances between rows was 70 cm and 32 cm between plants on individual rows. Sowing was carried out using hand manual planters ensuring sowing uniformity, better emergence rate and took place at the end of March, beginning of April. The study of these hybrids was undertaken following specific agro-technical testing standards. During vegetative growth period, the following observations and notations were made: sowing date, emergence date, flowering date (beginning and end of flowering period), head diameter, plant height, physiological maturity and full maturity that coincide with beginning of harvest. Harvesting was carried out for each hybrid separately according to the randomization scheme. The yield value of each hybrid studied was estimated by weighing the seeds obtained from each repetition. After harvest, the humidity (moisture) of the seed was measured. Data regarding productivity was processed following variant analytical method and by calculating the following: absolute yield of seed and relative yield of seed per Ha, middle and relative error values, yield difference between the studied hybrids and check. For each hybrid, several determinations were carried out in laboratory – TWK, hectolitric mass (HM), chemical analysis for determination of oil content for each sample. Based on the observations made, the vegetative growth period for each hybrid was established.

RESULTS AND DISCUSSIONS

Based on the observations carried out on all eight hybrids studied during 2007-2008, morphological and biological characteristics for each hybrid were determined. From the data gathered, the number of days from planting to emergence varied from 12-15 days and depended on soil temperature and humidity. Germination varied between 98-100%, the plants emerged uniformly and in short period. The duration of vegetative growth period varied depending on hybrid and the differences for the same hybrid is associated to the climatic conditions for the two years. The foliar area for each plant was influenced by meteorological conditions of each year, the genotype of the hybrids cultivated and the technology used in the field. The average values for plant height show variability amongst the hybrids studied. The diameter of the head is un-significantly different between hybrids. Determination of yield elements was carried out for calculating more precisely the seed yield at standard. The data regarding the yields obtained resulting from seed weight, the minimum differences between hybrids and check, the TWK, HM, seed oil content in percentage, oil content from yield per

Ha, vegetative growth period is presented in the tables below (tables 2 and 3) and in figures 1 and 2.

Yield productivity values for the hybrids studied ranges 2180kg/ha–3301kg/ha. The values obtained are not constant throughout the years of study but normally exceeds 2000 kg/ha even under stress conditions.

The oil production for Performer variant, a Romanian hybrid is significantly distinct compared to check, and the LHA-354/12 hybrid (not a Romanian hybrid) is very significantly distinct compared to the check variant.

In 2008, the HS 2626 variant has high oil content, very significantly distinct when compared to check.

CONCLUSIONS

Based on the results of this study using eight sunflower hybrids at Dîlga Centre for Variety Testing, the following conclusions can be extrapolated:

- The hybrids studied showed high quantity and quality yield potential, good adaptability to pedo-climatic conditions of Dîlga area as result of valuable breeding programmes and complements the portfolio of sunflower hybrids cultivated in this region;
- Performer Romanian hybrid with high oil content presents a high yield value under normal climatic conditions,
- Of the foreign hybrids studied, variant LHA 354/12 showed yield values significantly higher than check variant.

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TABLES

Table 1. Temperatures and precipitation recorded at CTS Dîlga between 2007-2008

Month/year	April		May		June		July		August	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Temperature °C (monthely average)	11,7	11,1	18,4	15,4	22,4	19,2	24,2	22,5	20,3	22,3
Precipitation (total month mm)	15,8	70,3	16,2	71,3	25,0	65,0	9,3	36,8	88,61	-

Table 2. Seed Production for 2007-2008 (average yields)

SEED

Variant	Dîlga							
	2007			2008			Average seed yield	
	kg/ha	%	semnif.	Kg/ha	%	semnif.	kg/ha	%
Favorit	2676	100		2966	100		2823	100
Performer	3150	118	***	3343	113	***	3247	116
HS 2624	1865	70		2494	84		2180	77
HS2626	1424	53		3411	115	***	2418	84
MAT16934	2497	93		3007	101		2752	97
PF100	2096	78		2916	98		2506	88
LHA354/12	3475	130	***	3127	105	*	3301	118
VR0134				3033	102		3033	102
DL 5%	29,7	1,1		118,1	4		73,9	2,6
DL 1%	40,6	1,5		160,7	5,4		100,7	3,5
Dl 0,1%	55,4	2,1		216,8	7,3		136,1	4,7

Table 3. Oil Productions for 2007 – 2008 (average oil production)

OIL

Variant	Dîlga							
	2007			2008			Average oil production	
	kg/ha	%	semn.	kg/ha	%	semn	kg/ha	%
Favorit	1165	100		1290	100		1228	100
Performer	1288	111	***	1367	106		1328	108
HS 2624	819	70,3		1095	84,9		957	78
HS 2626	619	53,2		1484	115	***	1052	86
MAT16934	1036	88,9		1248	96,7		1142	93
PF 100	721	61,9		1003	77,8		862	70
LHA354/12	1418	122	***	1276	98,9	*	1347	110
VR0314				941	72,9		1322	108
DL5%	18,2	1,5		140,1	11		79,2	6,3
DL1%	24,9	2,1		190,7	14,9		107,8	8,5
DL0,1%	33,9	2,9		257,2	20,2		145,6	11,6

FIGURES

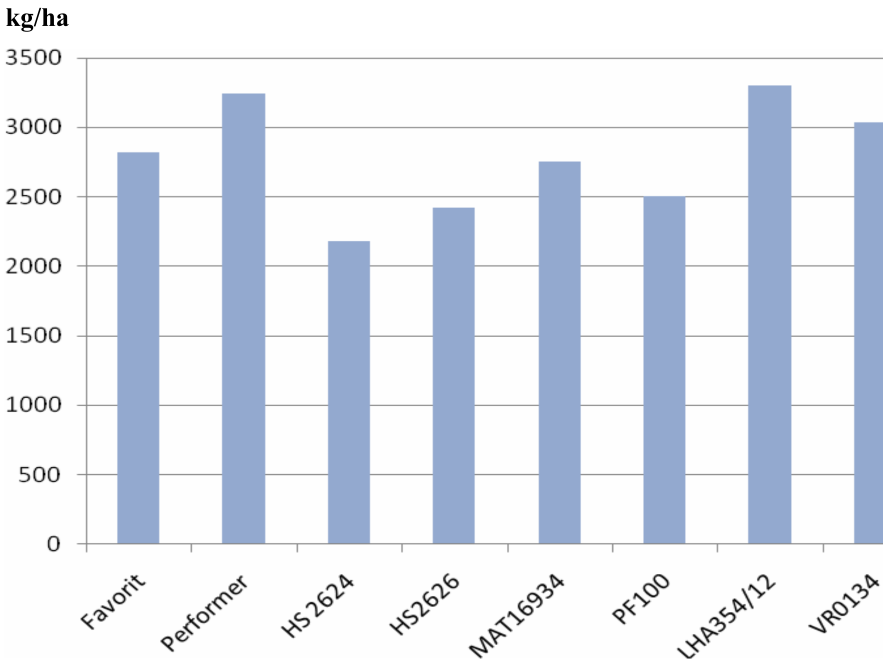

Fig. 1. Average yield per variant

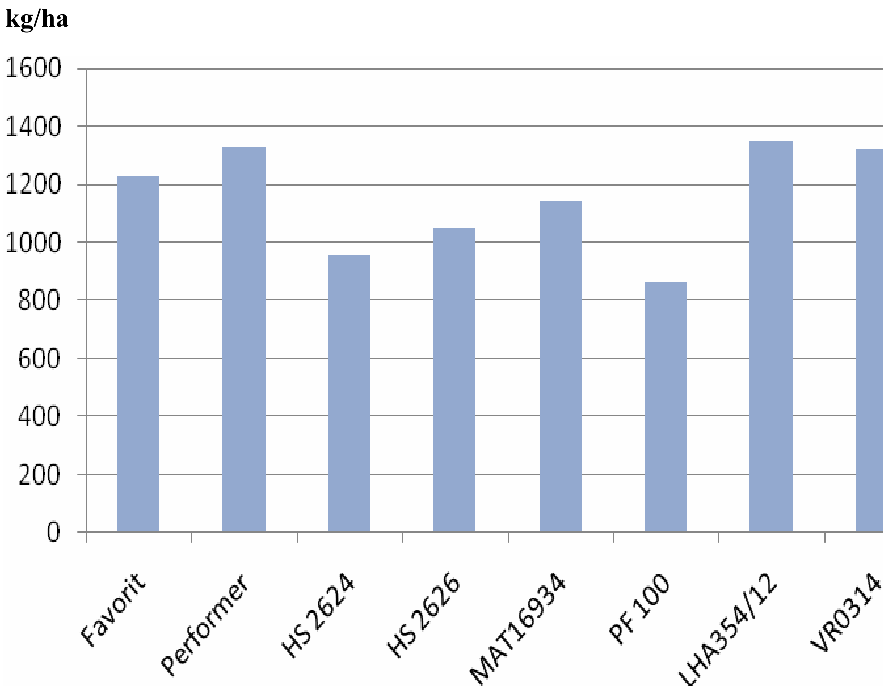

Fig. 2. Average oil production per variant

Agronomic performance of several sunflower hybrids at Centres for Variety Testing located in South-East plains of Romania

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Keywords: genetic potential, productivity, yield quality

ABSTRACT

Romania represents one of the major Sunflower growing countries, being sixth in 2006 from acreage perspective. Development in sunflower cultivation was fuelled by the increasing need for sunflower oil necessary in the food industry and other related sectors. Together with this increasing demand, new hybrids are being registered and marketed. Breeding programmes strive in obtaining sunflower hybrids targeted in providing higher seed production capacity and higher oil content. In the following study is presented the experimental results for several sunflower hybrids analysed in the south-east plains of Romania at the Centres for Variety Testing Dîlga, Cogealac, Râmnicu Sărat and Mircea Vodă.

INTRODUCTION

In Romania, sunflower is cultivated in different areas, o large surfaces, with favourable cropping conditions. The yield potential for sunflower crop is frequently diminished due to low humidity, condition that can only be ensured under irrigated conditions and due to certain soil types with physic-chemical composition unsuitable for sunflower cultivation on increasing land areas in the last years. For sunflower crop, six different areas for cultivation have been established, the south-east region representing area I. This area ensures optimum conditions needed for sunflower such as temperature for April-August (16-19.5°C) and needs with regards to humidity ensured through irrigation. Taking into consideration that annually new hybrids are introduced on the market and older inadaptable hybrids, those that for certain reasons do not correspond to current agricultural practices are taken off the market, in establishing a hybrid portfolio several factors must be taken into consideration such as behaviour with regards to limitative factors that affect yield and quality, and specifically focused to negative meteorological phenomenon's, diseases and pests. Pedo-climatic conditions in the south-east region of the Romanian plains can determine for the same sunflower hybrid/line variations in yield and oil content with values ranging from eight to ten percent.

Within this context, this study finds it place, under pedo-climatic conditions of south-east plains of Romania for which we have proposed to analyze the agronomic behaviour of several sunflower hybrids under field trial conditions at four Centers for Variety Testing located in this region. In obtaining concluding results, the study was carried out for two consecutive years (2007-2008), with climatic conditions varying from less favorable in 2007, to favourable in 2008. The meteorological elements that have characterized the weather during the two years of study for the Centers located in the south-east region of the Romanian plains are as follows: the centre for Variety Testing Dîlga is located in the centre of Baragan plains, Călăraşi county. The soil type for Dîlga centre is cernoziom, loam clay, with a content of 32-38% loam, 35-40% sand, middle soil texture, and freatic water level at 6 m depth. This area is located at 50-51 meters average altitude. The average annual temperature is 11,1°C, and the annual temperature variation in relation to average value of 21-23°C. During the summer, the temperature rises reaching around 30°C. In 2007, the average temperatures for the months of April-August, that characterise vegetative growth for sunflower were 19,4°C and precipitation amounted for 154,9mm. Temperatures and precipitation values varied during vegetative growth period. Precipitation value for April-July amounted for 65,1mm while in August this value was 88,9mm. The average temperature for June-July exceeded 24,4°C. 2008 was a favourable year for sunflower cultivation. Precipitation values for months of April and May amounted for 140mm, while for the months of June-July this value was 100mm. These values for precipitation ensured high yield for all sunflower hybrids analyzed. The average temperature for April-August was 18,1°C. The Centre for Variety Testing Cogealac is located at 48-56m altitude, average annual temperature of 11,2 and temperature variation in relation to average value of 25°C. The soil type for Cogealac centre is characteristic cernoziom oak carbonated, with a content of 65-70% sand and 11-15% loam, middle soil texture. In 2007, the amounted precipitation value during vegetative growth period was 142,5mm, and the average monthly temperature for April-August was 19,76 °C. In 2008, the precipitation values for April-August amounted for 253mm and the average temperature values for these months was 18,6°C. The study of sunflower hybrids at Mircea Vodă Centre for Variety Testing was carried out in 2008. The soil type at this centre is cernoziom chocolate, clay-loam. In 2008, the amounted precipitation value during vegetative growth period was 166,5mm, and the average monthly temperature for April-August was 18,6°C. At the Centre for Variety Testing Râmnicu-Sărat, the sunflower hybrids were studied during 2007-2008. The soil type at Râmnicu-Sărat is sandy-loam and the freatic water level is at 3,5m depth. In 2007, the average temperatures for the months of April-August was 21,0°C and precipitation amounted for 354,6mm. In 2008, the precipitation values for April-August amounted for 304mm and the average temperature values for these months was 20,7°C. The data obtained during this study was assessed using variant analytical method taking into consideration year-variant factors.

MATERIALS AND METHODS

The trials conducted at all four Centres for Variety Testing were undertaken using sunflower hybrids including Romanian and foreign varieties. The check hybrid used was Favorit that is a representative hybrid for cultivation in south-east region of Romanian plains. The field trial design and arrangement of the hybrids was carried out using randomized block method, with a number of five repetitions. The fifth repetition was used for observations and analysis during entire vegetative growth period. The surface area of each plot (block) was 22,4 sqm, with a number of 116 plants per plot, of which 100 plants used for harvest, 16 representing the plants eliminated at harvest. The sowing density was 44643 plants/Ha, the distances between rows was 70 cm and 32 cm between plants on individual rows. Sowing was carried out using hand manual planters ensuring sowing uniformity, better emergence rate and took place at the end of March, beginning of April. The study of these hybrids was undertaken following specific agrotechnical testing standards. During vegetative growth period, the following observations and notations were made: sowing date, emergence date, flowering date (beginning and end of flowering period), head diameter, plant height, physiological maturity and full maturity and vegetative growth period. Harvesting was carried out for each hybrid separately according to the randomization scheme. The yield value of each hybrid studied was estimated by weighing the seeds obtained from each repetition. After harvest, the humidity (moisture) of the seeds was measured. Data regarding productivity was processed following variant analytical method and by calculating the following: absolute yield of seed and relative yield of seed per Ha, middle and relative error values, yield difference between the studied hybrids and check. For each hybrid, several determinations were carried out in laboratory – TWK, hectolitric mass (HM), chemical analysis for determination of oil content for each sample.

RESULTS AND DISCUSSIONS

This study regarding several sunflower hybrids carried out during 2007-2008 showed difference in hybrid value and variation depending on the location of the trial. The table below shows the value in numbers of the hybrids analysed for each Centre for Variety Testing (table 1).

From this study regarding the behaviour of several sunflower hybrids in four different Centres for Variety Testing, the following information can be extrapolated: the yield capacity of the different hybrids studied varied from 2180 kg/ha to 4372 kg/ha. The hybrids recommended for the different areas studied does not ensure constant yields each year, but show good resistance to drought and disease and guarantee yield of over 2500 kg/ha. The content in oil is relatively high and the variants LHA354/12, HS2624 and HS2626 have proven to be significantly distinct when compared to check hybrid.

The hybrids recommended for the south-east regions of Romanian plains have a high yield potential ensuring good optimisation of weather conditions and agro-technology relevant for yield of over 2500 kg/ha.

Regarding the production of sunflower oil per hectare, the average value for the two years show that MAT16934 and LHA354/12 hybrids with high production value, significantly distinct. The HS 2626 hybrid performs well at Rm. Sărat Centre and M. Vodă Centre with production value significantly distinct when compared to check.

CONCLUSIONS

Based on the results of this study on several sunflower hybrids at four different Centres for Variety Testing located in south-east region of the Romanian plains, the following conclusions can be extrapolated:

- The experimental results show that for the south-east region of the Romanian plains the most valuable hybrids are: Performer, HS2626, MAT16934 and LHA 354/12 that in normal climatic conditions and under good agro-technical conditions can present yields of 2800-4000 kg/ha;
- For the area studied, PF100 hybrid presents interest which in Cogealac, Rm. Sărat and M. Vodă Centres shows yields significantly to very significantly distinct when compared to check hybrid;
- When using good agronomic and good crop rotation practices specific for this crop type, we consider that the sunflower hybrids cropped in this region correspond to the specific requirements for sunflower hybrids.

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TABLES

Table 1. Average yield (2007-2008)

Varianta	Dîlga			Cogealac			Rm. Sărat			M. Vodă		
	kg/ha	%	Semn.	kg/ha	%	Semn.	kg/ha	%	Semn.	kg/ha	%	Semn
Favorit	2823	100		2435	100		2548	100		3385	100	
Performer	3247	116	***	2408	97		2705	108	**	3657	108	*
HS2624	2180	77		2572	106		2150	88		3327	98	
HS2626	2418	84		2629	107	*	2896	120	***	4325	128	***
MAT16934	2752	97		3141	126	***	2585	105		4186	124	***
PF 100	2506	88		2658	107	*	2710	108	**	3811	113	***
LHA354/12	3301	118	***	2887	117	***	3302	135	***	4372	129	***
DL5%	73,9	2,6		146,8	6,3		135	5,5		202	6	
DL1%	101	3,5		200,5	8,6		185	7,5		275	8,1	
DL0.1%	136	4,7		217,9	12		250	10		371	11	

Table 2. Average oil production (2007-2008)

Variant	Dîlga			Cogealac			Rm. Sărat			M. Vodă		
	kg/ha	%	Semn.	kg/ha	%	Semn.	kg/ha	%	Semn	kg/ha	%	Semn
Favorit	1228	100		1069	100		1050	100		1577	100	
Performer	1328	108	*	1011	95		987	94		1452	92	
HS2624	957	78		1227	115	**	860	87		1630	103	
HS2626	1052	86		1184	111	*	1126	107	***	1925	122	***
Mat16934	1142	93		1376	129	***	1057	101		1951	124	***
PF100	867	70		1002	94		870	83		1422	90	
LHA354/12	1347	110	***	1230	115	**	1314	125	***	1884	119	***
DL 5%	79,2	6,3		139,1	11		46,9	3,7		104	5,3	
DL 1%	107,8	8,5		190,4	15		64,2	5,1		142	7,2	
DL0,1%	145,6	11,6		259,5	20,5		87,5	6,9		193	9,8	

Table 3. Main seed characteristics and vegetative period of the hybrids studied

Hybrid	Dîlga			Cogealac			Rm. Sărat			M. Vodă		
	MMB (g)	MH kg/l	per veg (days)	MMB (g)	MH kg/l	per veg (days)	MMB (g)	MH kg/l	per veg (days)	MMB (g)	MH kg/l	per veg (days)
Favorit	51	38	109	53	40	112	63	37	104	70	39	124
Performer	60	36	108	56	37	112	70	34	102	72	35	126
HS2624	48	40	108	52	41	112	53	38	105	67	39	127
HS2626	50	40	113	57	40	116	63	38	107	72	38	126
MAT16934	53	37	108	49	39	110	61	39	101	65	39	125
PF 100	62	38	108	69	40	111	75	37	105	73	41	124
LHA354/12	48	39	107	57	41	112	53	41	102	59	42	124

FIGURES

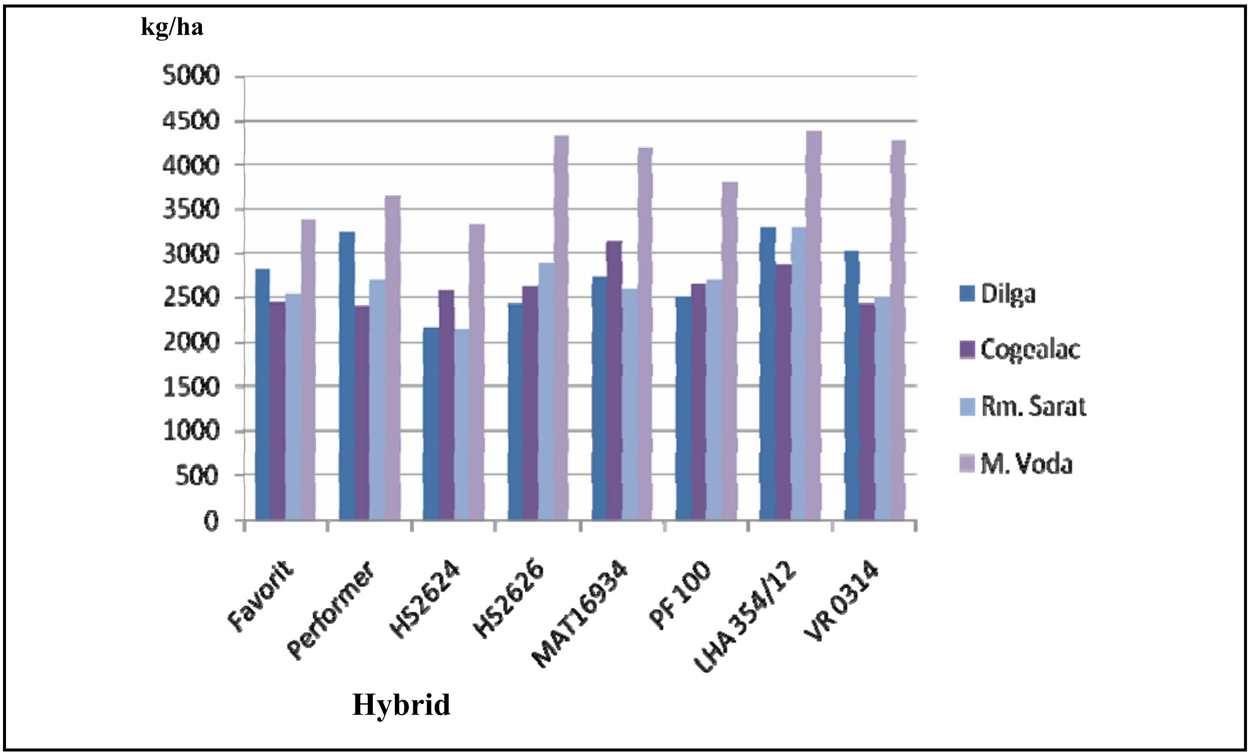

Fig. 1. Average yield per Centre

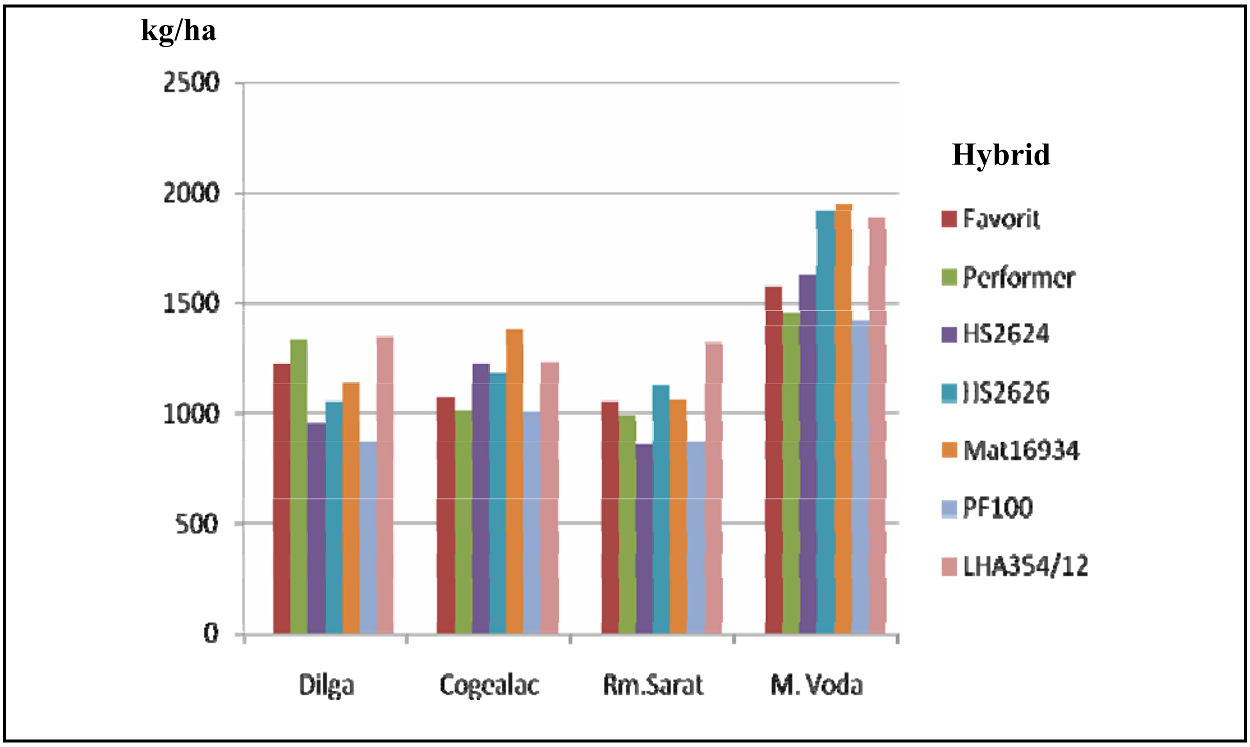

Fig. 2. Average oil production per Centre (2007-2008)

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Bioindicators, a method for investigating the existing pollution in an area

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Keywords: lichens, bioindicators, eco-monitoring, transplanted bioindicators, micobiont, phycobiont

ABSTRACT

An efficient method of monitoring the environment is the biologically active monitoring, which consists in observing the transplanted bioindicators, for the purpose of the ecological indication, mostly in the regions where bioindicators lack or which are poor in forest areas. The epiphyte lamellar lichens have been used, their thalluses together with the sublayer have been separated from the host-tree or branches with lichens have been collected, which have then been distributed in the examined area. Undegraded lichens samples were chosen, having approximately the same size, being in the same development stage, all of them growing in the same place. The choice of the area and the transplantation stations resulted from the real location of the green areas, taking into account the placement of the pollution sources, the wind rose and the perspectives of extending the afforested areas from the examined region.

Following the studies it has been noticed the great capacity of the lichens to accumulate the heavy metals existing in the air, which proves their use in the active monitoring of air quality. Under the influence of the pollutants, the transplanted bioindicators have decreased in size, have changed the colour and the aspect. Taking into account the results and the influence that the heavy metals might have on the people's health, the extension of the green areas would be very useful. The urbanization and the industrialization are affecting and negatively influencing the diversity of the animals. In the investigated areas 20 lichens species have been found. According to an evaluation made on the diversity, abundance and tolerance to toxicity, of all the examined areas, the indicatory species, the influence of the different geographical conditions, the placement of the pollution sources and their emissions spectrum leave their mark on the environment. The man only can improve the environment conditions and ecologically purify the environment and the nature.

INTRODUCTION

The ecological, structural and anatomical particularities of the lichens, which induce a high sensitivity to pollutants, suggest the possibility of investigating the quality of the environment components in various domains through these groups of organisms. The lichens are believed to be „vegetative pioneers”, as they are among the first which install themselves on the denuded places.

The lichens are complex organisms, according to their origin they are symbiotic, and consist of two main components: the micobiont (fungus) and the phycobiont (the alga), which, on their turn, are reciprocally providing themselves with the necessary substances in order to live. The photosynthesis function is carried out in this organism by the phycobiont, and the mineral nutrition function is carried out by the micobiont. In this symbiosis the micobiont is protecting the phycobiont from dryness and from extreme temperatures.

The water absorption by the body is a simple physical process similar to the water absorption by the filter paper. The lichens are capable to absorb water in high quantities, usually up to 100-300 % of the dry volume of their body. The minimum water quantity existing in lichens, in normal conditions, represents approximately 2-15 % of the dry volume of the organism. The water is also eliminated quickly out of the organism. Under the influence of the solar energy, after 30-60 minutes, the water-saturated lichen looses all the water and becomes fragile, meaning that the water quantity inside the organism becomes lower than the minimum necessary quantity for an active photosynthesis.

The lichens high ecological plasticity is also obvious regarding their distribution depending on temperature and lightness, being placed in the dessert and on the rocks but also in forest shady areas.

An important constituent in lichens nutrition is the nitrogen. The lichens which have as phycobionts *the green algae* (most of them) react to the nitrogen compounds from the watery solutions when their organisms impregnate with water. A small amount of the nitrogen compounds is probably taken by the lichens from the underlayer. The nitrophil lichens (*Xanthoria, Physcia, Caloplaca, etc)* grow in places full of nitrogen compounds – on the rocks, on trees trunks. The lichens which have as phycobiont the *blue-green algae* are able to fix the air nitrogen, as this type of algae has this ability. These species (of the *Collema, Leptoghium, Peltigera, Lobaria type, etc)* absorb the air nitrogen quickly and effectively. These lichens often grow on the underlayers, which are poor in nitrogen compounds. A significant part of the nitrogen which is fixed by the alga is directed to the micobiont and only a small part is used by the phycobiont itself. The micobiont existing inside the lichen has an active control over the assimilation and distribution of the nitrogen compounds which have been taken from the atmosphere by the phycobiont.

The environment monitoring system, depending on the organism's reaction to the pollutants action, is called biological monitoring, which includes the assessment and forecast of the changes of the ecosystems and their elements.

The passive monitoring consists in observing the bioindicators and their modifications in their natural environment under the influence of the exterior agents and pollutants.

There are groups of substances which influence the lichens growth. The first group includes the sulphur dioxide, the nitrogen oxide, the fluorine and its compounds, after their eduction into the atmosphere. The second group of compounds results from the chemical reactions, which include the elementary pollutants, carried away by the air (ozone), certain compounds of nitrogen, acid rains. The third group includes the industrial organic compounds, pesticides, heavy metals and metalloides.

The characteristics examined for the lichens have been the following: the total number of lichens on a certain area, the variety of species, the average quantity of each lichens species on a bole until 1,3 m high, the dominant species, etc. It has been noticed the fact that the dust particles which contain heavy metals fall closer to the pollution source, while SO_2, HF and NOx have a bigger spread range. It is precisely the gas pollutants that have the most negative impact on the lichens, being important the distance and the increase of the toxic level, which generates quick changes for the lichens.

The researches showed that the intrusion of HM (heavy metals) into the lichens thallus is a passive process, based on the physical and chemical properties of the membrane and which do not get to the metabolic processes. The HM embedment is directly proportionate to the pH and to the metal's concentration and, indirectly, to the environment temperature, lightness, oxygen concentration and the action of the various stopping agents (the ferments of the glycolysis, the tissues respiration and the photosynthesis do not take part to the HM embedment process).

The lichens are good HM collectors because the epiphyte lichens in general absorb from the atmosphere all the necessary elements for their vital activity; the lichens thallus is open during all its life for the elements found in the atmosphere; the size of their absorption open surface is 20-100 times bigger than the superior plants; they are organisms who live long time, they are active during all year long, they have pretty stable characteristics and are able to gather significant quantities of elements in their layers, without causing a visible damage for them.

The active monitoring consists in examining the transplanted bioindicators from one area to another and has the following advantages and disadvantages:

<u>The advantages</u> of this method for air monitoring are as follows:

1) the possibility of placing the bioindicating lichens in the examined area, even where they are missing due to various reasons:
2) the possibility of using a necessary quantity of bioindicators in order to get a precise monitoring and to examine the respective area;

3) the possibility of placing in control points the material gathered from regions having known natural conditions, which allows for a correct interpretation of the results;
4) the possibility of choosing the relevant representatives of a certain species;
5) the possibility of recording the pollution increase levels, which influence the bioindicators disappearance.

The disadvantages of transplanting are as follows:

1) the frequent destruction of the transplanted bioindicators by the local people;
2) transplanting the organisms from a habitual environment to another having new conditions can sometimes have a negative reaction towards the pollutants and might not coincide with the indications of the „domestic" bioindicators.

MATERIAL AND METHODS

Examining the vegetation is a complex procedure which represents not only a technique, but also a scientific research. This is why the lichens distribution has been recorded around the pollution sources, taking into account the regular spectrum of the existing species in various areas and each species specific frequency in the respective areas, the two characteristics being determined by the particular sensitiveness to pollution of each species.

The rates of the meteorological factors (the movement of the air-masses, values of temperatures, air humidity, solid suspensions, foul gases) have been taken from the data provided by the county competent institutions.

The intensity of the road traffic has been determined according to the regular methodology, partly on the main streets, for 10 minutes/1 hour, taking into account the rush hours (depending also on the season).

*The species frequency (**F**)* specifies in percentage the samples number found for a species towards the total number of samples collected. It is calculated by the following formula:

$$\mathbf{F = p/P * 100\%},$$

where:

F – frequency;
p – number of samples found for a certain species;
P – total number of examined samples.

The visual examination of the species *abundance* has been made based on different levels: **0** – absent; **1** – rare and dispersed; **2** – less rare; **3** – abundant; **4** – very abundant.

The minimum prominence surface of a plant formation, consisting in the examination of all plants species, represents a sample surface called *testifier.* The testifier's number depends on the area's surface. It can measure 1 sqm in case of the lichens growing on the rocks and in soil or even less (0,5 sqm) on the trees barks. The testifier's shape and size depend also on the area's climate.

Collecting, conserving, determining and preserving the species of indicating plants

The lichens can be collected all year long, especially during the rainy periods, when their thallus impregnates with water and gets the specific shape of the respective species. The samples are collected by using a special knife, which allows the separation of the thallus from the woody underlayer or by using other tools for those growing on the rocks. It is necessary to collect both the thallus and the fructifying parts of the organism, using the eye glass - soredia, etc. The collected samples will be put in envelopes or paper-made packages having the size of 25 * 15 cm. The wet material will be dried out in airy rooms. Each sample will have its own label, indicating the collecting place, vegetation type, and host underlayer, altitude above the ground, soil's particularities, brightness, date, and collector's name.

The laboratory experiment starts by observing the sample, determining the colour, type of ramie. It has sometimes been necessary to section the thallus, which has been examined using the eyeglass or the microscope. Chemical reagents have been used, which, depending on certain lichens acids, give different colours to the thallus, of which we mention:

1. KOH – 5 % or 10 % KOH solution dissolved in water can give the red, yellow or brown colour.
2. Lime water (calcium hypochlorite) – $CaCl_2O_2$ concentrated solution dissolved in water. It will be kept for a week in black, well closed tableware. Some species make the thallus green.
3. Iodine – watery solution having 10 % iodine in KI (K+I) or iodine alcoholic solution. It is used more often for sections, making them blue, which in time it will turn red. The organism's colour is more obvious in fresh samples or shortly after collecting them, due to the chlorophyll quality.

Quantity: it is usually collected enough material to be transplanted.

Lichens transplanting and examination methods

Undamaged lichens samples will be chosen for being transplanted, if possible having the same size and the same development stage. The layer's quality will be strictly controlled before transplanting. In order to do that, all lichens species will be laid down one next to the other, will be water-sprayed and then examined very carefully, the affected thalluses being removed, meaning those species whose colour is not green when filled with water. The larger samples will be chosen for a similar quality.

Various lichens transplanting methods are known, more often being used the method of fixing the transplanted bioindicators on trees trunks with thin metallic wires. The samples consist in lichens thalluses separated together with parts of dead exterior tissues of some typical tree trunks from the spontaneous forest, on which they grew. The maximum altitude for placing the samples on the trunks will be about 2 m from the ground. The trees, buildings and other objects can block the air-masses flow, this is why the transplanted bioindicators will be placed to a distance of more than 15 m from these. The transplanted bioindicators must have the same sense of direction towards light during the study period. The transplantation duration and the observations frequency will be determined by reckoning and by choosing the fixed and examined symptoms and characters. The transplanted bioindicators will be measured and photographed every month, but this lapse can vary depending on the character of the obtained data. In order to fix the exterior changes, more precisely the changes regarding the deterioration of the underlayer, the lichens will be photographed before transplanting them, according to the stipulated conditions. The photos will be taken from the stand, for an equal brightness, using the flash light. In order to compare the data it is necessary to use during the entire examination period the same camera and the same photo film. Before each photo is taken the lichens will be sprinkled with distilled water and one will wait (about 5 min.) until the water drops disappear from the lichens layer.

The most simple evaluation methods of the new conditions actions on the transplanted lichens thalluses are the following: estimation of the death rate or of the vitality of the transplanted layers, as well as the organism's structural changes (colour, layer's thickness, reproduction organs aspect, etc.). In order to determine the colour one can use special tables. The change of the exterior aspect of the transplanted layers will be assessed visually, the tools being used to measure the damaged parts of the thalluses.

RESULTS AND DISCUSSION

The lichens structural particularities from the examined area are directly influenced by the natural conditions specific to the forests existing in an inhabited plain, having villages and towns, cultivated fields and rivered by running waters and dead-waters. Thus, away from the inhabited places, where the lichens enjoyed better living natural conditions, one can find various species having lamellar and other type of thalluses. Near the inhabited or industrial areas one can find various lichens (which in natural conditions grow on trees) on fences, roofs, calcareous rocks (because these underlayers have a more alkaline pH), trees parts (stumps, fallen branches, sawdust, which absorb the humidity better) and on trees species known as good hosts for lichens - *Ulmus laevis*, *Fraxinus excelsior*, *Tilia cordata*, *Populus alba*, etc. (deciduous trees species which usually grow in forest regions and which, by their leaf canopy, can influence the existence of the light-loving lichens species).

The lichens species the most sensitive to air pollution (mostly the pollution with SO2, Nox, heavy metals, etc) are those with other types of thalluses, followed by those with lamellar thallus, and the most lasting ones are those with crusted thallus, well stuck by the undelayer. A large number of species having other types of thalluses have been noticed in the examined areas, at the outskirts of the inhabited regions (for ex.-*Ramalina fraxinea*, *Evernia prunastri*, *Ramalina farinacea*, *Hypogymnia physodes*, *Usnea hirta*, *Evernia prunastri*, *Ramalina farinacea)* and also the species having crusted thallus – in the southern parts of the area (for ex. *Arthopyrenia alba*, *Bacidia luteola*, *Lecidea glomerulosa*).

Nitrogen-loving lichens : the fact that the most common species are *Xanthoria parietina*, *Physcia ascendens*, *Ph.caesia*, *Ph.grisea, Ph.orbicularis,* which are nitrogen-loving species, indicate an increased atmospheric concentration of nitric oxides, which would have to be confirmed by the subsequent researches.

The host: it is important to note that green areas with older trees (having a more developed leaf canopy, a sterner bark, which can preserve the water resulted from the rains among their cracks) have more lichens species than the green areas with younger trees. It is the case of the forests central areas, where the biggest number of lichens has been noticed – 20 species, in comparison with the small number of lichens noticed in the marginal places. The poor abundance and diversity of the lichens species growing in certain ecosystems is also a consequence of the fact that the stand is too young and the lichens barely start to grow on the trees trunks.

CONCLUSIONS

The examinations allowed the division of the air pollution level (according to the species diversity and the bark's coverage degree with lichens) in 3 different areas: polluted, moderately polluted and uncontaminated. The following have been considered as being negative factors on the lichens vitality: the SO_2 influence on photosynthesis and on lichens respiration process, the intense traffic, the area, the low humidity degree, the young trees, etc.

The study of the transplanting bioindicators is especially used for determining the impact of certain separated sources of pollution of the atmosphere. The transplanting method allows for the record of the temporary changes of the lichens structure, growth and physiology. The change degree and the duration of these modifications can give, in general, different aspects of the pollution level. The lichens which grow in different underlayers can be used, but the lamellar lichens are used more often, which grow on the trees bark.

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The agriculture workforce in Bihor County

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Keywords: human resources, agrarian holding, the male and young workforce drain.

ABSTRACT

This research represents an analysis of the population structure involved in the Bihor county agriculture. There are made some reproof of the 2001-2008 period, over the entire population occupied in the agriculture and on genders, over the incomes achieved by the population of the Bihor county and the workforce administration. Concerning the reproof, the workforce of this county beared the consequences of the feminization and aging process and there are necessarily taking measures of renewing the workforce of this national economical sector.

INTRODUCTION

From all factors that are the basis of the agrarian production process, the human resources play a significant role. The role of the workforce in the agrarian domain is really important because a good coordination and work have a positive influence over the production results.

The human resources have an important role in the operation of the means of work and modern technologies. There takes place the work process rationalization and represent the significant factor of the agrarian activities.

General presentation of Bihor County

Bihor County is situated in the North-Western part of the country, being bordered in the Eastern part with the Carpații Orientali and in the South-Western part with the Munții Apuseni.

S = 7.544 km^2 (sixth place)

The geographical position of the Bihor county is favorable, in the western part is situated Hungary and it owns seven customs.

The Bihor county region is characterized through a variety of geomorphology: mountains, hills, plains.

The relief allowed the development of a diversified agriculture: in the mountains region there was developed animal husbandry, in the hills region the viticulture, fruit trees growing.

The agricultural land represent 65,9% of the Bihor counties' resources.

The land fund's structure at the 1rst of January 2008 in Bihor County:

- agricultural land 65,9%
- forests 26,1%
- mountains 3,0%
- roads and railroads 1,9%
- waters, ponds 1,8%
- other lands 1,3%

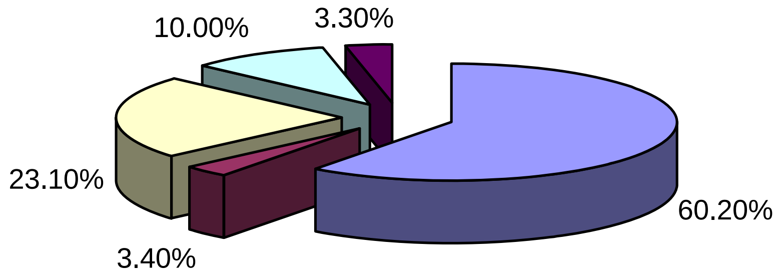
The agricultural areas' structure at the 1rst of January 2008 in Bihor County:

- arable land 62,3%
- pastures 27,4%
- hayfields 9%
- orchards 0,9%
- vineyards 0,4%

The incomes structure:

- gross salaries and other salary rights 60,2%
- incomes from non-agricultural independent activities 3,4%

- incomes from social provisions 23,1%
- other incomes 10,0%
- incomes from agriculture 3,3%



The human resources administration of the Bihor County's agriculture

Human resources represent a person or a group of persons who owns physical and psychical work capacity. These abilities might be externalized in the working process, in a socio-economical system.

Like any other resources, the human resources need a specific management.

The main features of this management are:

- the working processes are combined with biological processes
- the human resources administration is very complex and must be handled as a part of a strategy of the agrarian units
- the importance of the human factor in the agrarian is settled by the following aspects:
  - ➢ is the only values producer
  - ➢ represents the most dynamic and movable element participating directly by production improvement
  - ➢ is the only one that enhances its own work capacity, develops the experience
  - ➢ influences really hard the efficiency of using the material and financial resources
  - ➢ has an important share in the entire products' cost (more than 25% depending on the species, crop, growing system etc.)
  - ➢ creates social aspects especially in the small and medium units
  - ➢ represent the domain where the quality and the structure have a mainly influence over the production quality.

Taking into consideration these human resources aspects, an important necessity in working and development of the agrarian units in Bihor County is considered a correct management.

In Bihor county, the percentage of the women involved in the agrarian activities is high (53% in 2008) and the improvement of the workforce in agriculture (in 2008, 55% of the workforce is older than 50 years) lead to a complex workforce management (table nr. 1).

Table 1 - The population involved in agriculture, between 2001 and 2008, on genders: (thousand persons)

Activity	**2001**		**2006**		**2007**		**2008**	
Entire involved population	Entire 281,2	Women 143,5	Entire 272,7	Women 134,0	Entire 273,2	Women 136,5	Entire 278,1	Women 132,5
Agriculture, forestry	127,0	65,5	94,7	49,6	89,1	47,2	87,0	46,0

CONCLUSIONS

For the human resources management there must be taken into consideration:

- the development of some coherent objectives and policies concerning the human resources
- workplace finalization
- the recruitment and selection of new employees through mediation of the Employment County Agency
- training and improvement of the personal through classes organized by D.A.D.R. and O.J.C.A.

The male and young workforce drain from the Bihor County agriculture to the cities situated in Bihor County or even in the foreign countries led to a feminization and aging process of the workforces involved in agriculture. These processes, uncorrelated with mechanical means have a negative influence over the work productivity level, the work quality, the production and the incomes level.

Nowadays, the right human resources management is considered a strategic action, vital for the agrarian activity success.

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Correlation between the amount of active dry yeast and compressed yeast following the variation of the viable cells number

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Keywords: active dry yeast, compressed yeast, autolised cells, autolisis level

ABSTRACT

The fermentative activity of the bakery yeast- an important parameter of quality in obtaining finished quality products- is mostly influenced by the viable cells number of the used samples. This number depends on commercial type of yeast that is used.

The aim of this study was to establish the corellation between the amounts of different commercial types bakery yeast in terms of the viable cells number. In this study 2 types of commercial types of *Saccharomyces cerevisiae* yeast were used for determination: active dry yeast and compressed yeast.

MATERIAL AND METHODS

According to the classification made by Hansen in 1904, common bakery yeast attends to *Saccharomyces cerevisiae* species and is a superior fermentative yeast that attends to *Saccharomyces* genus *Saccharomycetaceae* familly, *Endomycetales* order, *Ascomycotina* subdivision (Bordei, 2000).

Together with flour, bakery yeast is the fundamental raw material used in bakery industry.

The strain of *Saccharomyces cerevisiae* yeast known as bakery yeast was firstly standardized and obtained on an industrial scale in 1868 by Charles Fleischmann.

Bakery yeast, facultative anaerobe used in baking process as an agent of biochemical breaking up of the dough can metabolise simple saccharide by anaerobic path (fermentation) or by aerobic path (respiration) depending on the conditions from the dough medium (Maloney et al.).

Because the fermentative activity of the yeast commercial types is very important to bakery industry it is necessary to know the viable cells number from a yeast sample.

Normally in practice the bakery industry doesn't determine this viable cells number, therefore in this paperwork it tried to establish the correlation between yeast amount and the viable cells number that are responsible for the initiation of the fermentative process.

For experiments it were used two commercial types of *Saccharomyces cerevisiae* yeast: compressed yeast and active dry yeast having the chemical proprieties (Table 1).

The concentration of yeast starter cultures was established according with the concentration of viable cells determined by direct microscopic examination of yeast cells in suspension in solution of blue methilen with citrate. The principle of this technique is that blue methilen diffuses both in living and autolysed cells, but in the living cells the reductase enzymes catalyze the reduction reaction by which the redox indicator is reduces to a colourless leucoderivative. By using Thoma cytometer were evaluated the number of viable cells expressed as colony units forming (CFU) per gram starter cultures, and ration of autolysed cells both in compressed yeast (Table 2) and active dry yeast respectively (Table 3).

RESULTS AND DISCUSSION

On market there are several commercial types of yeast which differs in their dry matter content.

Depending on commercial type, bakery yeast can have different dry matter values. It can be appreciated that 94% of yeast dry matter is compound of the main elements: carbon, hydrogen, oxygen and nitrogen from saccharide (glicogen, hemiceluloses, chews), proteins, nucleic acids, organic basis, lipids, mineral substances, vitamins and enzymes.

The carbon content of a yeast with 27% dry matter is about 12,7% and it serves as a base for the calculation of saccharide requirement for yeast biomass accumulation (Pointrenaud).

Almost 70% of total yeast nitrogen amount is included in proteins, 8-10% in purinic basis, 4% in pirimidins and nucleotides. Starting from the nitrogen content of the yeast, it can be established the inquiry of nitrogen substances for the mollasse correcting that is poor in nitrogen.

The yeast contains some important quantities of vitamins especially from B vitamin group.

Chemical composition differs very much from specie to specie and it is influenced by physiological grade and by corresponding stage of the cycle growth.

Reed and Nagodarithana (1991) reported that the mineral content of yeast cell is about 5-10% correlated with dry matter.

The data resulted from counting of the cells number from studied samples were registries in Table 2 for compressed yeast and in Table 3 for active dry yeast.

During fermentation process, the bakery yeast consumes the dough saccharose, resulting carbon dioxide and ethanol as primary products depending on the yeast fermentative activity. Because of the technological process that is used for yeast manufacturing, some transformations take place which conduct to the modification of yeast viable cells number that are experimentally established using Thoma cytometer for counting the total number of viable cells, budding cells and autolised cells for yeast samples that were used (Table 4) (Thorn et al.).

CONCLUSIONS

In order to make a correct comparison between yeasts fermentative activities it was necessary to establish the amounts equivalence of yeasts in order to work with the same cell number of starter strain, no matter of its form (compressed or active dry).

So in order to establish exactly the amounts of yeast that will be used in practice it calculated the viable cells number for the studied yeast types using blue methilen technique.

For the amounts of yeast that follow to be used in bakery industry must be kept this proportion: compressed yeast/active dry yeast=3:1 (w/w) established in terms of cells number/g yeast dry matter.

Number of cells/g compressed yeast dry matter/Number of cells/g active dry yeast dry matter= $(23,47x10^8)/(7,80x10^8)=3$

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TABLES

Table 1. Chemical, biochemical and organoleptic features of the yeast samples used

Bakery yeast	Compressed yeast	Active dry yeast
Chemical features		
Humidity,%	67,48	6,5
Dry matter, %	32,52	93,5
Protein content, % dry matter	40	42
Biochemical features		
Leavening dough capacity at fermentograpf Emission of ml CO_2 in 1,2h of fermentation and total	740/1190/1930	1000
***E. coli*, CFU/g**	<100	<100
Coliforms, CFU/g	<10000	<10000
Moulds, CFU/g	<100	<100
Organoleptic features		
Aspect	Compact mass, smooth surface, not sticky	Dry granular mass, without agglomeration, with granule between 1-3 mm
Consistency	Dense	Hard, easy breakable
Colour	Beige, light brown with yellow shade, uniform mass	Light beige
Smell	Characteristic without moulds smell, putrefaction or other strange smell	Characteristic without moulds smell, putrefaction or other strange smell
Taste	Characteristic, without bitter taste or other foreign taste	Characteristic, without bitter taste or other foreign taste
Foreign matters	none	none

Table 2. Number of cells numbered for compressed yeast

	Field 1	Field 2	Field 3	Field 4	Field 5	Field 6
Total number of cells	42	47	47	48	41	47
Bud cells	-	-	-	-	-	-
Autolised cells	-	1	1	4	1	-

Table 3. Number of cells numbered for active dry yeast

	Field 1	Field 2	Field 3	Field 4	Field 5	Field 6
Total number of cells	41	47	35	42	52	38
Bud cells	-	-	-	-	-	-
Autolised cells	3	8	1	4	3	7

Table 4. Biologic characteristics of starters

Yeast strain	Biologic characteristics of starters			
	Total number of cells/g dry matter starter (Nt)	**Budding**	**Total number of autolised cells/g dry matter starter (Na)**	**Autolysis stage %Na/Nt**
Compressed yeast	$23{,}47\ 10^{8}$	No budding cells were registered	$0{,}\ 604\ 10^{8}$	2,5
Active dry yeast	$7{,}80\ 10^{8}$	No budding cells were registered	$0{,}796 \times 10^{8}$	10,2

Studies regarding alcoholic fermentation of glucides extracted from Sweet Sorghum using *Zymomonas mobilis* different strains

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ABSTRACT

The need of using renewable sources to obtain fuel has led tot the appreciation of the energetic potential of the biomass. In this work, the vegetal substrate for ethanol production used was sweet sorgum (*Sorghum bicolor, var. zacharum*). For this propose of reduction of the technological costs in ethanol production from sweet sorghum extract fermentation we used *Zymomonas mobilis,* a Gram negative bacterium as microorganism able to metabolize sucrose. Our results show that *Z. mobilis* can grow and produce ethanol without any other additives in grow medium.

INTRODUCTION

The energy of the biomass offers the significant advantage of an energetic durable development on middle term [Chiaramonti *et al.,* 2002]. Because of these, The European Union goal is to replace 20% of the energy used with fuels from renewable sources in the transportation area until 2020 [Chiaramonti *et al.,* 2002]. Compared with the petrol-based products the bioethanol reduces considerably the toxic emissions. The impact on the environment is low because the biomass is a renewable resource without CO_2 emissions.

Sweet sorghum (*Sorghum bicolor* Moench L.) is the 5^{-th} cereal crops produced in the world after hey, rice, barley and corn. In 2007-2008, the world production of sorghum was about 64 million tones. Sweet sorghum is appreciated for its ability to grow in poor precipitation and high temperatures areas [Shewale and Pandit, 2009; Bennett and Anex, 2009] and it is known as ‘vegetal camel‘, providing large volume of easily fermentable juice [Bennett and Anex, 2009]. It has a short period of growth being appropriate for a double culture and craft switching [Shewale and Pandit, 2009]. Sorghum as a biomass has a high content in sugars that are easily convertible in to soluble guides and requires low costs of processing for bioethanol obtaining [Bennett and Anex, 2009]. Research has shown that sugar content from Sweet sorghum has the potential to produce up to 8000 litters of bioethanol per hectare of craft almost twice as much as the corn [Bennett and Anex, 2009].

Bio-refineries witch process sweet sorghum have similar structures and lower costs compared to the petrol refineries and corn starch in witch case the costs of the raw materials represents between 60-70% from the value of the product [Bennett and Anex, 2009]. There are studies for capitalization of sorghum for the production of glucose, ethanol; and starch [Shewale and Pandit, 2009].

Alcoholic fermentation of guides in the purpose of obtaining biofuels has some advantages. The ability of Zymomonas *mobilis* to use sugar represents a viable alternative for bio-fuel production due to the high efficiency in converting glucose and fructose in to ethanol [Swings and De Ley, 1977].

Zymomonas mobilis is a Gram-negative anaerobic bacterium but facultative aerobic, strictly fermentative and ethanologenic [Conway, 1992], it represents one of the few anaerobic bacteria, and potentially aerobe microorganisms witch use Entner-Doudoroff pathway [Conway, 1992]. The bacterium can catabolize very fast sucrose to ethanol, while it converts just a small part of the carbon substrate in to biomass [Kalnenieks *et al.,* 2000].

The purpose of the research was to obtain ethanol from sweet sorghum extract with the use of different *Zymomonas mobilis* strains, without the need to add different salts witch are usually used to grow this bacteria.

MATERIALS AND METHODS

The following *Zymomonas mobilis* bacterial strains were used: *Zymomonas mobilis* ATCC 10988, *Zymomonas mobilis* NCIB 11163, *Zymomonas mobilis* NCIB 11163-70, *Zymomonas mobilis* NCIB 11163-71, *Zymomonas mobilis* NCIB 11163-74, *Zymomonas mobilis* NCIB 11163-76, *Zymomonas mobilis* $CP_4^{PREVENTOL\ REZISTANT\ MUT3}$, *Zymomonas mobilis* CP_4^{PR} and the next varieties of sweet sorghum: 64A, 66B, 68B, 68C, 70A and 70B produced by Fundulea Institute of Technical Plants.

Regents and solutions: Complete medium for growth after Galani *and all*. (1985), containing yeast extract 0.5%, glucose or sucrose 2%, $(NH_4)_2SO_4$ 0,5%, KH_2PO_4 1%, $MgSO_4$ 0,5%. Sucrose determination has been realized after Halhoul and Kleinberg method (1972), using anthrone reagent. The phenols content has been determined after Hiuneburg *and all*. (2006) method using galic acid as standard.

From the types of sorghum mentioned 1kg of fine cut stem where boiled in 1,5 litters of distilled water for 2 hours. The extract was filtered and over the stem another 1.5 litters of distilled water where added and boiled for 2 more ours. The both extracts have been mixed and adjusted to 500 mL with distillate water.

The extracts where sterilized for being use as culture medium for *Zymomonas mobilis*. Exponentially growing cells were used as inoculum to yield a starting liquid culture of approximately 10^7 cells per ml. Growth was monitored turbidimetrically at a wavelength of 600 nm. An optical density at 600 nm (OD_{600}) of 0.9 corresponds to 0.35 mg of dry cell weight z ml21.

The inoculum in the exponential growth phase was inseminated in liquid medium and the cellular growth turbidimetrically monitorised [Stoian *et al.,* 2004].

The growth temperature of the bacterial strains was 30°C in complete liquid medium [Galani *et al.,* 1985]. The inoculum in the exponential growth faze was inseminated in liquid medium and the cellular growth was monitored turbidimetrically up to the exponential growth faze by measuring the optical density at 600nm. A value of 0.9 for the optical density corresponds to 0.35 mg dry substance/mL [Loos *et al.,* 1994].

From this an equal volume was inseminated in vial with sterile medium. For the growth curves D.O. is read at 600nm once an hour for 10 hours. For the consumption curves 500 µL of sterilized paraffin oil where added and weight at the analytical scale once an hour for at least 72 hours.

The turbidity measurements obtained through serial dilutions can be represented as a calibration curve.

The liquid medium with a concentration higher than $20g*L^{-1}$ glucose where inseminated with fresh inoculum of *Zymomonas mobilis* up to a density of approximately 10^6 cells/mL, was estimated the growth sped by measuring optical density for 24-36 hours from inoculation. The experiments where realized on complete and defined mediums and the duplication time for each type of wild strain *Zymomonas mobilis* of was determined. Time of duplication has been calculated for each studied strain.

RESULTS AND DISCUSSION

The results obtain in the experiment are presented in table no. 1.

Type 64A has the highest concentration of sucrose, followed by 68C, 66B, 70B, 70A, 68B, witch have concentrations over 10%. These types of sorghum can be recommended for the fermentation process as highly sugar productive.

From the sorghum extract the quantity of flavones was determined, those being considerate inhibitors for the bacterial growth. The phenols inhibits complex I. For example 4-nonilfenol (NP), pollutant derived from a nonionic detergent is possible to generate 2,4-dinitrofenol and other compounds carbonyl cyanate-*m*-clorophenil-hidrazones. It seems that NP binds with quinol resulting inhibitors of complex I [Degli Esposti, 1998]. The results show that the presence of phenolic compounds interferes in the metabolic processes of transforming sucrose in to ethanol, polifructans and carbon dioxide. From this reason, the polyphenols concentration from extracts of sorghum was determined - Table 2.

Results show that 70A, 68B and 68C have the lowest polyphenols concentration and for that reason are recommended for the fermentation process.

The extracts where sterilized to be used as culture medium for *Zymomonas mobilis.*

In the figures, the growth curves for the bacterial strain taken in to study are presented. The experiment was realized with sucrose as a carbon source.

In figure 1 the dates show that strains $CP4^{PR}$ and $CP4^{PR3}$grow fast on sucrose compared to the wild types **NCIB** 11163 and **ATCC** 10988.

Figure 2 show that using sorghum extract 64A as carbon and salts source with 2% sucrose concentration leads to a growth similar to the one on complete sucrose medium.

In figure 3 is shown that using sorghum extract from different types as carbon and salts source with 2% sucrose concentration for strain $CP4^{PR3}$ *Zymomonas mobilis* leads to a spectacular growth for the medium with sucrose, vigorous growth for 64A, 68B, 70B, and slow for 66B, 68C, and 70A.

Figure 4. Using the glucose from sorghum extract as a carbon source for *Zymomonas mobilis* $CP4^{PR}$ leads to a loss of weight, the strain being a high ethanol producer.

Figure 5. Using as a carbon source the sucrose from complete medium for strain $CP4^{PR3}$ conducts to a loss in weight, the strain being a high ethanol production one.

Figure 6. Using as a carbon source the sucrose from type 64A for the strain *Zymomonas mobilis* 11163-76 you can remark a quite important loss in weight for the strain is highly ethanol productive.

Figure 7 shows that the use of sucrose from sorghum extract as a carbon source for *Zymomonas mobilis* 11163-76 leads to a loss of weigh in the case of complete medium with sucrose, followed by 68B, 66B and 70A, for there are highly productive types.

Figure 8. A significant loss of weight due to the formation and release of ethanol can observed.

Figure 9. The study of consumption curves realized with strain 11163-70 on different extracts of Sweet sorghum and complete medium with glucose, respectively sucrose in the same concentration as carbon source, show that the strain ferments the substrate in the order: glucose, sucrose 68C, 64A.

CONCLUSIONS

1. The research on the alcoholic fermentation of glucides from sorghum for obtaining ethanol show that the presence of phenolic compounds in the extracts interfere in the metabolic transformation processes of sucrose in ethanol, polifructans and carbon dioxide.

2. Bacterial strains resistant to the ameliorants are supposed to be the most productive. *Zymomonas mobilis* strain $CP4^{PR3}$ recorded a vigorous growth on sucrose ant on other extracts as well compared to the wild type NCIB 11163 and ATCC 10988.

3. *Zymomonas mobilis* strain 11163-76 appears to produce the highest quantities of ethanol in the process of fermentation of any type of sorghum extract.

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TABLES

Table1. Sucrose concentration of extracts from different types of sorghum, expressed in percents

Types of sorghum	Sucrose concentration (%)
64A	19,52
66B	14,14
68B	9,76
68C	16,74
70A	11,95
70B	13,5

Table 2. Polyphenols concentrations of sorghum extracts expressed in mg/ml.

Varieties of sorghum	Polyphenols concentrations (galic acid equivalents)/ml extract
64A	143.7984
66B	104.9274
70A	72.50806
70B	105.8952
68B	78.6371
69B	149.7661
68C	91.37903

FIGURES

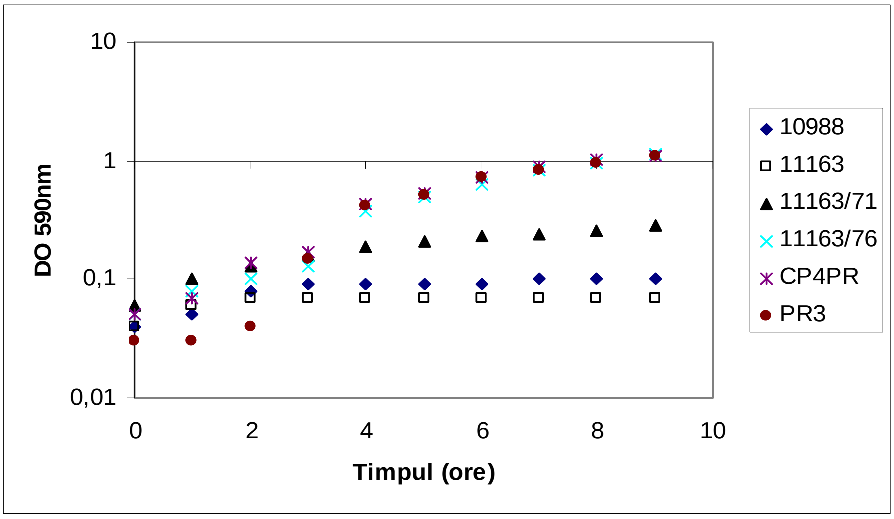

Fig. 1. Growth curve for different strains on complete medium with 2% sucrose

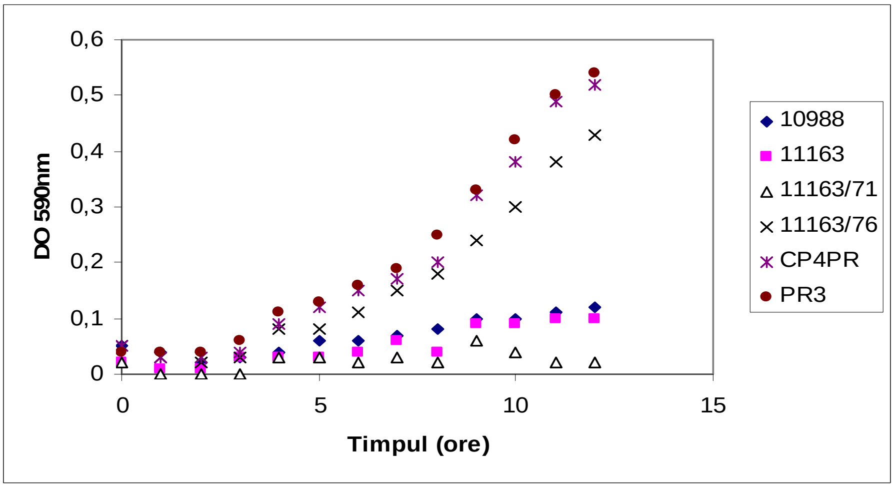

Fig. 2. Growth curve for different bacterial strains on sorghum extract 64A, 2% sucrose

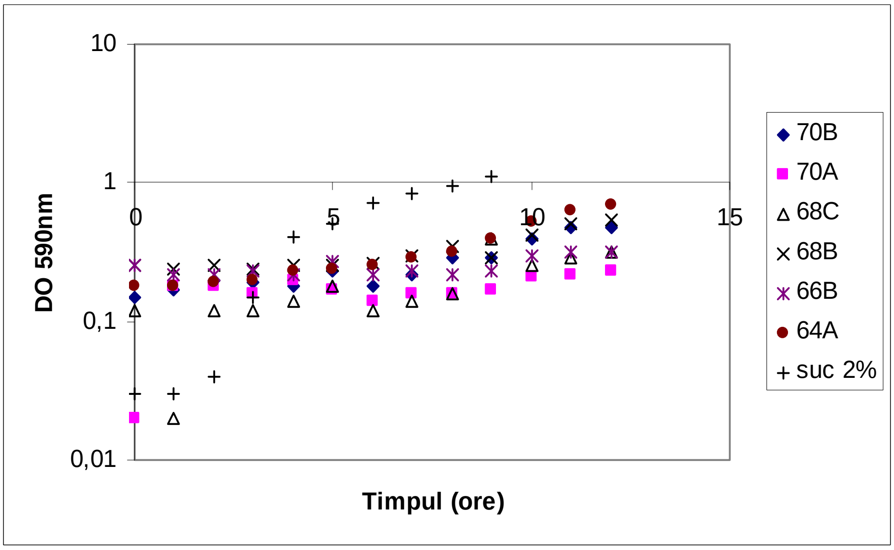

Fig. 3. Growth curve for strain CP4^{PR3} on several types of sorghum extract, 2% sucrose.

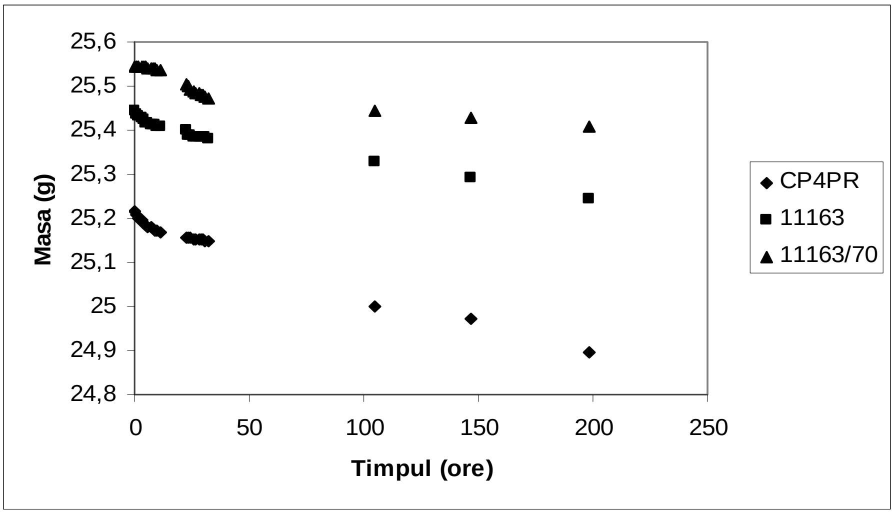

Fig. 4. Consumption curve for different bacterial strains on special medium with 2% glucose.

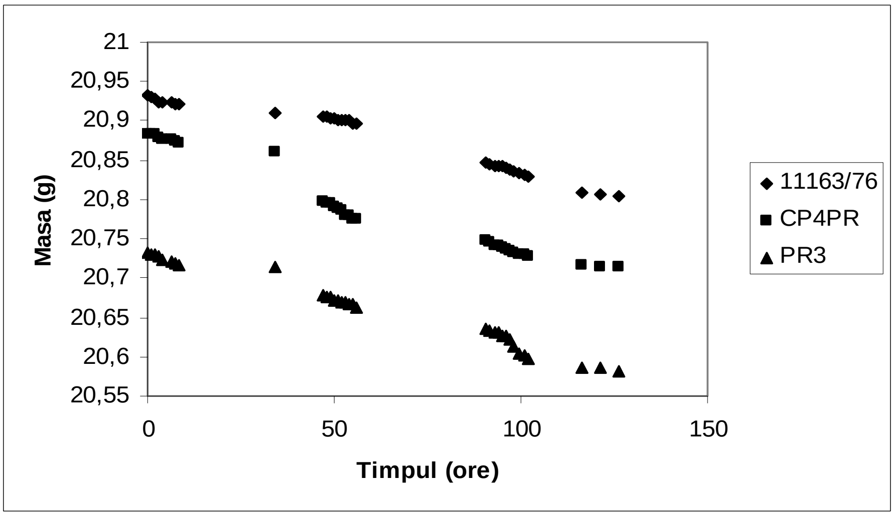

Fig. 5. Consumption curve for bacterial strains on special medium with 2%.sucrose

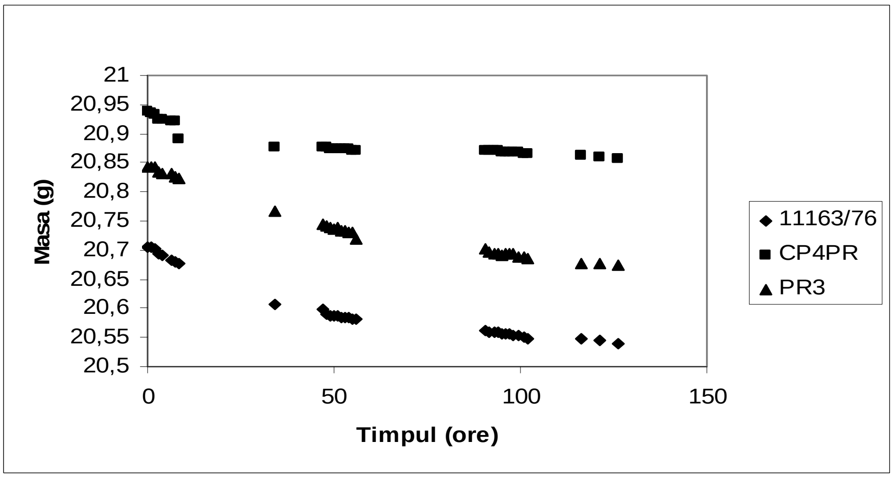

Fig. 6. Consumption curve for bacterial strains on sorghum extract 64A with 2% sucrose.

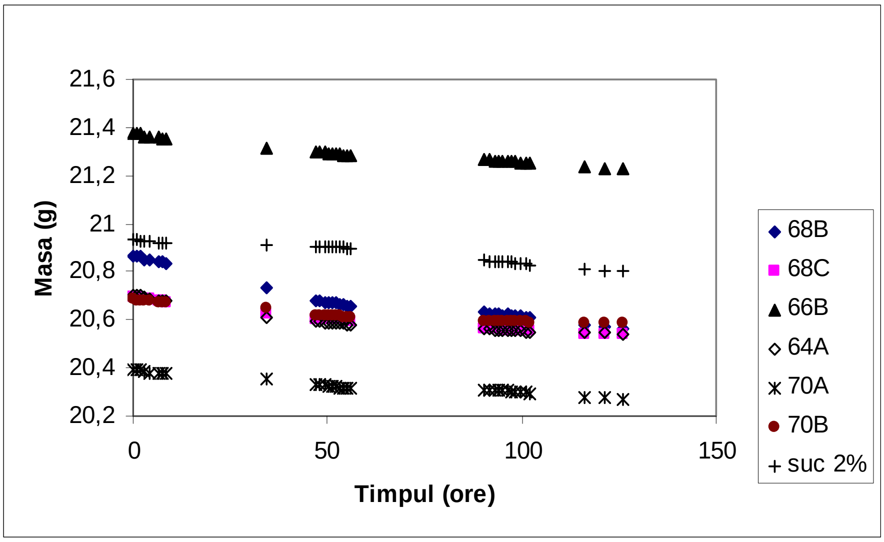

Fig. 7. Consumption curve for *Z. mobilis* 11163-76 on different types of sorghum with 2%sucrose.

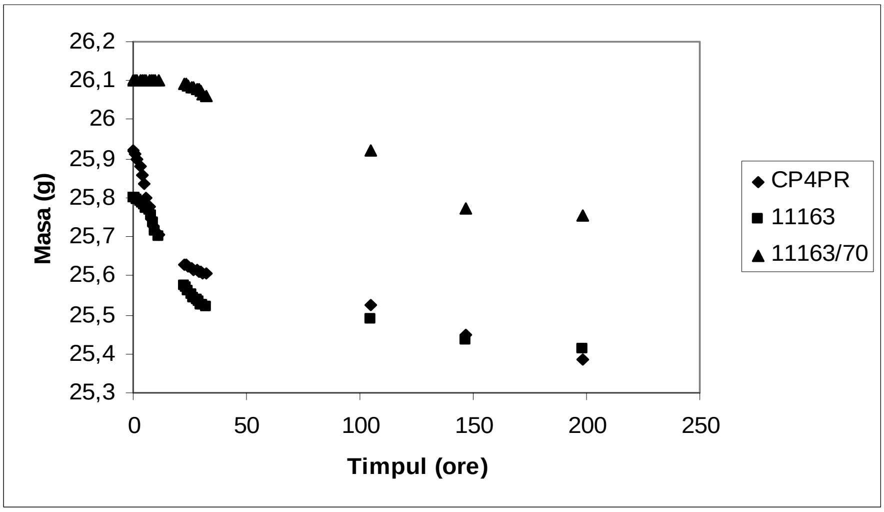

Fig. 8. Consumption curve for different bacterial strains on sorghum extract 64A with 9.7% sucrose.

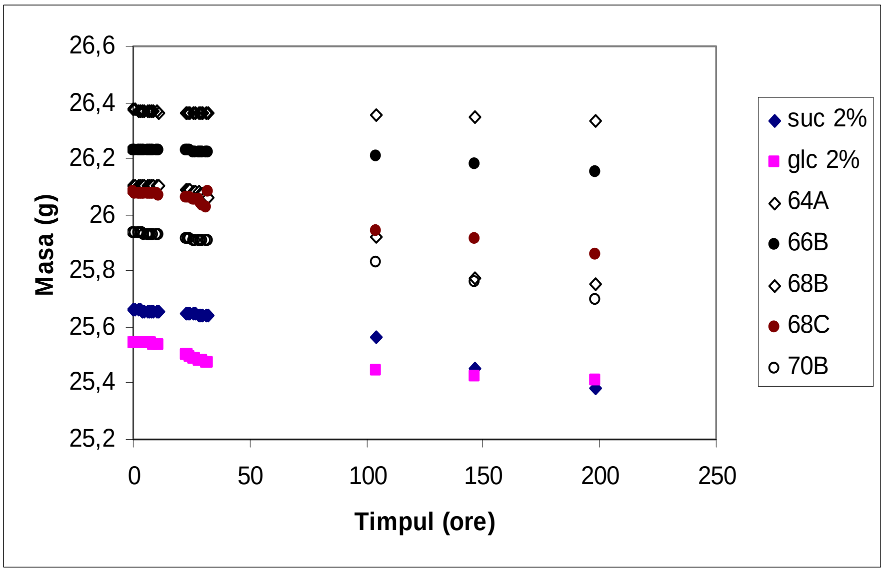

Fig. 9. Consumption curve for *Z mobilis* 11163-70 on different types of sorghum extract with 9,7%sucrose.

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