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USING THE ANALYTICAL HIERARCHY PROCESS IN SELECTING THE MOST IMPORTANT NON-WOOD FOREST PRODUCTS FROM OLT COUNTY

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Keywords*: AHP, Olt, non-wood forest products, NWFPs*

ABSTRACT

The present paper analyses the main non-wood forest products (NWFP) from Olt County based on an analytical hierarchy process (AHP) and a specialised decision-making software. The first part mentions the main characteristics of the forest fund from Olt County, followed by the identification of the main non-wood products. The research continues with defining and explaining the analytical hierarchy process and then establishing the categories of non-wood products used in the analysis. In addition, the analysis method for the selected criteria and established non-wood products is also presented. They are eight in total and belong to the following categories: mushrooms, tree and plant products and animal origin products. The results present the most important non-wood products from Olt County based on the realized analysis and discussing their main criteria as their strong or weak points. Based on the AHP results, the most important NWFPs products from this county are Acacia honey and penny bun (Boletus edulis), while the least important ones are peppermint (Mentha piperita) and common nettle (Urtica dioica).

INTRODUCTION

Situated in South Romania, Olt County (Fig. 1) has a forest surface of 58.824 ha, representing approximately 10% of the county's surface. This numbers place the county on the 22nd place in Romania in regard with forest coverage. An average of 0,13 ha/inhabitant results for the year 2014 by reporting the forest surface to the total number of inhabitants. This number can be compared with the average national (0.26 h/inhabitant) and with the European average (0,33 h/inhabitant) (http://apmot.anpm.ro). Olt County Forest Administration manages currently a surface of 30871 ha public state forest property whose management is realized through six forest districts (Balş, Caracal, Corabia, Draganeşti, Slatina and Vultureşti), 21 forest areas and 119 forest ranges (www.rosilva.ro).

According to the United Nations *Food and Agriculture Organization* (FAO), Non-Wood Forest Products (NWFP) are products of biological origin other than wood, obtained from forests, wooded land and trees located outside the forests. NWFPs include products used as food (nuts, fruits, mushrooms, herbs, plants, game), fibres (used for construction, clothing, furniture), gums, resins, or plant and animal products used for cosmetic, medicinal or cultural purposes (Man and Funar, 2011).

Regarding NWFP in Romania, research in this field were made for different categories and especially taking into consideration the forest found managed by RNP ROMSILVA. Thus, in 2016, Vasile Diana et al. addressed the issue of harvesting medicinal plants from the spontaneous flora of the forest fund administered by RNP Romsilva (Vasile et al., 2016) and that of harvesting the forest fruits from the same forest fund (Vasile et al., 2016b). Also, the impact of collecting mushrooms from the spontaneous flora on forest ecosystems in Romania was studied some years ago (Vasile et al., 2017).

The aim of this study was to highlight the most important non-wood forest products from Olt County.

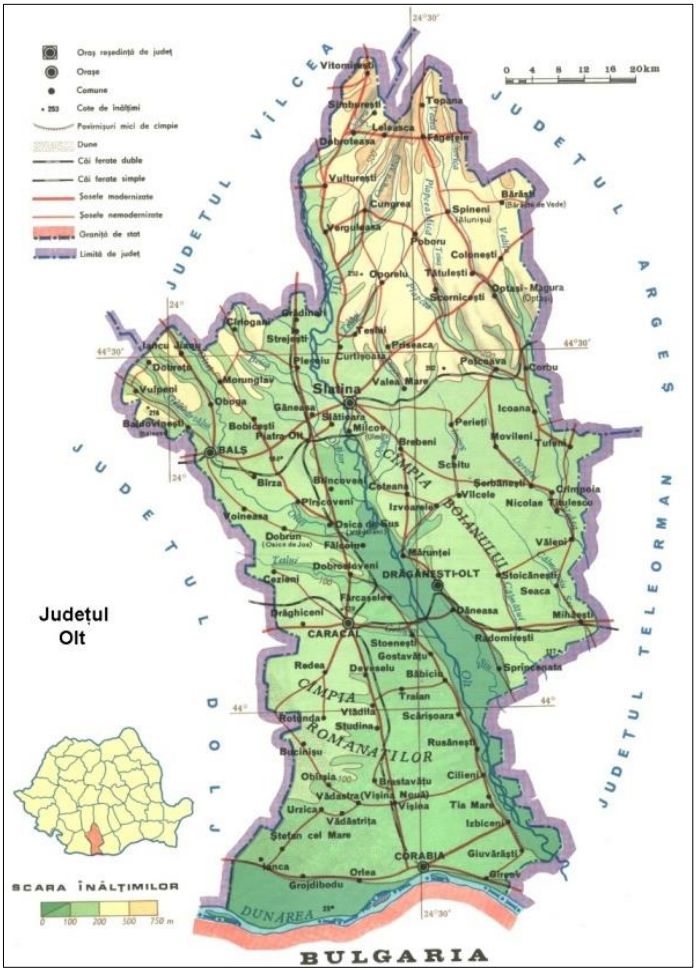

Figure 1. Location of Olt County (Source: www.peharta.ro)

MATERIAL AND METHODS

An analytical hierarchy process (AHP) was used in order to determine the most important NWFPs products from Olt County. AHP is a technique for analysing and organizing complex decisions, based on psychology and mathematics (Saaty,

2008). The method was developed by Thomas L. Saaty in the 1970s and it represents the most accurate approach for quantifying the criteria weights. The method uses the experience of individual experts in order to estimate the relative magnitudes of factors through pair-wise comparisons (https://en.wikipedia.org /wiki/Analytic_hierarchy_process).

In our case, the studied NWFPs were grouped in the following four categories: *Mushrooms*, *Tree products, Understory plants,* and *Animal* origin. The most important NWFPs were then selected by using the above-mentioned data.

The four categories were designed and used for research in the COST Action FP1203 European project. In Romania, the method was also used in similar studies recently conducted for Maramures (Enescu et al., 2017), Timis (Enescu et al., 2018), Bihor (Timiș-Gânsac et al., 2018) Prahova (Enescu et al., 2018) and Dolj (Cântar et al., 2018).

Nineteen criteria were taken into account in order to obtain the AHP analysis regarding the for NWFP categories (Table 1). Each NWFP was then studied based on these criteria and has obtained a grade from 1 to 8 for each one.

The Expert Choice Desktop software package (v. 11.5.1683) was used for centralizing the data.

RESULTS AND DISCUSSIONS

The NWFPs selected from each category were the following: penny bun (*Boletus edulis*) and parasol mushroom (*Macrolepiota procera* (Scop.) Singer) for the *Mushrooms* category, acorn (*Quercus* spp.) for the *Tree products* category, raspberry (*Rubus idaeus)*, common nettle *(Urtica dioica)* and peppermint (*Mentha piperita)* for the *Understory plants* category and *Acacia honey* and muflon (*Ovis musimon*) for the *Animal origin* category.

Based on the AHP results, the most important NWFPs from Olt county are Acacia honey and penny bun (*Boletus edulis*), while the least important ones are peppermint (*Mentha piperita)* and common nettle *(Urtica dioica)* (Fig. 2).

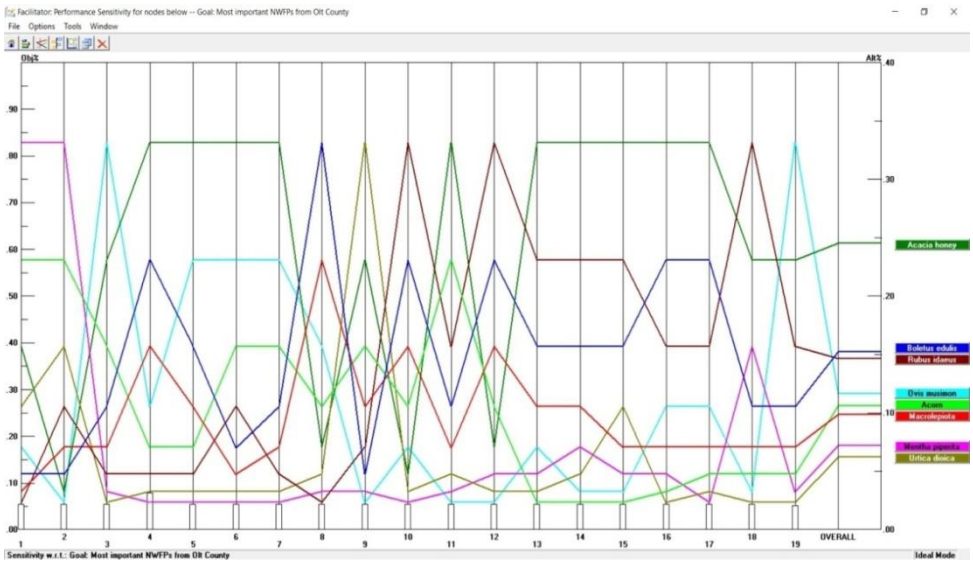

Figure 2. The ranking of the eight NWFPs

The grading of the above-mentioned NWFPs based on each of the 19 criteria is rendered in Table number 1.

Table 1

AHP alternative ranking

Criterion	Mushrooms		Tree products	Understory plants			Animal origin	
	Boletus edulis	Macrolepiota procera	Acorn	Rubus idaeus	Urtica dioica	Mentha	Acacia honey	Ovis
Harvesting period	4	2	7	1	5	8	6	4
Portfolio of derived products	3	4	7	5	6	8	2	1
Harvested quantity / worker / 8 hours	5	4	6	3	1	2	7	8
Harvesting cost	7	6	4	3	2	1	8	5
Knowledge for recognition	6	5	4	3	2	1	8	7
Knowledge for harvesting	4	3	6	5	2	1	8	7
Tools needed for harvesting	5	4	6	3	2	1	8	7
Complexity of harvesting process	8	7	5	1	3	2	4	6
Distribution range	3	5	6	4	8	2	7	1
Market potential	7	6	5	8	2	1	3	4
The price of raw product	5	4	7	6	3	2	8	1
The price of the derived product	7	6	5	8	2	3	4	1
Transport (harvesting - storage centre)	6	5	1	7	2	3	8	4
Perishability	6	5	1	7	3	4	8	2
“Celebrity” of the product on market	6	4	1	7	5	3	8	2
Market demand	7	4	2	6	1	3	8	5
Biotic threats	7	4	3	6	2	1	8	5
Abiotic threats	5	4	3	8	1	6	7	2
Development of harvesting process	5	4	3	6	1	2	7	8

Based on these results, Acacia honey has a low harvesting cost and a high price of raw products. The species has obtained very good grades for over half of

the considered criteria, with the exception of derived products portfolio, complexity of harvesting process, market potential and the price of derived products.

For the mushroom category, penny bun (*Boletus edulis*) is situated in the top, having a low harvesting cost, low complexity of harvesting process, a good marketing potential, low biotic and abiotic threats and a high price of derived products.

Acorn occupies a middle place in the NWFP classification but we consider that its future importance will be high. This forecast is consolidated by the fact that acornsrarely fructify, at intervals of 5-6 years, while the need for reintroducing these species in deforests fields from South Romania or even in the forest fund is high.

CONCLUSIONS

Taking into account the fact that the county's forest surface is reduced in comparison with the national average, the importance of NWFPs from Olt County is not very significant. However, if we take into account the protection function of the existent forests and the presence of some important natural reservations located here, NWFPs can represent an important economic alternative for capitalizing wood mass.

Harvesting and selling NWFPs represents an important income source both for forest managers as well as owners.

The present study and its results represent an important contribution in regard with the general potential of NWFPs as well as for the ones located in this county.

The used software, Expert Choise Desktop, combined with AHP proved to be an easy tool to use for solving complex decision-making problems. Obtaining more representative data might require the analysis of additional criteria and including certain specialists or people that are involved in multiple domains related with the analysed products.

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REALIZATION OF THE FIRST STAGES OF THE SCHEME OF THE CLONAL SELECTION AT THE VARIETIES *VICTORIA* AND *CANNER*

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Keywords*: varieties for table grapes*, *clonal selections, technological descriptors*

ABSTRACT

This paper presents the realization of the first stages of the Clonal Selection Scheme and obtaining valuable clonal selections: the selections in the populations of the varieties and the multiplication of two important clonal elites through the superior qualitative traits regarding the technological potential.

Two clonal elites of the Victoria and Canner varieties were selected from the production plantations, known for their high qualities. It was pursued, through the selection activity, to obtain a clonal elite from the respective varieties, selections that would be superior to the population.

Thus were obtained the selections Victoria 3-2-3 and Canner 35-2-1, which surpassed the varieties selected by weight of grapes and grains. It can be stated at the same time that the two varieties transmit in the vegetative descendants valuable characters, resulted through the process of improvement.

INTRODUCTION

In any process of improvement, the efficiency of the selection is conditioned by the variability of the material with which it is worked, by the degree of heritability of the characters and characteristics of the respective germplasm and by the chance of the breeder to be able to detect the copies corresponding to the objectives pursued. Because, by selection, no new forms are created, but only valuable specimens are retained, the success of the selection depends on the limits of genotypic variability existing within the germplasm. The different weight of genotypic variations and those determined by the environmental conditions depends largely on the way the plants reproduce (C. N. Leonte, 2011).

The precise knowledge of the determinants of the natural selection (climatic, edaphic, biotic) and their mode of action is obligatory for the breeder otherwise it cannot be used by the positive action, of the natural selection, it cannot be included in the selection activity, which he exercises it (M.I. Neagu, 1975).

Vegetative reproduction preserves the genetic structure (heterozygous or homozygous), as a result, all individuals belonging to a clone (offspring resulting from vegetative multiplication of a single individual) are genetically identical. A species with vegetative reproduction is made up of populations of biotypes or clones. The diversity of genotypes appears as a result of the mugural variations caused by

gene mutations, crossing over somatic and some changes in chromosome structure. It means that by choosing and cloning a part or an entire plant possessing individual characteristics useful economically, adaptively, structurally, ornamentally, the separation from the original population of a clone that can lay the foundation for the development of a new variety is achieved (T. Crăciun, 1981).

MATERIAL AND METHODS

Observations, determinations, analysis regarding the clonal elites from the experiments were individually recorded on the plant, except for the phenological observations and the phytosanitary status.

Phenological observations - the calendar data for the phases of the vegetative organs are recorded: bleeding (10% of the buds on the wine plant); bud burst; start of flowering, beginning of berry ripening, full physiological maturity of the berry, falling leaves.

Determinations made during the vegetation period on the elite and witness variety: the loading of the buds per plant, the number of viable buds on each plant, percentage of dead buds, numărul de lăstari (total și fertil), number of inflorescences per plant, number of bunches per plant, the average weight of a bunch, the average weight of a berry, production of grapes per plant.

The dry substance (refractometric) content of the fruits at harvest: the content of the must in sugars g/l; acidity g/l H_2SO_4.

Varieties subject to clonal selection are among the most important varieties for table grapes and raisins grown in Stefanesti. They have been noted through a series of qualitative, production and adaptability traits to different environmental conditions.

Victoria variety (fig. 1) was obtained by complex sexual hybridization, by Victoria Lepădatu and Gh. Condei at ICHV Baneasa and continued studies at S.C.P.V.V. Drăgăşani.

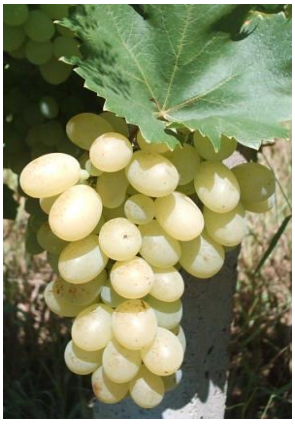

Figure 1.*Victoria* variety

Morphological characteristics: The mature leaf is medium in size, wedge-shaped, with five lobes, with a light green color, unpigmented with anthocyanins. The shape of base of petiole sinus is V-shaped, open, the hairs between main veins on lower side of the blade - none or very low. The bunch are large, long, with medium compactness and the slightly lignified peduncle. The berries are large, with pleasant

appearance, elongated elliptical shape, and the color yellow-green. It is also characterized by: uniformity of size, thin bloom, thin skin that coats the strong consistency pulp.

Agro biological and technological characteristics: The variety is of medium vigor towards the high. Fertility coefficients (absolute and relative) have values between 1.5-1.80 (CFA) and 0,9-1,2 (CFR), and productivity indices (ipa and ipr) express the productive capacity of the variety (300-600). It ripens during the stages II–III, when it accumulates on average 139 g/l sugars and an acidity of 3-3,8 g/l H_2SO_4. The average crop per plant is 4,0kg, and the total output calculated per hectare is over 17,0 t, of which 90% of merchandise production.

The main phenophases: bud burst: 29.04-5.05; start of flowering: 3.06-8.06; beginning of berry ripening: 21-27.07; full physiological maturity of the berry: 10-28. 08. Good resistance to diseases, pests and behaves well to the hoar-frost and frosts of spring due to the later bud bursting. The variety is cultivated on large areas in the country and abroad.

The characteristics that showed interest: earliness, size of bunches, berries, berry shape and color, frost tolerance.

The *Canner* variety *(Hunisa x Sultanina)* was obtained in 1963 by P.H. Being an seedless variety, it is recommended for obtaining raisins, sweetness and juice.

Morphological characteristics: The mature leaf is very large, wedge-shaped, with five lobes, green colour. The anthocyanin pigmentation is low, goffering of blade is weak and the teeth are long, short relative to base width, both sides straight. The leaf is also characterized by: the shape of the petiole sinus is open compared to the upper lateral sinuses that are closed, prostrate hairs none. In relation to the middle vein the petiole is shorter. The shape of bunch is funnel shaped, large, loose. The berry is large in size and length, it has an broad ellipsoid shape, and the yellow-green color, rusted on the sunny side. Firmness of flesh is slightly firm, medium juicy and with small rudimentary seeds.

Agro biological and technological characteristics: The variety belongs to the group of varieties with very high growth vigor. Fertility coefficients (absolute and relative) have values between 1.40 and 0.9 and productivity indices - (absolute and relative) fall within the limits of 340 - 212.

Figure 2. *Canner variety*

The main phenophases: bud burst: 15-30.04, start of flowering: 5 -10. 06, beginning of berry ripening: 20 -30.07, full physiological maturity of the berry: 25.08 - 5.09. The average crop per plant is 2,5 – 4,0 kg/plant and 12 to/ha. It has medium tolerance to low temperatures in winter, to *Plasmopara* and *Oidium.* It ripens during the stages IV, accumulating a sugar content of 140-170 g/l and a acidity 4,4 – 6,4 g/l H_2SO_4. The average weight of a bunch reaches 300 g and the berry weight weighs 3 - 4 g.

The characteristics that showed interest: shape and color of berry, the size of bunches and berries, vigor, seedless.

RESULTS AND DISCUSSIONS

Within the populations of the two varieties subjected to clonal selection, several elites were selected. One elite of each variety it was particularly noticeable, for which they were multiplied and planted in the breeding greenhouse (fig. 3 şi 4).

Figure 3 and 4. Clonal selection of varieties: Canner şi Victoria

The main objective pursued by the clonal selection of the varieties presented was to obtain elites with grapes and large grain, which would exceed the plants of the selection plantation.

After a three-year study in the field of selection of elite plants, through which repeated measurements and weighing were performed on each selected individual, it was found that at least one elite was superior to the population in terms of average weight of bunches and berries.

The Victoria variety, valuable for its qualitative properties, especially for the weight of the bunches and grains, was surpassed by the selection **3-2-3.** Comparing the values expressed for the weight of the grapes, it can be seen in figure 5 that the variety subjected to the selection was exceeded by the elite by 53 g**.**

The 100 berries weighed on average per plant, for 3 years, show us that the selection presented larger and larger berries (821 g elite, compared to 808 population) demonstrating the improvement value of the *Victoria* variety (fig.5)

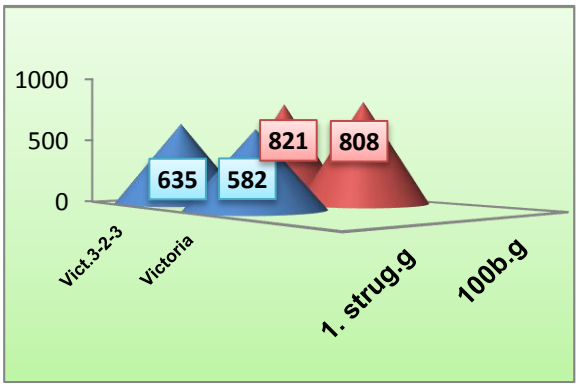

Figure 5. Average weight of bunches and 100 berries for *Victoria* variety and selection **3-2-3**

Wishing to obtain clonal selections with seedless berries, larger, crunchier and more appealing than the Canner variety, several different plants were chosen by these characteristics. Elita 35-2-1 proved superior to the population, the weight of 100 berries exceeded the variety by 25 g, while the weight of the bunches approximated the two genotypes (fig.6).

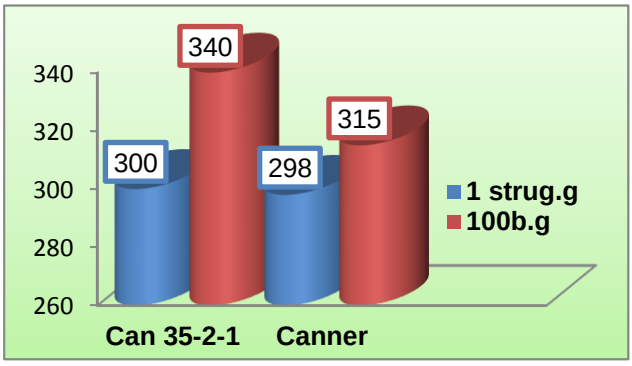

Figure 6. Average weight of bunches and 100 berries for *Canner* variety and selection **35-2-1**

CONCLUSIONS

Following the clonal selection, the *Victoria* **3-2-3** and *Canner* **35-2-1** selections were obtained, which outweighed the varieties selected by weight of bunches and berries. It can be stated at the same time that the two varieties transmit in the vegetative descendants valuable characteristics, resulted through the process of breeding plants.

The Victoria variety valuable for its qualitative properties, especially for the weight of the bunches and berries, was exceeded by the selection **3-2-3**, comparing the values expressed for the weight of the bunches, that the variety submitted to the selection was exceeded by the elite by 53g.

The 100 berries weighed on average per plant, for 3 years, show that the selection presented larger and larger berries (821 g elite, compared with 808 population) demonstrating the improvement value of the *Victoria* variety.

And in the case of the elite **35-2-1** this proved superior to the population, the weight of 100 berries exceeded the variety by 25 g, while the weight of the bunches approximated the two genotypes.

ACKNOWLEDGMENT

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INFLUENCE OF THE TREATMENT APPLICATION WITH ADDITIONAL LIGHT ISSUED BY BLUE LEDS ON THE PHYSIOLOGICAL PARAMETERS IN TOMATOES

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Keywords*: led light treatment, tomato, physiological parameters*

ABSTRACT

Recent climate changes, characterized by the rising of global temperatures and extending periods with extreme climatic phenomena, directly influence the quantity and quality of vegetable crops. Counteracting or mitigating the effects of climate change can be done through an appropriate strategy that involves the biological element (genotype) and the technological elements that can be applied to the cropps. In this paper, three tomato lines (L-75, L-76, L-1.03) which are being elaborated at Vegetable Research and Development Station Buzau (V.R.D.S.) Buzau, Romania, were analyzed. The purpose was to investigate the response of plants (seedlings), which posses high nutritional value and ecological plasticity, from the selected tomato lines and cultivated under laboratory controlled conditions, on the performance of some physiological parameters. following the application of the additional light emitted by blue-light -emitting-diodes (LEDs).

INTRODUCTION

Vegetables play a very important role in ensuring and maintaining the vitality of the human body (Pem & Jeewon 2015). Due to their biochemical composition, tomato fruits are characterized by a high content of vitamins, sugars, mineral substances, amino acids and organic acids, which ensures the proper functioning of the immune system. They offer a great protection against pathogens and certain diseases, and ensure the permeability of cell membranes, thus determining the proper functioning of the internal glands, the muscular, circular, digestive system, etc. (Gharbi et al. 2018).

The current varieties and hybrids, characterized by a high rate of homozygosity, become vulnerable to the new climatic phenomena that have emerged in recent years (Abewoy, 2017). The instability of harvests levels from one year to the next or the quality diminuations of the cropps are found mainly in the cultivars of vegetables from other geographical areas, with a different climate to our area. Choosing the assortment of cultivated varieties should be done with great care, based on observations and determinations in the field of research.

The most recent horticultural research has shown that this problem can be alleviated by using an appropriate LED lighting system. LED lamps can have a strong positive impact on the health, growth rate and harvesting period of almost any crop, due to the possibility of adjusting the intensity, color and duration of light. LED lamps also have the advantage, compared to natural lighting, that light variations can be programmed both in time and intensity and in different areas, depending on the needs of the respective cultures (Massa et al. 2008, Deram et al. 2014, Bantis et al. 2018)..

Different wavelengths of light have different effects on plants. Recent researches have shown that light wavelengths between 400nm and 710nm have a great impact on the development of plants, thus: 455nm (blue color light) and 660nm (red color light) play the most important role in plant growth (Dieleman et al.2019).

The blue light with a wavelength of 455nm helps regulate the opening of the stomata, and by doing this it helps to control both the loss of water and the absorption of carbon dioxide. Also, the blue light regulates the growth of the plant, inhibits the elongation of the stems, promotes the synthesis of chlorophyll, facilitates the assimilation of nitrogen, the synthesis of proteins and facilitates the synthesis of antioxidant substances. Plants grown with blue light are usually shorter and have greener, smaller, thicker and darker leaves than plants grown without blue light (De Visser et al.2014).

Also, Klimkowski et al. (2014) conclude in their research on tomato transplants grown in late autumn under natural light that have been characterized by lower leaf gas exchange rates and reduced growth. Introduction of additional light source caused an increase of the intensity of photosynthesis and transpiration. Supplemental lighting also resulted in an enhanced plant vigor. In general, no differences in the efficiency of photosynthetic apparatus and growth between the plants grown under different light sources were recorded. The study showed that the energy-efficient LED light source can be successfully used in production of tomato transplants instead of the less efficient high-pressure sodium lamps.

Considering the above, the purpose of the present work was to determine the physiological effects induced in the tomato seedlings, following the application of the treatment based on the supplement of blue light emitted by an experimental device with LED bulbs.

MATERIAL AND METHODS

Biological material

In the experiments were used seeds from 3 tomato lines, namely: L-75, L-76, L-1.03, which were provided by the Vegetable Research and Development Station Buzau, Romania. The peculiarities of the tomato lines analyzed differ by the color of the fruit but also by the habit of growing the plants. Thus, the plants in the L-76 line form orange fruits; those in Line L-75 are of indeterminate growth and those of Line L-1.03 have fruits in the shape of an ox heart, reaching up to 140 g / fruit and indeterminate growth of plants.

Experimental device

In order to apply the treatment based on the blue light supplement, an experimental device was used, for laboratory scale, with 12 blue LED bulbs. The constructive parameters and the working performance of the experimental device with blue LEDs used in the present research for the additional illumination of the seedlings from 3 tomato lines (L-75, L-76, L-1.03), has been described in a previous research (Popa et.al 2008). The distance between the LED equipment and the plants

was about 20 cm. The treatments with supplementary illumination based on blue light emitted by LEDs, was done at 5 different time variants, at: 5, 10, 15, 18 and 20 minutes, performed successively for 2-3 days.

Experimental methods applied.

For seed germination under laboratory conditions, plastic cups were used and filled with COMPO-SANA commercial substrate, based on peat (degree of decomposition H_2 – H_7), pearlite and lime, at a pH value between 5.0 - 6,5. In this soil was added a nutrient content with the following values: 200-550 mg / l soluble N-nitrogen ($CaCl_2$), 200-500 mg / l P_2O_5- soluble phosphorus and 300-550 mg / l K_2O -soluble potassium. For the subsequent statistical analysis of the results, 5 repetitions / sample for each of the experimental groups as well as for those used as Control / Control plants were considered.

The seedlings from each tomato line, from the Sample variants (seedlings additionally illuminated with the blue light emitted by LEDs), have been exposed since the 30th day from the beginning of germination, to the additional treatment with illumination based on the blue light emitted by LEDs, over a period of 15 days. Biometric measurements were performed to evaluate the growth of plants.

Physiological parameters determined

The temperature in the laboratory where the test and control seedlings were grown (additional non-illuminated seedlings), was constant at 23°C and a light intensity of around 800 (μmoli CO_2 $m^{-2}s^{-1}$) was provided, below saturation point for light. Between 8:30 a.m. and 11:30 a.m., the following physiological parameters were determined: the intensity of the photosynthesis process, respectively the amount of carbon dioxide consumed during the process (μmol CO_2 $m^{-2}s^{-1}$); the intensity of the sweating process (mmol H_2O $m^{-2}s^{-1}$), the stomatal conductance (mol H_2O $m^{-2}s^{-1}$), as well as the intercellular concentration of carbon dioxide (Ci) (μmol CO_2 mol^{-1}). All the gas exchange determinations were made at the level of the third leaf from the tip to the base, using the portable device (LC Pro SD) provided with an infrared gas analyzer (IRGA).

The total amount of chlorophyll was estimated by the non-destructive method, using the CCM-300 Opti Sciences chlorofilmeter, and the results were expressed in mg m^{-2}.

Statistic analysis

Significance of differences between different experimental variants was performed based on the analysis of the variant (ANOVA). The results were expressed as mean values and their specific standard errors, using MS Excel software. To determine the significance of the differences at $P \leq 0.05$, compared to the control, the T test was used.

RESULTS AND DISCUSSIONS

The experimental results obtained after the analysis of the pants that have been exposed to additional illumination with blue LEDs are presented in Table 1-A and Table 1-B.

From the data presented in the below tables (average values / 5 repetitions) we can see that the treatment based on blue light emitted by LED has a positive influence on the tomatoes, and it can be observed that the length of the tomato stems which were undergone the LED light treatment evolved much faster than the tomatoes which were not subjected to the blue light treatment.

Table 1-A

Dynamics of the increase in length of the stems in relation to the treatment with LED illumination and the untreated control sample, day 1 and day 5 of treatment

Line …..Obs. ……..date	Medium height / plant (cm)									
	Day 1					day 5				
Time of exposure (minute)	5	10	15	18	20	5	10	15	18	20
Sample L-75	16	15	14	17	17	17.5	16.5	16	19	20
Control L-75	11					11				
Sample L-76	12	16	17.5	18	20	13	18	17.5	20	20
Control L-76	12					13				
Sample L-1.03	18	14	6	17	11	23	15	6	19	12
Control L-1.03	8					8				

Table 1-B

Dynamics of the increase in length of the stems in relation to the treatment with LED illumination and the untreated control sample, day 8 and day 11 of treatment

Line …….Obs. ……..date	Medium height / plant (cm)									
	Day 8					Day 11				
Time of exposure (minute)	5	10	15	18	20	5	10	15	18	20
Sample L-75	18	17	16	20.5	21	19	18	18	22	22
Control L-75	12					12				
Sample L-76	13	18	20	21	22	14	20.5	21	23	23
Control L-76	14					14				
Sample L-1.03	25	16	6	21	13	26	18	6	23.5	14
Control L-1.03	8					8.5				

From the first morphological determinations (Table 1-A and Table 1-B) analyzed during the application of 5 treatments (during 15 days) with LED light on the seedlings of the 3 tomato lines, the following differences were obtained by comparison of the stem lenghts were registered at the end of the blue light treatment, compared to the values measured at the date of the first treatment with blue LED lighting:

- For the sample variants of L-75 tomato line, the strains were elongated between a minimum of 3 cm, (for samples with 5 and 10 minutes exposure) and a maximum of 5 cm (for samples with 18 exposure) and 20 minutes).
- For the sample variants of L-76 tomato line, the strains elongated between a maximum of 5 cm (in the sample with 18 minutes exposure), as well as 4.5 cm (in the sample with 10 minutes exposure) compared to those of the Control sample where the difference was only 2 cm. However, a low reaction was observed at the exposures of 5 minutes,15 minutes and 20 minutes.
- For the sample variants on the L-1.03 tomato line, the strains elongated between a maximum of 8 cm (in the sample with 5 minutes exposure) and 6.5 cm (in the sample

with 18 minutes exposure). In the case of exposures at 10 and 20 minutes, the growth of the stems was equal to 4 cm.

The present results are in agreement with those obtained by Gomez and Mitchell (2015) in the case of different tomato lines, when the additional illumination by combining the red and blue light resulted in an improvement of the growth potential of the seedlings, as well as a further compact development (Yang et al., 2018).

Other researches showed that *Cannabis sativa* plants that were illuminated with white light grew higher by 23%, and the leaf area was bigger by 20%, compared to those grown under the blue-red light emitted by LEDs, which means that a complete light spectrum has positively influenced the growth and development of plants (Lalge et al. 2017).

Differentiated results in corelation to the species were also highlighted by Snowden (2015), when at a flux of photosynthetic photons (PPF) of 500 μmol m^{-2} s^{-1}, an increase of blue light from 11% to 28% decreased significant dry mass in tomatoes, cucumbers and peppers, but no significant effect on soy, salad and wheat was observed. The dry mass decreased significantly only in the case of red radiation in the entire range of experienced blue light. Growth of the tomato hybrid 'Raissa F1' transplants was en-hanced under supplemental UV (380nm) light in the high-power solid-state lighting modules with the mains blue, red and far red LEDs. (Brazaitytė et al. 2010).

Experimental results recorded at the determinations of physiological parameters. After 2 months from the beginning of the experiment, determinations were made at the leaf level of the samples with the help of the portable analyzer - LCPro-SD, the results beeing shown in Table 2. By examining the results it can be seen that very significant differences regarding the rate of photosynthesis are recorded between the L-75 tomato line and the control, the values being lower at the control ($P < 0.01$).

The analysis of the difference in the case of the L-76 line and control denotes that in the case of the control the registered values were significantly higher ($P < 0.04$). Regarding the difference between the L-1.03 and the control plants, the values were significantly lower in the L-1.03 compared with the control ($P < 0.001$).

According to the researches made by Tewolde et al. (2016), the combined use of LED lighting modules (red and blue) in greenhouse conditions, at the lower leaf level during the day and respectively at night it was concluded that the illumination treatment during the night can improve efficiently the growing process of tomato plants and their yield, with a lower energy consumption, compared to the treatment applied during the day, both in summer and in winter time.

The results showed that supplemental illumination using LED or HPS light sources affected growth and physiological responses of tomato plants. The higher rates of leaf gas exchange were found in the plants supplementary lighted (compared to the control ones).

Table 2

Value data of some physiological indicators for tomato seedlings leaves (average values ± standard error; n = 10)

Determinations / Line	Intensity of photosynthesis (μmoli $CO_2 m^{-2}s^{-1}$)	Intensity of transpiration (mmoli $H_2Om^{-2}s^{-1}$)	Stomatal conductance (moli $H_2Om^{-2}s^{-1}$)	Internal concentration of CO_2 (μmol CO_2 mol^{-1})
Sample L-75	10,55±0,66A*	3,53±0,16B	0,17±0,01B	266,7±5,44B
Control L-75	6,03±1,56B*	7,76±0,25A	0,28±0,02A	345,7±9,98A
Sample L-76	4,41±1,11B	3,34±0,07B	0,13±0,004B	339,7±13,22A
Control L-76	7,13±1,02A	6,91±0,35A	0,30±0,02A	331,3±8,27A
Sample L-1.03	5,63±0,63B	3,83±0,30B	0,12±0,01B	286,6±15,13A
Control L-1.03	10,03±1,03A	8,78±0,20A	0.34±0,02A	320,4 ±10,52A

*Capital letters in a column indicate significance (comparing the sample with the control) of $P < 0.05$ by T test.

Supplemental lighting also resulted in enhanced plant growth, however no significant differences were found between the plants lighted with HPS or LED. The obtained results showed that HPS lamps can be replaced by LEDs in greenhouse lighting systems for tomato transplant production during periods with insufficient natural light. (Klamkowski si al., 2014).

Yang et al. (2018) concluded that the illumination with white light, as well as a combination of blue and red light, resulted in increased photosynthetic efficiency in tomatoes, while blue and purple light significantly reduced the process efficiency by influencing plant morphology, deteriorating membrane structure, reducing the amount of assimilating pigments, as well as reducing the electron transport rate. At the same time, in the blue and purple light the cyclic transport of electrons was favored, being induced a process of photoprotection of photosystem II and I, on the way of acidification of the thylakoid lumen.

The transpiration rate in the plant samples from the analyzed lines (Table 2), recorded significantly higher values in the control samples of the L-75 tomato line, compared to the treated L-75 sample ($P < 0.001$), which indicates a lower efficency for the water use and, consequently, a lower photosynthetic rate, as stated above. Similar behavior was also observed for the L-76 sample, compared to the L-76 control ($P < 0.001$).

It should be noted that for L-76, at a higher intensity of transpiration rate, the values of the rate of photosynthesis were also high, which indicates that a suitable gas exchange was also ensured by a good stomatal conductance (0.30 at control L-76). These parameters were good for the proper performance of the photosynthetic reduction of carbon dioxide.

The same behavior was registered in the variant L-1.03. The intensity of the transpiration rate was significantly higher in the case of the control sample ($P < 0.001$), in relation to an increased rate of photosynthesis, possible not only of a good supply of water and mineral salts of the leaf cells, but also to favor the process of absorption of the CO_2. Moreover, in the case of the control, a stomatal conductance of 0.34 is reconsidered.

The stomatal conductance values that were recorded shown significantly higher values in control tomato plants of line L-1.03, compared with control samples L-1.03, for all three situations (P <0.001).

It must be taken into account that, besides the stomatal resistance, there is also the resistance of the mesophyl, in terms of the rate of carbon dioxide transfer, a raw material in photosynthesis. The values of the latter are not to be neglected, as demonstrated by the studies conducted by Hicklenton and Jolliffe (1978).

The internal CO_2 concentration was significantly lower in the L-75 tomato line compared to the control (P <0.001), and the rate of photosynthesis was higher. Therefore, an intense consumption of carbon dioxide occurred in the process of photosynthetic reduction.

For the L-75 and L-1.03 tomato plants, there were no statistically significant differences (P> 0.05), compared with the control, although in the control samples of L1.03 line, the values were higher .

The decrease in stomatal conductance also affects internal CO_2 concentration (case L-75, L-1.03) and if this modification of internal CO_2 concentration is not counteracted by an increased levels of mesophilic conductance, the CO_2 concentration in chloroplast, at he place of RuBisCO-dependent carboxylation will be reduced, which may favors the oxidase activity of the enzyme. The L-75 seems to have behaved properly in terms of photosynthetic efficiency and water use efficiency.

Experimental results recorded for the determination of the amount of chlorophyll by the non-destructive method using the chlorofilmeter CCM-300 Opti Sciences)

The results recorded after 2 months from the date of the seeds sowing of the 2 tomatoes lines are shown in Table 3. The analysis were performed at the level of the third leaf from the apex of the main stem.

Table 3

The amount of total chlorophyll (mg m^{-2}) in tomato leaves
(values represent the average ± standard error; n = 5)

Tomato line	Time of exposure (minutes)					
	5	**10**	**15**	**18**	**20**	**Control**
L-75	619 ±0.00B*	621.40 ±1.47B	620.20 ±1.20B	621.40 ±1.47B	626.40 ±1.40A	625 ±0.00A
L-76	625.40 ±2.91B	629.20 ±1.71B	629.20 ±3.28B	625 ±0.00B	621.60 ±4.26B	638 ±0.00A
L-1.03	623.80 ±1.20B	629.20 ±1.71A*	620.20 ±1.20B	619.00 ±0.00B	615.40 ±1.47B	623.80 ±1.20B

*Different capital letters in a row indicate significant significances (comparing the sample with the control) of P < 0.05 by T test.

For the L-75 tomato line, after 5 and 10 minutes, the differences (P <0.03) regarding the total amount of chlorophyll and also in the samples exposed for 15 minutes, the differences (P <0.01), were significantly smaller compared to the control sample. Comparing the values recorded in the control samples with those of the sample exposed to blue LED treatment for 18 minutes, the result is P <0.03. It should be noted that there were no statistically significant differences between the control

and the 20-minute time (P> 0.05), even if we note that in the 20-minute variant, the chlorophyll amount peaked.

In the case of the L-76 tomato line, statistically significant differences were recorded between the L-76 control plants (with maximum amount of chlorophyll) and those exposed to different time of blue LED light treatment - 5, 10, 15, 18 and 20 minutes. (P <0.01).

In the case of the L-1.03 tomato line, the maximum amount of chlorophyll was recorded in the exposed plants for 10 minutes (629.20 mg m^{-2}) and the differences compared to the control were significantly greater.

Regarding the seedlings from all the 3 control lines, there were registered increases of the stems between 2-0,5cm, in the laboratory conditions provided during the 15 days.

Only with some exceptions, our results are opposite to those presented by other researchers, who specify that the blue light stimulates the biosynthesis of the pigments, inluding chlorophyll synthesis (Carvalho et al., 2011).

Dieleman et al. (2019) found that plants grown under blue light were shorter, with smaller leaves oriented obliquely upward, with a higher content of assimilating pigments, but the rate of photosynthesis was lower.

Recent researches, based on the experiments carried out by Kaiser et al. (2019), it was concluded that although it is not absolutely necessary to add blue light in addition to the red light, in greenhouse conditions, for a functional harvest, the blue light (in relation to 6-12%) is advantageous for growth, while adding a supplement of 24% becomes suboptimal for growth.

CONCLUSIONS

In conclusion, a ranking regarding the positive effect recorded on the growth of the stems (cm) in the seedlings in relation to the tomato line (L-75, L-76, L-1.03) and the duration of exposure (minutes) to the treatments with the blue light emitted by the bulbs LED was:

I. Line L-1.03 (Sample) - 8 cm/5 min>6,5cm/18min>4 cm/10 min = 4 cm/20 min > 0 cm/15 min; (Average=4,5 cm)
II. Line L-75 (Sample) -5 cm/18 min = 5 cm/20 min > 4 cm/15 min >3 cm/5 min = 3 cm/10 min. (Average=4,0 cm)
III. Line L-76 (Sample)- 5 cm/18 min >4,5 cm/10 min >3,5 cm/15 min >3 cm/20 min > 2 cm/5 min; (Average=3,6 cm)

For the duration of favorable lighting, close values of growth of tomato stems between 6.5 cm (L-1.03 Sample) and 5 cm (L-75, L-76 Sample) were recorded 18 minutes after the lighting with the blue light emitted by the LED bulbs.

The decrease in the rate of photosynthesis in the case of blue light (LEDs 5 minutes/day) could be caused by the effects of these light radiation (as a possible abiotic stress factor) on the membrane integrity, especially of the functioning of photosystems II and I, respectively of their adaptation (especially FS II), resulting in photoinhibition.

Given that the treatment for this experiment was performed on seedlings with young leaves (in the seedling stage), the process of acclimatizing the leaves to the incident light as in the case of mature plants did not correspondly occur, so the risk of photooxidaduve damage is high in the case of an insufficient mechanisms of the dissipation of the excess energy received.

As the time of exposure to blue LED light increased, the total chlorophyll levels decreased progressively and significant differences were compared with the control, with the lowest value recorded after 20 minutes of exposure (615, 4 mg / m^2).

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PHYSICAL AND CHEMICAL PROPERTIES OF STRAWBERRY FRUIT AT HARVEST MATURITY AND POSSIBILITIES OF CAPITALIZING ON THEM

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ABSTRACT

Strawberry (Fragaria viridis) is a plant with tonic, tasty and aromatic fruits, rich in potassium, phosphorus, calcium, magnesium, iron, sodium, vitamins (C, B1, B2, E), salicylic acid, pantothenic acid, proteins, sugars, flavonoids, volatile oils, tannins and antioxidant polyphenols. Therefore, in the present paper we have proposed the elaboration of the recipe and the technological manufacturing scheme for obtaining a finished strawberry product according to the evolution of the main chemical characteristics of the strawberries during the processing and also according to the consumers' requirements regarding the presence of the seeds in the fruit of strawberry. The strawberry paste is a finely-cut product with a delicate taste, balanced and delicate texture. The aroma is an intense sweet characteristic of strawberry fruit. The color of the product is dark red specific to the raw material.

INTRODUCTION

Strawberry (*Fragaria viridis*) is a plant with tonic, tasty and aromatic fruits, rich in potassium, phosphorus, calcium, magnesium, iron, sodium, vitamins (C, B1, B2, E), salicylic acid, pantothenic acid, proteins, sugars, flavonoids, volatile oils, tannins and antioxidant polyphenols. They have many therapeutic properties: they stimulate natural immunity and liver function, regulate tension, re-mineralize the body, detoxify, lower cholesterol etc. Fruits are used fresh or preserved or processed in the form of compotes, syrups, jams, etc.

With a history of over 2,200 years, strawberries have been found since ancient times on both the European and American continents. These were officially discovered in Virginia by the first explorers in 1588 (https://www.csid.ro/diet-sport/dieta-si-nutritie/capsune-proprietati-beneficii-si-retete-14392408).

The first strawberry was grown in France at the end of the eighteenth century. However, wild strawberry species have been grown since ancient times, the strawberry being a fruit mentioned in the literature of Ancient Rome. Thus, it was used to treat melancholy, fainting, inflammation, fever, infection, unpleasant odor and many other conditions.

Beginning with 1300, the French began to take plants from the woods and grow them in the garden for decorative purposes, Charles V, the King of France between 1364 and 1380 had over 1,200 strawberries in the royal garden of the Louvre. In Belgium, there is a museum dedicated to strawberries, where food can

be purchased from these fruits, from jam to beer. Due to the perishability and the short marketing time, most of the strawberry production is processed immediately after harvesting as jam, syrup, compote, jam, etc.

The most important problem with the processing of strawberries is given by the anatomical constitution of the fruit, which is a fake (poliachen) fruit with the seeds on the outside. Their presence can disturb the consumer when the fruit is fully used for processing (jam). On the other hand, changing the consumer's taste in the food sector as well as his curiosity and opening up to the experimentation of new products implies the need to change the range of processed products on the market.

Therefore, diversifying the range of processed products by introducing new products that harness the strawberry fruit can lead to the revival of the processing industry thus reviving an important sector in the food industry. At the same time, maintaining in the processed product the chemical characteristics of fresh strawberries in large proportion can determine the type of product and their processing method. By developing an appropriate technology and obtaining a product that meets all these characteristics can attract the attention of the consumer thus increasing the economic efficiency of the processing enterprises.

Therefore, in the present paper we have proposed the elaboration of the recipe and the technological manufacturing scheme for obtaining a finished strawberry product according to the evolution of the main chemical characteristics of the strawberries during the processing and also according to the consumers' requirements regarding the presence of the seeds in the fruit of strawberry.

The main objectives pursued were:

- Obtaining a new high-quality finished product which is the largest proportion of the active principles of the fresh fruit;
- Developing manufacturing technology
- Eliminate problems that could lead to accidents and manufacturing defects.

MATERIAL AND METHODS

Plant material

In order to achieve the target, the straw *Roxana NF 205* was purchased from the market. The fruit imported from Italy but also from a private household in Dolj county were chosen and two variants were taken in the study. The Roxana NF 205 cultivar is originated from: Cesena (Italy) 2002, BREVETTO EUROPEO N ° 14557 (http://www.bordeaux.inra.fr/eustrawberrydb/individual/626). It is a suggested cultivar for all types of crops: tunnel, solar, free field, garden, hydro-cultivation, etc. It is vigorous and productive, with large leaves. Roxana is a variety of strawberries adapted to cold climatic conditions, resists frost, tolerates heavy winter. It is resistant to most root diseases, tolerant to *Oidium* and *Xantomonas* but remains sensitive to *Collectotrichum*.

In both variants the main physical and chemical characteristics were determined by laboratory analysis. The fresh fruits belonging to the two variants were processed in the form of a paste, thus establishing the production recipe as well as the technological flow related to the obtaining of this type of product. Thus, two variants of the finished product (Table 1) and strawberry spreads were used, using imported fruits (Italy) as well as private crops. The spreadable paste was obtained by concentrating with the addition of sugar to a dry matter content of at least 67% soluble. Several measurements and analyzes were performed on finished products to determine the loss of active principles in processing. The main active principles determined were: anthocyanin content, polyphenols as well as antioxidant activity.

Table 1

Experimental variants

No.	Variant	
1	V1	Strawberries of native origin
2	V2	Imported trawberries (Italy)
3	V3	Strawberry spread paste made from native raw material
4	V4	Strawberry spread made from imported raw material (Italy)

Analytical methods

Fruit linear dimensions (length, L; width, W; thickness, T) were determined with a Luthier digital caliper manufactured by StewartMacDonald (USA) and the results were expressed as mm. Average fruit weight (g) was determined by individual weighing on an analytical scale model ABT-320-4M manufactured by Kern (Balingen, Germany). Soluble solids content of fruit juice was measured with a digital refractometer (Hanna Instruments, Woonsocket, USA).

Total content in polyphenols was determined using the phenol-Ciocalteu phenol reaction method (Singleton and Rossi, 1965). The Folin-Ciocalteu (2N, Merck) reagent, gallic acid (99% purity, Sigma-Aldrich) and anhydrous sodium carbonate (99% SigmaAldrich) were used. One gram of strawberry homogenate (spreadable paste) was extracted with 15 ml of methanol in an ultrasonic bath for 60 minutes at ambient temperature. After extraction, the samples were centrifuged for 5 minutes at 4200 rpm and the supernatants were filtered through polyamide membranes with a pore diameter of 0.45 pm and stored at a temperature of -20 °C. 100 pl of each methanol extract from the dock mix with 5 ml of distilled water and 500 pl of Folin-Ciocalteu reagent.

After 30 seconds to 8 minutes, 1.5 ml of sodium carbonate (20% v / v) was added. The reaction mixture was diluted with distilled water to a final volume of 10 ml. Preparation of the standard gallic acid solution followed the same procedure. Absorbance at each 765 nm was measured on a Varian Cary 50 UV spectrophotometer (Varian Co., USA) after incubation for 30 minutes at 40 ° C and the results were expressed in mg of gallic acid (GAE) / 100 fresh weight (fw).

Antioxidant activity was measured in the methanolic extract using the DPPH test (2,2-diphenyl-1-picrylhydrazyl). Methanol (Merck, Germany), DPPH (2,2-diphenyl-1-picrylhydrazyl) (SigmaAldrich, Germany) and Trolox (Merck, Germany) were used. Extraction of samples was performed according to the same protocol described for total polyphenol content. The ability to capture the free radicals of the extracts against DPPH free radical was evaluated as described by Oliveira et al. (2008), with some modifications. Each ethanol strawberry extract (50 pl) was mixed with 3 mL of 0.004% (v / v) DPPH methanolic solution.

The mixture was incubated for 30 minutes at room temperature in the dark and the absorbance was measured at 517 nm on a Varian Cary 50 UV-VIS spectrophotometer. The DPPH free radical capture capacity was calculated with reference to Trolox (6-hydroxy-2,3,7,8-tetramethylcroman-2-carboxylic acid), which was used as the standard reference to transform the inhibitory capacity of each solution of extract in trolox mmol equivalent antioxidant activity / L. Radical was freshly prepared and protected from light. A methanol / water control was used in each analysis. All tests were performed in triplicate and the results were expressed in mmol of Trolox / 100 g of fresh weight (fw).

The total anthocyanin content was determined by the differential absorption method, as described by Cheng and Breen (1991). Absorbance of one gram of fruit pulp was measured at 510 and 700 nm in buffer at pH 1.0 (potassium hydrogen chloride-0.2M potassium chloride, 0.2M) and pH 4.5 (1M sodium acetate acetate,). Anthocyanin content was calculated using a molar extinction coefficient of 29,600 (cianid-3-glucoside) by the formula:

A = [(A510 - A700) pH 1..0- (A510 - A700) pH4.5]

The results were expressed in mg of cyanidin-3-glucoside equivalents / 100 g of fresh weight.

RESULTS AND DISCUSSIONS

Results on loss of active principles during strawberry processing

The main physical and chemical properties were determined for the raw material used. The results are shown in Tables 2,3,4,5.

Table 2

The main physical properties of native strawberries (V1)

Repetition/ Determination	Length (L) (mm)	Width (W) (mm)	Thickness (T) (mm)	Weight g
1	36.4	31.9	42.3	20.7
2	39.5	30.6	39.9	21.2
3	46.7	42.6	46.2	27.8
4	36.4	35.3	44.8	15.3
5	39.8	39.2	45.6	13.7
6	25.5	25.2	30.8	8.7
7	36.3	35.0	32.7	9.5
8	41.8	39.7	47.3	13.6
9	30.1	25.3	34.6	11.2
10	30.4	26.8	32.6	11.7
Average	**36.29**	**33.16**	**39.68**	**15.34**

From the data on the physical properties of strawberries belonging to the two variants it can be noticed that the fruits of version V2 (Italy) are characterized by larger dimensions than those of native origin, even if they belong to the same variety. Also, the average individual weight is lower for autochthonous fruit (V1 = 15.34g) compared to imported (V2 = 25.31g) with significant differences.

We can conclude that there are significant differences in the individual weight between the two variants and therefore the climatic conditions and the culture technology significantly influence the physical parameters of the fruits belonging to the same variety.

From the data obtained regarding the chemical properties of the raw material it can be noticed that although the imported fruits had larger individual size and weight than the indigenous ones, in terms of the chemical characteristics, the native ones had higher contents in active principles of those imported.

Table 3

Main physical strawberry properties – from Italy (V2)

Repetition/ Determination	Length (L) (mm)	Width (W) (mm)	Thickness (T) (mm)	Weight g
1	40.2	38.7	45.0	34.1
2	45.9	39.7	53.5	36.2
3	39.5	35.0	45.2	24.2
4	30.1	26.5	36.3	12.3
5	36.0	35.7	41.9	21.5
6	35.8	33.5	42.3	19.7
7	36.6	33.0	41.5	20.1
8	37.5	34.5	48.5	23.8
9	45.1	37.6	47.8	32.5
10	43.2	39.3	41.3	28.7
Average	**38.99**	**35.35**	**44.33**	**25.31**

Table 4

The main chemical properties of native strawberries (V1)

V1	Soluble solids content (SSC) %	Anthocyanins mg/100 g fw	Total polyphenols mg of gallic acid (GAE) / 100 fw	Antioxidant activity mmol Trolox / 100 g fw
	9.70	16.57	102.34	4.29

Table 5

The main chemical properties of strawberries from Italy (V2)

V2	Soluble solids content (SSC) %	Anthocyanins mg/100 g fw	Total polyphenols mg of gallic acid (GAE) / 100 fw	Antioxidant activity mmol Trolox / 100 g fw
	8.47	5.44	83.7187	4.26

Thus, domestic strawberries had a SSC content of 9.70% compared to those from Italy with 8.47%, a much higher content in polyphenols 102.34 mg of gallic acid (GEA) / 100 fw. than those with a content content of only 83.71 mg gallic acid (GAE) / 100 fw.

However, the two variants showed similar values of antioxidant activity with values of 4.29 mmol Trolox / 100 g fw. to the native variant respectively 4.26 mmol of Trolox / 100 g fw to the import.

In terms of anthocyanin content, the fruits belonging to the native variety differ by a triple content of 16.57 mg / 100 g fw from the imported ones with only 5.44 mg / 100 g fw. This can be attributed to the maturity at which the fruits were harvested, being known the fact that for long distance transport the strawberries are harvested few days before consumption maturity and probably the imported fruits did not have time to reach full maturity during the transport.

The same chemical determinations were performed on the finished product, the results are shown in Table 6.

From the data obtained, it can be noticed that the processing of strawberries in the form of spreads or the applied heat treatment (concentration) affects the content in the main chemical components of the filled matter.

Table 6

The main chemical properties of the finished product from the analyzed variants

	Soluble solids content (SSC) %	Anthocyanins mg/100 g sp	Total polyphenols mg de acid galic (GAE) / 100 sp	Antioxidant activity mmol Trolox / 100 g s.p.
V3	70%	7.44	96.68	3.92
V4	68%	3.24	65.28	3.45

On the processing stage, chemical components are lost, the highest recorded beings in terms of the content in the athocyans, which is also reflected in the color of the finished product. It also lowers the polyphenols content as well as the antioxidant activity of the product.

That is why it is very important to use high-quality raw material with the highest content in chemical components.

The differences of composition between the two variants were maintained during the industrial processing.

This was also noticed as a result of the appreciation of the finished product, the spread made from autochthonous fruits having a more pronounced, pleasant color and a more balanced taste.

As regards the content of the finished product in soluble solids (SSC) %it is found that it is within the required limits of the type of product obtained (70% for V1 and 68% for V2 respectively) concentrated products requiring a minimum content of SSC of 67%.

Results on the chosen manufacturing recipe and the manufacturing process flow

With regard to the manufacturing recipe chosen as a result of laboratory experiments on small quantities, we have found that using equal amounts of strawberries and sugar leads to an extremely sweet product, that is why we have reduced the amount of sugar to 700 grams for 1 kg of fruit.

Since the end goal was to obtain a product with a fine texture in addition to introducing the fruit crushing operation, the filtering operation was also introduced to remove strawberry seeds. These two operations require a pre-heating of the pulp. Also, to avoid gelling the pasta, strawberries being known as high-content fruits in gelling substances (pectins), we found it is necessary to use small amounts of acid (citric acid).

Therefore, the ingredients used to make 1000 g of spreads were as follows:

- 1 kg of strawberries
- 700 g of sugar
- Citric acid 10 g

At the same time, due to the water content of the analyzed fruits (84-89%), water was added to the concentration mass, the sugar being added to the solid state. As a result, the established technological flow diagram was as follows (fig 1):

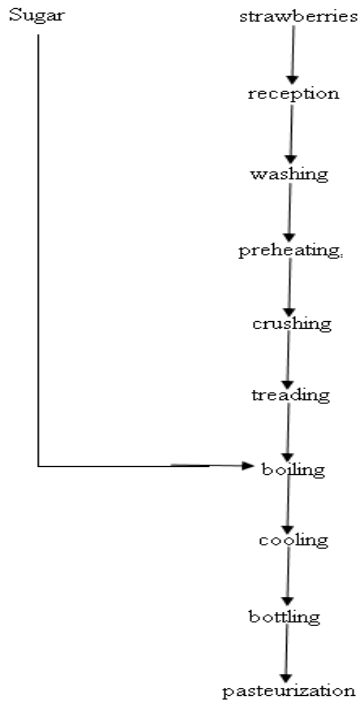

Fig.1 Flow diagram

Preheating, pressing and squeezing can be done using the equipments used to the tomato paste. Boiling-concentrating - in the technology of processing fruits preserved with sugar, heat treatment is used for various purposes including: heating, scrubbing, pasteurization and especially for the purpose of concentration.

Cooking the paste is considered the main operation, to which the quality of the finished product depends most. In order to obtain a high quality product, it is recommended that the cooking time should not be longer than 30 minutes after which it is cooled down. For concentrating use: duplicate boiler.

The finished product will be emptied into pools with a capacity of up to 200 kg - to cool - at the same time, a homogenization of the batch. Cooling should not be exaggerated, and practically it should be up to about 70^{o}C. Otherwise, its viscosity increases, filling operations are hampered. By closing - filling the containers, the vapor contained in the space between the finished product and the lid may condense. Water droplets are produced on the surface of the chutney and conditions for the development of microorganisms are created. For this reason mainly and for the purpose of achieving some vacuum, the chutney is pasteurized.

Pasteurization should be short-lived because it does not refer to the contents of the container but only to saturated steam. Consequently, temperatures of 100 ° C are sufficient for a maximum of 10 minutes. The cooling of the containers is very necessary to be carried out, which will also allow a closing control, a slight concave shape - as a result of a vacuum of about 500 mm Hg column. For pasteurization you can use the usual autoclaves, and with better effects, tape pasteurizers.

For dosing in packaging, given that the finished product has a pleasant taste with a strong aroma and special finesse we considered that the packaging used, in addition to attracting the buyer must highlight the new product. At the same time, because it contains high amounts of sugar as a hypercaloric product and therefore has to be consumed in moderate quantities, we decided to use as jars of medium capacity (400 g) and small, with a special shape and twist-off closure. The finished product had a soluble solids content (SSC) %of 75%, which is in the category of low calorie products to be consumed in relatively small quantities. It has a pasty consistency characteristic of the products obtained by concentration and a dark red color characteristic of the raw material. The taste is sweet, the strong strawberry flavor and the texture is the very fine texture, the product being easily spreadable

CONCLUSIONS

The strawberry paste is a finely-cut product with a delicate taste, balanced and delicate texture. The aroma is an intense sweet characteristic of strawberry fruit. The color of the product is dark red specific to the raw material. The spread of strawberry paste although it is a hypercaloric product to be consumed in relatively small quantities has a lower energy value than other concentrated strawberry products such as jam.

Regarding the raw material used, it is found that the fruits of native origin, although smaller in size and weight than imported, contain larger quantities of active principles, resulting in a finer, more colorful, more aromatised product and sweeter. This can be done on the basis that, when products are transported over long distances, they are harvested before full maturity, and they are not matured during transport and in terms of crop conditions. For this reason there are major chemical composition differences in the analyzed lots even if the fruits belong to the same variety. In the processing of strawberries, under the influence of applied thermal treatments there are losses of chemical constituents, especially anthocyanins and phenolic substances.

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MORPHOLOGIC CHARACTERISTICS VARIABILITY IN BLACKTHORN FRUITS OF WILD GENOTYPES

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ABSTRACT

The present study was performed on 36 blackthorn genotypes (Prunus spinosa L.) from spontaneous flora of southern Oltenia (Dolj county), which belonged to 4 populations: Calopar, Gura Vaii, Banu Maracine and Dranic. The ripe fruits from selected genotypes were harvested over a three year period and analyzed; some morphological characteristics of fruits have been determined (fruit volume, size index and shape index, respectively). The volume of 100 fruits per population ranged from 122.82 cm³ (Gura Vaii, year 2018) to 221.33 cm³ (2017) for Banu Maracine population. Size index of fruits per population, ranged from 12.01 (Gura Vaii, 2018) to 16.06 (Dranic, 2017). Shape index was between the following average values per population: 0.88 (2017, Dranic) and 1.04 (2016, Gura Vaii). The present study demonstrates that there is a high variability between the blackthorn genotypes from the investigated areas, in terms of fruit characteristics, under the same ecological conditions, and these genotypes could be important in terms of fruit and food.

INTRODUCTION

Prunus spinosa species has been known since ancient times under many different popular names in Romanian language. All organs of the plant are of particular importance. Blackthorn has food value (fruits), therapeutic (root, flowers, fruits and seeds), ecological, ornamental and fruit-growing role. Wild fruits are often an important source of antioxidant compounds. The Dacians treated the toothache with decoction prepared by boiling the root bark associated with the oak root bark (Parvu 2005). Although they have food and medicinal properties, we can rarely find blackthorn products on the market or that have added blackthorn (Sikora et al. 2013). In Turkey *P. spinosa* fruits are consumed either fresh or stored for winter storage with "çörek", a kind of bread, or they sometimes dried to make "kak", a kind of compote that is consumed in in winter. Along with the increased cultivation of commercial plum varieties, "kak" and "çörek" disappear, replacing the canned jams and goods (Kargioğlu et al. 2010). Łuczaj (2012) argues that in Slovakia, blackthorn is consumed fresh after frost, especially by children or they are making plum brandy from fruits. Fruits (blackthorn) are globular drupes (Cosmulescu 2014), small, short pedunculated, black-blueish, strongly hoary - they are covered with pruina (Iliescu 2002). The pulp is green, dense and very astringent to taste. The fruit has a diameter

of 10-15 mm, rich in natural pigments (anthocyanins and carotenoids) with antioxidant action, covered with a whitish film, is edible with acid and astringent taste (Cela et al. 2003, Torre 2006, González 2006). It is consumed in fresh state only when overcooked (Ghena et al. 1977). Due to the special qualities of fruits, this paper aims to evaluate morphological properties of fruits derived from *Prunus spinosa* L. genotypes grown in spontaneous flora of southern Oltenia, in Calopar, Gura Vaii, Banu Maracine and Dranic populations, in order to identify genotypes with higher characteristics.

MATERIAL AND METHODS

Material. Blackthorn genotypes were identified and labelled, from four populations that grow spontaneously in southern Oltenia, Dolj county, one in Gura Vaii (44°12'28"N/23°47'53"E), the 2nd one in Calopar (44°10'03"N/23°44'27"E), the 3rd in Dranic (44°02'54"N/23°50'35"E) and the 4th in Banu Maracine (44°17'11"N/23°54'19"E). From each genotype in Gura Vaii, Calopar, Banu Maracine and Dranic populations, each autumn 100 fruits were collected and carried to the laboratory in optimum conditions, in plastic containers that were labeled, where measurements were made (fruit volume, size index, shape index). **The volume of 100 fruits** was measured using a cylinder with a metal rod that has at one end a perforated sheet washer; the cylinder was filled with water until the water started to flow through the side drain tube; the metal rod was inserted into the cylinder; the last drop of water was allowed to drain; the metal rod was removed then a Berzelius glass was placed under the drain tube and the fruits were introduced; the volume of water collected in the beaker was measured with a graduated cylinder and represents the total volume of one hundred fruits expressed in cm³ (Ionica 2014). Subsequently, the average volume of a fruit was calculated. **The size index** represents the average of three morphological measurements (the height, the large diameter and the small diameter of fruit) and was calculated according to the formula Im= H+D+d/3 (Ionica 2014), where: H = the length of the fruit (the height), D = large diameter of fruit, d = small diameter of fruit. To calculate the fruit size the electronic calliper was used with which the two diameters and the length of the fruit were measured. The results were expressed in mm for height and diameter. **The shape index** represents the ratio between the fruit height and the large diameter and was calculated according to the method presented by Ionica (2014), according to the following formula: If = H / D, where H = the height of fruit; D = large diameter of fruit. **Methods for statistical analysis**. The data obtained from determinations were statistically processed, calculating the arithmetic mean, standard deviation, variation amplitude (maximum and minimum, respectively), coefficient of variation for each feature, using the Data Analysis option in Microsoft Office Excel.

RESULTS AND DISCUSSIONS

The volume of fruits. In table 1 the average, minimum and maximum values per population for the volume of 100 analyzed fruits are shown. Thus, this characteristic varied between the following average values per population: between 122.82 cm³ (2018) and 146.94 cm³ (2016) for the Gura Vaii population; between 131.54 (2016) and 186.58 cm³ (2017) for genotypes from the Calopar population; between 192.33 cm³ (2018) and 221.33 cm³ (2017) for the Banu Maracine population; between 188.00 cm³ (2018) and 219.50 cm³ (2017) in the genotypes that came from Dranic population. The volume of 100 analyzed fruits was within the following limits:

-84.00 cm³ (2017) and 198.00 cm³ (2016) in Gura Vaii population;
-96.00 cm³ (2018) and 241.00 cm³ (2017) in Calopar population;
-178.00 cm³ (2018) and 265.00 cm³ (2017) in Banu Maracine population;
-170.00 cm³ (2018) and 236.00 cm³ (2017) in Dranic population.

Table 1

Average values of fruits volume * from *Prunus spinosa* L. genotypes from southern Oltenia

Population	Descriptive statistics	Volume (cm^3)		
		2016	2017	2018
Gura Vaii	Average	146.94	128.06	122.82
	Standard deviation	37.41	23.68	15.45
	Minimum	106.60	84.00	104.00
	Maximum	198.00	179.00	155.00
	CV%	25.46	18.49	12.58
Calopar	Average	131.54	186.58	142.36
	Standard deviation	16.37	31.39	25.64
	Minimum	108.80	147.00	96.00
	Maximum	159.80	241.00	172.00
	CV%	12.45	19.95	18.10
Banu Maracine	Average		221.33	192.33
	Standard deviation		38.76	16.26
	Minimum		191.00	178.00
	Maximum		265.00	210.00
	CV%		17.51	8.45
Dranic	Average		219.50	188.00
	Standard deviation		23.33	25.46
	Minimum		203.00	170.00
	Maximum		236.00	206.00
	CV%		10.63	13.54

The coefficients of variation for the volume of fruits have the following values:
- within Gura Vaii population, 25.46%, 18.49 and 12.58% respectively, expressing a small uniformity in 2016 respectively an average uniformity, in the years 2017 and 2018;
-to the fruits of Calopar population, 12.45%, 18.10 and 19.95%, respectively, which proves an average uniformity for this characteristic, in all analyzed years;
-to the drupes from Banu Maracine population, 8.45% (2018) and 17.51% (2017) respectively, indicating a high uniformity in 2018 and an average non-uniformity in 2017;

- within Dranic population 10.63% and 13.54% respectively, expressing an average variation.

Marakoglu et al. (2005) found in genotypes of *Prunus spinosa* L. in the Konya province of Turkey a volume of 1288.5 mm³. In the Table 2 are presented the values of **size index** (IM) and **shape index** (IF) for pigeon fruits in the southern area of Oltenia. The size index showed average values per population (Gura Vaii) between 12.01 (2018) and 13.76 (2016), which shows that the fruits had a higher size in 2016, compared to the other years analyzed with variation limits between 10.64 (2017) and 16.84 (2016). In 2016, the fruit size index showed maximum values at GV8 (16.84) and minimum values at GV1 (10.82). In 2017, the size index had the highest values in the GV37 genotypes (13.49) and the minimum values were found in GV24 (10.64). In 2018, maximum values of the same characteristic were recorded at genotype GV26 (13.24) and minimum values at genotype GV30 (10.96). The aforementioned characteristic showed within Calopar population (table 2), average values between 12.60 (2016, 2018) and 13.55 (2017), with limits of variation from 10.71 (2018) to 15.14 (2017). In 2016, maximum values of this parameter were calculated at C6 (13.82) and minimum values at C2 (11.64). In 2017, the size index had the highest value at C31 (15.14) and the lowest value at C25 (12.68). In 2018, this feature had maximum values for genotype C29 (13.70) and minimum values for genotype C24 (10.71). Within Banu Maracine population, the analyzed feature presented the average values per population between 13.36 (2018) and 14.09 (2017), respectively, with variations between 12.69 (2018) and 16.04 (2017). In 2017, the lowest value of size index was calculated on BM3 genotype (12.89) and the highest on BM2 genotype (16.04). In 2018 the limits of variation for this feature ranged from 12.69 to 14.42 and were maintained at the same genotypes. Within the Dranic population (table 2), the size index had average values per population between 14.72 and 16.06, with limits of variation ranging between 13.86 (2018) and 16.56 (2017). In 2017, the lowest value of the average size index was calculated in D2 genotype (15.56) and the highest in D1 genotype (16.56), and in 2018 the minimum was 13.86 in D1, and the maximum 15.58, in D2 genotype. Cosmulescu & Gavrilă Călușaru (2018) calculated on the fruits harvested from wild blackthorn genotypes in southern Oltenia, a size index between 9.82 and 15.50. Variation coefficients calculated for the size index had the following average values per population:

-6.16, 6.80%, and 16.07% respectively in case of Gura Vaii population, which shows a high and average uniformity;

-5.42%, 6.95% and 8.21% respectively, for Calopar population, which indicates a high uniformity;

-6.96% and 12.11% respectively, in genotypes from Banu Maracine population, which indicates a high uniformity, respectively average of the analyzed characteristic;

-4.39 and 8.27% respectively, for genotypes in Dranic population, which shows a small variation.

Table 2

Average values of size index and shape index in southern Oltenia blackthorn population for a hundred analyzed fruits

Population	Descriptive statistics	Size index (IM)			Shape index (IF)		
		2016	2017	2018	2016	2017	2018
Gura Vaii	Average	13.76	12.42	12.01	1.04	0.97	0.99
	Standard deviation	2.21	0.85	0.74	0.03	0.05	0.02
	Minimum	10.82	10.64	10.96	1.02	0.88	0.94
	Maximum	16.84	13.49	13.24	1.07	1.04	1.03
	CV%	16.07	6.80	6.16	2.43	4.66	2.10
Calopar	Average	12.60	13.55	12.60	1.03	0.95	0.98
	Standard deviation	0.66	0.94	1.03	0.03	0.03	0.05
	Minimum	11.64	12.68	10.71	0.98	0.90	0.93
	Maximum	13.82	15.14	13.70	1.06	1.02	1.08
	CV%	5.42	6.95	8.21	2.46	3.69	4.81
Banu Mărăcine	Average		14.09	13.36		0.92	0.97
	Standard deviation		1.71	0.93		0.07	0.04
	Minimum		12.89	12.69		0.88	0.92
	Maximum		16.04	14.42		1.01	1.01
	CV%		12.11	6.96		7.79	4.59
Dranic	Average		16.06	14.72		0.88	0.91
	Standard deviation		0.71	1.22		0.02	0.07
	Minimum		15.56	13.86		0.86	0.86
	Maximum		16.56	15.58		0.89	0.97
	CV%		4.39	8.27		2.17	7.84

The shape index of fruit was in case of Gura Vaii population between the average values per population of 0.97 (2017) and 1.04 (2016), with the minimum value of 0.88 in 2017, and the maximum value of 1.07 (2016). Within Calopar population (table 2) it had average values between 0.95 (2017) and 1.03 (2016), and the variation limits were 0.90 (2017) and 1.08 (2018). The average values of shape index per population (Banu Maracine) ranged from 0.92 to 0.97. Within Dranic population the population averages for this characteristic were between 0.88 and 0.91, with the minimum of 0.86, and the maximum of 0.97. Variation coefficient calculated for the shape index (table 2) had values between 2.10% (2018) and 7.84% (2018), the limits being met within populations of Gura Vaii and Dranic. These values indicate a high uniformity for this feature. Marakoglu et al. (2005) found in genotypes of *Prunus spinosa* L. from Konya province of Turkey a shape index (1.03) close to the values

found the author of this paper. The shape index had average values between 0.88 and 1.04, and between 0.90 and 1.02 respectively in blackthorn fruits analyzed by Cosmulescu & Gavrilă Călușaru (2018), harvested from the shrubs growing in spontaneous flora of Oltenia.

CONCLUSIONS

The present paper shows that there is a high variability between blackthorn genotypes, in terms of physical characteristics of fruit, under the same ecological conditions, and these genotypes could be important in terms of fruit-growing and food value.

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STUDY ON THE QUALITY OF TYPES OF CHOCOLATE

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Keywords*: chocolate, quality indicators, consumption.*

ABSTRACT

Made from sugar, cocoa powder and butter, chocolate contains vitamins (A, B1, B2, C, D and E), proteins, lipids, lecithin, carbohydrates and minerals (calcium, copper, iron, phosphorus and magnesium). In this study, the organoleptic and physico-chemical quality of the main types of chocolate used in our country are monitored: bitter chocolate, milk chocolate (direct consumption), household chocolate and cover chocolate (industrial consumption). Chocolate for sample formation was purchased from the trade and analyzed in the laboratory at room temperature.The main quality indicators were determined on the chocolate samples made in the laboratory: determination of humidity, fat content, ash content and pH.

INTRODUCTION

Chocolate is composed of solid substance, cocoa and cocoa butter; then, other ingredients, such as sugar, are usually added to sweeten and lecithin to emulsify (Banu et al. 2002, Mursu et al. 2004, Bruinsmams et al. 1999). The solid cocoa mass is used to make solid chocolate, including the one with added vegetable fats, while the liquid cocoa mass is used especially for creams and assortments of fine chocolate. The cocoa mass is characterized by a specific taste and a fine chocolate smell (McEwan et al. 1989, Thomson et al. 2010).

Dark chocolate, even with a higher cocoa content, does not maintain the macronutrient proportions of cocoa beans. In fact, the main component does not refer to fats, as in the case of grains, but carbohydrates, followed by total fats, and this is due to the choice to add a larger proportion of sugar, which exceeds the amount of fat (according to Hetherington et al. 1993).

The amount of cocoa butter and chocolate minerals also depends on the geographical origin of the cocoa beans, and especially on the growing conditions (Djoussé et al. 2011).

The early traders in chocolate therefore required the help of themedical profession to demonstrate that chocolate was beneficialto health (Selmi et al. 2006). Some studies show that moderate consumption of dark chocolate may be beneficial: it leads to inhibition of platelet aggregation and activation, decreased blood pressure, etc. (Selmi et al. 2006, Nasser et al. 2011, Sokolov et al. 2013, Merrill & Alkerwi 2016, Crichton et al. 2017).

MATERIAL AND METHODS

The material used consisted of small samples of bitter chocolate, milk chocolate, household chocolate and blanket chocolate (industrial consumption). The analysis methods used were: organoleptic analysis, fat determination, humidity determination, fat content determination and ph determination for each sample analyzed.

From the qualitative point of view it was followed: the appearance - it is examined in a room where there is a temperature of 16 ° -18 ° C and must be: on the outside, glossy surface, without stains, scratches or air holes (bubbles) indoors, for non-filled chocolate, it should be homogeneous, matte (non-sticky), without bubbles; for the stuffed chocolate, the filling or the addition should be evenly distributed and have a homogeneous consistency; the color may be white or brown-light in chocolate with cocoa and milk, or dark-brown in bitter chocolate; consistency, it is examined in a room with a temperature of 16 ° -18 ° C - strong and brittle, the taste and smell, pleasant, aromatic, characteristic of the assortment of chocolate, without foreign taste or smell; fineness, it is appreciated by tasting and in order for a chocolate to be fine it must give the sensation of an unctuous product, not to produce toothpaste.

The determination of the fat in chocolate is done by dissolving the fat in a solvent, distilling the solvent, weighing the extracted fat and relative to the mass of the sample analyzed. The determination of humidity in chocolate is done by determining the free water (stove) and reporting it to the mass of the analyzed sample.

The determination of the total ash content was achieved by burning, cooling, weighing the samples to be analyzed. The final result was expressed by calculation. The determination of the pH in the chocolate was carried out with the pH-meter, after a preliminary preparation of the sample.

RESULTS AND DISCUSSIONS

Sensory properties are one of the most important factors for chocolate analysis. That is why the first contact of the consumer with the chocolate is realized by sensory path and consequently the sensory properties hold, a paramount role in the selection and the decision of purchase. On the other hand, the sensory properties constitute the first analysis bulletin within the reach of the consumer, with real data related to the quality of the chocolate.

The technical quality control of the chocolate samples in the study will ensure that the product has a smooth, dry, non-stick surface. Chocolate pieces with cracks, broken corners or stains are not allowed. The color of the chocolate is specific to each assortment, as well as the taste and aroma. The chocolate contains a variable content in total sugar, expressed in invert sugar, an acidity, humidity, contained in variable fat. The control of the chocolate products is done first by checking the marking and packaging, after which the organoleptic examination is performed. The chocolate taken into consideration was delivered in tablet forms, having the characteristic mass and packaging mode. In order to control the quality of the chocolate types taken in the study, elementary samples were formed. Out of 10 packages of each type of chocolate studied, one tablet was taken at random. For the chocolate samples obtained, the sensory analysis was performed in order to establish the quality. The four types of chocolate studied were organoleptic compliant. Thus, in terms of packaging design, all the types of chocolate studied presented an integral package, with modern opening system, attractive colors and visible inscriptions.

The label data is easily visible and complete. For bitter chocolate, the paper is matte, semi-waterproof, brown with purple color, with the presentation of the mark as well as the chosen assortment (70% cocoa). The milk chocolate presents a glossy, semi-waterproof, purple color paper, with the presentation of the company logo (purple vacuity) and the brand as well as the chosen assortment (milk). Household chocolate presents matte, semi-waterproof, brown paper, with the presentation of the mark as well as the chosen assortment (60% cocoa) and the cover chocolate has matte, semi-waterproof, cream-brown paper, with the presentation of the mark as well of the selected assortment (52% cocoa). Regarding the external appearance and in the section, the determination was made at room temperature (20ºC), all types of chocolate analyzed presenting regular shapes, with a smooth-glossy surface, without defects. Milk chocolate presents a drawing made with matrix representing the company name. Consistency presented different degrees depending on the type of chocolate. Thus: bitter chocolate: hard, when broken it has a specific, fine bit; milk chocolate: hard, when broken it has a specific, fine, pastry filling; household type chocolate: Rigid, when broken it has a specific bit, medium fineness; Cover chocolate: semi-rigid, when broken it has a specific bit, medium fineness. Color, another parameter analyzed on the four types of chocolate was uniform, intense, specific to the assortment for chocolate with a higher content of cocoa (blanket, household, bitter), medium intensity, pleasant, specific to milk (milk chocolate). Regarding the odor, the analyzed samples presented a pleasant odor, specific for each type, without foreign odor. Taste, strong, well specified, pleasant, specific, with a bite of intense cocoa for the bitter chocolate; characteristic, well specified, pleasant, specific, with a milk husk without a foreign color for milk chocolate; coarse, well specified, pleasant, specific, with intense cocoa bite for household chocolate and well specified, pleasant, specific, with intense cocoa bite perceptible to the chocolate cover. The sensory analysis of the types of chocolate studied was also done by the scoring method. In the determination, a number of 5 tasters participated, the final score being realized by forming an average score (Table 1). The score given for each characteristic of each type of chocolate, individually analyzed, highlights quality products that have obtained maximum score (bitter, with milk, blanket). The house-style chocolate has been taken down a point for taste, aroma and exterior appearance. It is noted that although by visual analysis, all the samples were appropriate, by the scoring method, a clear and relevant assessment of the chocolate samples could be achieved. Humidity and fat content are standardized, showing their importance and defining the quality of the product. Chocolate moisture analysis is important because high humidity can lead to the development of microorganisms. Also the appearance of the stickiness aspect causes the organoleptic properties during the retention to decrease qualitatively. Fat content is a characteristic sought and researched for two reasons: the higher the content, the finer the taste and the chocolate with a lower melting point, but at the same time the fat content increases the nutritional value next to the sugar and causes the growth in weight in case of abuse. Table 2 shows a moisture content in the standard, all analyzed samples falling within a maximum of 2%. A value close to the maximum presented the chocolate type cover with 1.97%. From table 2 it can be seen that the humidity of the studied chocolate types falls in Stas: Max. 2% (fillings up to 18-25%). And as for the fat content, it can be said that the determined values were in stas, values close to the maximum presenting the types of blanket chocolate and milk chocolate. This aspect also indicates an increased fineness of the two types

of chocolate but also a higher degree of melting than the other types of chocolate analyzed (bitter and household) (Table 2).

Table 1

Sensory analysis of the types of chocolate studied by awarding points

No.	Characteristics to be examined	Maximum score given	Chocolate type	The score awarded
1	Exterior appearance and in section (at temperature of 20 ± 2 ºC) and shape	4	bittersweet	4
			with milk	4
			housekeeping	3
			blanket	4
2	Consistency (at temperature of 20 ± 2 ° C)	4	bittersweet	4
			with milk	4
			housekeeping	4
			blanket	4
3	Color	2	bittersweet	2
			with milk	2
			housekeeping	2
			blanket	2
4	Flavor	3	bittersweet	3
			with milk	3
			housekeeping	2
			blanket	3
5	Taste	7	bittersweet	7
			with milk	7
			housekeeping	6
			blanket	7

Table 2

Determination of the physico-chemical characteristics of certain types of chocolate

No	Characteristics physicochemical	Chocolate type				According to Stas
		bittersweet	blanket	with milk	housekeeping	
1	Humidity,% max.	1,91	1,97	1,62	1,82	Max. 2% (fillings up to 18-25%)
2	Total fat,% max.	28	29	30	27	26-31%
3	Total ash,% max.	1,92	1,89	1,98	2,03	Max. 2%
4	pH determined	5,8	6,1	5,2	5,8	5,5-6,5

Determination of the total ash content indicates a higher percentage of mineral substances in household type chocolate, followed by milk, bitter and blanket chocolate. All the types of chocolate analyzed were within the Stas values in terms of fat, moisture and ash content. Regarding the pH determination, an important element in the physico-chemical determination, all the types of chocolate analyzed were according to Stas, a higher pH presenting the chocolate covered, without departing from the limits presented by the stas for the food product: chocolate.

CONCLUSIONS

The four types of chocolate studied were organoleptic compliant. Thus, in terms of packaging design, all the types of chocolate studied presented full packaging, with modern opening system, attractive colors and visible inscriptions, the label data being easily visible and complete. The appearance of the exterior and the section was consistent, all the types of chocolate analyzed had regular shapes, with a smooth-glossy surface, without defects. Consistency presented different degrees depending on the type of chocolate. The color was uniform, intense, specific to the assortment for chocolate with a higher cocoa content (blanket, household, bitter), medium intensity, pleasant, specific to milk (milk chocolate). Regarding the odor, the analyzed samples presented a pleasant odor, specific for each type, without foreign odor.

Taste, strong, well specified, pleasant, specific, with a bite of intense cocoa for the bitter chocolate; characteristic, well specified, pleasant, specific, with a milk husk without a foreign color for milk chocolate; coarse, well specified, pleasant, specific, with intense cocoa bite for household chocolate and well specified, pleasant, specific, with intense cocoa bite perceptible to the chocolate cover. The score given for each characteristic of each type of chocolate, individually analyzed, shows quality products that have obtained maximum score (bitter, with milk, blanket), the household type chocolate having a point to taste, aroma and external appearance. Following the analysis of humidity, fat content and ash content, data were obtained that fell within the limits imposed by the standard, the quality of the types of chocolate being superior. And the determination of the pH, showed in all the types of chocolate analyzed the classification within the limits presented by stas for chocolate.

In conclusion, the four types of chocolate studied presented the quality parameters (organoleptic and physico-chemical) according to the standard being recommended for consumption.

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QUALITATIVE ASPECTS OF OILS OBTAINED BY COLD PRESSING

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Keywords*: edible vegetable oil, quality indices*

ABSTRACT

In this study we want a qualitative analysis of three types of oil obtained by cold pressing, two obtained from native raw materials: sunflower seeds and soybeans and another by pressing a European raw material: olive fruits. The oil samples were purchased from the trade and analyzed in the laboratory. The use of these categories of oil was aimed at obtaining data regarding the physico-chemical and organoleptic stability, in a short period of time (4 weeks). In this respect, the main quality indices (acidity index and iodine index) were followed, as well as careful observation of organoleptic findings, determinations with precise indication regarding the quality of the oils obtained by cold pressing.

INTRODUCTION

Fats are indispensable food components, which largely determine the nutritional, biological, energy value and taste qualities of food. The efficiency of food lipid assimilation in the human body is given by the balance between fatty acids present (after Connor 2000 and Mahan et al. 2000). It is known that edible vegetable oils have a rich chemical composition, varied in composition of fatty acids, specific for each type of vegetable oil and which, by the importance and role they play in the body, determines their quality (by O'Brien 2008, Walisundera 2000, Heird 2007). Sunflower, as a source of vegetable oil, ranks first in our country. The content rich in unsaturated fatty acids, mainly represented by linoleic acid (44-75%) and oleic acid (14-43%), as well as the presence in small quantity of linolenic acid (0.2%) give the high nutritional value of sunflower (Shahid & Bhanger 2007, Zhang et al. 2010). Famous in history, for its benefits, olive oil has been permanently in the consumers' share between food and medicine. It is among the only vegetable oils that can be consumed, in the raw state, without any processing, and the high content of monounsaturated fatty acids and antioxidant substances successfully recommends it in the diet (Koski et al. 2002, Jiménez et al. 2017). Soybean oil contains arachidonic acid which provides strong blood cholesterol lowering properties (which form atheromas on artery walls and even cause myocardial infarction and angina pectoris), in improving gastric and duodenal ulcer and in intestinal obstructions (by Papadopoulos et al. 2003). The increasing demands of the Romanian market for the crude oils obtained by cold pressing are evidenced by the increasing desire lately of the consumers to know as many medical, but also technological and nutritional aspects.

MATERIAL AND METHODS

The material used consisted of samples consisting of oils obtained by cold pressing: sunflower oil. soybean oil and virgin olive oil. Cold pressed sunflower oil as well as virgin olive oil and soybean were purchased from trade for laboratory testing (Figure 1).

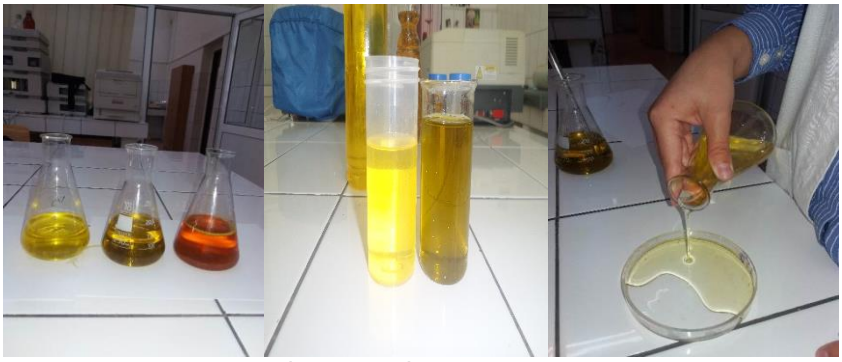

Figure 1 Laboratory tests

The analysis methods (Căpruciu R., 2016) consisted of: organoleptic analysis of the oil samples studied and the determination of quality indices: acidity index and iodine index (Hanus method). Organoleptic analysis was determined using the senses (sight, smell and taste) following quality indices such as appearance, consistency, color, taste and smell. The evaluation was done by the scoring method. Regarding the appearance and consistency, the transparency of the analyzed oil samples was observed, on a 100 mm high layer, in a glass with a diameter of 50 mm. It has been checked whether the oil is cloudy, emulsified or contains mechanical impurities. The color was examined by inserting the oil into colorless glass glasses with a diameter of 50 mm. The examination was conducted in natural light. The odor was examined by heating the samples at 50oC on the water bath. The taste was appreciated by tasting a small quantity, from the sample, at room temperature. The acidity index represents the amount of KOH, in mg, required to neutralize the free fatty acids in one gram of fat. For this purpose, the oil dissolved in ethanol with 0.1 n NaOH solution in the presence of phenolphthalein was titrated. Weigh 5 g of the sample to be analyzed (sunflower oil) - (depending on the acidity of the sample), with an accuracy of 0.01 g, and pass quantitatively into an Erlenmayer beaker. In the case of dark oils (olive oil) work with smaller quantities of sample (3 g). Add 100 cm3 of solvent to the sample. Stir until the sample is completely dissolved and add 5 drops of indicator. Then titrate with sodium hydroxide solution to the color turning point (pink in the case of phenolphthalein). The acidity expressed in% oleic acid is calculated according to the calculation formula. The iodine index indicates the degree of unsaturation of oils and fats and is expressed in absorbed iodine in relation to 100 g of product. Knowing the iodine index of an oil or fat, an indication is obtained about its unsaturation. The presence of unsaturated acids gives these products certain properties (dryness, sensitivity to the action of the air), adversely influencing their resistance to longer storage. In value, the iodine index is calculated as mg I_2 per100 mg fat, being represented by a dimensionless figure, according to the calculation relation.

RESULTS AND DISCUSSIONS

The analysis of the qualitative potential of two types of oil obtained by cold pressing was achieved following the establishment of two objectives: establishing the qualitative potential of some oils obtained by cold pressing through organoleptic analysis as well as analyzing the qualitative potential of oils obtained by cold pressing determining the quality indices and determining the direction of use. In order to go through the stages in which the quality of the oils to be analyzed is established, the organoleptic analysis was started immediately after opening the container for each oil sample. The organoleptic analysis was performed under normal laboratory conditions at a constant temperature of 20 ° C and under natural light conditions. Because obtaining sunflower oil, soybean and olives requires cold pressing, the raw material is carefully selected, aiming for the sunflower seeds to have an appreciable content in botanical oil, to have the same size as possible. , without defects of form or color, with humidity determined according to the standard. The appearance is of oily mass with a high degree of suspension when stirring in the case of cold pressed sunflower oil and with a high degree of suspensions when stirring in the case of virgin olive oil. Soybean oil did not present suspensions during shaking. Also, when tasting, sunflower oil and cold pressed soy as well as virgin olive oil presented an intense aroma, specific to the raw material from which it was obtained. For the analysis of the odor, a rapid inhalation of the covered vessels was carried out for several seconds, both types of oil having a characteristic odor of the raw material from which they come, more noticeable to the sunflower oil obtained by cold pressing, and to the soy persisted grassy hue. The color of virgin olive oil is green - light. For soybean, the color of green was perceived yellow and that of sunflower obtained by cold yellow-brown pressing. In both categories, no color spots were detected in the mass of the analyzed oil. Comparing organolepically, the oils obtained by cold pressing of different raw materials are major differences in color, consistency, smell and taste. It is observed, following the laboratory analyzes, differences between the three categories of oils analyzed (sunflower oil, olive oil and soybean oil, obtained by cold pressing) in terms of the value of the physical-chemical indices analyzed (table 1). The assessment of the quality of the types of oil taken in the study was performed on samples formed when the container was unsealed, immediately after the purchase, forming the samples: F1- sunflower oil sample when the container was unsealed; M1 - sample of olive oil on container sealing; S1- Soybean oil sample on container sealing;

Also, to observe the oil samples during storage under conditions established by temperature and humidity, but in the presence of air, new samples were formed after 4 weeks of storage: F2 - sunflower oil sample after 4 weeks of storage in contact with the air; M2 - olive oil sample after 4 weeks of storage in contact with air; S2- Soybean oil sample after 4 weeks of storage in contact with air. Regarding the determination of the free acidity expressed in% oleic acid, it is found that when the container is desiccated, the sample of olive oil shows a much lower acidity than that recorded in the sunflower and soybean oil samples (1.2% oleic acid). versus 2.6% oleic acid). Soybean oil sample (S1) showed an acidity of 2.1% oleic acid. The acidity values increase after 4 weeks of storage for all the oil samples analyzed (table 1). It is found that the sample of sunflower oil shows after the storage period an increase of acidity above the norms passed in stas (4% for cold pressed sunflower oil). A high value also presents the soybean oil that reaches a value of 3.9% expressed in oleic acid, close to the maximum allowed by stas for this type of oil (4% expressed in oleic

acid). From the point of view of acidity we can say that during storage, more virgin olive oil is prepared, followed by unrefined soybean oil and sunflower oil obtained by cold pressing.

Table 1

Determination of the main quality indices for some cold pressed oils

No.	*Physico-chemical indices*	*The type of oil*						*As standard*
		F_1	*F_2*	*M_1*	*M_2*	*S_1*	*S_2*	
1	I.A. *(% oleic acid)*	*2,6*	*4,1*	*1,2*	*1,8*	*2,1*	*3,9*	*≤ 4 (unrefined sunflower oil) ≤ 2% (virgin olive oil) ≤ 4 (unrefined soybean oil)*
2	I.I. (g)	*130*	*145*	*85*	*93*	*127*	*148*	*125-145 (sunflower oil) 78-94 (olive oil) 120-140 (soybean oil)*

In which: I.A.- acidity index; II - iodine index; F1 - sunflower oil sample upon container sealing; F2 - sunflower oil sample after 4 weeks in contact with air; M1 - olive oil sample on container sealing; M2 - olive oil sample after 4 weeks storage in contact with air; S1- sample of soybean oil upon container sealing; S2- sample of soybean oil after 4 weeks of storage in contact with air.

This aspect concerns two aspects: in case of keeping the oil in the household after the container has been unsealed and the oil is kept in contact with the air at the wrong temperature (room temperature or higher: the temperature in the kitchen during cooking) or if the lot has not been purchased and is approaching the end of the validity period. In this case, according to the data recorded in table 1 regarding the acidity index, after four weeks of preservation a higher risk in terms of loss of quality is presented by the crude sunflower oil, followed by the crude soybean oil. The mentioned samples also presented sediment on the bottom of the glass which attracted the change of color and smell, thus the qualitative depreciation. The acidity of the virgin olive oil was maintained in the norms established by Stas. Determining the iodine index (table 1) for the types of oil taken into consideration, highlights the lower degree of unsaturation of olive oil compared to that of sunflower obtained by cold pressing and unrefined soy. The value calculated for the iodine index in the sunflower oil obtained by cold pressing (130) when the container is unsealed, falling within the limit set by Stas. An increase in the iodine index is observed during storage, reaching after 4 weeks at the upper limit stipulated in the Stas (145). The virgin olive oil has an iodine index value of 85g expressed in oleic acid, which means on the one hand that it is a drying oil, so in contact with the air, it dries, forming glossy solid films, which can be valorised in the case of the use of olive oil in industry (cosmetic or medicine) and on the other hand that it has a lower degree of unsaturation, aspect found also in the samples kept in the deposit (the value of the iodine index did not exceed the norms stipulated in stas. A high degree of unsaturation weighed the soybean oil that exceeded the value of the iodine index

registered in Stas (148 g iodine absorbed in 100g product compared to stas with 140 g iodine absorbed in 100g product). The physico-chemical analysis of the categories of oil analyzed shows the qualitative character more accentuated to the virgin olive oil. It is also necessary that, after the containers are cleared, they are protected from direct sunlight and room temperature. It is recommended that the storage temperature be between 4 and 8°C, lower temperatures leading to precipitation of oils with the appearance of deposit at the bottom of the glass.

CONCLUSIONS

Following the organoleptic analysis, all the analyzed oils had specific characteristics of the cold pressed oils, without modifications to the primary samples formed when the containers were unsealed. Comparing the oils obtained in the study, obtained by cold pressing, from an organoleptic point of view, there are major differences in color, consistency, smell and taste.

It is observed, following the laboratory analyzes, differences between the three categories of oils analyzed (sunflower oil, olive oil and soybean oil, obtained by cold pressing) regarding the value of the qualitative indices analyzed, both at the initial samples and after four weeks of storage. Determination of the free acidity expressed in% oleic acid, it is found that when desealing the container the sample of olive oil has a much lower acidity than that recorded in the sunflower and soybean oil samples. The acidity values increase after four weeks of storage in all the oil samples analyzed. Thus, the sunflower oil and soybean samples show an increase in acidity after the storage period over the norms passed in stas. From the point of view of acidity we can say that the storage is more virgin olive oil. Determining the iodine index for the types of oil taken into consideration, highlights the lower degree of unsaturation of olive oil compared to that of sunflower obtained by cold pressing and unrefined soy. An increase in the iodine index is observed during the retention period, reaching four weeks after the upper limit stipulated in the stash. The virgin olive oil has a value of iodine index in Stas data which shows that it has a lower degree of unsaturation, aspect observed also in the samples kept in the storage (the value of iodine index did not exceed the norms stipulated in the stas). Canlite analysis of iodine index shows that virgin olive oil samples are better suited to storage than cold pressed sunflower oil and unrefined soybean oil. This is confirmed by calculating the acidity index.

The virgin olive oil samples, due to the value of the quality parameters recorded after the laboratory analyzes and the organoleptic determinations, can be used for food purposes for up to four weeks, while the sunflower oil samples cold pressed and soy unfinished has restrictions on the time of use, thus after about three weeks since the staining of the stain, their quality degrading in contact with the air.

As a result, it is recommended that sunflower oil and soybean oil samples be subjected to the refining process, if their direction is for storage and not for immediate consumption.

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METHODS TO REDUCE PRODUCTION LOSSES CAUSED BY THERMAL STRESS AT THE EGGPLANTS CULTURE IN THE SOUTHERN AREA OF OLTENIA

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Key words*: eggplant, sandy soils,production*

ABSTRACT

In the south of Oltenia, in the last years the average annual temperatures have shown a tendency of increase, and the absolute maximum temperature has shown significant increases. The high temperatures in the air between July and August, the relative low humidity, the strong insolation accentuate the aridity effect with adverse effects on the production of eggplants. Under these conditions the fruits ripen matures, discolor and harden and become non-marketable. At the eggplants exposed directly to the natural environmental conditions the depreciated production was between 9.5-23.2 t/ha, respectively 12.4-23.2% of the total production compared to the eggplants shaded with HDPE UV green mesh during the temperature period over 30^{0}C at the Aragon F1 hybrid and between 8.1-21.2 t / ha (11.4-29.9% of total production) in the Alexandra variety. Also at the shaded plants there was no mite attack.

INTRODUCTION

The eggplants are pretentious with respect to heat, water, light and food. The optimum temperature for normal growth and development is 25-300C, but can withstand temperatures of 450C. Plants are destroyed by light frosts and are affected by cold periods without frost (Voican V., Lăcătus V., 1998). The productive yield of eggplants fruits is significantly dependent on air temperature (Katarzyna Adamczewska-Sowinska et al., 2016). The high temperatures reduce the number of flowers and implicitly the number of fruits and favor the appearance of mites. The insufficiency of the light causes the growth stagnation, the abortion of the flowers, and the related fruits remain small. Eggplant are pretentious to water. For eggplants, the low level of moisture in the soil manifests rapidly through the abortion of flowers and the qualitative depreciation of fruits. The cultivation of eggplants is favorized of a balanced regime of humidity in the soil, which should not fall below 60% of i.u.a, but not be excessive (Buzescu D. et al., 1996). For sandy soils the optimum level of water supply of the soil is 70% of i.u.a. on the depth of 50 cm (Marinică Gh., 1989).

In recent years, climate change has taken place globally, causing the emergence of the phenomena of desertification and aridization of many areas with

influences on the normal unfolding of metabolic processes in plants. For the area of sandy soils in the south of Oltenia, the tendency of temperature increases began after 1985, the climatic conditions being very changing from year to year. The highest temperatures are recorded in the months of July-August, which corresponds to the period of maximum fruiting for the eggplants crops. Temperatures above the upper biological thresholds decrease or stagnate the growth phenomena, slow down or stop the physiological and biochemical processes causing significant damage (Oslobeanu M. et al., 1980). The harmful influence of the high temperatures depends on the period of the annual biological cycle, on the phenophase, on the agro-phytotechnical works, etc. The color of eggplant patches is strongly influenced by the temperature conditions. During the hot season color development is faster (Nothmann J. et al., 1978).

Based on these assertions, we considered it necessary to establish specific culture methods to prevent the undesirable effects caused by the thermal stress that is created under the climatic conditions of the sandy soil area of southern Oltenia.

MATERIAL AND METHODS

The experience is trifactorial and was placed in the experimental field according to the method of the plots subdivided into 3 repetitions. In each variant, two rows were planted at a distance of 75 cm between rows and 30 cm between plants / row. The surface of a variant was 4.5 m^2.

Factors studied

Factor A - The cultivator

a1 - Alexandra

a2 - Aragon F1

Factor B - cultivation method

b1 - no mulch

b2 - with mulch

Factor C - the method of protection

c1 - unprotected

c2 - protected with agril in the first part of the vegetation period

c3 - unprotected, but shaded at over 30^0 C

c4 - protected with agril in the first part of the vegetation period and shaded during the period with temperatures above 30^0 C

It was determined the number of fruits / plant, the average weight of a fruit, the production of eggplants in dynamic and total. The obtained results were calculated and interpreted statisticall.

RESULTS AND DISCUSSION

The June was warm, with a monthly average of 22.5^0 C, 0.9^0 C higher than the multiannual average of the area of 21.4^0 C. In June in 10 days temperatures were recorded between 25-30^0 C, in 15 days the maximum temperatures were between 30-35^0 C and in one day temperatures were above 35^0 C. The maximum in June was 35.7^0 C, and the rainfall amount quite high for the area, of 195.2 mm (table 1).

Table 1

The climatic conditions during June - August 2018, registered at the RDSPCSS Dăbuleni weather station

Specification	The month		
	Iune	Iuly	August
Number of days with maximum temperatures between 25-30^0 C	10	8	2
Number of days with maximum temperatures between 30-35^{0}C	15	20	25
Number of days with maximum temperatures between 35^{0}C	1	-	4
The monthly average (^{0}C)	**22.5**	**23.6**	**25.1**
The monthly maximum (^{0}C)	35.7	34.9	35.7
Rainfall (mm)	195.2	147.9	30.0
Multiannual average temperatures (1956-2018)	**21.4**	**23.2**	**22.6**

In July the average monthly temperature was 23.6^0 C, very close to the multiannual average. In 8 days maximum temperatures were recorded between 25-30^0 C and in 20 days the maximum temperatures were between 30-35^0 C, the maximum of July being 34.9^0 C.

The amount of rainffal, although it was high (147 mm), their distribution was uneven, alternating periods with high amounts in precipitation with drought periods, was necessary watering plants with water. And in August the average monthly temperature was much higher than the average multiannual temperature (25.1^0 C in August 2018 and 22.6^0 C multiannual average). In 2 days the maximum temperatures were between 25-30^0 C, in 25 days there were temperatures between 30-35^0 C and in 4 days the maximums exceeded 35^0 C, the maximum of the month being 35.7^0 C, and the precipitation amount was 30 mm.

The high temperatures in the air between July and August, the low relative humidity, the strong insolation accentuated the burning effect with adverse effects on the production of eggplants. In these conditions, in the shaded variants, the fruits was ripened rapidly, became discolored and hardened, becoming non-marketable.

In the *Alexandra* variety, in without mulch culture, in the non-shaded plants, the degree of fruit depreciation was influenced by the age of the plants. At unprotected plants, the depreciated production was 15.3 t/ha, which represented 28.3% of the total production, and in the plants that were protected with agril in the first part of the vegetation period, the depreciated production was 21, 2 t/ha which represents 29.9% of the total production (table 2).

At the same cultivar, in the with polyethylene mulch culture, the amount of eggplants depreciated was lower: 9.6 t/ha in the unprotected variant (20% of the total production) and 8.1 t/ha (11.4% of total).

At the *Aragon F1* cultivator, in the crop without mulch the depreciated production was of 9.5 t/ha in the unprotected plants representing 23,1% of the total production and in the variant that was protected with agril the losses of production were of 23,2 t/ha (23.7% of total production).

Table 2

The influence of the studied variants on the non-marketable production of eggplant

The cultivar	Method of cultivation	Method of protection	Total production (t/ha)	Impaired production		Total commercial production (t/ha)
				t/ha	% of total	
Alexandra	Without mulch	C1	54.0	15.3	28.3	38.7
		C2	92.7	21.2	29.9	71.5
		C3	58.3	0	0	58.3
		C4	92.0	0	0	92.0
	With mulch	C1	48.0	9.6	20.0	38.4
		C2	70.8	8.1	11.4	62.7
		C3	65.3	0	0	65.3
		C4	76.6	0	0	76.6
Aragon F1	Without mulch	C1	41.1	9.5	23.1	31.6
		C2	97.7	23.2	23.7	74.5
		C3	52.4	0	0	52.4
		C4	89.3	0	0	89.3
	With mulch	C1	48.2	10.7	22.2	37.5
		C2	88.1	10.9	12.4	77.2
		C3	58.2	0	0	58.2
		C4	74.6	0	0	74.6

In the with mulch crop the losses of production were smaller: 10.7 t / ha in the unprotected variants (22.2% of the total) and of 10.9 t/ ha in the variants protected with agril (12.4% of the total).

Compared to the plants exposed directly to the climatic conditions by shading the plants with HDPE UV green cloth, there were no production losses due to the depreciation of the eggplant fruits. Also at the shaded plants there was no mite attack.

The eggplant production was greatly influenced by the method of protection (table 3).

Tablel 3

The influence of the method of protection on the production marketable by eggplants on the sandy soils

Method of protection	*Production*		*Difference (t/ha)*	*Significance*
	t/ha	*%*		
Without protection	36.6	100	Mt.	Mt.
Protection with Agril	71.5	195	+34.9	xxx
Without protection + shading	58.6	160	+22.0	xxx
Protection with Agril + shading	83.1	227	+46.5	xxx

LSD 5% = 11,61 t/ha

LSD 1% = 15,79 t/ha

LSD 0,1% = 21,15 t/ha

In natural conditions, planted in the optimum period, an eggplant production of 36.6 t/ha is realized, and by shading an increase of 22 t/ha is realized, respectively a production of 58.6 t/ha. In conditions of protection with agril the eggplant production was much higher than the unprotected, the production being determined by the

increase of the production phase, with four additional crops being harvested at the beginning of the period. In these variants, the total production was 71.5 t/ha resulting in a production increase of 34.9 t/ha compared to the unprotected variant, very statistically significant. By protecting with agril in the first part of the period of vegetation and shading during the warm period, a production of 83.1 t/ha was obtained, resulting in an increase of 46.5 t/ha compared to the unprotected variant, an increase assured from a statistical point of view as very significant.

At the same cultivar, eggplant production was influenced differently by the method of protection used (Table 4).

Table 4

The influence of the method of protection on the production of eggplants depending on the cultivar

The cultivar	Method of protection	*The production*		Difference (t/ha)	Signifi-cance
		t/ha	*%*		
Alexandra	Without protection	38.6	100	Mt.	Mt.
	Protection with Agril	62.7	162	+24.1	xx
	Without protection + shading	61.8	160	+23.2	xx
	Protection with Agril + shading	84.3	218	+45.7	xxx
Aragon F1	Without protection	34.6	100	Mt.	Mt.
	Protection with Agril	75.9	219	+41.3	xxx
	Without protection + shading	55.3	160	+20.7	x
	Protection with Agril + shading	82.0	237	+47.4	xxx

LSD 5% = 16,43 t/ha
LSD 1% = 22,34 t/ha
LSD 0,1% = 29,92 t/ha

For *Alexandra* cultivator, the production was 38.6 t/ha in the unprotected variant, and in variant in the unprotected with shaded it was 61.8 t/ha, the increase of 23.2 t/ ha achieved being distinctly significant from the point of view statistical. By protecting the plants with agril in the first part of the vegetation, 62.7 t/ha were obtained, with 24.1 t/ha more than the unprotected ones, and by using shading the plants production reached 84.3 t/ha.

The *Aragon F1* cultivator realizd a production of 34.6 t/ha in unprotected crop, 55.3 t/ha in unprotected but shaded crop, respectively a statistically significant increase of 20.7 t/ha. The protection of the plants with agril led to a production of 75.9 t/ha, and by shading the plants that were protected with agril, the production level increased to 82 t/ha.

CONCLUSIONS

The area of sandy soils in the south of Oltenia is favorable to the eggplant culture, however during the period of July to August there is the risk of the fruit depreciation due to excessively high temperatures that have been registered in recent years.

Green HDPE UV cloth protects eggplant plants from excessive heat, eliminating production losses caused by heat stress.

Regardless of the hetdod of cultivar used, the eggplant production are higher in plants protected with agry compared to unprotected ones and also higher in plants shaded than those without shading.

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ACCLIMATIZATION OF *PERILLA FRUTESCENS* AND ITS DIRECTIONS FOR APPLICATION

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Keywords*: asian species, medicinal plant, Perilla frutescens*

ABSTRACT

This paper presents the new plant, Perilla frutescens and the importance of this species for Romanian culture medicinal plants.

INTRODUCTION

Perila (*Perilla frutescens*) belonging to the Lamiaceae family of being a species originating in the the Himalayas and today is spread in several areas of the world, such as: Asia, North America, Europe, (Asif M. and Kumar A. 2010). From the beginning, the human being depends on plant species for food, clothing, shelter and health care needs. Plants were the main components of folk medicine, probably practiced by man since its inception. If we look at the other animals, we realize that many, if not all, have developed the ability to use plants to adjust their nutrition and health requirements. The peril is an annual plant, has a height of 50-200 centimeters, with stalked stems, characteristic of lamiaceae (Korea Biodiversity Information System, 2016). *P. frutescens* has been used in traditional herbal medicine to treat various diseases: depression, anxiety, tumors, cough, asthma, colds, allergies, intoxication and some intestinal disorders and also as an antioxidant. Perilla is widely cultivated in all Asian countries, such as China, Japan, South Korea, Vietnam and India; however, China is considered to be a primary gene center for this species (Asif M and Kumar A. 2010). In Japan, it has historically been used for the manufacture of drying oil, for waterproofing umbrellas or as lamp oil. Perilla is used as a culinary plant for coloring and flavoring pickles, as well as garnish for raw fish (Ito M. et al. 2008). In traditional herbal human medicine in China and India, the plant strain has historically been used as an analgesic and anti-abortion agent. The leaves are believed to be useful against asthma, colds, influenza, chest weight, vomiting, cough, constipation and abdominal pain, as well as in stimulating stomach function (Negi VS et al., 2011).

MATERIAL AND METHODS

Perilla is a highly diversified species and its variability is expressed in numerous names, varieties, forms and variety names. Currently, the peril is considered as a single complex species that is divided into varieties and cultivars, based mainly on the size and color of the leaves, the type of incision of the leaf margin, the size and brush size of the fruit cup, and the size and color of the walnut. Cultivations include "Atropurpurea", "Crispa" and "Curled". The classification of the pearl is still confusing because the botanists did not agree on the recognition and classification of the two distinct cultigens (as different species or cultivars).

A first classification of the two cultigens into different species occurred in 1884, when the synonym *P. arguta* Benth was mentioned. being a shiso (mint), and the synonym *P. ocymoides* L. which was given to the oil seed peril. The genus *Perilla* is part of the Family *Lamiaceae*, also called *Labiatae*, or the mint family, of flowering plants, with 236 genera and more than 7000 species, the largest family of the Lamiales order. Aromatic plants are important for people as a spice plant useful for aroma, fragrance or medicinal properties. Most family members have stumps; pairs of leaves simple, opposite; and tubular corolla with two labia, open, with tubules (petals joined), with "bell" type caliphs (sepals joined) with five lobes.

The leaves are simple, trimmed opposite, gradually, with decreasing dimensions, from the base at the top of the plant, finely hairy to dense hairs; petiolate with a length of 0-7 cm, absent or very small on the upper leaves; leaflet broadly ovate to circular, 7-12 cm long and even 17 cm wide, and 5-8 to 12 cm wide, base rounded at the cone, fine margin to coarse, sometimes wavy, with short acuminate apex at the mucronate. The leaves are green, sometimes colored purple below. (Korea Biodiversity Information System). As an example, both varieties have leaves of the same shape: broad leaves ovate, serrate, arranged opposite.Meanwhile, Korean researchers have found in recent years that in Korean peril the most active aromatic compounds were ketone, (Z) -3-hexenal (green), egoma ketone, and isoegotic ketone. The red (purple) forms of shiso (the purple and crisp form) have their own pigment, called "anthocyanin peril" or anthocyanin of shisonin.

The color is present on both sides of the leaves, as well as on the entire stem, buds and flowers (chalice). The wrinkled red leaves (called chirimenjiso in Japan) were considered as a form of shiso, which were later examined first by Western botanists, being called P. crispa (which would mean "wavy or wrinkled"). This Latin name was later retained when the shiso was reclassified as a variety.

There are also bi-colored varieties (var. Crispa form discolor Makino, which are red only at the bottom. There are also varieties with green leaves (called chirimenaojiso, form viridi-crispa).

The flowers appear from July on the apical tip. The very small flowers are white, sometimes pink. There are melliferous with a pleasant smell: a mixture of coriander, cinnamon and anise, with a hint of citrus. The flowers are grouped in raceme apical inflorescences (at the tip of the stem) and bloom in August and September. The calyx, with a length of 3-4 millimeters, consists of three upper and two lower sepals.

The corolla is 4-5 millimeters long with the lower lip larger than the other. Two of the four stamens are long (Asif M and Kumar A. 2010). Inflorescences are terminal or axillary, racemate or paniculate, 2-20 cm long, formed from a spiky whorl with 2 flowers, densely hairy; peduncle 1-1.5 cm long; bracts linear-lanceolate to subcircular, 3-6 mm × 0.5-4 mm, glandular red-brown. Pedicel about 1.5 mm long; campanulate calyx, lower lip, glandular pockets, 2 mm high, lower lip approximately 3 mm long, with 2 lanceolate teeth, longer than the upper 3-tooth upper lip; in fruits, the calyx is larger up to 11 mm and becomes enlarged or pendulous; corolla bell-shaped, with 2 beaks, 3-4-4 mm long, white to red-violet, lower lip with 3 lobes, upper lip with 2 lobes; 4 stamens erect, almost equal; pistil with a deep lobe with 4 lobes and a style ending in 2 stigmatic lobes.

Fruits composed of 4 almost spherical nucles with a diameter of 1-2 mm, gray-brown to brownish-black, with a smooth surface, enclosed in the persistent cup.

The fruit is a schizocarp, 2 mm in diameter and with an interesting pattern on the outside Asif M and Kumar A. 2010).

The seeds of peril can be soft or strong, being white, gray, brown, dark brown and globular in shape (Miller, W. 1922).

1000 seeds weigh about 4 grams (Yu, H.C., Kosuna, K. & Haga, M. (Editors), 1997).

Peril seeds contain approximately 38-45% lipids (Miller, W. 1922).

RESULTS AND DISCUSSIONS

After verifying the germination capacity of the peril seeds according to the temperature, we found that after two years of storage at room temperature the germination capacity decreased below 4.7% which is very little. However at 4-6 ° C it did not fall below 90%. The verification was done by sowing in pots filled with the same substrate 60% peat, 30% pearl for moisture and aeration and 10% garden soil. Germination of seeds stored under different temperature conditions.

Seeding

It can be sown directly in the field at the place of cultivation where beautiful, well-branched plants can be obtained. The seeds must be fresh, from the previous year because if kept under improper conditions they can lose much of their germination capacity in one year. In the case of crops initiated in pallets / bacilli the sowing is done quite early in the spring in a slightly acidic mixture, possibly corrected with acid peat. The seeds are placed on the surface of the substrate and then covered with soil. For a good germination a temperature of 20 ° C and high humidity will be maintained inside the production space, germination room or in a greenhouse at the end of March. In heat, humidity and a bright place, *Perilla frutescens* germinates quickly in 5-10 days.

Table 1

The influence of the storage temperature on the germination capacity of peril seeds

Harvest date September 20, 2017

Sample	Storage temperature 18-24 ° C				
	Nr. of seeds				
	Seeded	Germinated after a number of days of storage			
		60	120	150	360
1	30	26			
2	30		21		
3	30			11	
4	30				2
Germination percentage%		87	70	37	6.7
Sample	Storage temperature 4-6 ° C				
	Nr. of seeds				
	Seeded	Germinated after a number of days of storage			
		60	120	150	360
1	30	30			
2	30		29		
3	30			29	
4	30				28
Germination percentage%		100	97	97	93

Plantation

Planting seedlings is done as early as possible in pots if a container / pot or field crop is grown after the danger of temperatures below 10 ° C has passed. Plants are pruned when they have 2 to 3 pairs of leaves, to obtain beautifully branched plants.

The planting scheme is in rows at 70 cm with a distance of 30 cm between plants, achieving a density of 47 600 plants / ha or in strips of two rows at 30 cm distance and 30 cm between plants, the strips being 120 cm apart , the realized density is about 44 800 plants / ha, allowing mechanization work.

The density, in case of sowing in the field, for ***oilseed*** production is about **330 000** plants / ha.

It is interesting that the plant is delayed or even prevented from flowering by cutting the flowering stems as soon as they appear, the plant lives longer, this being of interest if the plant is intended to **obtain leaves** and is used in ***landscaping***, unless we want to we harvest the flowers and seeds. On the other hand, some seeds should be left to ripen and be carefully harvested for sowing the following spring.

Table 2

Field anatomical measurements

Nr	Parameter	The average size Irrigated and fertilized culture (experimental culture, SCDL-Buzau)	Irrigated culture wn farm, Gugeşti-Vrancea)	Culture without the application of special agrotechnical easures (ornamental, USAMV-Bucharest Campus)
1	The height of the plant	2m	2,05 m	1,2 m
2	The diameter of the bush	>1,40 m	>1,30 m	>0,7 m
3	Height of the stem to the first branch	6-8 cm	8-9 cm	7-8 cm
4	The diameter of the stem at the parcel	2,2-2,9 cm	2,2-2,7 cm	1,2-2,0 cm
5	Number of main shoots	16-18	16-18	10-12
6	Length of shoots 1 m	1 m	1 m	0,6 m
7	The diameter of the shoots	0,8-1,4 cm	0,8-1,2 cm	0,6-0,9 cm
8	Number of leaves per shoot	150-160	140-150	60-80
9	The length of the leaflet	17 cm	16,5 cm	12,5 cm
10	The length of the leaflet	11 cm	10,5 cm	7,5 cm
11	The depth of the teeth of the leaflet	3-5 mm	3-5 mm	2-3 mm
12	The length of the leaf petiole	9 cm	9 cm	6 cm
13	Diameter of leaf petiole	5 mm	5 mm	3 mm
14	Length of inflorescence	10-12 cm	10-12 cm	10-12 cm
15	Number of flowers in inflorescence	38	39	27
16	The distance between the vertices	5 mm	5 mm	5 mm
17	The distance between the leaves	8 cm	8 cm	6 cm
18	Total vegetative production per plant	2,5 kg	2,5 kg	-
19	Early flowering	September 1, 2016 ((13:15 ☼ / 10:45 ❍) August 15, 2017 14:04 ☼ / 09:56 ❍) August 25, 2018 (13:35 ☼ / 10:25 ❍)	August 28, 2016 3:27 ☼ / 10:33 ❍) August 15, 2017 14:04 ☼ / 9:56 ❍) August 26, 2018 3:32 ☼ / 10:28 ❍)	August 22, 2018 (13:44 ☼ / 10:16 ❍)
20	Start bound	October 10, 2016/40 days September 25, 2017/41 days October 3, 2018/39 days	October 8, 2016/41 days September 24, 2017/40 days October 5, 2018/36 days	September 29, 2018/38 days
21	Number of seeds in flower	4	4	4
22	Planting distance	50-70x120 cm	40x120 cm	30 cm
23	The diameter of the root system	40-45 cm	35-40 cm	-
24	The depth of the roots	25-30 cm	25-30 cm	-

CONCLUSIONS

Perilla frutescens through the cultigens it contains is a very important plant considering the acclimatization with very good results to the pedoclimatic conditions of Romania, the very wide range of uses that are suitable, respectively food as vegetable and aromatic plant, medicinal with given applications of the plant itself as well as the extracts that can be obtained (oils), industrial, landscape, social and economic. Cultivation of the Perilla Frutescens species both in protected areas and in the field with the application of common agrotechnical works to both vegetables without specific works in good soil and constantly supplied with water but without excess, in strong light without high soil fertility requirements; Soil, propagation methods to be those used for many common annual vegetable crops;

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RESEARCH STUDIES ON THE VALORISATION OF ENVIRONMENTAL CONDITIONS SPECIFIC TO SOUTHERN OLTENIA SANDS BY GRAPEVINE CULTIVATION

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Keywords*:* grapevine*,environmental conditions, southern Oltenia sands*

ABSTRACT

The sandy soils in our country are significantly different from one another due to certain pedological and agro-production particularities. Research studies were conducted differentially on natural geographical areas, fact which allowed the highlighting of elements specific to every area. In order to assess the valorisation of environmental conditions characteristic to sands in southern Oltenia through grapevine cultivation an experiment was made with view to assessing the behaviour of certain varieties from the ampelographic collection of SCDCPN Dăbuleni under conditions specific to years 2018 and 2019.

INTRODUCTION

The area of sands and sandy soils in southern Oltenia has been prone to an ever increasing aridisation during the last years due to current climatic changes manifested by a tendency of annual average temperature increase, high thermal amplitudes, low precipitations with uneven and hazardous distribution. With the more evident climatic changes, the research-development results obtained at CCDCPN Dăbuleni have got a significant value within the national strategy to reduce aridisation. Technological solutions for the improvement and laying out of sandy soils, as well as the cultivation technologies implemented, had remarkable economic results, thus contributing to the rural development in the sandy soils area. Significant contribution to setting up technologies for the valorisation of specific conditions through grapevine cultivation was brought throughout time by a large number of scientists (Baniţă P., 1983, Daniela Cichi, D.C.Costea ,2008, Costea D,C. et al 2008, 2013C,l Olteanu I. et al 2002, Popa A. et al 2015, Rățoi I., 2017, Vlădoianu E., 1979)

MATERIAL AND METHODS

In order to assess the valorisation of environmental conditions characteristic to sands in southern Oltenia through grapevine cultivation an experiment was made with view to assessing the behaviour of two varieties from the ampelographic collection of SCDCPN Dăbuleni under conditions specific to years 2018 and 2019, namely the Alb aromat variety for white wines and the Amurg variety for red wines (Figure 1 and Figure 2). Both varieties have been newly introduced to the sandy area culture in southern Oltenia.

The technology applied in the experiment was the one elaborated and recommended by SCDCPN Dăbuleni.

The experimental observations and determinations performed during 2018 and early 2019 were focused on the assessment of climatic conditions, namely phenological observations (bud opening, blooming, grape berry growth, ripening, grape maturation, leave falling), viability of buds upon entry to vegetative period; quantity and quality of grape production.

RESULTS AND DISCUSSIONS

The climate in the sandy soil area of southern Oltenia is arid and semiarid, with annual average temperatures of over 11 °C (11.4 °C is the multiannual average) and an annual sum of temperatures of over 4400 °C. The average quantity of precipitations is 548 mm, out of which 308 mm during the vegetative period with uneven distribution throughout the year and high variations from one year to another, which fails to cover the water requirement for grapevines.

According to Köppen the sands and sandy soils in southern Oltenia belong to the climatic region C.F. a. x. with a strong temperate continental character and light Mediterranean influence, characterised by serious droughts throughout July-September and excess of precipitation during May-June.

Through the analysis of the weather data recorded at the weather station located at SCDCPN Dabuleni it was found that during the experimental period, the annual average temperature was higher than the multiannual average, i.e. 12.2 ^{0}C compared to 11.4 ^{0}C. Due to 2018 specific climatic conditions (temperatures over the average multiannual level), one could notice the phenophase earliness. Bud opening happened approximately two weeks earlier (during the second ten-day period of April), while blooming took place in mid-May. Phenophase earliness lasted until the maturation of grapes (Table 1).

Table 1

Phenological observations of 2018 grapevine varieties under study

Variety	Bud opening	Blooming		Grape berry growth -Start-	Ripening -Start-	Maturation of grapes
		Start	End			
Alb aromat	16-22.04	13.05	25.05	26.05	19.07	06.09
Amurg	16-22.04	14.05	25.05	26.05	15.07	11.09

The values of bud viability and fertility were higher in case of Amurg variety during a year when buds were not affected by the unfavourable conditions of the vegetative rest period (2018)-Table 2.

In 2019 phenological observations pointed out the normal calendar development of the first phenophases (Table 3).

Table 2

The viability of buds at the start of the vegetative period and the fertility of sprouts in 2018 grapevine varieties under study

Variety	Potential crop (number of buds / vine)	Viability of buds at the start of the vegetative period (%)	Number of inflorescences / vine	Fertility coefficient	
				relative	absolute
Alb aromat	20	80	13	0.75	1.15
Amurg	20	84	17	1.3	1.54

Upon the start of the vegetative period in 2019, it was noted that the Alb aromat variety was significantly affected by climatic conditions during the vegetative rest period, namely only 15 % of the buds resulted from regular pruning entered the vegetative period (3 buds out of 20). Amurg variety was not affected, fertility indexes were comparable with the previous year (Table 3).

Table 3

Phenological observations in 2019 grapevine varieties under study

Variety	Bud opening	Potential crop (number of buds)	Number of buds entered into vegetation	Number of fertile sprouts / vine	Number of inflorescences / vine
Alb aromat	25.04.-3.05	20	3	3	4
Amurg	20.04-01.05	20	18	18	32

Figure 1 - Alb aromat variety (2019)

Figure 2 - Amurg variety (2019)

Table 4

Producțion of grapes and their quality in 2018 grapevine varieties under study

Variety	Production of grapes (kg/ha)	Weight of 100 grape berries (g)	Total sugars (g/l)	Total titratable acidity (g/l H_2SO_4)
Alb aromat	9467	450	182	4.5
Amurg	8710	272	198	4.5

Under specific climatic conditions in the experimental period, one could notice that in 2018 the grape production of Alb aromat variety registered the highest level, while the production of Amurg variety was lower, yet with higher content of sugars (Table 4). In 2019 the production of Alb aromat variety was compromised due to the buds damaged in the vegetative rest period, while the number of grapes of Amurg variety provided conditions for a normal production in terms of quantity and quality (Table 3).

CONCLUSIONS

The period when experimental observations were made may be considered as atypical especially for 2018 when annual average temperatures were 0.8 ^{0}C higher than the multiannual average temperature, while precipitations during the vegetative period were much higher compared to multiannual values. Under such experimental conditions, the conclusions were the followings:

-The start of the bud vegetation happened very quickly, within 5-7 days, during the second ten-day period of April (2018) and the end of April respectively (2019,) due to low temperatures.

-The full maturity was reached in 2018 with 6-7 days earlier compared to other years due to the high temperatures from August-September.

-Under specific climatic conditions of 2018 experimental period one could note that Amurg variety was better adapted to sandy conditions compared to Alb aromat variety, fact proven by the quality of production (2018) and the resistance to vegetative rest conditions (2019).

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THE EVALUATION OF THE PEPPER SEEDS GERMINATION AFTER APPLYING THE LIGNOGUMATED PRODUCT

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Keywords*: long pepper, seedling, biostimulator*

ABSTRACT

*Humic acids used as organic fertilizer can influence seed germination and seedling growth and development. The aim of this study was to evaluate the effect of the LIGNOGUMAT fertile-stimulating product for seed germination and the production of pepper seedlings in an ecological system. This product is a high concentration humic fertilizer (90%), with microelements in the form of chelates that can be used as a growth stimulator and antistress for plants. The experiment was performed in a randomized block, with 3 treatments and 4 variants according to the specificities of the variants (*V1- distilled water Control*;* V_2-1.0 g Lignogumat/l water; V_3-1.5 g Lignogumat/ l water; V_4- 2.0 gLignogumat/ l water *The results showed that the humic acids in this product did not inhibit the seed germination, which shows that the humic products are efficient in increasing the germination index (GI) (from 91.6% at V_1 to 146.8% at V_4) and the increase of the seedling Vigor Index (SVI) of the plants, from 606.0 to V_1 to 794.6 to V_4 (2 g Lignogumat/l water).*

INTRODUCTION

World-wide research focuses on current trends from the perspective of sustainable agriculture, paying particular attention to the quality of organic culture, including vegetables. In this way, we try to use the least possible chemical fertilizers in favor of organic, natural ones. The use of humic acid fertilizer products has shown high valence, but it cannot be said with certainty which are the optimal doses for vegetable species in general or for peppers in particular.

Recent studies by Traversa et al. (2014) have shown that humic acids isolated from three different types of compost (green compost, mixed compost and coffee compost) have increased seed germination in four populations of *Panicum virgatum L.* Canellas and Olivares (2014) aimed to increase the seed germination index in some vegetable species after applying humic acids.

Humic substances ensure an increase in the size of the plants and the number of roots, the absorption of nutrients as well and a better rooting, influencing the biochemical and physiological processes, increasing the assimilation of water by the seeds. These substances contribute to the efficiency of enzymatic synthesis due to the formation of soluble compounds with micronutrients (Rodrigues et al., 2014).

Numerous studies have been carried out in which humic acids and humic substances have been used to germinate seeds in different horticultural species: salad (Bezerra et al., 2007), soybean (Benites et al., 2006), tomatoes (Dinu et al. 2013; Bernardes et al., 2011), carrot (Dinu et al. 2012).

Many authors have different opinions regarding the use of these humic substances because their positive effects depend on a variety of factors such as: the species of plants studied, the characteristics of the humic substances, the concentrations, etc. Carvalho and Nakagawa (2000) have shown that factors such as structure, aeration, water retention capacity and level of contamination by pathogens influence the seed germination in the humic material, increasing or affecting the.

It is estimated that a quarter of the world's population consumes peppers and their derivatives, especially of the hot peppers, having a high use in the food, pharmaceutical (content in carotenoids, flavonoids, ascorbic acid, phenolic) and cosmetic industries (Silva et al., 2015; Soare et al., 2017).

On the market, peppers on physiological maturity (ripe), colored in red, orange or yellow, are highly appreciated, being known to have a higher vitamin C content than green peppers or citrus fruits. The application of humic acid-based fertilizers improves the biochemical properties of the fruits of: melon (Dinu and Soare, 2016, Soare et al., 2018), tomatoes (Dinu et al. 2013) or cabbage (Soare et al., 2018).

The aim of this study was to highlight the influence of the Lignogumat product on the germination processes of the pepper seeds and the morphological characters of the plants and as well the applied dose, in which this humic product is used. Also it was evaluated the impact on the physiological quality of the seeds and the initial growth of the seedlings before transplanting.

MATERIAL AND METHODS

The experience was located in a heated greenhose, in the Giuvărăști village from Olt county, (43°47′02″ N 24°40′31″ E) in 2019. The long pepper hybrid studied was Kaptur. The production of the seedlings started with the wetting of the seeds in Lignogumat solution: V_1-Control; V_2-1.0 g/l; V_3-1.5 g/l and V_4 -2.0 g/l of water and lasted 48 hours.

After wetting, the dried seeds were sown in sowing peat, on 04.02.2019. After sowing, the substrate was irrigated with water on V_1-control and with Lignogumat solution for the other three variants (V_2, V_3, V_4). The temperature until plant emergence was up to 18-20^{0}C in the soil and 20-22 ^{0}C in the air.

After seedlings emergence, there were made records on the germination coefficients of the seeds: germination percentage (GP), germination index (GI), coefficient of velocity germination (CVG) and seed vigor index (SVI). The morphological characters of the pepper seedlings were also determined before being transplanting: root length, stem length and average number of leaves/seedling. These characters were also determined in the seedlings before planting.

Germination percentage (GP). The germination percentage was calculated according to the formula: GP=n/N*100, n-no. of germinated seeds, N- total no. of seeds from the pot.

Germination index (GI). Index (GI) was calculated as described by the Association of Official Seed Analysts (AOSA, 1983): GI=Σ(GT/Tt)

Coefficient of velocity of germination (CVG). Coefficient of velocity of germination (CVG) was evaluated as follows:

CVG = (G1+ G2+ …+Gn)/1xG1 = 2xG2+….+nxGn)

where *G* is the number of germinated seeds and *n* is the last day of germination.

Seed vigor index (SVI). Seed vigor index (SVI) was calculated according to Baki and Anderson (1973) as follows:

SVI = [Seedling length (cm) x GP (%)]

Statistical analysis Datele obtinute au fost interpretate statistic prin analysis of variance was performed using ANOVA, and mean values were compared with the Fisher'sleast significant differences (LSD) at the 0.05 probability level as well as the Pearson correlation.

RESULTS AND DISCUSSIONS

The observations and determinations regarding the germination of long pepper seeds - Kaptur F_1 are presented in table 1.

In the first stage of observations (11.02.2019) the number of germinated seeds ranged from 10 in the control variant to 170 in V_4, with a significant increase in the number of seeds in the treated variants (V_3 and V_4). At the next observation stage (13.02.). the number of germinated seeds also increased in the control variant, reaching 123, and in the variants to which the Lignogumate was applied the number of germinated seeds was significant compared to the control. In the following stages, the seeds germinated almost entirely, maintaining a higher number also in the treated variants compared to the untreated control.

Table 1. Emerging pepper seedlings dynamics (2019)

Specification	Days/ number of germinated seeds			
	11.02.	13.02.	14.02.	15. 02.
V1- distilled water Control	10	123	397	400
V_2-1.0 g Lignogumat/l water	32	386	409	410
V_3-1.5 g Lignogumat/ l water	100	386	402	412
V_4- 2.0 gLignogumat/ l water	170	395	412	414

The complete emergence occurred in a relatively short period of time, starting with 11.02.2019 when the first young plants appear and ending on 15.02.2019 when the number of young plants remains stable for 4 more days (Table 1). It should be noted that the seeds were sown on 04.02.2019.

Regarding the germination rate of long pepper seeds, it is observed that the treatment of seeds with humic acids is efficient because it has determined an increase of the germination rate and evidently of emergence using a dose of 1.5 and 2.0 g/1 l water. These observations are according with those of Vieira et al., (2018), who found that humic acids increase the germination rate of pepper seeds in the first 14 days of sowing.

In a study made by Borsari (2013), it was found that humic acids are a source of nitrogen, phosphorus and sulfur, which directly influence the nutrition of plants,

and consequently their development. On the other hand, humic acids contribute to the availability of adsorbed phosphorus, forming the calcium phosphate precipitate which is not available for most of the plants. Silva et al. (2015) and Borsari (2013) reported an increase of the root system of some species after the application of humic acids.

Piccolo et al. (1993) stated that the fractions of organic matter with low molecular weight and high levels of acid groups favor the development of seedlings. Data that characterize the humic materials have shown that humic acids have larger acid groups than humic substances. In addition, the humic acids have a lower molar mass compared to humic substances, which may be related to the increased germination rate Piccolo et al. (1993). Bernardes et al. (2011) have shown that humic substances can influence the growth and speed of germination rates, the growth of seedlings and implicitly their quality.

In this study the percentage of germination (GP**)** of pepper seeds had higher values in the variants treated with Lignogumat (97.1% - 98.1%) compared to the control variant where it was 94.7%, but unsignifficat between them. Prakash et al., (2014) in a study of radish seeds treated with humic acids where higher values were recorded in the treated variants, compared to the untreated control (Table 2).

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Table 2. Germination parameters for Kaptur F_1 pepper seeds

Specification	GP %	GI	CVG	SVI
V1- distilled water Control	94.7^{ns}	91.6^{c}	36.36^{ns}	606.0^{d}
V_2-1.0 g Lignogumat/l water	97.1^{ns}	125.4^{b}	37.2^{ns}	718.5^{b}
V_3-1.5 g Lignogumat/ l water	97.6^{ns}	134.6^{b}	37.4^{ns}	663.6^{c}
V_4- 2.0 g Lignogumat/ l water	98.1^{ns}	146.8^{a}	37.6^{ns}	794.6^{a}
LSD 5%	7.56	9.81	7.58	8.45

Means followed by the same letter are not significantly different at $p<0.05$ level (LSD test)

Germination Index (GI)

Significant differences were recorded between the control variant (V_1) and the variants treated with Lignogumat (table 2). The germination index increased from 91.6 to V_1 to 146.8 to V_4. This increase is determined by the concentration of the Lignogumat solution with which the pepper seeds were moistened before germination.

Coefficient of velocity germination (CVG). Regarding this coefficient, there are insignificant differences between the control, untreated and the variants treated with Lignogumat. However, a slight increase in CVG was observed, depending on the specificity of the variant. These results are consistent with those reported by Katembe et al. (1998). Seed vigor index (SVI) was influenced by the application of Lignogumat product. There was no direct correlation between the applied dose and the increase of this index, but the highest value was also at V_4 where the dose of humic product was 2.0 g/l water (794.6).

The values of the correlation coefficients between germination indices are very high, which represents strong connections between them (table 3).

Table 3.Correlation Person (r) for analyzed variables

Specification	CVG	GI	GP	SVI
CVG	-	0.999*	0.993*	0.834*
GI	-	-	0.994*	0.849*
GP	-	-	-	0.820*

*,** Significant at 0.01 probability levels, r=0.780

Root length is an important parameter because the roots come in direct contact with the soil from which they absorb water and mineral salts (Jamil and Rha, 2004). The significant value for this parameter was recorded at V_2, followed by the control variant and by V_3 and V_4 with the highest concentrations of Lignogumat. In the present study, the moistening of the pepper seeds with the humic acid product, Lignogumat, decreased the root length but positively influenced the increase in the height of the seedlings and as well the average number of leaves/seedling (Figure1).

About the relation between the root length and the aerial part, it was observed that these variables were influenced by the dose of Lignogumat, observations sustained also by Vieira et al. (2018).

The height of the pepper seedlings was influenced by the Lignogumat product and especially by the concentration at which it was applied. The higher the concentration of the fertilizer product, the more the plants reacted in height increase (Figure 2). The diameter of the seedlings at the parcel recorded values between 4.0 mm at V_1 and 5.8 mm at V_4, the highest value in the variant with the highest dose of Lignogumat.

The leaf area is important for light capture, the higher number of leaves causes an increase in the yield. It is observed that the number of leaves was higher in the variants in which the Lignogumate product was applied (Figure 2)

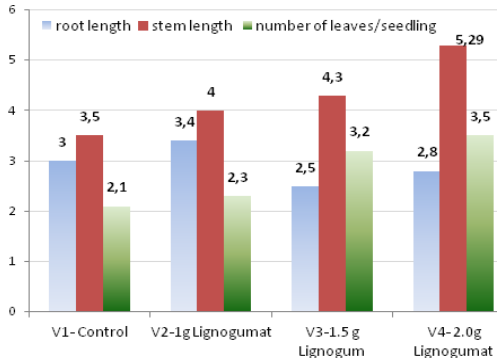

Figure 1. Morphological characteristics of pepper seedlings at transplanting

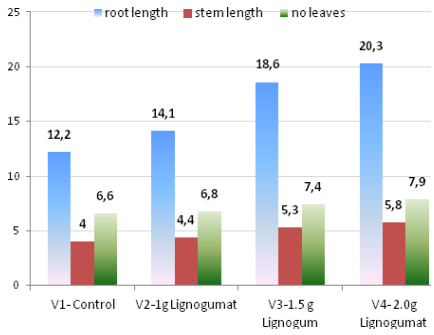

Figure 2. Morphological characteristics of pepper seedlings at planting

From the data recorded in this study, a direct correlation between the fertilizer dose and the morphological characters of the pepper seedlings can be observed. The highest values were recorded at V_4 where the plants had a balanced growth in both the height increase and the diameter of the plants, but also in the average number of leaves per plant. In addition to these bioactive effects, humic acids are considered as additives for introducing microorganisms as inoculants form into the soil-plant system (Canellas and Olivares, 2014).

We may say that the application of humate potassium positively influences the growth of the pepper seedlings and can be used both as a seed treatment for organic crops and as a growth regulator, statements supported by other authors. Thus, in 2014, Dinu et al. conducted a study on seed germination on three vegetable species and found the positive effect of humic acids on the tomato seedling height increase, also on cucumber and pumpkin seedlings, and Prakash et al. (2014) on radishes. The positive effect of humic acids on the root system and the vegetative growths was observed also in flowering species, *Pelargonium peltatum* (Manda et al., 2017)

CONCLUSIONS

The action of humic acids was positively reflected on the germination index (GI) and the seed vigor index (SVI) of long pepper after 11 days after sowing. The application of humic acids also influenced the root length of the seedlings and the aerial part of the plants before transplanting, given the initial stage of development. Thus, the use of humic acids is efficient for the initial germination and growth of long pepper plants (*Capsicum annuum L.*). The obtained results in this study highlighted the possibility of using humic acids in the germination of pepper seeds as a natural fertilizer, thus avoiding the use of substances that can have harmful effects on the environment.

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α AMYLASE AND GLUCOAMYLASE ACTIVITY ON DIFFERENT SUBSTRATES TYPES

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Keywords*: α amylase, glucoamylase, oat, corn maize, wheat*

ABSTRACT

The main objective of the present study was to examine the α amylase and glucoamylase activity on different type of substrates. Oat flour, corn, maize wheat flour as raw materials it was used to test enzyme activity at different temperatures and different period. Enzyme addition temperature has an important role in enzymatic activity and depends by substrate types.

INTRODUCTION

Enzymes α amylase and glucoamylase are used in starch liquefaction and saccharification for spirit and glucose industry. α-Amylase is an endo-amylase that cleaves α-(1,4)- bonds present in the inner part of the starch chain, thereby generating dextrins with varying length (Van der Maarel et al., 2002). A large-scale starch processing industry has emerged in the last century. In the past decades, we have seen a shift from the acid hydrolysis of starch to the use of enzymes such as α amylase and glucoamylase in production of glucose, maltose, fructose. Nowadays α amylase, β amylase and glucoamylase record approximative 30% of the world's enzyme production. Besides the use in starch hydrolysis, starch-converting enzymes are also used in a number of other industrial applications, such as laundry and porcelain detergents or as anti-staling agents in baking, etc. (Van der Maarel et al., 2002).

Glucoamylase hydrolyzes long-chain polysaccharides best, while a-glucosidase prefers short malto-oligosaccharides (Van der Maarel et al., 2002). Other studies, however, reported that the combination of α-amylase and glucoamylase addition increased bread volumes to a same extent as addition of 6% sucrose did (Pomeranz et al., 1964; Valjakka et al., 1994).

As a starch material, corn grain — which has starch content average 72% dry matter is very important in the distillation industry (Belyea et al., 2004). Of the cereals, corn is characterized by the highest ethanol performance per unit weight and per unit area of cultivation: 420 L ton−1 and 2520 L ha−1 (Devantier et al., 2005; Kwiatkowski et al., 2006; Ramchandran et al., 2015)

Dry heat treatment of wheat flour has been widely studied over the last few years. The results show an impact of the treatment on the viscosity properties of the flours with a significant increase of apparent viscosity compared with native counterparts. This modification could be due to structural changes within the gluten molecules (Bucsella et al., 2016; Keppler et al., 2018; Neill et al., 2012; Ozawa et al., 2009; Van Steertegem et al., 2013).

Enzyme kinetics provides a systematic approach to the analysis and quantification of parameters determining its activity (Chaudary et al., 2016). Among those commonly considered are enzyme and substrate concentrations, pH, temperature, ionic strength and moisture, as well as the presence of inhibitors, activators or co-factors (Azevedo & Reis, 2009; Whitehurst & Oort, 2010). A range of temperatures (30–100 ^{0}C) at neutral pH activated the heat-stable enzyme to cleave solubilised starch molecules and produce a variety of dextrins and sugar (Divakaran, Chandran, & Chandran, 2011). The enzyme maintains biological potential to partially degrade starch, during long-term storage at ambient and frozen conditions, resulting in the presence of trace amounts of dextrin that interfere with side-chain retrogradation (Gerrard et.al., 1997; Van der Maarel et. al., 2002)

In present study, we aimed to check the influence of addition temperature over the α amylase and glucoamylase activity on different type of substrates such as wheat flour, corn maize and oat flour.

MATERIAL AND METHODS

Experiment develop:

Mash preparation: 50 grams of wheat flour was added in 1 liter of water for preparation of wheat mash; 50 grams of maize corn was added in 1 liter of water for preparation of corn mash and 50 grams of oat flour corn was added in 1 liter of water for preparation of oat mash. In each mash it was added 2 ml of liquid enzyme such as: α amylase samples preparation: 2 ml of α amylase in wheat mash; 2 ml of α amylase in corn mash and 2 ml of α amylase in oat mash. Glucoamylase sample preparation: 2 ml of glucoamylase in wheat mash; 2 ml of glucoamylase in corn mash and 2 ml of glucoamylase in oat mash. Different temperatures were used for enzymes addition: 20^{0}C; 40^{0}C; 60^{0}C and 80^{0}C. Mash acidity and soluble sugar content was measured in 24 hours from enzymes addition and after 144 hours (7 days).

Material and chemicals:

PROTEMYL HT27L - α amylase, activity: causes the rapid decrease of the viscosity of the gelled starch, by its hydrolysis in water soluble dextrins; PROTEMYL GA150L – glucoamylase, activity: grains, potatoes or cereals, after being liquefied with an α-amylase contain soluble dextrins which will be hydrolyzed by PROTEMYL GA150L in fermentable sugars. sodium hydroxide (NaOH), phenolphthalein, electronic refractometer.

Titratable acidity:

Pipette 10 ml of homogenized sample into a titration flask, add distilled water and a few drops of phenolphthalein and titrate with 0.1 N NaOH until a faint pink colour persists for 30 sec. (AOAC, 1984)

RESULTS AND DISCUSSIONS

Mash total acidity after α amylase and glucoamylase addition at different temperatures.

Table 1. Mash acidity (mEq/l) in 24 hours and after 144 hours from α amylase addition

Sample Mash temperature	24 hours					144 hours			
	Blank	20^{0}C	40^{0}C	60^{0}C	80^{0}C	20^{0}C	40^{0}C	60^{0}C	80^{0}C
Oat flour	0.5	12	3	1	2.5	6	1	1.5	1
Corn maize	0.5	11	2	2	2	5	1	1	1
Wheat flour	0.2	10	1.5	1	1	4.5	1	1	1
Rye flour	0.5	10	2	1.5	1	4	2.5	1	1

Table 2. Mash acidity (mEq/l) in 24 hours and after 144 hours from glucoamylase addition

Sample Mash temperature	24 hours					144 hours			
	Blank	20^{0}C	40^{0}C	60^{0}C	80^{0}C	20^{0}C	40^{0}C	60^{0}C	80^{0}C
Oat flour	0.5	29	5	3.5	5	1.5	3	3	5
Corn maize	0.5	31	4.5	3.5	1	2.5	5	9.5	5
Wheat flour	0.2	30	3	3	1	1	2	27	11
Rye flour	0.5	32	5	3.5	1	1.5	3	11	7

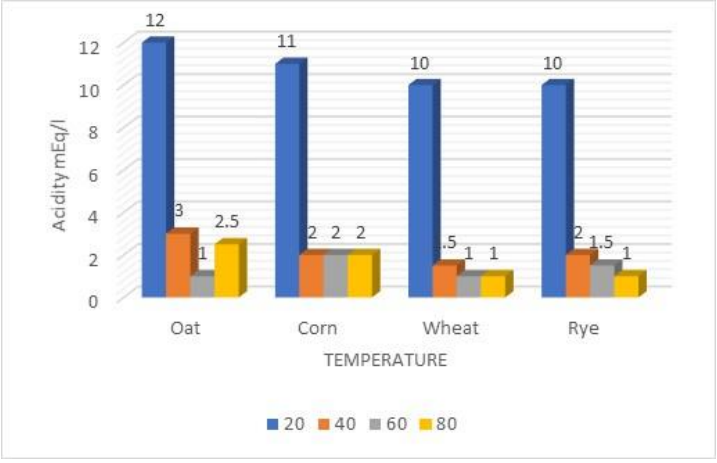

Figure 1. Mash acidity after 24 hours from α amylase addition

Mash acidity after 24 hours from addition of □□amylase depends by addition temperature. High acidity records in samples where enzyme was added at 20^{0}C compare with the rest of samples. At 40^{0}C acidity decrease in all the samples, 40^{0}C represent the temperature where enzymatic activity is still present. 60^{0}C and 80 ^{0}C are limit temperatures, where enzymatic activity is reduced very drastic.

Compare with blank samples, □ amylase increase the acidity in all the variants. Results confirm that mashes acidity is low before □□amylase addition and increase significant when the mash temperature is 20^{0}C. Even more, □ amylase addition in mash at temperature 80^{0}C generate an acidity more than acidity records in blank samples. At 80^{0}C □ amylase could have a low activity.

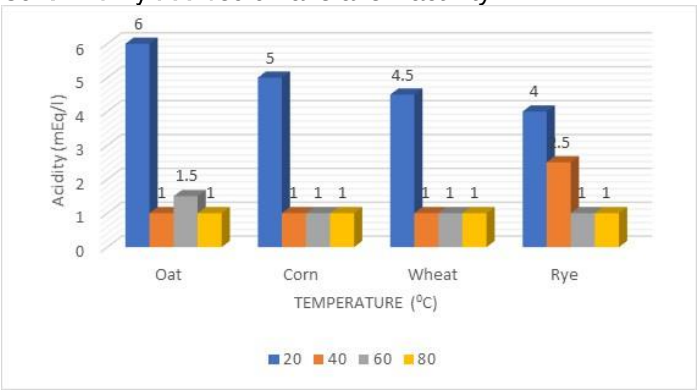

Figure 2. Mash acidity after 144 hours from α amylase addition

After 144 hours then α amylase addition mash acidity records important decrease in samples where initial mash temperature was 20^{0}C and not significant in rest of samples. All the samples present molds in different quantities. In generally, at samples where enzyme addition was at 20^{0}C molds consume total acidity. On the different type of substrates high acidity record in samples with oat and corn and decrease to samples with wheat and rye.

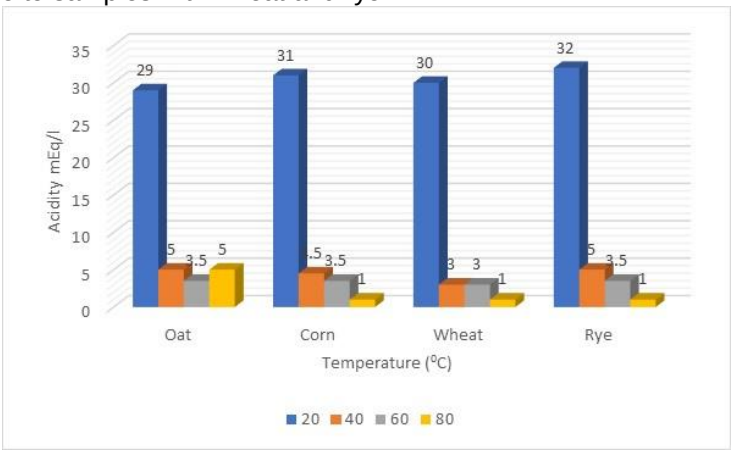

Figure 3**.** Mash acidity after 24 hours from glucoamylase addition

Mash acidity after 24 hours after glucoamylase addition show in Figure 3. Glucoamylase addition at 20^{0}C determine in 24 hours increase the acidity in all the samples. High content of acidity records at rye and corn mash and decrease to wheat and oat mash. If the mash temperature during glucoamylase addition is 40^{0}C total acidity decrease in all the samples. At 40^{0}C glucoamylase activity record a significant decrease. For the mash temperature 60^{0}C and 80^{0}C total acidity continue to decrease, except oat mash where acidity is the same at 80^{0}C with 40^{0}C. Anyway,

acidity in all samples at 60^0C and 80^0C is bigger than acidity in blank samples, which explains a low activity of glucaomilase even at high temperatures.

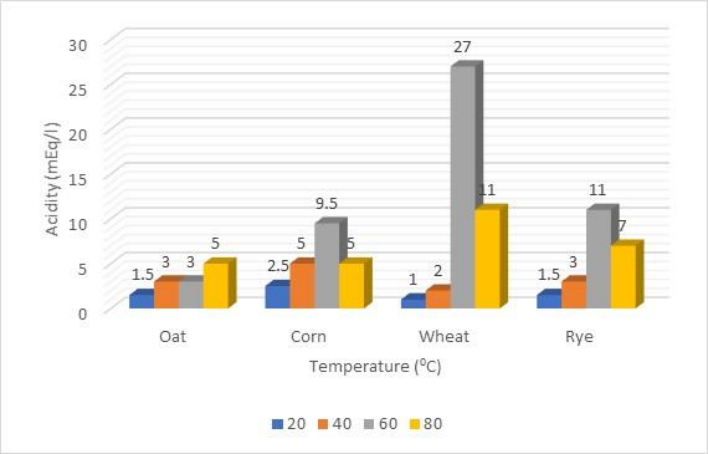

Figure 4. Mash acidity after 144 hours from glucoamylase addition

Figure 4 present mash total acidity at 144 hours from glucoamylase addition. Acidity increase in samples where glucoamylase added at 60^0C different than α amylase where acidity record high values at 20^0C. Samples treat at low temperatures record low content in acidity, samples treat at 60^0C and 80^0C record high content in acidity. Regarding the substrate wheat and rye lead to high content in acidity while corn and oat lead to low content in acidity. Glucoamylase induce in mashes different transformation than α amylase. Results is important for industry: first in mashes need to add α amylase and then glucoamylase to obtain best results.

CONCLUSIONS

Mash acidity after 24 hours from α amylase addition record an increase in all the samples where mash temperature was 20^0C. After 144 hours acidity keep at the high value in the samples where enzyme was added at 20^0C. Regarding the substrate oat and corn mashes present high acidity than wheat and rye.

Mash acidity after 24 hours from glucoamylase addition record an increase in all the samples where mash temperature was 20^0C. After 144 hours acidity keep at the high value in the samples where enzyme was added at 60^0C and 80^0C. Regarding the substrate wheat and rye lead to high content in acidity while corn and oat lead to low content in acidity.

Results is important for spirit industry: too obtain best results first in mashes need to add α amylase and then glucoamylase.

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CHEMICAL AND BIOLOGICAL PROPERTIES OF A SANDY LOAM SOIL AMENDED WITH HEMP SEED RESIDUES WHICH REMAINED AFTER THE OIL EXTRACTION BY COLD COMPRESSION, IN VITRO

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Keywords: Hemp seed; soil chemical *properties; waste*

ABSTRACT

In this study, 1.25, 2.5 and 5.0 g of air dried and well milled hemp seed residues, were applied to 50 g of soil, respectively. All treatments were incubated for 15 weeks at a constant temperature of 28 ^{0}C and after the incubation period, suitable chemical analyses were performed. The results of the experiment showed that the hemp seed residues added in soil, are subjected to higher rate biodegradation, in comparison with the control, after a long incubation period. This biodegradation of soil organic carbon is higher with increasing amount of seed residues which are added to the soil. Also, the hemp seed residues, increased the content of the soil at the available forms of P, K, Mn, Fe, Zn and nitrogen-nitrate. These results, confirm the role of hemp seed residues as organic soil amendment, while the recycling of waste constitutes a useful practice for environment protection.

INTRODUCTION

The addition of organic materials in the soil, affect soil drainage, structure, nutrient availability, and the biological activity of microflora (Riber et al. 2014, Gougoulias et al. 2017). The incorporating of organic material, have a impact on plant health and crop productivity. The organic materials and composts that are rich in nitrogen reducing the negative impact of soil pathogens (Bailey and Lazarovits 2003). Furthermore, by using composts improves soil fertility and protect environment (Poulsen et al. 2013).

Hemp seed contains over 30% oil and about 25% protein, with considerable amounts of dietary fiber, vitamins and minerals (Callaway 2004). Hemp seed oil as an important source of nutrition, contains over 80% polyunsaturated fatty acids, and is an exceptionally rich source of the essential fatty acids such as linoleic acid and a-linolenic acid. In addition, Hemp seed oil contains tocopherol, β-carotene, flavonoids, phenolic acids, β-caryophyllene, myrcene, β-sitosterol and trace amounts of methyl salicylate and cannabidiol (Leizer et al. 2000, Teh and Birch 2013).

Hemp seed residues which remain after the oil extraction by cold compression, have not been sufficiently studied for their use. The aim of this work was to examine in the laboratory for an incubation experiment, the biodegradation in soil of the hemp seed residues and the consequences of that biodegradation on chemical properties of soil.

MATERIAL AND METHODS

Hemp cultivation was conducted site at the Experimental Farm of the Technological Educational Institute of Thessaly, Larissa (latitude 39°62′69″ N, longitude 22°38′14″ E). The seeding took place applying 45 kg ha^{-1} of seed cultivar 'Fibranova'. Seed collection took place at a fully mature stage. After the oil extraction of hemp seed by cold compression, the residue which remained was used for the incubation experiment.

Incubation experiment: In this study, 1.25, 2.5 and 5.0 g air-dried and milled hemp seed residues were applied to 50g of soil respectively, (Table 1) and their effects on the chemical properties of soil, after 15 weeks of incubation at 28 ^{o}C were studied. Thus an experimental unit is constituted by 50 g of soil, and a variable amount of hemp seed residues. The experimental design was completely randomized with four replications. During the first three weeks of the incubation period, the moisture was maintained at two-thirds of field capacity, but for the next three weeks the soils were left to dry. This process was repeated until the end of the incubation period according to (Wu and Brookes 2005) they reported that the alternation of drying and rewetting soil samples enhances mineralization of both soil biomass organic matter and non-biomass organic matter. At the end of the incubation period, soil samples were analyzed.

Methods of analyses: Samples were analyzed using the following methods which are referred by (Page et al. 1982).

Organic matter was analyzed by chemical oxidation with 1 mol/l $K_2Cr_2O_7$ and titration of the remaining reagent with 0.5 mol/l $FeSO_4$.

Both ammonium and nitrate nitrogen were extracted with 0.5 mol/l $CaCl_2$ and estimated by distillation in the presence of MgO and Devarda's alloy, respectively. Available P forms (Olsen P) was extracted with 0.5 mol/l $NaHCO_3$ and measured by spectroscopy. Exchangeable forms of potassium and sodium ware extracted with 1 mol/l CH_3COONH_4 and measured by flame photometer.

Available forms of Mn, Zn, Fe and Cu were extracted with DTPA (diethylene triamine pentaacetic acid 0.005 mol/l + $CaCl_2$ 0.01 mol/l + triethanolamine 0.1 mol/l) and measured by atomic absorption. For the determination of total metals Mn, Fe, Cu and Zn, 1 g of material, digestion at 350 ^{0}C + 10 ml HNO_3 + 5 ml $HCLO_4$. According to the method described by (Varian 1989), the samples were analyzed by Atomic Absorption (Spectroscopy Varian Spectra AA 10 plus), with the use of flame and air-acetylene mixture.

Statistical analysis: Data analysis was made using the MINITAB (Ryan et al. 2005) statistical package. Analysis of variance was used to assess treatments effect. Mean separation was made using Tukey's test when significant differences (P = 0.05) between treatments were found.

RESULTS AND DISCUSSIONS

The results of the laboratory experiment at the end of the incubation period, they showed a higher rate biodegradation of soil organic carbon from the application of the three rates of seed residues, in comparison with the control (soil). This biodegradation of soil organic carbon is higher with increasing amount of seed residues which are added to the soil. In particular, the data showed an mineralization of soil organic carbon from 31.4 to 71.0% at all rates addition of seed residues, while the control they showed a biodegradation of the organic carbon by 17.1% (Figure 1).

Table 1

Chemical properties of soil samples, hemp seed residues used in the experiment

Property	Soil	Hemp seed residues
Texture	Sandy Loam	
pH	7.77 ± 0.3	-
* EC, dS/m	0.28 ± 0.04	-
Organic matter (%)	0.77 ± 0.06	67.0 ± 3.52
$CaCO_3$ (%)	7.38 ± 0.4	-
N -Total (g/kg)	1.17 ± 0.12	42.0 ± 2.55
$N\text{-}NH_4^+$ (mg/kg)	45.2 ± 4.8	-
$N\text{-}NO_3^-$ (mg/kg)	188.2 ± 15.2	-
K-exchangeable (mg/kg)	219.6 ± 7.7	-
Na-exchangeable (mg/kg)	102.3 ±9.6	-
CEC (cmol/kg)	20.7 ± 1.3	-
P –Olsen (mg/kg)	16.5 ± 2.8	-
Cu –DTPA (mg/kg)	0.77 ± 0.06	-
Zn -DTPA (mg/kg)	1.01 ± 0.08	-
Mn -DTPA (mg/kg)	2.05 ± 0.17	-
Fe -DTPA (mg/kg)	0.25 ± 0.02	
Na-Total (mg/kg)	-	194.7 ± 9.98
P -Total (mg/kg)	-	8038.2 ± 459.3
K-Total (mg/kg)	-	456.5 ± 23.41
Cu –Total (mg/kg)	-	30.9 ± 1.93
Zn -Total (mg/kg)	-	301.1 ± 17.71
Mn -Total (mg/kg)	-	126.7 ± 9.75
Fe-Total (mg/kg)	-	500.0 ± 27.03

*Electrical conductivity, (EC) and soil pH is determined in (1:5) soil/water extract; Data represent average means and SE deviation, (n) = 4.

The increased biodegradation of soil organic carbon probably is due increased microbial activity. In similar laboratory studies, it was found that incorporation of coir residue on soil, after his use as substrate, they showed biodegradation of organic carbon, about 35% (Gougoulias et al. 2017).

The available forms of P were increased by the addition of hemp seed residues at the end of the incubation period in comparison with the control, the greatest increase was observed when seed residues were added at the higher doses (Table 2).

Nitrate-nitrogen content of soil increased by the addition of hemp seed residues at the end of the incubation in comparison with the control, and the nitrification effect on soil proceeded normally, the greatest increase was observed when seed residues were added at the higher doses. Moreover, ammonium-nitrogen content of soil was not showed significantly differences at the end of the incubation period from the addition of hemp seed residues in comparison with the control (Table 2).

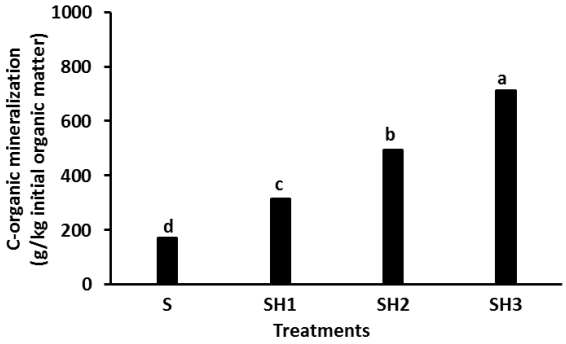

Figure 1. Effect of hemp seed residues on soil content in organic carbon; S, control (soil); SH1, SH2 and SH3, hemp seed residues 1.25, 2.5 and 5 g respectively, per 50 g of soil; Bar values with the same letter on the top are not significantly different according to Tukey's test (P > 0.05).

The exchangeable Na content of soil by the addition of hemp seed residues was not showed significantly differences at the end of the incubation period in comparison with the control. While the exchangeable K content of soil were increased by the addition of seed residues at the end of the incubation period in comparison with the control, the greatest increase was observed when seed residues at the higher doses were added (Table 2). In particular, the three times higher rates of added seed residues increased the corresponding content of exchangeable K of soil from 34 - 126% in comparison with the control at the end of the incubation period.

Table 2

Chemical properties of soil mixtures at the end of the incubation period

Treatments	Property						
	Available forms			Exchangeable forms		Extract 1: 5 in H_2O	
	(mg kg^{-1} soil)			(mg kg^{-1} soil)		(dS m^{-1})	
	P-Olsen	N-NH_4^+	N-NO_3^-	Na	K	EC	pH
S	17.93d	45.29a	321.2d	126.0a	229.6d	0.31d	8.29a
SH1	54.4c	32.56a	439.5c	137.1a	309.5bc	0.79c	8.20a
SH2	132.5b	43.26a	1376.4 b	115.2a	349.4b	0.98b	7.90b
SH3	211.7a	45.65a	1521.7 a	126.1a	519.1a	1.90a	7.75b

S, control (soil); SH1, SH2 and SH3, hemp seed residues 1.25, 2.5 and 5g respectively, per 50 g of soil; Columns with the same letter do not differ significantly according to the Tukey's test (P = 0.05).

Electrical conductivity of soil were increased by the addition of hemp seed residues at the end of the incubation period, the greatest increase was observed when seed residues at the higher doses were added. Contrary, the addition of seed residues reduced the pH of soil in comparison with the control. The decrease of soil

pH at the end of the incubation period, probably is due to the stronger decomposition of soil organic matter, and in the oxidation of the ammonium-nitrogen to nitrate-nitrogen (Table 2).

The available forms of Cu were increased by the addition of hemp seed residues at the end of the incubation period in comparison with the control, only when hemp seed residues were added at the highest dose. The addition of hemp seed residues increased available forms of Zn, Mn and Fe of the soil at the end of the incubation period as compared to control, the greatest increase was observed where seed residues at the higher doses was added (Table 3).

Table 3

Chemical properties of soil mixtures at the end of the incubation period

Treatments	Property			
	DTPA - (mg kg^{-1} soil)			
	Cu	Zn	Mn	Fe
S	1.10b	1.03d	2.09d	0.32c
SH1	1.17b	1.57c	3.97c	0.99b
SH2	1.27b	2.71b	5.47b	1.48a
SH3	1.67a	4.79a	6.70a	2.02a

S, control (soil); SH1, SH2 and SH3, hemp seed residues 1.25, 2.5 and 5 g respectively, per 50 g of soil; Columns with the same letter do not differ significantly according to the Tukey's test (P = 0.05).

CONCLUSIONS

The results of the experiment showed that the hemp seed residues added in soil, in comparison with the control, are subjected to an higher rate biodegradation of the organic carbon, after a long incubation period. This biodegradation is higher with the increasing amount of seed residues which added in the soil. The hemp seed residues, increased the content of the soil at the available forms of P, K, Mn, Fe, Zn and nitrogen-nitrate after a long incubation period. However, exchangeable forms of Na and available forms of ammonium-nitrogen of soil was not significantly affected by the addition of hemp seed residues in comparison with the control.

These results, confirm the role of hemp seed residues as organic soil amendment, and very possibly is important components for composting products, while the recycling of residues constitutes a useful practice for environment protection.

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THE EFFECTS OF *ROSMARINUS OFFICINALIS* L. FOLIAR TISSUES ON SOIL ORGANIC MATTER BIODEGRADATION AND OTHER SOIL CHEMICAL PROPERTIES

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Keywords*: Rosemary; soil chemical properties; soil organic matter biodegradation*

ABSTRACT

The effects of rosemary dry leaves on soil organic matter biodegradation and on soil chemical properties in an incubation experiment were studied. The air dried foliar tissues, incorporated at five different rates (0, 0.2, 0.4, 0.6 and 0.8 g per 50 g of soil mixture with 10.75 g of manure) resulted increase in organic carbon mineralization and nitrate nitrogen. The levels of available forms of K, Cu, Mn and Fe were increased at the two higher rates of added leaves, while the levels of available forms of P, Zn, ammonium nitrogen and exchangeable Na did not show statistically significant differences in comparison with the control at the end of the incubation period. The addition of dry leaves in the soil resulted an increase in total forms of K and P. This study indicated that the rosemary dry leaves could be applied to the soil to improving the chemical and biological properties of the soil.

INTRODUCTION

In modern alternative forms of agriculture (biological agriculture) is mandatory to replace chemicals with natural additives. Between them, the plant debris for their role in the soil fertility, the plant essential oils for their role as pesticides against soil-borne pathogens (Gravanis et al. 2005). The addition of organic materials in the soil, affects the composition and the structure of soil, nutrient availability and the biological activity of microflora, which determines the biochemical status of soil fertility (Gougoulias et al. 2013, Riber et al. 2014). The incorporating of organic materials and composts, have a impact on plant health, crop productivity, simprove soil fertility, and protect environment (Poulsen et al. 2013). In addition, it has been proven that organic materials and composts that are rich in available elements reducing the negative impact of soil pathogens (Bailey and Lazarovits 2003).

The plant is used as a condiment, as a food preservative, and at the traditional medicine (Peter 2004, Arranz et al. 2015), while essential oil of Rosemary is used in pharmaceutical, production of perfumes and food industry (Hamedo and Abdelmigid 2009). Rosemary are a natural reservoir of phenolic compounds (carnosic acid, rosmarinic acid, caffeic acid), of carotenoids and volatile compounds (Arranz et al. 2015). The rosemary exerts anti-inflammatory, antifungal,

antimicrobial, antioxidant, anticancer, antithrombotic and anti-diabetic activity (Gougoulias 2012, Arranz et al. 2015).

The aim of work is to examine in vitro the effect of rosemary leaves on soil organic matter biodegradation and on soil chemical properties.

MATERIAL AND METHODS

Foliar tissues collection of rosemary took place at the end of the growing season from the experimental farm of Technological Educational Institute of Thessaly, Larissa, Greece.

Incubation experiment: In this study, 10.75 g of manure containing 3.75 g of organic matter, obtained from the farming establishments of TEI of Thessaly, was added to 50 g of air-dried soil that was poor in organic matter, derived from the same region (Table 1). Into 50 g of this soil plus 10.75 g of manure, 0, 0.2, 0.4, 0.6 and 0.8 g of air-dried and well milled of leaf tissues rosemary were added. Thus an experimental unit is constituted by 50 g of soil, 10.75 g of manure and a variable amount of rosemary. In the incubator, the treatments kept at 28 ^{0}C for a period of 15 weeks and were prepared in four replicates. During the first three weeks of the incubation period, the moisture was maintained at two-thirds of field capacity, but for the next three weeks the soils were left to dry. This process was repeated until the end of the incubation period according to (Wu and Brookes 2005) they reported that the alternation of drying and rewetting soil samples enhances mineralization of both soil biomass organic matter and non-biomass organic matter. Soil aeration and regulation of moisture enhance the growth and metabolic activity of aerobic soil microorganism (Gordon et al. 2008). At the end of the incubation period, soil samples were analyzed.

Methods of analyses: Samples were analyzed using the following methods which are referred by (Page et al. 1982).

Organic matter was analyzed by chemical oxidation with 1 mol/l $K_2Cr_2O_7$ and titration of the remaining reagent with 0.5 mol/l $FeSO_4$.

Both ammonium and nitrate nitrogen were extracted with 0.5 mol/l $CaCl_2$ and estimated by distillation in the presence of MgO and Devarda's alloy, respectively. Available P forms (Olsen P) was extracted with 0.5 mol/l $NaHCO_3$ and measured by spectroscopy.

Exchangeable forms of potassium and sodium ware extracted with 1 mol/l CH_3COONH_4 and measured by flame Photometer.

Available forms of Mn, Zn, Fe and Cu were extracted with DTPA (diethylene triamine pentaacetic acid 0.005 mol/l + $CaCl_2$ 0.01 mol/l + triethanolamine 0.1 mol/l) and measured by atomic absorption.

For the determination of total metals Mn, Cu, Fe and Zn, 1 g of material, digestion at 350 ^{0}C + 10 ml HNO_3 + 5 ml $HCLO_4$. According to the method described by (Varian 1989), the samples were analyzed by Atomic Absorption (Spectroscopy Varian Spectra AA 10 plus), with the use of flame and air-acetylene mixture.

Statistical analysis: Data analysis was made using the MINITAB (Ryan et al. 2005) statistical package. Analysis of variance was used to assess treatments effect. Mean separation was made using Tukey's test when significant differences (P = 0.05) between treatments were found.

Table 1

Chemical properties of soil samples, manure and rosemary foliar tissues used in the experiment

Property	Soil	*Manure	Rosemary (air dried material)
Texture	Sandy Loam	-	-
pH	7.84 ± 0.44	8.91 ± 0.49	-
EC, dS/m	0.36 ± 0.02	2.29 ± 0.13	-
Organic matter (%)	0.80 ± 0.04	23.8 ± 1.29	-
N -Total (g/kg)	1.12 ± 0.11	9.21 ± 0.06	15.4 ± 1.14
$N\text{-}NO_3^-$ (mg/kg^{-1})	119.2 ± 9.17	-	-
$N\text{-}NH_4^+$ (mg/kg)	45.2 ± 4.22	-	-
Na-exchangeable (mg/kg)	102.3 ± 6.2	-	-
K-exchangeable (mg/kg)	203.7 ± 9.9	-	-
CEC (cmol/kg)	11.8 ± 0.7	-	-
P -Olsen (mg/kg)	11.1 ± 2.2	-	-
Cu –DTPA (mg/kg)	0.80 ± 0.06	-	-
Zn -DTPA (mg/kg)	1.21 ± 0.09	-	-
Mn -DTPA (mg/kg)	1.33 ± 0.11	-	-
Fe -DTPA (mg/kg)	1.03 ± 0.09	-	-
K-Total (g/kg)	4.51 ± 0.32	5.52 ± 0.33	11.02 ± 0.65
Na-Total (g/kg)	0.28 ± 0.02	0.42 ± 0.03	0.29 ± 0.02
P -Total (g/kg)	0.29 ± 0.02	4.26 ± 0.30	1.78 ± 0.09
Cu –Total (mg/kg)	-	22.5 ± 1.61	25.0 ± 1.89
Zn -Total (mg/kg)	-	221.2 ± 11.9	25.0 ± 1.47
Mn -Total (mg/kg)	-	443.5 ± 31.7	51.8 ± 3.87
Fe-Total (g/kg)	-	7.11 ± 0.48	0.15 ± 0.01

*Digested sheep manure four months; Electrical conductivity, (EC) and soil pH is determined in (1:5) soil/water extract; Data represent average means and SE deviation. (n) = 4.

RESULTS AND DISCUSSIONS

The results of the laboratory experiment at the end of the incubation period, they showed that decomposition of soil organic matter added as manure or preexisted organic matter in the soil, was increased from the application of rosemary foliar in the soil mixtures, in comparison with the control (soil plus manure). This mineralization of soil organic carbon it was higher when applied increasing amount of rosemary leaf to the soil mixtures. In particular, the data showed an increased mineralization of soil organic carbon from 9.8 to 21.6 % at all rates of leaf rosemary incorporation, in comparison with the control (Figure 1).

Previous laboratory studies have shown, the effect of oregano and basil on degradation of organic fertilizers, and it was found that the presence of foliar tissues of oregano, act a slowing effect on degradation of organic fertilizer, while the presence of basil, accelerate it (Chouliaras et al. 2007, Gougoulias et al. 2010).

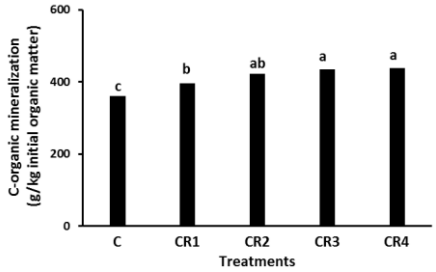

Figure 1. Effect of rosemary dry leaf added rates on soil organic carbon mineralization; C, control (soil plus manure); CR1, CR2, CR3 or CR4, control and foliar tissues 0.2, 0.4, 0.6 or 0.8 g, respectively; Bar values with the same letter on the top are not significantly different according to Tukey's test (P > 0.05).

Nitrate-nitrogen content in the soil mixtures (soil plus manure) increased by the addition of dry leaves at the end of the incubation period in comparison with the control, the greatest increase was observed when dry leaves were added at the higher doses. The available forms of Cu, Mn and Fe were increased at the end of the incubation period with the application of the two higher doses of dry leaves in the soil mixtures (soil plus manure), in comparison with the control (Table 2). In addition, available forms of P, Zn and N-NH_4^+ by the addition of dry leaves in the soil mixtures (soil plus manure) did not show statistically significant differences at the end of the incubation period in comparison with the control for all treatments (Table 2).

Table 2

Chemical properties of soil mixtures at the end of the incubation period

Treatments	Available forms			DTPA			
	P-Olsen	N-NH_4^+	N-NO_3^-	Cu	Zn	Mn	Fe
	(mg/kg soil)						
C	254.1a	72.1a	133.0d	0.89c	5.16a	2.33c	1.74b
CR1	266.1a	63.8a	180.4c	0.85c	5.54a	2.28c	1.87b
CR2	250.2a	64.5a	248.7b	0.91c	5.41a	2.78bc	1.62b
CR3	254.5a	66.5a	271.1ab	1.39b	5.51a	3.32b	2.22a
CR4	269.5a	76.5a	304.6a	1.89a	5.26a	4.50a	2.37a

For each chemical property of soil mixtures, columns of table with the same letter do not differ significantly according to Tukey's test (P = 0.05); C, control (soil plus manure); CR1, CR2, CR3 or CR4, control and rosemary dry leaf 0.2, 0.4, 0.6 or 0.8 g, respectively.

The exchangeable K content and the cation-exchange capacity (CEC) of soil mixtures were increased with the application of the three higher doses of the dry leaves in the soil mixtures (soil plus manure), at the end of the incubation period in comparison with the control (Table 3). While, the exchangeable Na content of soil mixture by the addition of dry leaves was not showed significantly differences at the end of the incubation period in comparison with the control. Electrical conductivity of soil mixtures (soil plus mixture) were increased with the application of the three higher doses of the dry leaves of rosemary, at the end of the incubation period in comparison with the control, without the risk of salinity. Contrary, the addition of dry leaves reduced the pH of soil mixtures in comparison with the control. The decrease of soil pH at the higher doses at the end of the incubation period, probably is due to

the stronger decomposition of soil organic matter, and in the increased oxidation of $N\text{-}NH_4^+$ to $N\text{-}NO_3^-$.

The addition of rosemary foliar tissues in the soil mixtures (soil plus manure) increased total forms of P and K in all added doses at the end of the incubation period, in comparison with the control (Table 4). However, total forms of Na, Cu, Zn, Mn and Fe was not significantly affected by the addition of dry leaves rosemary at the end of the incubation period, in comparison with the control (soil plus manure).

Table 3

Chemical properties of soil mixtures at the end of the incubation period

Treatments	Exchangeable forms			EC	pH
	Na	K	CEC	Extract (1: 5) soil/water	
	(mg/kg soil)		(cmol/kg)	(dS/m)	
C	133.4a	655.2b	12.82b	0.39b	7.81a
CR1	124.2a	663.0b	12.97b	0.42b	7.61ab
CR2	117.3a	713.7a	15.56a	0.52a	7.46bc
CR3	126.5a	709.8a	15.04a	0.49a	7.39c
CR4	119.6a	709.8a	16.00a	0.52a	7.39c

For each chemical property of soil mixtures, columns of table with the same letter do not differ significantly according to Tukey's test (P = 0.05); C, control (soil plus manure); CR1, CR2, CR3 or CR4, control and rosemary dry leaf 0.2, 0.4, 0.6 or 0.8 g, respectively.

Table 4

Total element contents of soil mixtures at the end of the incubation period

Treatments	Total forms						
	Na	K	P	Fe	Cu	Zn	Mn
	(g/kg soil)				(mg/kg soil)		
C	0.36a	5.79c	1.89c	2.12a	30.5a	96.4a	827.5a
CR1	0.38a	6.18b	1.99bc	2.18a	30.8a	92.7a	869.6a
CR2	0.37a	6.57ab	2.17ab	2.32a	30.6a	106.9a	869.6a
CR3	0.38a	6.57ab	2.17ab	2.18a	31.8a	92.3a	845.3a
CR4	0.38a	6.79a	2.42a	2.29a	34.7a	95.5a	845.3a

For each chemical property of soil mixtures, columns of table with the same letter do not differ significantly according to Tukey's test (P = 0.05); C, control (soil plus manure); CR1, CR2, CR3 or CR4, control and rosemary dry leaf 0.2, 0.4, 0.6 or 0.8 g, respectively.

CONCLUSIONS

Four different rates of rosemary dry leaves were applied into a soil amended with manure, and after an incubation experiment 15 weeks the effects on the soil chemical properties were attested. These results confirm that, dry foliar tissues of rosemary it is a valuable material for soil amendment, could be applied to the soil as an acceleration agent for soil organic matter biodegradation, improves soil chemical and biological properties.

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THE DRIVING OF CHERRY TREES BY THE CUP-SHAPED CROWN SYSTEM

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Keywords*: cherry trees, variety, cup-shaped crown*

ABSTRACT

The paper relates to fruit growing, namely to a process for formation of cherry trees cup-shaped crown. The work refers to a process of forming the crown in the form of a cup of the cherry tree. The method of forming the cherry tree in the form of a vase comprises the formation of trees a trunk of 40-50 cm and a short shaft, at the base of which lies 3-4 structure charades, spaced at 10-15 cm from each other, radial around the shaft with the branching angle of 50-60 degrees , and the inclination of 35-40 degrees from the vertical, on each slope at 30-40 cm from the shaft, a horizontal sub serpent directed horizontally, when the serpent does not change its insertion angle and the direction of tilt the central shaft is cut at 30-40 cm above the base of the upper serpent at a lateral branch, on the slopes and on the uniform sub serpent are arranged only branches of semischelet and fruit branches with the renovation cycle of 4-5 years in the spigot with a length of 10-15 cm.

INTRODUCTION

The cherry culture system requires simplicity in the process of forming, cutting and maintenance of the crown, relatively free forms, with low volume, with central and cup-shaped shaft, such as early quality and stable crops (Calabro et al. 2009; Cimpoieş, 2018). Modern cherry orchards are characterized by precoties, yield per hectare, fruit quality and regularity of production, being determined by the structure of the plantation, including the planting distance, Crown shape, spatial location mode of plant macrostructure and rows on the territory of orchards(Balan, 2015). Regardless of the management system of the crown the training cuts are extremely important for cherry trees, because they ensure the formation of the airy and balanced crown in the vertical and lateral plane, early harvards, reduction of the final height of the trees in accordance with the culture system (Balan, 2015; Long, et. al. 2014).

It is known the management system of the cherry trees with medium and high force of growth after the crown of the pyramid of the floor with the semi-open center. The Crown constitutes a shaft on which 6 charslopes are framed. At the distance of 70 cm from the ground are placed 4 floor-shaped slopes spaced at 8-12 cm between them, oriented under angles of 30-45 degrees from the direction of the

row. In the 2nd floor at the distance of 40-60 cm from the first are placed 2 branches oriented perpendicular to the row direction. The shaft is shortened, by transfer, above the last serpent on the 2nd floor. On the alternate bilaterally, the altern shall be placed 2-3 subcharslopes spaced at 40-50 cm from the shaft and between (Babuc et al. 2015).

The disadvantages of this form of crown consist in the formation of dense crowns in the direction of the row and poorly illuminated in the center of the crown, because the one-storey charpanes are facing the direction of the row, and the subserpent is too many and stuffed the crown not only at the base but at its peak. In modern orchards is widely used the form of the Spanish Tufa crown (Spanish Bush) which, consists of a short trunk of 30-40 cm, 4-5 branches of short base 15-20 cm long, grained with 20-30 branches of structure that reduce the vigor of the growth of the tree and Favors the process of tree maintenance and fruit harvesting. It is recommended for combinations of large-force parent stock variety at planting distance 5-5.5 x 2.5-3 m and for the average combinations at the distance of 4.25-5 x 1.8-2.5 m Long, Lynn E. et al. 2014). The disadvantages of this form of Crown consist in the formation of numerous branches of the skeleton, which shade the center of the crown, the leaves are yellow, the branches suffer, and the center of the crown becomes poorly productive. Further suppress 2-4 branches located at the center of the tree to allow light to penetrate better inside the crown, but when annual increases become weak it is necessary to suppress from inside the crown and other branches. Wounds made to the suppression of skeleton branches can be the outbreak of infection with bacterial cancer.

Elaboration of the process of forming the crown in the form of a cup of cherry tree, in high-density system, for the efficient use of the workforce, obtaining qualitative and competitive fruit production on the market, becomes a matter of great value for the farmer.

MATERIAL AND METHODS

The experience was organized in the Pomicole area of the centre of the Republic of Moldova, at SRL Vindex-Agro, Orhei region, at ' Petru Balan ' and at LLC "Staragrogrup" Criuleni region. The process of forming cherry trees in the form of vase was applied to the cherry varieties Lappins Skeena, Big Star and Ferrovia. The Ferrovia variety is grafted on small-force rootstocks Gisela 6 and planted at the distance of 4 x 2 m. Varieties Lappins, Skeena and Big Star, are grafted on medium-sized MaxMa 14 rootstocks, and planted at a distance of 5 x 3 m (Balan et al. 2017).

The propagating material was of high quality: viable buds on the entire length of the shaft; well-developed root system; the conincrease between Grafi and excellent rootstock without traces of necrosis. The planting was carried out in the spring in pits with dimensions of 60 x 60 x 60 cm. When planting in each pit, 20 kg of well-fermented manure was administered. The soil is maintained naturally, the orchards irrigate by drip, and to monitor the soil humidity, the Watermark transducers are used. The water is distributed through the tubes with dropper fastened to 40 cm from the ground on the direction of the row. The bands between the rows 2.5 m wide, with weeds that grow spontaneously are coated to necessity and remain as mulch.

The experiences are linear and include 4 repetitions of 8 trees each. Records and appreciation of important characters and attributes to trees from a biological and technological point of view or executed in field and laboratory conditions according to the method of stationary and biological research (Moiseicenko, 1994).

RESULTS AND DISCUSSIONS

In modern cherry orchards, the form of crown of the trees must be simple both in the process of forming the crown and in the way of cutting the branches, to produce many fruits of high quality, to allow the renewal of the wood that is fruitful without interruption (Babuc, 2012).

To modernise the cherry crop we developed new methods of driving cherry trees, graft on small-force vegetative rootstocks (Gisela 5 and Gisela 6) and average (MaxMa 14) after the system of driving the bush-shaped trees. (Balan et al. 2017).

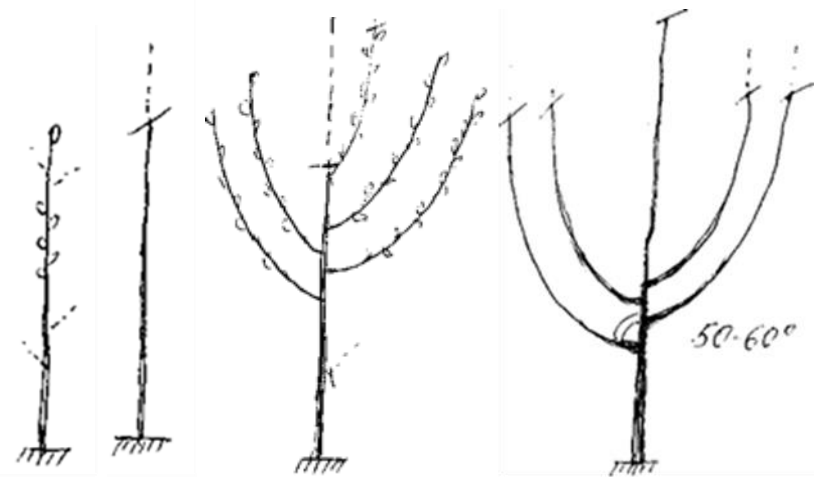
In the first year, spring before the start of vegetation the trees (rods) were shortened to 80-90 cm above ground level (Fig. a). At the depod, they suppressed the buds on the trunk at a height of 40-50 cm and were blinded 2-3 axial shoots located under the two terminals, to promote the growth of the ramifications with high insertion angle, less prone to disbinary and weaker infected by bacterial cancer (Fig. b).

The training work continued when the shoots reached the length of 20-25 cm. The central axle extension bark was eliminated and the competitor's head pinched at 3-4 the leaf at the top, which temporarily attenuates the apical growth of the shaft and the shoots, are obtained anticipated shoots (Fig. c). From the shoots at the base of the crown were chosen 3-4 with high angles of insertion (50-60 degrees) radial around the shaft, for future charslopes. From the shoots at the base of the crown were chosen 3-4 with high angles of insertion (50-60 degrees) radial around the shaft, for future charslopes. If the insertion angle of the shoots is small, it was mechanically increased to 50-60 degrees with the help of toothcutters or pliers.

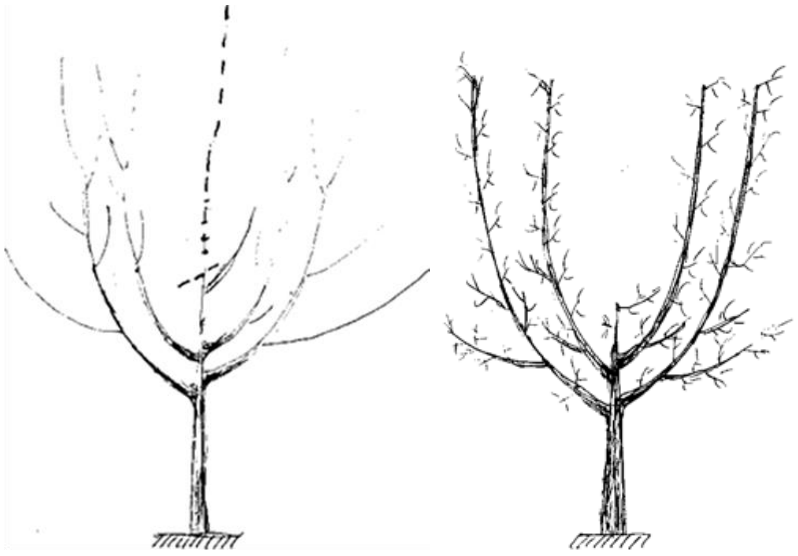
In the second year, the spring corrected the position and balance of the growth of the future of the charslopes. In trees where there were no operations in the green in the previous year, a vertical branch was selected to be the leader and 3-4 branches spaced over a bud or at 10-15 cm from each other, radial around the shaft, for future charslopes, with the angle of branching of 50-60 degrees, with a uniform force, which were shortened to 60 cm from their base in order to form ramifications. The leader shortened to 20 cm above the tip of the base branches in order to reduce the excess force of the serpent and strengthen them in the required position (Fig. D). Branches with strong increases have suppressed, and with moderate increases they have been left as branches of Semischelet to moderating the growth of trees.

During the vegetation period when the shoots reached the length of 50-60 cm, the shoots for extending the serpent with the corresponding outward orientation were chosen, and the vertical or inward-growing shoots were cut to the spigot by 5-10 cm, to obtain anticipated shoots. Subsequently, by transferring cuts to the outer lateral ramifications with the horizontal position, branches of semischelet are formed in the free space of the crown. Shoots bred with large insertion angles remain intact as branches of becoming semischelet.

In the third year, we check the correctness of the direction of growth of the serpent, a branch of extension of the serpent with a vertical position was selected, shortened to 60 cm from the insertion site for a more uniform garniption. The mean inclination direction of the charslopes must be 35-40 degrees from the vertical. If the serpent does not have the necessary position, by transferring cuts to new lateral ramifications, they are directed to the projected position.



a) b) c) d)



e) f)

Figure. The scheme of formation of the delayed vessel to the cherry trees. a) The trees (rots) are shortened to 80-90 cm above ground level; b) Suppress the buds on the trunk at a height of 40-50 cm and orbit 2-3 axial shoots located under the two terminals; c) Remove the central shaft extension bark, and the competitor shoots pinch to 3-4 leaves at the top); d) The serpent shall be shortened to 60 cm from the base and the leader 20 cm above their top; e) The central axle is cut to 30-40 cm above the base of the upper serpent, to a lateral branch with a position, predominantly, horizontally; f) The crown consists of 3-4 axes with horizontal branches at the base in the form of a spindle.

At 30-40 cm from the base of the serpent was selected a subserpent facing outward with a wide angle of inclination, shortened to 60 cm from its base and it was horizontal to widen the base of the crown. When the insertion angle and the required direction of tilt of the serpent have been established, the central axle was cut to 30-40 cm above the base of the upper serpent, to a lateral branch with a predominantly horizontal position, which can become a branch of Semischelet (Fig. E). If the shaft is removed earlier than the right time, then the serpent will grow stronger than normal and will decrease the tilt angle towards the vertical.

Each charslope is treated as an individual spindle-shaped tree. The vase with the crown in the form of a vase creates a small waist system with a height of 2.5-3 m that allows the cutting and harvesting of fruit at ground level and on low platforms of 0.5-1 m height. The Ferrovia variety, which thrives more on the buds that develop at the base of the annual branches and the Lapins variety that form bundles of cherries together very close to each other develops very well if they are driven by this form of crown, and produce a significant number of qualitative fruits.

The branches with moderate growth remain intact as branches of the growing semischelet, the vigorous branches were shortened to 60 cm, and the vertical branches and those inside the crown were shortened to the spigot of 5-10 cm to control the growth of the trees, to allow the light to penetrate better inside the crown and begin the initiation of integration into the renovation of semischelet branches with the 4-5-year cycle.

During vegetation, Hulpavi shoots, vertical or with inward orientation, and those who overstuffed the crown were cut to 5-10 cm. The required direction of the serpent is maintained through the transfer cuts to a lateral barking with favorable position.

In the fourth year, subsequently the cutting of the axle shaft transfer and shortening at 60 cm of its extension branch shall be carried out similar to the previous year. The base of the crown must consist generally of a permanent skeleton in a horizontal and well-branched direction for each serpent (Fig. f).

CONCLUSIONS

The result of the invention allows the formation of the crown in the form of a well illuminated delayed vase of small waist with a height of 2.5-3 m, consisting of 3-4 charades/branches, which form with vertical angles of 35-40 degrees. Each charade can be treated as an individual tree in the form of a garnied spindle with a single level of semischelet branches and fruit-bearing branches, which descend as a length from the base to the tip of the serpent, ensuring the cutting of the trees and harvesting the fruit from the of the soil and on low platforms of 0.5-1 m height.

The trees led according to the invention have a small trunk of 50-60 cm and a short shaft, at the base of which there are 3-4 structure roofs, spaced at 10-15 cm from each other, radial around the shaft, with the branking angle of 50-60 degrees and the inclination of 35-40 degrees from the vertical level. The central shaft of the crown is shortened to 30-40 cm above the fourth serpent, by transfer to a lateral branch, when the serpent does not change its insertion angle and tilt direction. Thus we obtain a cup consisting of four charades, which each can be treated as an individual tree in the form of a garnished-shaped spindle with a single level of branches of semischelet and branches of spigot, which descents as length from the base to the top of the tree.

ACKNOWLEDGMENT

The paper relates to fruit growing, namely to a process for formation of cherry trees cup-shaped crown. The process, according to the invention, includes pruning of the tree in the spring in the first year after planting and removal of buds from the trunk at the height of 40-50 cm with dazzling of 2-3 axial buds located under two terminal buds, removal of the extension shoot of the central axis with pinching of the top of the competing shoot; selection of a vertical branch for the future central axis and 3…4 branches for the future scaffold branches from the base of the tree crown, with a branch angle of 50…60° with respect to the vertical; the future scaffold branches are pruned 60 cm from their base, and the central axis − 20 cm higher than the top of the scaffold branches; removal of branches with strong growth and twig pruning in 5…10 cm of the shoots with vertical growth and with direction inside the tree crown; establishment of the direction of growth and the angle of inclination of the scaffold branches of 35…40° relative to the vertical, selection at 30…40 cm from the base of the scaffold branches of a second-order scaffold branch horizontally directed to the outside of the crown and pruning of the central axis 30…40 cm from the base of the upper scaffold branch above a lateral branch.

The problem that the proposed invention solves consists in the formation of simple crowns in the form of a delayed, well-lit cup with 3-4 permanent charades, garnified with a subserpent, with branches of Semischelet and spigot, which can be treated individually as a spindle-shaped tree, respecting the vigor of the Semischelet branches to undescend from the bottom up.

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COMPARATIVE STUDY ON POLYPHENOLS CONTENT AND ANTIOXIDANT ACTIVITY OF LEAVES FROM SOME HEMP VARIETIES GROWN IN CENTRAL GREECE

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Keywords*: Cannabis sativa; DPPH activity; phenolic fractions; total phenols*

ABSTRACT

Four Cannabis sativa varieties (Fibranova, Felina, Futura and Fedora) were cultivated at the Experimental Farm of the TEI Thessaly, and it has been studied in the hemp leaf the total phenols content, phenolic fractions and the antiradical activity DPPH. The total phenols content in the hemp varieties studied ranged from 19.61 to 26.61 mg (GAE) / g dw, the non-flavonoid phenols content ranged from 7.54 to 8.41 mg (GAE) / g dw and the flavonoid phenols content ranged from 11.77 to 18.89 mg (GAE) / g dw. The antiradical activity DPPH• in the hemp varieties studied ranged from 8.4 to 12.7 μmol (Trolox) / g dw. The leaves of Fibranova variety they showed the highest polyphenols content and antiradical activity DPPH. The results showed that the hemp leaves can be used as potential sources of bioactive phenolic compounds for pharmaceutical purposes.

INTRODUCTION

Cannabis sativa it is grown in many regions for fiber production, use as a food, fuel source, building material, etc.(Bertoli et al. 2010; Mihoc et al. 2012; Amaducci et al. 2015). It is grown selectively bred to produce low levels of Δ9-tetrahydrocannabinol (THC) and high levels of cannabidiol (CBD). *Cannabis sativa* are rich to cannabinoids, terpenes and polyphenols. In hemp, about 20 flavonoids have been identified (Flores-Sanchez and Verpoorte 2008), while the cannabinoids represents a group of C21 terpenophenolic compounds (Brenneisen 2007).

The leaves of many plant species containing polyphenols have been used as spices, as sources for the preparation of natural antioxidants and as forages (Benavente-Garcıa et al. 2000; Ruan et al. 2008). Also, the extracts of many leaves species, rich in essential oils and phenol compounds, are used as substitutes of the synthetic pesticides in biological agriculture (Rhouma et al. 2009). In addition, many of the effects of polyphenols on health are associated with their ability to scavenge and remove the harmful free radicals. The generation of free radicals in the human and animal cells induces the oxidation of the biological macromolecules which cause the occurrence of many diseases (Pokorny et al. 2001).

The aim of the present study is to determine of total phenols content, of phenolic fractions and antioxidant activity in the leaves from four different hemp varieties grown in central Greece.

MATERIAL AND METHODS

Experimental: Four *Cannabis sativa* L. varieties (Fibranova, Felina, Futura and Fedora) were cultivated on April 2018 at the Experimental Farm of the Technological Educational Institute of Thessaly (latitude 39°37′25″ N, longitude 22°22′48″ E, 80 m altitude). Fertilization was applied 244 Kg N per hectare and irrigation 100% ETo, the evapotranspiration is 500 mm. The study area is characterized by a typical Mediterranean climate with cold humid winters and hot-dry summers. In particular, the average air temperature ranged to 22.9^{o}C while the noticed precipitation was 290 mm during the growing period. At the harvest period the leaves from each variety were dried in a dark place at room temperature, finely ground and kept at 4^{o}C. Four replicates per variety were used.

Soil analysis: The Texture of soils was determined by the bouyoucos hydrometer method (Bouyoucos 1962). Soil samples was analyzed using the following methods which are referred by (Page et al. 1982).

Organic matter was analyzed by chemical oxidation with 1 mol L^{-1} $K_2Cr_2O_7$ and titration of the remaining reagent with 0.5 mol L^{-1} $FeSO_4$. Inorganic nitrogen was extracted with 0.5 mol L^{-1} $CaCl_2$ and estimated by distillation in the presence of MgO and Devarda's alloy, respectively. Available P forms (Olsen P) was extracted with 0.5 mol L^{-1} $NaHCO_3$ and measured by spectroscopy. Exchangeable form of potassium was extracted with 1 mol L^{-1} CH_3COONH_4 and measured by flame Photometer (Essex, UK). Table 1 shows the soil chemical properties before sowing of hemp.

Table 1

Soil chemical properties

Properties	Soil depth 0-30 cm
Texture	Sandy Clay Loam
pH	7.26 ± 0.05
EC (dS m^{-1})	0.20 ± 0.01
Organic matter (%)	1.44 ± 0.07
N-inorganic (mg kg^{-1})	381.5 ± 29.3
P -Olsen (mg kg^{-1})	18.2 ± 1.21
K-exchangeable (mg kg^{-1})	555.8 ± 23.4

Electrical conductivity, (EC) and soil pH is determined in (1:5) soil/water extract; Data represent average means and SE deviation. (n) = 4.

Preparation of leaves extracts: Two g of finely ground hemp leaves were two rounds treated by 20 ml of 80% aqueous ethanol. Samples were incubated for 24 h in the extractant at stirring; The extract was gathered after centrifugation and filtration. The pellet was retreated with 20 ml of 80% aqueous ethanol for two h at stirring at ambient temperature. The extract was gathered after centrifugation / filtration and the volume was made up to 50 ml with aqueous ethanol and used for further chemical analysis (Kanner et al. 1994).

Analysis of plant tissues: The amount of total phenols (TP) was determined with the Folin-Ciocalteu (F.C.) reagent according to the method of (Singleton and Rossi 1965), and were expressed as gallic acid equivalent (GAE) in mg/g dry weight. The content of nonflavonoid phenols (NFP) was determined with the F.C. reagent after removing the flavonoid phenols (FP) with formaldehyde according to the method of (Kramling and Singleton 1969) and was expressed as gallic acid equivalent (GAE) in µg/g dry weight. Flavanoid phenols (FP) were determined as a difference between the content of total phenols (TP) and nonflavonoid phenols (NFP). Their amount was evaluated as gallic acid equivalent in µg/g dry weight.

The radical scavenging activities by antioxidants in the leaves extracts were evaluated using the stable free radical 2,2′-diphenyl-1-pycrylhydrazyl radical (DPPH•), as a reagent, according to the method by (Brand-Williams et al. 1995) and the results were expressed as µmol Trolox equivalent/g dry weight.

The inhibition coefficient (IC_{50}), represents 50% reduction in the colour intensity of the DPPH radical by the total phenols in the studied extracts after plotting the dependence of the TP content on the bleaching of DPPH• solutions. The inhibition coefficient (IC_{50}) was calculated using the following equation:

$$\% \text{ inhibition} = [(E0 - Ex)/E0] \times 100$$

where E0, is the extinction of the radical solution before the reaction and Ex,after polyphenols addition (Yen and Duh 1994), percent of extracts were used to determine of the inhibition coefficient (IC_{50}).

Statistical analysis: Data analysis was made using the MINITAB (Ryan et al. 2005) statistical package. The results are means of four parallel samples. Analysis of variance was used to assess treatment effects. Mean separation was made using Tukey's test when significant differences (P = 0.05) between treatments were found.

RESULTS AND DISCUSSIONS

The total phenols content in the hemp leaves ranges from 19.61 to 26.61 mg GAE/g dw (Table 2). The leaves of Fibranova variety are characterised by the highest total phenols content, and those from the Fedora by the lowest total phenols content, and the difference between them amounts them is 26.3%. The total phenols content in the leaves of hemp varieties studied has the following sequence: Fibranova > Felina > Futura > Fedora. Our results they agree with the data obtained by other authors who have established differences on total phenolic content in different hemp varieties (Ferrante et al. 2019).

Flavonoid phenols (FP) content in the hemp leaves studied ranges from 11.77 to 18.89 mg (GAE) / g dw (Table 2). The Fibranova variety are characterised by the highest flavonoid phenols content, while the Fedora variety are characterised by the lowest flavonoid phenols content, and the difference between them is 37.7%. The flavonoid phenols content in the hemp leaves has the following sequence: Fibranova > Felina > Futura > Fedora. The flavonoid phenols fraction represents from 60.0 to 71.0 % of the total phenols amount and is the major constituent of total phenols in the *Cannabis sativa* varieties (Table 2).

The non-flavonoid phenols content in the hemp leaves studied ranges from 7.54 to 8.41 mg (GAE) / g dw. The Futura variety are characterised by the highest non-flavonoid phenols content, while the Felina variety are characterised by the lowest non-flavonoid phenols content, and the difference between them is 10.3%. The non-flavonoid phenols content in the hemp leaves has the following sequence: Futura > Fedora > Fibranova > Felina.

Table 2

Total phenols (TP), flavonoid (FP) and non-flavonoid phenols (NFP) content of hemp leaf mass

Hemp varieties	TP	FP	NFP	FP% of TP amount
	mg (GAE) g^{-1} dry weight			
Fibranova	26.61a	18.89a	7.72b	71
Felina	22.84b	15.30b	7.54b	67
Futura	22.14b	13.73c	8.41a	62
Fedora	19.61c	11.77d	7.84b	60

For each chemical property, columns of table with the same letter do not differ significantly according to the Tukey's test (P = 0.05).

The antiradical activity DPPH• in the hemp leaves studied ranges from 8.4 to 12.7 μmol Trolox / g dw (Figure 1). The Fibranova variety exert the highest activity with 12.7 μmol Trolox / g dw, while the Fedora variety exert the lowest with 8.4 μmol Trolox / g dw. These values are higher than those reported by other authors for some *Cannabis sativa* varieties grown in Northern India (Arya et al. 2012). The highest activity in the Fibranova variety could be due to the higher concentration of the phenolic compounds, as well as the specific influence and the synergy exerted from the individual compounds. The correlation between the antiradical activity DPPH• and the total phenols content during harvest of the hemp leaves was moderate, with correlation coefficient (r^2) equal to: 0.79.

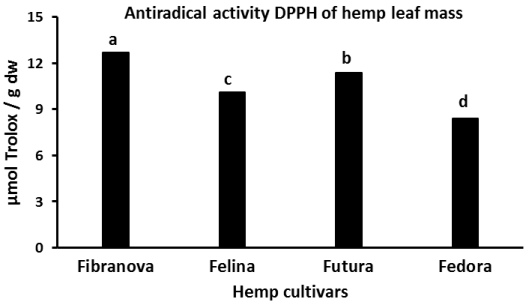

Figure 1. Antiradical activity DPPH of hemp leaf mass. Each characteristic of the graph with the same letter do not differ significantly according to the Tukey's test (P = 0.05).

The inhibition percentage DPPH of the ethanol extracts in different hemp varieties were examined at different concentrations of the samples. The IC_{50} values of radical scavenging activity of leaves hemp extracts are presented in Figure 2. The Fibranova variety showed the highest activity (IC_{50} of 117 μg/ml), while the Fedora variety showed the lowest activity (IC_{50} of 217 μg/ml). The lower inhibition concentration (IC_{50}) corresponds in the higher antioxidant capacity.

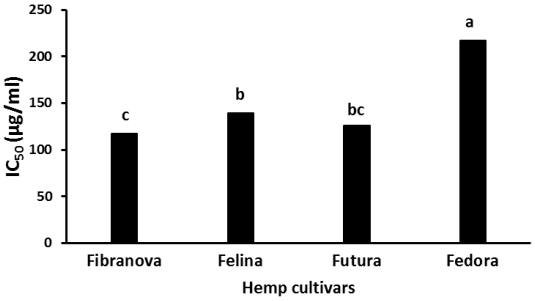

Figure 2. Antioxidant capacity through IC_{50} (Inhibition concentration) of the hemp cultivars. Each characteristic of the graph with the same letter do not differ significantly according to the Tukey's test (P = 0.05).

CONCLUSIONS

The results on the hemp leaves are showed that all varieties studied are characterised by high content of polyphenols, differences in composition affect the antioxidant activity DPPH of hemp leaves. The leaves of Fibranova variety they showed the highest polyphenols content and antiradical activity DPPH.

Because of high polyphenols content and antioxidant activity, the hemp leaves can be regarded as potential sources of bioactive phenol compounds for pharmaceutical purposes and for natural pesticides.

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EVALUATION OF THE TWO MAIN GREEK PISTACHIO VARIETIES

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ABSTRACT

Pistachio is an important nut crop in Greece, especially in arid regions, grown in a variety of soils. Two Greek pistachio varieties have been developed, 'Aegina' and 'Pontikis', and their cultivation has been widely expanded in many Greek areas, from the north to the south in Greece. The two varieties evaluated were grafted on seedling rootstocks of Pistacia terebinthus L., cv. Tsikoudia, in the Institute of Plant Breeding & Genetic Resources, Dept. of Nut Trees, HAO-DEMETER, Lamia, Greece. Evaluation of the two varieties revealed that blooming in 'Aegina' variety occurs from early to mid of April, and fruit maturation at middle to late of August. Production starts at 6 to 7 year from grafting, with full production observed at year 14. Blooming and fruit maturation in 'Pontikis' occurs about 2 to 4 days later than 'Aegina' variety and production starts at 6 to 7 year from grafting, with full production observed at year 13. The male trees needed to produce pollen must be scattered around orchards at a percentage of 12% relative to females. Nut fruits of 'Aegina' and 'Pontikis' pistachio have ovoid shape and very attractive appearance. Fruit opening in both varieties is symmetrical and up to ¾ of its length. Color of kernel is green externally and green to green-white internally, more green in 'Pontikis' relative to 'Aegina' variety. Ten-year old trees of both varieties gave a mean production of 10 kg of dried nuts and 25 year old trees gave a mean production of 25 kg of dried nuts with mean production 4500 kg/ha.

INTRODUCTION

Pistachio (*Pistacia vera* L.) is cultivated in the Middle East, United States, and Mediterranean countries. As is an important nut for human consumption, Greece is among the most important pistachio producing countries worldwide (6th position), with 4500 ha cultivated area and 12,300 tons annual production (FAO Stat, 2019). It is of particular importance for Greece, as it is cultivated mainly in lowland and semi-mountainous areas of the country, in arid regions and can exploit a variety of soils, from slightly acidic to alkaline, even without irrigation. However, one or two irrigations

give much better results (Rouskas, 2005). There are many *Pistacia* species in Greece, such as *Pistacia palestina*, *P. terebinthus* and *P. lentiscus*, which are used as ornamental shrubs. However, 'Aegina' and 'Pontikis' are the main varieties in Greece (Rouskas and Zakinthinos, 1994). 'Aegina' variety has taken its name from Aegina Greek island, where this cultivar is the most cultivated on the Aegina island (Chitzanidis, 2010). The famous 'Aegina' pistachio from the Aegina island has been designated as a Protected Designation of Origin (PDO) product by the EU (EC 1263/96).

The variety 'Aegina' originated from seedling selection (most likely of the 'Ashoury' variety), whereas 'Pontikis' variety originated from a seedling selection obtained by professor C.A. Pontikis from the 'Aegina' variety. Initially, 'Aegina' variety cultivation was restricted to the coasts of Attica and Aegina. From 1950 it began to expand in the areas of Viotias, Corinthos, Evias and of Fthiotidas and from 1968 its cultivation expanded in central and northern Greece (Thessaloniki, Halkidiki, Rodopi), in Crete and Cyclades. 'Pontikis' variety is cultivated mainly in Thessaly, but recently its cultivation has been expanded in other areas as 'Aegina' variety.

The largest pistachio orchards in Greece are overwhelmingly well-organized, with agricultural machinery, peeling machines and dryers. Where they lag behind is only in the mechanical harvesting of pistachios. The mechanization of cultivation results in the lowest cost of the product, but at the same time in the case of pistachio, it enables the rapid execution of the work required to achieve the highest quality pistachio production (Rouskas, 2005).

MATHERIAL AND METHODS

The two varieties evaluated were grafted on seedling rootstocks from *Pistacia terebinthus* L., cv. Tsikoudia, in the Institute of Plant Breeding & Genetic Resources Dept. of Nut Trees, HAO-DEMETER, Lamia, Greece.and planted in the collection in Lamia, at an altitude of 35 m and a slope of about 1%. Soil examination (0-30 cm, 30-60 cm, and 60-90 cm depth), before installing the collections, provided the following:

- Mechanical soil composition (Bouyoukos hydrometer method): clay 52-56%, silt 32-36%, sand 8-14%, soil characterization clayey.
- Water saturation 65-70%, electrical conductivity 0.55-0.59 mS / cm, total salts 0.2%, pH 7.6-7.7 (Jackson, 1958), calcium carbonate 7.6-10, 1% with Bernard calcimeter, 1.4-2% organic matter according to Walkley and Black (1934) method.
- Soil content of macronutrients: total N 105-165 mg / 100g (Kjeldahl,1883), assimilable P 2 mg / kg (Olsen et al., 1954), assimilable K 0.46 meq / 100 g (ammonium acetate) and trace elements with dry combustion and atomic absorption: Cu 4.9-6.7 ppm, Mn 6.4-9.4 ppm, Fe 15-28 ppm, Zn 0.94-1.03 ppm, and the cation exchange capacity was 42-49.8 meq / 100 g (ammonium acetate method).

The two Greek 'Aegina' and 'Pontikis' varieties were planted in 7x7 m distances in 1990 and the main pollinators used were 'Macho 502' and the Greek clones 'Gamma' and 'Beta'/'Delta'. Irrigation was performed by drip and generally, the same cultivation (fertilization, irrigation, etc.) care were applied to all trees.

RESULTS AND DISCUSSIONS

Tree characteristics

The trees of 'Aegina' variety from the collection have intermediate vigor with semi-erect growth habit and compound leaves (3 to 5 leaflets). Blooming occurs from early to mid of April, whereas fruit maturation (80% of fruits with mature pericarp) occurs at middle to late of August. Production starts after 6 or 7 years from grafting, with full production observed in the 14th year.

The trees of 'Pontikis' variety planted in the collection have intermediate vigor with is semi-erect growth habit and compound leaves (3 to 5 leaflets). Blooming occurs from early to mid of April, whereas fruit maturation (80% of fruits with mature pericarp) occurs at late of August. Blooming and fruit maturation occurs about 2 to 4 days later to 'Aegina' variety. Production starts at 6 to 7 year from grafting, with full production observed in the 13th year.

Since, pistachio is a dioecious species, i.e. male and female blossoms are on separate trees, the male trees only needed to produce pollen for fertilizing female trees, and must be scattered around orchards at a male percentage of 12% relative to females.

The male pollinator varieties are very important for the yield of varieties (both quantitative and qualitative). A very good pollinator must exhibit tree characteristics (bud size, leaf number, leaf shape, vegetation season, tree size, etc.) relative to the female variety with which it should coincide with the flowering dates, i.e. emission of pollen of the pollinator variety to cover the entire flowering period of the female flowers having a favorable stigma. Of the known male Greek clones, 'Beta' and 'Gamma' appear to be suitable for pollinating the 'Aegina' and 'Pontikis' varieties that coincide in flowering. However, in the case of the 'Aegina' variety for several years it has been clearly seen that there is a significant proportion (20-30%) of flowers with a marked position 3-6 days after the finish of bloom of clone 'Gamma' pollen (which is the most late than 'Beta'). The result is a decrease in the productivity of the 'Aegina' variety, with a significant increase in the percentage of biennial bearing (a usually year production followed by a low year production).

Fruit characteristics

'Aegina' pistachio fruit in shell has ovoid shape with unilateral curvature and very good appearance. Fruit measurements taken in 2017 and 2018 revealed a mean fruit weight of 1.08 ± 0.08 g, large diameter 11.12 ± 0.56 mm, small diameter 11.20 ± 0.68 mm, height 20.76 ± 0.87 mm, size index 14.36 ± 0.50 mm, shape index 0.78 ± 0.02 and suture opening 5.07± 1.21 (Table 1). Measurements of more years showed that the percentage of open pistachios is around 72 - 85%. Fruit opening is symmetrical and up to ¾ of its length. Kernel dry weight percentage is around 56-57%. Color of kernel is green externally and green-white internally. Kernel contains 20% protein and 51% fat.

'Pontikis' pistachio fruit in shell has ovoid shape with unilateral curvature and very good appearance. Fruit measurements taken in 2017 and 2018 revealed a mean fruit weight of 1.14 ± 0.13 g, large diameter 11.90 ± 0.60 mm, small diameter 11.24 ± 0.71 mm, height 20.34 ± 0.87 mm, size index 14.50 ± 0.47 mm, shape index 0.80 ± 0.02 and suture opening 4.00 ± 2.48 (Table 1). Measurements of further years showed that the percentage of open pistachios is around 78 – 90%. Fruit opening is symmetrical and up to ¾ of its length. Kernel dry weight percentage is around 56-57%. Color of kernel is green externally and green to green-white internally, more

green than ‘Aegina’ variety, with slightly pleasant flavor. Kernel contains 19.7% protein and 53% fat.

Harvest condition

Table 1

Pistachio nut characteristics of ‘Aegina’ and ‘Pontikis’ varieties measured (mean 2017-2018).

	Large diameter (D) (mm)	Small diameter (d) (mm)	Height (h) (mm)	Size index $\frac{(D+d+h)}{3}$ (mm)	Shape index $\frac{(D+d)}{2*h}$	Weight (g)	Suture opening (mm)
‘Aegina’ variety							
Mean	*11.12*	*11.20*	*20.76*	*14.36*	*0.78*	*1.08*	*5.07*
Min	*9.8*	*9.43*	*18.61*	*13.21*	*0.74*	*0.82*	*2.63*
Max	*12.88*	*12.3*	*22.13*	*15.19*	*0.82*	*1.17*	*6.9*
Variance	*0.32*	*0.46*	*0.75*	*0.25*	*0.00*	*0.01*	*1.47*
Standard deviation	*0.56*	*0.68*	*0.87*	*0.50*	*0.02*	*0.08*	*1.21*
Coeficient of variation	*5.08*	*6.07*	*4.18*	*3.48*	*2.61*	*7.63*	*23.87*
‘Pontikis’ variety							
Mean	*11.90*	*11.24*	*20.34*	*14.50*	*0.80*	*1.14*	*4.00*
Min	*10.9*	*10.07*	*18.4*	*13.58*	*0.76*	*0.89*	*0*
Max	*13.04*	*12.43*	*21.4*	*15.46*	*0.84*	*1.37*	*7.52*
Variance	*0.36*	*0.51*	*0.75*	*0.22*	*0.00*	*0.02*	*6.16*
Standard deviation	*0.60*	*0.71*	*0.87*	*0.47*	*0.02*	*0.13*	*2.48*
Coeficient of variation	*5.07*	*6.32*	*4.27*	*3.23*	*2.54*	*11.06*	*62.12*

Harvesting was performed mechanically from the end of August to the end of September, in one or two times with a difference of 10-12 days, from one to the other harvesting. Ten year old trees gave a mean production of 10 kg of dried nuts and 25 year old trees gave a mean production of 25 kg of dried nuts with mean yield 4500 kg/ha.

Figures 4-6. Nuts and kernels of ‘Pontikis’ pistachio variety.

CONCLUSIONS

In conclusion, ‘Aegina’ and ‘Pontikis’ varieties are the dominant cultivated pistachio varieties in Greece, that are well adopted to Mediterranean climate conditions, they are high yielding varieties, with big fruit size of acceptable appearance and high quality. Their behavior in the conditions of culture in Lamia confirmed their value and sustain their use into private farms.

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STUDY ON THE CURRENT OENOCLIMATE OF OLTENIA REGION

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Keywords*: viticulture, climate, indicators, terroir*

ABSTRACT

The paper is a climatic study based on the meteorological data recorded by seven weather stations in Oltenia, which are representative for the characterization of the oenoclimate in the main vineyards and wine-growing centers of this region. The meteorological data for 30 years were processed in order to obtain conclusive result. Their interpretation was conducted using a series of climate indicators specific to the viticulture ecology, calculated and analysed according to the specifications in the literature. The result of this study is the characterization of the current climate of Oltenia, referring to its favorability for viticulture.

INTRODUCTION

The study of the oenoclimate of the wine-growing areas represents a continuous activity, necessary to keep the data up-to-date, especially in the context of the current climatic changes. The methods that are applied are diverse, being graphical or numerical (Buzatu G.D. et al., 2015; Giugea N., et al., 2015), adding also the data provided by the Geographic Information System (GIS). In this way, the differences between the wine regions of a country, the dynamics of the oenoclimate (Stan S. et al., 2011) or the variability of the climate within a region under the influence of the mesoclimate factors (Kullaj E. et al., 2013) are some of the elements highlighted. As a result, changes in the structure of cultivated varieties can be made, technologies used in viticulture can be improved and new strategies for future viticulture can be proposed (Schultze S., et all., 2019). Simulations have shown that climate warming can have negative effects on viticulture in some regions of the planet (Malheiro AC et al., 2010; Santillán D. et all., 2019).These aspects are not only specific to viticulture, they characterize the entire agriculture in various regions of the world (Maximova N. et all., 2019).

MATERIAL AND METHODS

The study is based on known ecoclimatic indicators (average annual temperature, active and useful thermal balance, annual amount of precipitation, amount of precipitation during the vegetation period, De Martonne aridity index, oenoclimatic aptitude index). The meteorological data were collected from seven weather stations (Tg. Jiu, Dr. Tr. Severin, Drăgăşani, Craiova, Calafat, Bechet, Bâcleş) located so as to ensure the correct evaluation of the oenoclimate in the vineyards of Oltenia. For the most accurate characterization, the meteorological

recordings refer to a period of 30 years. This is the recommended range to determine the normal values of a climatic parameter.

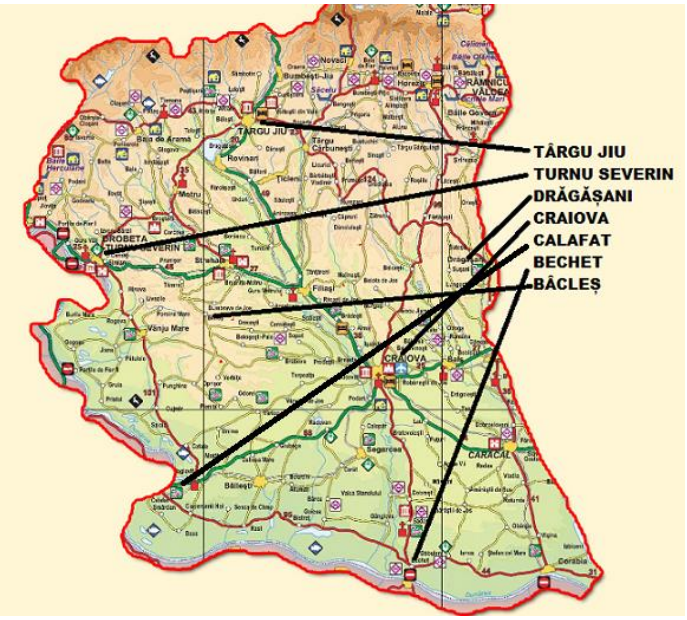

Figure no: 1. The location of the weather stations in the Oltenia region

RESULTS AND DISCUSSIONS

The presented data, obtained by systematizing the meteorological data over a long period of time, are representative for the characterization of macroclimate in Oltenia (table 1). Important vineyards and wine-growing centers are located right in the vicinity. From the point of view of insolation, this wine-growing area favours obtaining white and red wines of different quality categories, including wines with a controlled designation of origin (DOC). It is also possible to obtain aromatic wines, from varieties that have the capacity to maintain their acidity under higher temperature conditions. The southern area of Oltenia can also be exploited by cultivating varieties of table grapes, as the temperature and light resources are amplified and ensure the optimum maturation of these varieties. This resource is especially important for those varieties that mature later.

From the point of view of precipitation, they are favourable for viticulture, with no constant water excess. On the contrary, in the southern part of Oltenia we are at the limit of unirrigated culture of vines.

The temperatures are favourable for viticulture but they also correlate with other ecological factors (soil, relief, water regime) to ensure quality wines, dry, semi-dry or sweet wines.

If we refer to the De Martonne index, we observe maximum aridity in the Bechet area. The climate is similar to Calafat and then it becomes semi-humid in the Drăgășani, Dealurile Craiovei, Severin vineyards. As we get closer to Tg.Jiu, the climate becomes more humid and cooler and it is correlated with a transitional vegetation from forest steppe to forest.

Table 1

The climate indicators that characterize the Oltenia oenoclimate
(average of the 1984 – 2013 period)

Weather station / Indicator	Tg. Jiu	Tr. Severin	Drăgășani	Craiova	Calafat	Bechet	Bâcleș
Average annual temperature (°C)	10.63	11.80	10.61	11.09	11.93	14.28	10.36
Annual amount of precipitation (l/m^2)	691.5	606.52	602.86	575.43	526.98	482.10	611.94
Sum of precipitation during the vegetation period (l/m^2)	435.76	331.61	362.01	331.32	289.79	276.12	346.42
Real insulation during the vegetation period (hours)	1602.84	1578.99	1522.98	1572.59	1648.20	1573.63	1533.78
Active thermal balance (°C)	3216	3459	3173	3346	3541	3556	3140
Useful thermal balance (°C)	1416	1659	1373	1546	1741	1756	1340
De Martonne index	33.6	27.87	29.3	27.35	24.10	22.87	30.12
Oenoclimatic aptitude index	4627	4957	4585	4838	5156	5148	4577

The combination of the three vegetation factors (temperature, humidity, insulation) is represented by the oenoclimatic aptitude index which provides information on the direction of production of the vineyard. Basically, as the values increases, the oenoclimate changes. This is favourable for white wines in Tg. Jiu, and as we approach Drăgăşani, Craiova and Severin, the climate becomes favourable for obtaining high quality red wines. Here it is possible to grow varieties of table grapes, with medium maturation. Those with late maturation are recommended to be grown in southern Oltenia where the heliothermic resources are high, even in excess, and where the quality level of the wines is not the same as the one in the aforementioned wine-growing centers.

CONCLUSIONS

In Oltenia, the viticulture is practiced in a climate very similar to that of steppe, semi-humid, in the southern area; semi-humid in the central area and then in a favourable climate for forest species in the north-west area.

The oenoclimatic aptitude shows that Oltenia is favourable for obtaining quality white wines in the north-west part, quality white and red wines in the center part (Mehedinți, Vâlcea, Dolj, Olt counties), while the high heliothermic supply is unsupported by an appropriate edaphic factor in the south of Oltenia, and it is favourable for obtaining ordinary wines and for cultivating table grape varieties.

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CONTROL OF THE QUALITY PARAMETERS OF RED GRAPES AND WINES

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Keywords*: grape maturity, anthocyanin, red wines, chromatic structure*

ABSTRACT

Under the favorable ecological conditions for viticulture in the Drăgăşani vineyard, the red wine varieties, in addition to the higher potential of carbohydrate accumulation, have a remarkable capacity for anthocyanin biosynthesis. The chromatic structures of the anthocyanic extracts represented by the yellow, red and blue pigments are balanced, attractive and in accordance with the current requirements. They are dimensioned by the values of the intensity and the hue of the color, which are in accordance with the requirements for high quality red wines.

INTRODUCTION

The quality of grapes is determined by the contents of the primary metabolites (*carbohydrate* and organic acids) and of the secondary ones (phenolic compounds and aromatic substances). The contents and proportions of primary metabolites are decisive for the quality of grapes (Muntean Camelia, Stoica Felicia, Băducă C., 2017).

The main carbohydrates (glucose and fructose) and acids (malic acid and tartaric acid) are primarily stored in the vacuoles of mesocarp cells; however, some glucose and fructose may be found also in the exocarp (Lund & Bohlmann 2006).

A critical role in grapes plays a sufficient and harmonic content of acids as far as the suitability of grapes for wine making is concerned (De Bolt *et al*. 2007). Also, acids help to maintain the colour of wine and influence esterification and wine aroma (Stoica F., et al. 2015).

Anthocyanins are contained in the grape skin, except in the case of a few cultivars whose pulp is also pigmented. Thus, a close relationship can be expected between anthocyanin composition and visual appearance.

Anthocyanins are gradually accumulated in berry skins from veraison through grape ripening (Muntean Camelia, Stoica Felicia, Băducă C., Cichi Daniela Doloris, 2018).Regarding to Rolle, 2011, the anthocyanin concentration may decline just before harvest and/or during over-ripening.

MATERIAL AND METHODS

This study was carried out with grapes of the three cultivars *Vitisvinifera* cv. Cabernet Sauvignon, Merlot and Pinot noir fromthe Drăgăşani vineyard.At the grape samples of three red cultivators (V. vinifera L.), the baking process was followed, in

order to establish the full maturity and the technological maturity. The determination of the sugar content, the total acidity, the weight of 100 grains, and the anthocyanins were done by taking from 5 to 5 days until the maturity of harvest for each individual variety. These analyzes were performed in the 2017 wine year.The wine was obtained under the same biotechnological conditions of red vinification which was SO_2 - 50 mg/l; ADY addition 15 g/hl; 6 days maceration time; Maceration temperature 26-28^0 C. Determination of anthocyanins from grapes and wine, pigments structure and also chromatic composition and intensity and tonality of wine was done.

Carbohydrate content was determined using the refractometric method (Zeiss hand refractometer method). After the machine has been adjusted and 2-3 drops of clear must have been placed, the content of dry matter in% at 20 ° C is read. If the temperature of the must is higher or lower than 20 ° C, adjustments are made as follows: for every 3 ° C, a correction of 0.2 is added or subtracted. After correcting the content in dry matter, proceed to the determination of the content: must in sugar using tables or applying the formula: % sugar = (N · 4.25): 4 – 2,5.
where: N - content of dry matter read and corrected; 4.25 - the ratio between the density of the wort and its refractometric index. 2,5 - content in% of the must in other soluble organic substances.

The acidity of the must and the wine is determined titrimetically, by neutralizing the acids of a determined quantity of must or wine with an alkaline solution with the known title. Based on the amount of basic solution used in the titration, the acidity of the must or the wine is calculated. The titratable acidity of the must or wine is expressed in grams of sulfuric acid or tartaric acid at 1 liter. x = (n x f x 0.0049) x 100 g / l sulfuric acid; n - ml alkaline NaOH solution, N / 10 used for titration f - the correction factor of the alkaline solution.

The volatile acidity of the wine was determined by a direct method, based on the following principle: the volatile acids of the wine are separated by a repeated distillation process under special conditions, and then determined titrimetrically in the distillate.

Alcohol is one of the main constituents of wine. The concentration of wine in alcohol is expressed in alcoholic degrees or% by volume. The ebulometric method is based on the principle of the difference between the boiling temperature of the water and that of the wine.

The determination of glycerol with periodic acid is based on the general reaction of the polyalcohols with this oxidant. Glycerol is oxidized to methanal and formic acid.

The total dry extract was determined by the densimetric method (Tabarie method). The relative density of the aqueous solution of the extract is calculated, corresponding to the difference between the relative density of the wine sample and the relative density of the hydroalcoholic mixture with the same concentration as that of the wine sample. Based on the relative density thus calculated, the content in the corresponding total dry extract is deduced. The sensitivity of the method is 0.2 g / l.

Grape anthocyanins determined by the method of Poissant Leon. An average sample of 50 grape berries, weighed than the skin are carefully detached from the grape pulp. In order to remove excess moisture, the skins were buffered with filter paper and dried in a hot air source.

Dry skins are powdered quartz fine sand after which they are passed into a flask with ground glass stopper by repeated washing with 1% HCl solution (approx. 10 ml concentrated HCl / liter).

In order to extract anthocynins first wash fraction (50 ml) to be in contact with the skins to about 12 hours. Thereafter, the filtered or centrifuged extraction liquid is brought to a constant volume of 200 ml by mixing and the fractions resulting from repeated acid addition and kept in contact with the extract for at least one hour.

After obtaining the skin sample and the anthocynins extract, the filtered extract is read on a 1 cm cuvette spectrophotometer at the optical density of 520 nm. The amount of anthocynins is determined on the basis of the formula:

$$mg/kg\,grapes = \frac{OD520 \times 22.76 \times 0.4}{berries\,weight} \times 1000$$

Anthocyanins in wine are determined with spectrophotometer by pH difference (method RibereauGayon - Stonestreet - 1968). The difference between the optical densities read at 520 nm of a solution at two different pH is proportional to the amount of anthocynins contains the wine. From the optical density of the solution of pH 0.6, the optical density of the solution of pH 3.5 is decreased, thus obtaining the PA. The concentration in anthocynins is determined from the calibration curve, based on the data, and the expression is expressed in mg / l.

The colour of red wines (Glories, 1984) is determined with a T 70+UV/Vis spectrometer PG Instruments Ltd. in the visible field at wave lengths of 420, 520 and 620 nm.

RESULTS AND DISCUSSIONS

At present, it isconsidered that the first factor that conditions the quality of the grapes, from which the wine naturally derives, is their state of maturity. The quality of the crop is estimated by determining the carbohydrate content, total acidity and the richness of phenolic compounds (especially in anthocyanins). A fairly accurate picture of the characteristics of the wines is revealed by the way they evolved in grapes, carbohydrates, acids and coloring matter expressed by anthocyanins.

Table 1

THE MAIN CHARACTERISTICS OF GRAPE COMPOSITION

Full maturity						
Varieties	**Carbohydrates g/l**		**Total acidity g/l H_2SO_4**		**Antocyanin, mg/kgfresh berries**	
	Variation	**Average**	**Variation**	**Average**	**Variation**	**Average**
Cabernet Sauvignon	150-200	175	10,9-6,43	8,16	1230-1420	1325
Merlot	152-210	185	9,6-5,92	7,86	840-1010	925
Pinot noir	175-220	197,5	8,91-4,89	6,9	400-640	520
Technological maturity						
Cabernet Sauvignon	204-223	213,5	5,50-4,90	5,20	1280-1590	1435
Merlot	211-227	219	5,30-4,48	4,48	990-1090	1040
Pinot noir	220-240	235	4,35-4,50	4,23	500-790	645

Analyzing the main quality parameters of the grapes of the black varietiescultivated in the Drăgăşani vineyardat full maturity and the technological one (table 1), itis found that the three varieties react differently depending on the genetic potential of the variety. Thus the Pinot noir variety is registered, with the highest

relative carbohydrate contents (197.5 g / L at full maturity and 235 g / L respectively at technological maturity), followed by Merlot variety (185 g / L and 219 g / L respectively it). The Cabernet Sauvignon variety had the lowest carbohydrate contents 175 g / L at full maturity and 213.5 g / L at technological maturity.

The acidity is quite high due to the low carbohydrate contents at full maturity. Thus, the highest relative values of acidity were recorded in the Cabernet Sauvignon 8.16 variety (g /L lH2SO4), and the lowest were reached by the Pinot noir variety (g / L H2SO4). The acidity contents decreased as they progressed. of the ripening process, so that at the technological maturity of harvest the contents were: 5.20 (g / L H2SO4) at Cabernet Sauvignon, 4.48 (g / L H2SO4) Merlot, 4.23 (g / L H2SO4) at Pinot noir. When reaching the maximum production and the absolute maximum content in grapes, at full maturity, the proportions in anthocyanins register significant differences between varieties. In this respect, the Cabernet Sauvignon variety is at the forefront, with proportions of 1325 mg / kg grains followed by Merlot 925 mg / kg grains and Pinot noir 520 mg / kg grains. At the technological maturity, the proportions of anthocyanins increased, maintaining the proportion, being 1435 mg / kg grains in Cabernet Sauvignon, 1040 mg / kg Merlot grains and 645 mg / kg grains in Pinot noir. The main composition parameters of the wines studied (alcohol, total acidity, volatile acidity, glycerol, extract,) are listed in table 2. Considering that the year 2017 was a year with climatic conditions, favorable for the production of red wines and in the context of using in the process of vinification of the selected yeasts and of the enzymatic preparations, the alcoholic degree registered, in all the 3 analyzed wines, was over 12 vol%, Pinot Noir variety having the highest alcohol content 13.82 vol%, corresponding to a sugar content of 235 g / L.

Table 2

THE QUALITY PARAMETERS OF WINES

Varieties	Alcool %vol	Total acidity g/l H_2SO_4	Volatil acidity g/l H_2SO_4	Glicerol g/l	Reduced extract g/l
CABERNET SAUVIGNON	12,55	5,10	0,48	9,98	26,56
MERLOT	12,88	4,45	0,45	10,10	26,33
PINOT NOIR	13,82	4,10	0,43	11,05	26,12

Acids are an important component of wine, along with sweetness, tannins and alcohol. If a wine has a low acidity, it will have a flat and uninteresting taste. If the acidity is too high, it will have a sourand astringent taste. Analyzing the values of this parameter for all 3 wines, there were values over 4 g / L, the Pinot Noir variety, whic his slightly deficient at this parameter, recorded a lower acidity of only 4.10 g / L. Acetic acid is the main component of volatile acidity of wine. The other acids in the acetic acid series: formic, propionic and butyric acid are found in traces and appear due to bacterial activity. For the 3 wines analyzed, the values of this parameter were between 0.43 g/ L at Pinot noir and 0.48 g/ L at Cabernet Sauvignon.

Glycerol, a component with an essential role in red wines in the modeling of the taste asperity printed by tannin, which prints fine and soft wines, has values of around 10 g / L for all wines, being in accordance with the alcoholic degree, components formed in parallel by the fermentation process, both depending on the contents of the fermentable carbohydrates in the must. The glycerol ratios recorded in all 3 wines analyzed, constitute a valuable composition factor and organoleptic

factor, being between 11.05 g / L at Pinot noir and 9.98 g / L at Cabernet Sauvignon. The extractability of over 26 g / L in the analyzed wines, is able to confer them, attributes to be classified in the high quality categories. Red wines have a more complex composition than white wines, due to the phenolic compounds, which give them a red-ruby color, softness, astringency to taste, extractability (corpulence), physical-chemical stability and long stor age time.

Anthocyanins of red wines are the constituents that fundamentally differentiate these products from the othe rcategories of wines. Their importance is considerable, both compositionally and hygienically. They obviously enrich the composition of the wines in which they are found. The values of optical densities at wave lengths of 420 nm, 520 nm and 620 nm specific tot he different categories of pigments based on which the chromatic properties of the wines, listed in table 3, are calculated, high light the differences, which take into account, to a large extent, the genetic nature of the variety and less than the primary wine making technology. Analyzing the values of the three categories of pigments, it is found that the Cabernet Sauvignon variety has the highest values and the Pinot noir variety the lowest.

Table 3

THE OPTICAL DENSITIES OF RED WINES VARIETIES

Varieties	Yellow pigments OD 420 nm	Red pigments OD 520 nm	Blue pigments OD 620 nm
CABERNET SAUVIGNON	0,461	0,788	0,183
MERLOT	0,459	0,786	0,159
PINOT NOIR	0,268	0,534	0,065

An image as accurate as possible on the quantity and quality of the coloring matter in wines is obtained based on: the absolute contents in anthocyanins, the percentage participation of the different categories of pigments and the values of the chromatic properties, for their definition taking into account the values of optical densities (mentioned in Table 4).

The anthocyanin content has the highest value in Cabernet Sauvignon wine, 817 mg / L, and the lowest in Pinot noir 402 mg / L. The data regarding the participation of the different categories of pigments in the composition of the coloring matter and the levels of the chromatic properties The coloring intensity and the tonality of the color, of the anthocyanic complex, show very advantageous chromatic structures, in all the wines, and the proportions of the different categories of pigments are able to assure, the levels of the colors totally appropriate under visual report.

Table 4

CHROMATIC COMPOSITION OF RED WINE

Varieties	Antocyaninmg/l	Pigment participation%			Ic	Tc
		Yellow pigments OD 420nm	Red pigments OD 520nm	Blue pigments OD 620 nm		
CABERNET SAUVIGNON	817	33,3	52,4	14,3	1,432	0,585
MERLOT	698	33,3	53,5	13,2	1,404	0,583
PINOT NOIR	402	34,7	54,1	11,2	0,867	0,501

Ic = DO 420nm + DO 520nm + DO 620nm ; Tc = DO 420 / DO 520nm

Following the chemical composition of these wines, and especially of the balance between theess ential compounds, the wines are generous, corpulent, are ample and balanced from an olfacto-tastepoint of view.

CONCLUSIONS

The wine must be characterized by personality and be ar the specific imprintprinted by the factors that under lieits production: the variety, the natural conditions and the production technology. Drăgăşani vineyard, benefits from an ecological environment with an oeno-pedo-climatic vocation ideal for obtaining high class wines. The condition that a wine must fulfill in order to be able to be put on the market and more, to be appreciated and purchased by consumers, is to comply with all the quality requirements imposedandal so to pass that control rigorously encompassing the results of physical-chemical, color, microbiological and sensory analyzes. Following the chemical composition of these wines, and especially the balance between the essential compounds, the wines are generous, they have personality, they are ample and olfacto-taste.

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THE INFLUENCE OF ASFAC FERTILIZATION ON THE GROWTH AND DEVELOPMENT OF TOMATO CULTIVARS IN SOLARIUM CULTURE

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Keywords*: biostimulant, tomatoe, growth, yield*

ABSTRACT

This paper presents the experiment made in University of Agronomical Sciences and Veterinary Medicine from Bucharest- Horticultural Department on different tomatoes cultivars with the fertilization with Asfac in different variants.The yield are higher in the cases of Asfac doses and the quality of tomatoes are good for consume.

INTRODUCTION

Tomatoes are eaten fresh and can be used in simple salads or complex salads mixed with other vegetables. Tomatoes may also be used as ingredients in a variety of culinary preparations.

However, tomatoes are widely used in industry, where they can be processed in different forms: tomato paste, broth, ketchup, tomato juice, peeled tomatoes, tomato powder or they can be used in making preserves or as being mixed with other vegetables or as even being mixed with meat or fish preparations. Tomato fruits contain significant amounts of vitamins, mineral salts and organic acids.

In order to be consumed tomatoes must be of high quality, contain high levels of carbohydrates, organic acids, etc. and low levels of potentially toxic elements such as nitrates and nitrates.

The term biostimulant is relatively new and its use in the scientific community is still nebulous (du Jardin, 2012). One broad definition was introduced by du Jardin (2012): “Plant bio-stimulants are substances or materials, with the exception of nutrients and pesticides, which, when applied to plants, seeds or growing substrates in specific formulations, have the capacity to modify physiological processes in plants in a way that provides potential benefits to growth, development, or stress response.” Other workers differentiate between biostimulants, biofertilizers, and biopesticides by their direct hormonal effects (biostimulants) (Subler et al., 1998), indirect effects on nutrient availability (biofertilizers) (Orhan et al., 2006), and enhanced control of pathogens or pests (biopesticides) (Copping and Menn, 2000).

The research was carried out in the solariums of the University of Agronomic Science and Veterinary Medicine of Bucharest - Horticulture Department in 2019

using Asfac product in two doses: 0.15% and 0.30%, both applied to the preparation of the soil. Five hybrids of different origins were used.

The application of 0.15% Asfac has resulted in growth of production of all the cultivars, so it can be recommended in the production of tomatoes in solariums.

The quality of the obtained fruits draws attention to the accumulation of nitrates in high quantities which can cause the declining and prohibition of tomato fruits for consumption.

MATERIAL AND METHODS

The experiment was of a bifactorial type, organized in blocks of 3 repetitions per variant, each repetition having 5 plants. The variable factors in the experiment were:

Factor A: Cultivator: Izmir, Cinto, Mei Shui, Alamina, Clarabella, Mahitos.

Factor B: Asphalt Fertilizer (0.15% and 0.3%)

By combining the fertilizer products with the cultivars used, the following experimental variants have resulted:

Table 1

Scheme of experimental variants

Var.	Cultivar	Fertilization	
V1	Izmir	Unfertilized (control)	Semi-early hybrid with indefinite growth. Presentation of fruit of 140-150 gcu round shape and of superior quality
V2		Asfac 0.15 %	
V3		Asfac 0.3 %	
V11	Cianto	Unfertilized (control)	Early hybrid, generative type, with indefinite growth. The plants are vigorous, have a semi-open port .. Fruits of round shape and pleasant red color. The average weight of a fruit is between 200 - 300 g.
V12		Asfac 0.15 %	
V13		Asfac 0.3 %	
V21	Mei Shui	Unfertilized (control)	Mei Shui F1 is the newest hybrid tomato from the Seminis range, which produces large sized fruits. Mei Shui F1 tomatoes are especially recommended for the first cycle of cultivation. The fruits produced by the Mei Shui F1 hybrid reach an average weight of 220 - 230 g,
V22		Asfac 0.15 %	
V23		Asfac 0.3 %	
V31	Alamina	Unfertilized (control)	Extratemporal hybrid of generative peak, with indefinite growth. Round firm fruits, weighing between 170-220 g and being of a bright red color.
V32		Asfac 0.15 %	
V33		Asfac 0.3 %	
V41	Clarabella	Unfertilized (control)	emi-early hybrid, generative type, with indefinite growth. The fruits are round, slightly flattened, firm and uniformly red in color. The average weight of the fruits is between 200-250 g. Very good resistance to storage and transport.
V42		Asfac 0.15 %	
V43		Asfac 0.3 %	
V51	Mahitos	Unfertilized (control)	Early hybrid, generative type, with indefinite growth. BEEF type fruit hybrid, one of the most successful hybrids in our current assortment. It is a very productive hybrid
V52		Asfac 0.15 %	
V53		Asfac 0.3 %	

ASFAC - BCO-4 is a biostimulator of growth for agricultural crops. Toxicity - This product is practically non-toxic. The product is biodegradable; ASFAC-BCO-4 solution has auxinic action in physiological processes of plants. The product is systemic and enters the absorptive group of the plant, favoring the increase of the chlorophyll content, which is essential in the process of photosynthesis, thus plants are becoming more resistant to stress and they are becoming immune to diseases and pests.

A series of care works both general and special interest was applied to the tomato culture. The culture was established by planting seedlings on 4.04.2019. The tomatoes were paled with raffia rope. The airing of the solarium was done daily. In the first part of the vegetation period the ends of the solarium were opened daily for shorter periods of time; then, as the outside temperature began to rise, its sides were raised. Pinching-out was done weekly. The irrigation was done by dripping whenever necessary, so that the soil was constantly moist.

The average weight was determined 3 times, by harvesting the fruits on each variant and weighing with an electronic scale. The total weight was divided by the number of fruits obtained, thus the average weight resulted. The production registration was done by calculation, based on the results.

At the same time, analyzes were made regarding the quality of *Lactuca sativa* L. for consumption and the amount of nitrates, phosphates and potasium absorbed by the plants.The methods used in the analyzes were: Griess method, spectrophotometric for nitrates, nitrites and Duval reagent and spectrophotometric phosphorus dosing, and for flame spectrophotometry. These methods are according to the standards in our country: ISO 9001.(Metodologia de analiza a solului si plantei. ICPA, 1987). The results represents a medium values of three analyses of every nutritive elements.

RESULTS AND DISCUSSIONS

Following the researchers conducted on the foliar fertilization of the tomatoes grown in the solar, it is appreciated that both the hybrid and the fertilization product influenced the processes of growth and fruiting of the plants.

The weight of the fruits varied depending on the cultivar and the application of Asphalt. Thus the heaviest fruits were registered at Clarabella where the variants with the application of Asphalt reached weights of 230.76g on the V43 variant, where the Asphalt applied was 0.3%, 203.19g on the V42 variant with the application of 0.15 Asphalt then follows the Alamina cultivar with a weight of 200g at an application of 0.3% Asphalt.

Overall the experimental variants, the application of 0.3% Asfac resulted in the obtaining of fruits with a high weight in all the variants except the Cianto and Mei Shui cultivars.

The production of kg / plant and of kg / m2 registered significant increases in all the variants to which Asphalt was applied compared to the controls.

The quality of the fruits produced was good, with the accumulation of nitrates in the variants with the application of Asphalt above the limits accepted by 400ppmN-NO3 (Ordinul nr. 1/2002 privind conditiile de securitate si calitate), except for the Clarabella cultivar. Phosphorus and potassium have accumulated within normal limits that respect the limits allowed by the specialized literature (Velicica Davidescu, David davidescu, 1999).

Table 2

Fruit weight and production recorded in experimental cultivators

Var.	Cultivar	Fertilization	Average fruit weight, g	Production of kg/plant	Production of kg/m2
V1	Izmir	Unfertilized (control)	109,20	3,64	11,28
V2		Asfac 0.15 %	164,90	5,60	17,36
V3		Asfac 0.3 %	184,90	5,99	18,56
V11	Cianto	Unfertilized (control)	150,5	3,64	11,24
V12		Asfac 0.15 %	185,9	6,20	19,22
V13		Asfac 0.3 %	153,7	4,24	13,14
V21	Mei Shui	Unfertilized (control)	189,37	4,39	13,60
V22		Asfac 0.15 %	190,68	5,33	16,52
V23		Asfac 0.3 %	161,38	3,38	10,47
V31	Alamina	Unfertilized (control)	185,16	3,48	10,78
V32		Asfac 0.15 %	180,46	5,16	15,99
V33		Asfac 0.3 %	200	4,96	15,37
V41	Clarabella	Unfertilized (control)	164,44	3,28	10,16
V42		Asfac 0.15 %	203,19	6,58	20,39
V43		Asfac 0.3 %	230,76	5,90	18,29
V51	Mahitos	Unfertilized (control)	132,05	3,24	10,65
V52		Asfac 0.15 %	168,04	5,00	15,50
V53		Asfac 0.3 %	180,71	4,44	13,76

The statistical interpretation of the production shows that all cultivars except Mei Shui and Cianto have achieved significant results. In the case of Cianto, the application of Asphalt 0.3% resulted in insignificant production results and Mei Shui with 0.3% Asfac applied resulted in significant but negative results.

Table 3

The quality of tomato fruits in terms of nutrient content

Variant	Cultivar	Fertilization	N-NO3, ppm	P-PO4, ppm	K, ppm
V1	Izmir	Unfertilized (control)	380	167	1670
V2		Asfac 0.15 %	475	187	1756
V3		Asfac 0.3 %	494	198	1825
V11	Cianto	Unfertilized (control)	532	165	1835
V12		Asfac 0.15 %	494	175	1854
V13		Asfac 0.3 %	589	178	1878
V21	Mei Shui	Unfertilized (control)	360	187	1786
V22		Asfac 0.15 %	425	213	1825
V23		Asfac 0.3 %	455	220	1850
V31	Alamina	Unfertilized (control)	315	179	1650
V32		Asfac 0.15 %	445	190	1675
V33		Asfac 0.3 %	455	215	1765
V41	Clarabella	Unfertilized (control)	300	180	180
V42		Asfac 0.15 %	356	198	2031
V43		Asfac 0.3 %	396	220	2200
V51	Mahitos	Unfertilized (control)	378	215	1876
V52		Asfac 0.15 %	432	234	1975
V53		Asfac 0.3 %	435	245	1980
Values admitted by the specialized literature			**400ppmN-NO3**	**200-400ppm**	**1000-2000ppm**

Table 4

Statistical interpretation of the production obtained from the experience with tomatoes fertilized with Asfac

No	Hybride	Tratment	Production kg/m2	Diference ±	Percent, %	Significant
1	Izmir	Unfertilized (control)	11,28	-	100.00	-
2		Asfac 0.15 %	17,36	+6,08	153,90	***
3		Asfac 0.3 %	18,56	+7,28	164,54	***
6	Cianto	Unfertilized (control)	11,24	-	100.00	-
7		Asfac 0.15 %	19,22	+7,98	170,99	***
8		Asfac 0.3 %	13,14	+1,90	116,90	ns
9	Mei Shui	Unfertilized (control)	13,60	-	100.00	-
10		Asfac 0.15 %	16,52	+2,92	121,47	*
11		Asfac 0.3 %	10,47	-3,13	76,98	o
12	Alamina	Unfertilized (control)	10,78	-	100.00	-
13		Asfac 0.15 %	15,99	+5,21	148,33	***
14		Asfac 0.3 %	15,37	+4,59	142,57	***
15	Clarabella	Unfertilized (control)	10,16	-	100.00	-
16		Asfac 0.15 %	20,39	+10,23	200,68	***
17		Asfac 0.3 %	18,29	+8,13	180,02	***
18	Mahitos	Unfertilized (control)	10,65	-	100.00	-
19		Asfac 0.15 %	15,50	+4,95	145,54	***
20		Asfac 0.3 %	13,76	+3,11	129,20	*

DL 5% = 2,32kg/m2

DL 1%=3,45kg/m2

DL 0.1% = 4,54kg/m2

CONCLUSIONS

The application of 0.15% Asfac has resulted in growth of production of all the cultivars, so it can be recommended in the production of tomatoes in solariums.

The quality of the obtained fruits draws attention to the accumulation of nitrates in high quantities which can cause the declining and prohibition of tomato fruits for consumption.

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THE EFFECT OF USING THE ASFAC BIOSTIMULANT IN THE CULTURE OF 3 HORTICULTURAL SPECIES IN THE SOLARIUM

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Keywords*: lettuce, cucumber, tomatoe, biostimulant.*

ABSTRACT

This paper presents the use of Asfac in doses 0%, 0,10% and 0,30% as fertilizers in three culture: lettuce, cucumbers and tomatoes in solarium. Results shows that the accumulation of nitrates in cucumbers were higher comparative with the Maximum Addmited Limits from our country.

INTRODUCTION

In recent years all over the world, there has been an assiduous research on reducing impurities in horticulture to prevent pollution, but also to ensure the need for products intended for human consumption. under the conditions of our country.Biostimulants are plant extracts and contain a wide range of bioactive compounds that are mostly still unknown. Biostimulants are capable to stimulate nutrient uptake and use efficiency by plants, increase plant tolerance to abiotic/biotic stress and improve crop quality when applied in small amounts (De Vasconcelos et al.2009). Furthermore, biostimulants can enhance the activity of rhizosphere microbes and soil enzymes, the production of hormones and growth regulators in soil and plants, and the photosynthetic process (Calvo etal.2014).However. In vegetables, the application of biostimulants allowed a reduction in fertilizers without affecting yield and quality. In leafy vegetables susceptible to nitrate accumulation, biostimulants have been able to improve the quality and keep the nitrates under the limits imposed by EU regulations(EBIC, 2012). Moreover in leafy vegetables, biostimulants increased leaf pigments (chlorophyll and carotenoids) and plant growth by stimulating root growth and enhancing the antioxidant potential of plants.

In addition to chemical fertilizer, foliar application of agricultural biostimulant products to plant leaves are not only provide nutrients, but also boost and stimulate various metabolic processes in plant, to increase nutrient use efficiency, or crop yield and quality (Parrado et al.2007, Parrado et al.2008). When foliar nutrients are applied, small quantities of chemical fertilizers are required as compared to application of nutrient through soil. Foliar application also reduce leaching or fixation of nutrients. One of the most major benefits of using foliar nourishing is that it is less expensive than various other ways for boosting growth of plant (Dhanasekaran and Bhuvaneswari 2005).

MATERIAL AND METHODS

Our proposed experience was in 2018 in the solariums of the Department of Vegetables, the Faculty of Horticulture at the University of Agronomic Science and Veterinary Medicine Bucharest.

In the experiment, two variants of Asfac concentration of 0.1% and 0.3% respectively were applied to the *Lactuca sativa* L. plants, Cornichon cucumbers and tomatoes. For each species, two cultivars were considered.The biological material used was made up of 2 *Lactuca sativa* L. hybrids: Centore și May King, 2 cultivars of cucumber respectively Kybria and Amour and 2 cultivars of tomatoes Ismir and Ema de Buzău. All cultures had the necessary technology application. After planting, the two doses of Asfac 0.1% and 0.3% were sprayed twice at two weeks.

At the same time, analyzes were made regarding the quality of *Lactuca sativa* L. for consumption and the amount of nitrates, phosphates and potasium absorbed by the plants.The methods used in the analyzes were: Griess method, spectrophotometric for nitrates, nitrites and Duval reagent and spectrophotometric phosphorus dosing, and for flame spectrophotometry. These methods are according to the standards in our country: ISO 9001.(Metodologia de analiza a solului si plantei. ICPA, 1987). The results represents a medium values of three analyses of every nutritive elements.

Table 1

Scheme of experimental variants

No.	Specie	Cultivar	Experimental variant	Tratment
1	**Lactuca sativa L.**	**Centore**	Control	Control
2			V1	Asfac 0.1%
3			V2	Asfac 0.3%
4		**May King**	Control	Control
5			V1	Asfac 0.1%
6			V2	Asfac 0.3%
7	**Cornichon cucumber**	**Kybria**	Control	Control
8			V1	Asfac 0.1%
9			V2	Asfac 0.3%
10		**Amour**	Control	Control
11			V1	Asfac 0.1%
12			V2	Asfac 0.3%
13	**Tomatoe**	**Ismir**	Control	Control
14			V1	Asfac 0.1%
15			V2	Asfac 0.3%
16		**Ema de Buzău**	Control	Control
17			V1	Asfac 0.1%
18			V2	Asfac 0.3%

RESULTS AND DISCUSSIONS

Table 2

Values regarding nutrient elements from horticultural products

No.	Specie	Cultivar	Experimental variant	N-NO3, ppm	P, ppm	K, ppm
1	**Lettuce**	**Centore**	Control	817	167	1750
2			V1	927	213	2050
3			V2	902	198	1980
4		**May King**	Control	814	250	2120
5			V1	969	228	2190
6			V2	1024	230	2300
Limits from scientific literature				**2000**	**200-400**	**1000-2000**
7	**Cornichon cucumber**	**Kybria**	Control	513	99	1870
8			V1	589	114	2010
9			V2	592	144	2120
10		**Amour**	Control	513	83	1970
11			V1	523	68	1940
12			V2	494	76	2020
Limits from scientific literature				**400**	**200-400**	**1000-2000**
13	**Tomatoe**	**Ismir**	Control	152	137	1750
14			V1	247	175	1920
15			V2	266	213	2020
16		**Ema de Buzău**	Control	156	205	1760
17			V1	247	160	2020
18			V2	278	198	2050
Limits from scientific literature				**300**	**200-400**	**1000-2000**

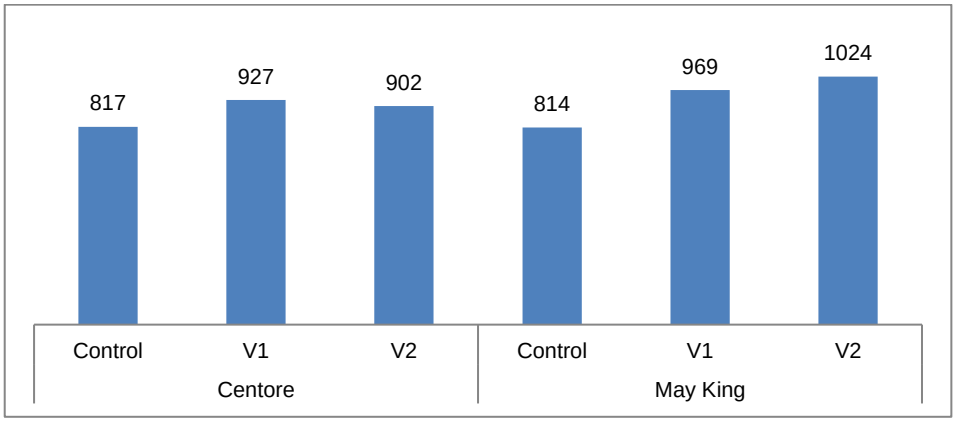

Figure 1.Values of nitrates in lettuce cultivars

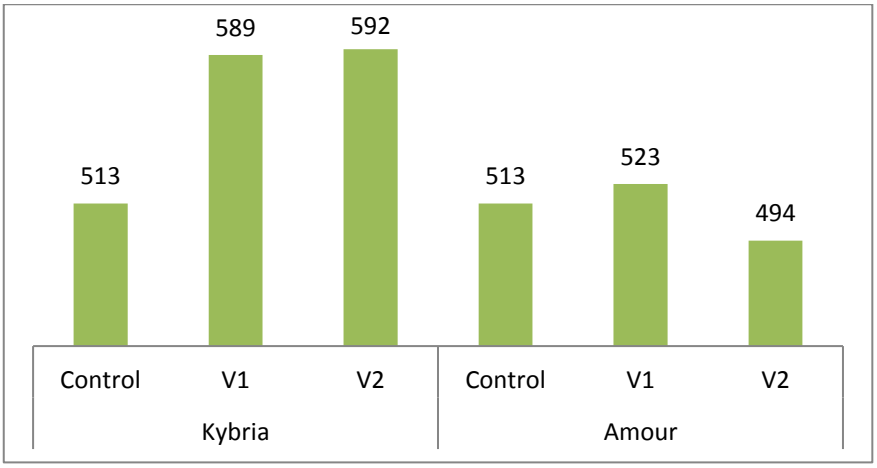

Figure 2. Values of nitrates in cornichon cucumbers cultivars

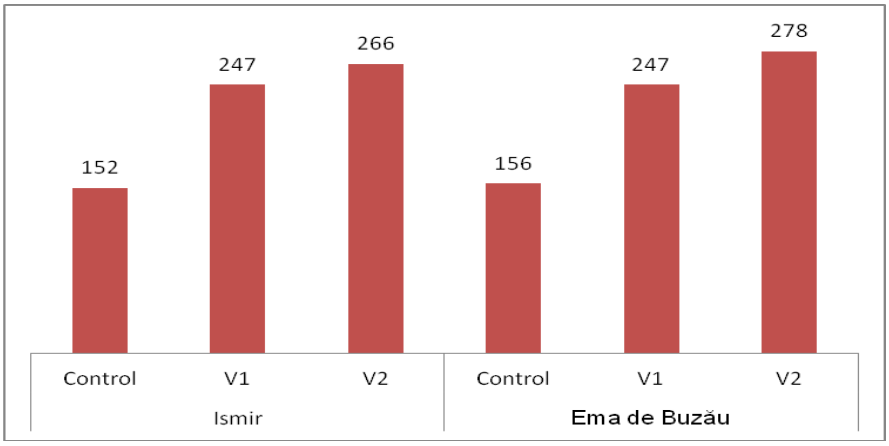

Fig.3. Values of nitrates in tomatoes fruits cultivars

The analysis of nitrates, phosphates and potassium for the different species examined are presented in table 2.

The use of the Asfec biostimulator helps increase photosynthesis and as a result of the absorption of different nutrients in plants.

From the analysis of the nitrates in lettuce at the two cultivars (fig. 1) Centore and May King we can see that the absorption of this element was decreased compared to the Maximum Admissible Limits for solarium provided in Romania of 2000-3000ppmN-NO3.(Ordinul nr. 1/2002 privind conditiile de securitate si calitate).

The values presented vary between 814ppm at May King and a maximum of 1024ppm at the same cultivar.

As for phosphorus, this element has accumulated in normal quantities of 167ppm at Centore and a maximum of 250ppm at May King. Potassium has also accumulated within the limits set by the literature of 1000-2000ppmK in both cultivars.

These accumulations do not pose problems in the use of Asfac in the lettuce culture in the solarium.

In the case of cucumbers, the accumulation of nitrates (fig. 2) is high between 494ppm in Amour and 592ppm in Kybria compared to M.A.L. 400ppm N-NO3 (Ordinul nr. 1/2002 privind conditiile de securitate si calitate).

Phosphorus and potassium accumulated in normal quantities compared to the literature.

In the case of cucumbers it is necessary to reduce the doses of Asfac and the control by experience of each cultivar because it raises the problem of declining the cucumbers for human consumption.

For tomatoes the accumulation of nitrates (fig. 3) was reduced below 300ppmN-NO3 (M.A.L.) in both cultivars, accumulating between 152ppmN-NO3 and 266ppmN-NO3 in Ismir and 156ppmN-NO3 and 278ppmN-NO3 in Ema de Buzau.

The phosphorus and potassium content of tomatoes do not pose problems so the quality of these fruits is superior, good for consumption.

CONCLUSIONS

The use of Asfac as a biostimulator in solariums in different crops has led to the different accumulation of nutrients with an essential role in the growth and development of plants.

From the examination of three horticultural species it is observed that:

1. In the lettuce, the accumulation of nutrients was within normal limits for this culture, with no problems in the consumption of the population;

2. In cucumbers, the accumulation of nitrates has exceeded the limit allowed for nitrates and the doses of Asfac used must be reduced;

3. In tomatoes, in the case of cultivars examined, the accumulation of nitrate, phosphate and potassium was within normal limits.

We propose that the use of biostimulators should be based on more detailed experiences regarding the doses used but also the variety of local or imported cultivars.

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EFFECT OF TREE CONDUCE ON THE PRECOCITY, YIELD AND FRUIT QUALITY TO APRICOT

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Keywords: *Apricot, varieties, crowns, yield, soluble solids, total acids.*

ABSTRACT

The experimental plot is placed in the orchard "Agroparc Management" Ltd. founded in 2015 year. The study subject of the experience was Spring Blush and Pinkcot apricot varieties grafted on Mirobalan 29C rootstock, conducted by 6 forms of crowns: Non-layered (control); Mixed pyramid; Slender Spindle; Open vase; Free palmetto; Pal-spindel. The distance of plantation is 5.0 x 3.0 m. The research was conducted during the period of 2018 year. During the research, it was studied number of fruits, mean fruit weight, yield, soluble solids and total acids. It was established that, the formation of crowns of the apricot trees influence on number of fruits, mean fruit weight yield and soluble solids and total acids of studied varieties.

INTRODUCTION

The apricot has long been viewed with distrust, due to the traits related to low resistance to frost, sensitivity at specific diseases, premature loss of trees from plantations and short duration of operation of the orchard (Babuc, 2012 Balan et al., 2008; Cimpoieş, 2018; Cociu et al., 1993).

Currently, the culture of the apricot in Europe, has undergone great transformations regarding the assortment of varieties and rootstocks, the crown form, the technology of plantation maintenance which allowed to obtain 20-25 t/ha crops of qualitative fruits (Cociu et al., 1993; Milatovic et al., 2013; Pîntea, 2019).

The optimization of the structure of the apricot plantation can be achieved only through the implementation in production of new crown shapes suitable for the species concerned in the intensive system. This would allow for higher, constant and competitive quality productions (Negru, 2018; Pesteanu et al., 2018).

The aim of this study was to evaluate the behavior of two new varieties of apricot for Republic of Moldova led by six forms of crowns grafted on Mirobalan 29C rootstock.

MATERIAL AND METHODS

The researches were carried out during the year 2018 in the intensive apricot orchard of the company "Agroparc Management" LTD. The plantation was founded in the spring of 2015, with one-year-old trees from the Spring Blush and Pinkcot varieties, grafted onto the Mirobalan 29C rootstock. Planting distance 5.0x3.0m.

In order to solve the suitability of apricot varieties to different forms of crown management, the following variants have been studied: 1 – Non-layered (control); 2 - Mixed pyramid; 3 – Slender Spindle; 4 – Open vase; 5 – Free palmetto; 6 - Pal - spindel.

The experimental design was a randomized complete block with 4 replicates and 8 trees per replicate. The researches were carried out under field and laboratory conditions according to accepted methods of carrying out the experiments for studying apple orchards.

Soluble solids were determined by refractometer, and total acids (expressed as malic acid) by titration with 0.1 M NaOH.

Statistical processing of the data was performed by the method of dispersion analysis.

RESULTS AND DISCUSSIONS

Productivity is the final index after which it is possible to appreciate how all the agro technical works were carried out in the respective plantation and which from the links of the technological chain deserves improvement.

The investigations show that fruit production at a tree is closely correlated with the amount of fruits and their average weight (tab. 1).

A greater amount of fruit in the trees of Spring Blush variety was registered when the crown was formed as open vase - 255 pcs/tree. In the case of the formation of apricot trees after the mixed pyramid, the amount of fruit constituted - 168 pcs/tree, free palmetto - 149 pcs/tree and in control variant - 144 pcs/tree. The smallest amount of fruit was registered in the pal-spindel crown - 110 pcs/tree and slender spindle crown - 119 pcs/tree.

For the Pinkcot variety, the legacy shown for the Spring Blush variety is valid, but with other values. The amount of fruit in the case of variants while be conducting by different training mode ranged from 187 pcs/tree to 375 pcs/tree. Higher values than in the previous variety were obtained within the open vase. Further downward is the variant founded after the mixed pyramid crown -235 pcs/tree, control variant - 201 pcs/tree, free palmetto 193 pcs/tree, slender spindle - 187 pcs/tree and pal-spindle - 153 pcs/tree.

The biological characteristics of the variety influence the index in question. Lower values of the average weight of a fruit were recorded in the Spring Blush variety (42.3-53.8 g) compared to the Pinkcot variety (50.1-63.1 g).

The lower values of the average weight of the fruit of the Spring Blush variety, were recorded in the case of the trees formed by open vase crown type (42.3 g). With the increase of the degree of cutting, the average weight of a fruit is increased, registering higher values when forming the trees after the crowns the slender spindle - 51.3 g and pal-spindle - 53.8 g.

The study of apricot production in a tree ranged from 5.91 kg in the case of crowns following the pal-spindle system to 10.78 kg/tree when they were conducted after the improved vessel system. Mean values were recorded in the other crowns.

The global harvest at a surface unit correlated directly with the production obtained within a tree. Lower values are obtained when trees were formed after the pal-spindel system - 3.94 t/ha, and the highest values at the crown of the vessel improved - 7.19 t/ha. The other variants recorded average values, from 4.07 to 5.01 t/ha.

Table 1

Productivity of the apricot plantation according to the biological particularities of the variety and the way of conducting the crown, a. 2018

Variety	The crown type	The quantity of fruits, pcs/tree	The average weight, g	Production		In % compared to witness
				kg/tree	t/ha	
Spring Blush	Non-layered (control)	144	47.3	6.81	4.54	100.0
	Mixed pyramid	168	44.7	7.51	5.01	110.3
	Slender Spindle	119	51.3	6.10	4.07	89.6
	Open vase	255	42.3	10.78	7.19	158.3
	Free palmetto	149	46.0	6.85	4.57	100.7
	Pal-spindel	110	53.8	5.91	3.94	86.7
Pinkcot	Non-layered (control)	201	56.7	11.40	7.60	100.0
	Mixed pyramid	235	54.1	12.71	8.48	111.6
	Slender Spindle	187	58.9	11.01	7.34	96.5
	Open vase	375	50.1	18.78	12.52	164.4
	Free palmetto	193	57.1	11.02	7.35	96.7
	Pal-spindel	153	63.1	9.65	6.44	84.8
LSD 5%		3.9	0.76	0.11	-	-

In the Pinkcot variety, the lower average apricot weight was recorded in the case of the open vase variant - 50.1 g. With the decrease of the amount of fruits in the crown of the trees, the average weight of the apricot fruits increases, constituting in the trees formed by the pal-spindel system - 63.1 g.

The productivity of the trees on the variants in the study ranged from 9.65 to 18.78 kg. Lower values of fruit production were recorded at crown formation after the pal-spindel system - 9.65 kg/tree, and higher in the case of improved open vase form - 18.78 kg/tree, where the degree of cutting at crown formation was more limited.

The production of apricots per unit area is directly correlated with the productivity of a tree. Higher values for both varieties studied or recorded when the trees were run after the improved open vase. The other variants recorded average or insignificantly lower values.

The biological peculiarities of the variety and the method of crown formation influence on the soluble solids, total acids, and relationship between soluble solids/total acids (tab. 2).

The content of soluble solids in tested apricot cultivars varied from 13.0% in Pinkcot variety to 14.1% in Spring Blush variety. The Spring Blush variety and on the crown forming variants has a larger content of soluble solids like Pinkcot variety.

A larger quantity of soluble solids in both varieties was recorded in the variant where the trees were crowned as a open vase and the sun rays penetrated the crown more rationally and the intensity of the photosynthesis process is more eloquent. In this variant et the Pinkcot variety the content of soluble solids was 13.6%, but et the Spring Blush variety – 14.1%.

The content of total acids in apricot cultivars varied from 1.40% in Spring Blush to 1.68% in Pinkcot varieties.

Table 2

Productivity of the apricot plantation according to the biological particularities of the variety and the way of conducting the crown, a. 2018

The crown type	Spring Blush variety			Pinkcot variety		
	Soluble solids (%)	Total acids (%)	Soluble solids/total acids	Soluble solids (%)	Total acids (%)	Soluble solids/total acids
Non-layered (control)	13.5	1.49	9.06	13.0	1.68	7.74
Mixed pyramid	13.2	1.49	8.86	13.1	1.66	7.89
Slender Spindle	13.7	1.44	9.51	13.2	1.63	8.10
Open vase	14.1	1.40	10.07	13.6	1.57	8.66
Free palmetto	13.7	1.42	9.65	13.4	1.62	8.77
Pal-spindel	13.8	1.42	9.72	13.3	1.60	8.31

The content of total acids was highest to both varieties, when the crowns were formed by the mixed pyramid and in the control variant, in Pinkcot variety constituted respectively 1.66 and 1.68, but in Spring Blush variety 1.49%. Within trees was formed as slender spindle, free palmetto and pal-spindel crowns have been recorded average values, but the lowest in variant open vase (1.40-1.57).

Ratio between soluble solids content and acids content indicates the sweetness of the fruit. The relationship between soluble solids and total acids has an important role in consumer acceptance. Higher ratio was found in variant open vase to the both varieties.

CONCLUSIONS

The fruit production correlates with the crown formation and to obtain early harvests it is necessary to minimize the cuts during the formation period, to increase the weight of the rodent microstructure in the shortest period of time.

The quantity of soluble solids, total acids, and relationship between soluble solids/total acids is correlated with the biological particularities of the variety and the method of crown formation.

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STUDY ON PROPAGATION AND VEGETATIVE GROWTH OF SOME *FICUS BENJAMINA* L. CULTIVARS

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Key words*: propagation, rooting substrate, vegetative growth, ornamental plant, cultivar*

ABSTRACT

Ficus benjamina L. is a high value ornamental plant, which can be successfully cultivated indoors, in offices, shopping malls, restaurants and other public spaces. It is highly appreciated as a potted plant for its attractive leaves, tolerance to different growing conditions and because it improves the indoor air quality by absorbing and filtering pollutants and toxic chemicals. The objective of this study was to investigate the effect of different rooting media (perlite, sand, peat and perlite) on rooting of cuttings in four weeping fig cultivars ('Exotica', 'Kinky', 'Monique' and 'Twilight') and to evaluate the vegetative growth of plants during eight months after planting in pots. The results showed that the highest rooting percentage, number of roots and root length were recorded on 'Exotica' cultivar in perlite, while the 'Monique' cultivar presented the best rooting parameters in the cuttings grown in mixture of peat and perlite. The highest values of the analysed morphological characteristics (plant height, number of shoots per plant, length of shoots, length and width of leaves) were recorded on the 'Exotica', while the plants had the lowest growth rate in the 'Kinky' cultivar.

INTRODUCTION

Ficus benjamina L. (Moraceae family) is a species native to Southeast Asia, India, Malaysia and Northern Australia, highly appreciated and cultivated indoors, for its elegant appearance and beauty of the leaves, very decorative. In its natural environment it grows as a tree, which can reach 15-30 m in height or as a shrub, but cultivated in pots as an apartment plant, reaches 2-3 m in height, its size and shape being easily controlled by pruning. It has thin, arched shoots, with numerous simple, alternate, leathery and glossy leaves, 4-12 cm long. Leaves have oval-elliptic, ovate, ovate-lanceolate shape, entire or wavy edge and sharp tip. There are many beautiful cultivars with green or variegated leaves and also with small leaves and dwarf characteristics on the market. The dwarf cultivars are especially used for miniature gardens and small size bonsai.

Light is an important factor for the growth of the weeping fig. It is grown in places with bright, indirect sunlight or partial shade, the light requirement varying depending on the cultivar. *F. benjamina* responded to interior low light conditions by reducing leaf thickness and increasing specific leaf area, internode length and chlorophyll b content (Chen et al., 2005b). It is very sensitive to leaf drop and, the variegated varieties are also sensitive to leaf browning, that can occur both in young and in older leaves. These are the most important problems for consumers and they

can be reduced by placing the plants under high light conditions after the cultivation and transport period (Bulle & de Jongh, 2001). Some cultivars have a good tolerance to the low-light levels of indoor spaces and an increased resistance to leaf drop. Weeping fig prefers high humidity and it should be regularly watered during the warm season, to keep the culture substrate permanently moist, but it should be rarely watered during winter. It does not withstand sudden temperature fluctuations and cold air streams. It requires fertile, well-drained soils, because the excess of water causes leaf drop and the aesthetic value decreases.

Ficus benjamina is vegetatively propagated mainly by tip shoot cuttings. The substrates used for rooting of the cuttings should be light, porous, permeable, stable and free from pathogens, being formed of components that provide optimal characteristics of aeration, drainage and moisture retention. If the rooting substrate contains fine or too many large components, it may dry out too quickly and inhibit rooting or if this is too heavy, compact and retains much water, the rooting may be slow. Natural or artificial materials are used, such as fibrous peat, river sand, perlite, vermiculite, etc., which may be simple or in various mixtures, with different proportions. Many researchers have studied the effect of different substrates, cuttings type, the harvest period of the cuttings and treatments with rooting stimulants in different concentrations on the rooting of *F. benjamina* cuttings.

A suitable rooting medium selection is important in ornamental plants propagation. According to Kshatri et al. (2005) coarse sand can be a low cost alternative medium for rooting of *F. benjamina* cuttings in farm conditions. Studies conducted by Ibironke & Enitan (2016) revealed that this species can be easily propagated by hardwood cuttings and the best media mix for root formation and growth of cuttings is topsoil + river sand + rice husk. Topacoglu et. al. (2016) obtained the highest rooting percentage of cuttings in perlite (70.51%), followed by peat substrate (53.19%). Sangeetha et al. (2018) concluded that the most suitable rooting medium for ornamental stem cuttings is the sand.

The biostimulators applied as aqueous solutions in different concentrations or as powder, determine the cell division and the formation of adventitious roots on cuttings, the shortening of the rooting duration and increases the percentage of rooted cuttings and have different effects on morphological characteristics. Shirzad et al. (2012) reported that, in combined treatment of IBA 6000 ppm + sand, the highest rooting percentage and number of roots was obtained. Noori (2013) shows that 1000 mg/L NAA and 2000 mg/L IBA are the best concentrations for rooting of *F. benjamina* cuttings. Dulić et al. (2015) also reported that the stem cuttings treated with plant growth regulators containing 0.5% α-naphthalene acetic acid had the highest percentage of rooting. According to Ingole et. al. (2016) the interaction of IBA 1000 ppm with hardwood cuttings was found superior to other concentrations of IBA for both root and shoot parameters. The highest rooting ratios were obtained for 10 ppm of NAA (94.43%) and 100 ppm of IBA (93.9%) in liquid rooting media, which provide greater advantages in comparison to the conventional applications (Topacoglu et al., 2016).

Micropropagation *in vitro* is an alternative method for rapid and mass production of high quality planting material to many commercial ornamental plants. *F. benjamina* was also propagated by *in vitro* culture techniques, using different types of explants for shoot formation (Amo-Marco & Picazo, 1994; Han et al., 1997; Gabryszewska & Rudnicki, 1997; Rzepka-Plevnes & Kurek, 2001).

This study was conducted to determine the influence of different substrates on rooting of cuttings and to evaluate the vegetative growth of plants during eight months after rooted cuttings planting in pots, at four *Ficus benjamina* L. cultivars.

MATERIAL AND METHODS

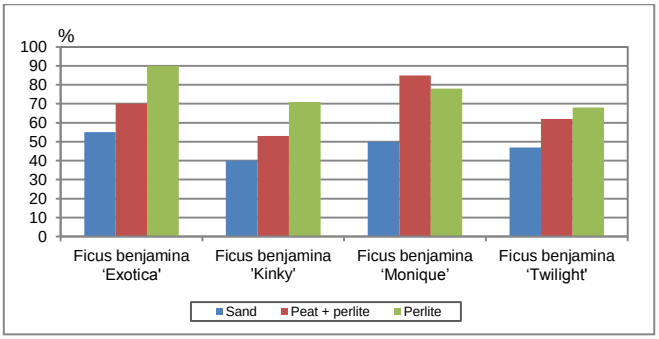
The research was carried out in the greenhouse of the Floriculture Department, Faculty of Horticulture from Craiova, during the 2016-2017 period, at four *Ficus benjamina* L. cultivars: 'Monique' (narrow, deep green, wavy on the edge leaves), 'Exotica' (light green leaves with long, twisted tips), 'Kinky' (light green with white leaves) and 'Twilight' (glossy, green edged in creamy-white leaves).

The biological material was formed of shoots collected in August from healthy, vigorous mother plants, from the didactic collection, plants grown in pots, to which current maintenance work was provided. Cuttings of 8-10 cm length, with 2-3 leaves were made from the tips of the shoots, very early in the morning. The lower leaves were removed and the cuttings were kept in warm water for 15 minutes for washing the latex. For more uniform and rapid rooting, the prepared cuttings were treated with Radistim 1, and then they were placed on three rooting substrates: perlite, peat + perlite (1:1) and sand, with the thickness of 14 cm. After 52 days, observations were made regarding the percentage of rooting, average number of roots per cutting and root length, then the rooted cuttings were planted in plastic pots of 12 cm in diameter, in a substrate formed by mixture of manure, peat and perlite in equal parts. The survival rate of the rooted cuttings after planting in pots was established and there was observed the further evolution of the plants over a period of eight months, making monthly biometric measurements and observations on vegetative growth rates, the height of the plants, number of shoots per plant, length of the shoots, length and width of leaves.

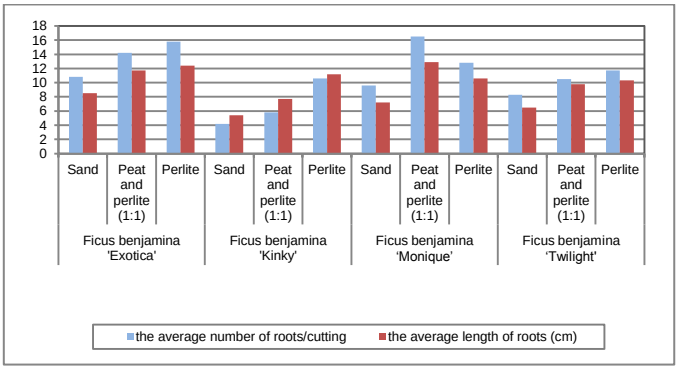
RESULTS AND DISCUSSIONS

The rooting generally depends on cultivar, cutting type and harvest period, physiological age of the cuttings, pre-treatment of the cuttings with different exogenous hormones, the rooting substrate used and its aeration and drainage properties. Regarding the influence of the substrate on rooting, the highest percentage of rooted cuttings was obtained in perlite, in the 'Exotica' cultivar (90%), respectively in peat and perlite in the 'Monique' cultivar (85%). For all the studied cultivars, the lowest percentage of rooted cuttings was observed in the sand, ranging between 40% in 'Kinky' and 55% in 'Exotica' (graph 1).

The rooting substrate of cuttings plays an important role in producing a good root system. The root system ensures the support of the plants by anchoring them in the soil and the absorption of water and nutrients, being essential for the growth and development of the plants. Before planting the rooted cuttings in pots, the average number of roots per cutting and the average root length were recorded. In the 'Monique' cultivar, the best results regarding the average number of roots (16.5) and the length of the roots (12.9 cm) were obtained at the cuttings rooted in peat and perlite, while in the 'Exotica' cultivar, the highest number of roots per cutting (15.8) and root length (12.4 cm) were recorded in perlite. Lower values of these morphological parameters were obtained in all cultivars, in sand, compared to the other rooting substrates. The lowest average values were recorded in 'Kinky' (4.2 roots/cutting and 5.4 cm root length), followed by 'Twilight' with 8.3 roots/cutting and a root length of 6.5 cm (graph 2).



Graph 1. The rooting percentage of cuttings at *Ficus benjamina* cultivars



Graph 2. The average number of roots per cutting and the roots length

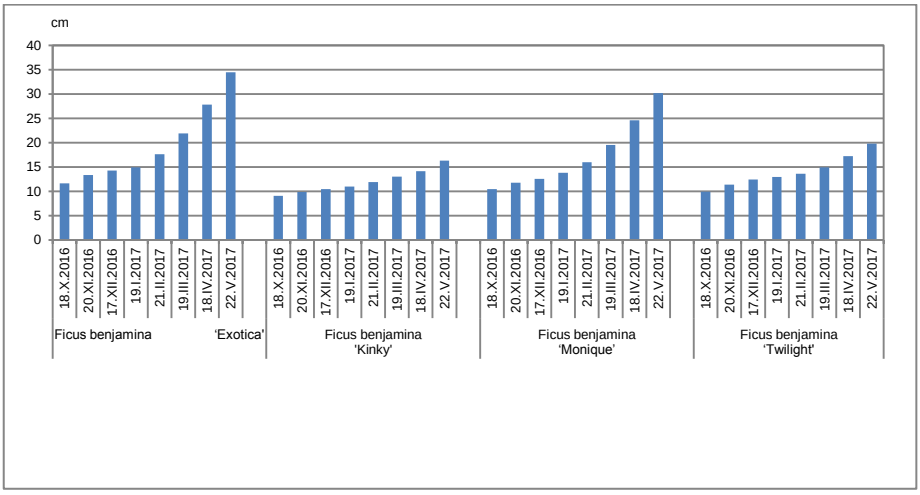
After evaluating the root system of the rooted cuttings, they were planted in pots with a diameter of 12 cm, in a substrate rich in nutrients and monthly the growth rate of the plants was determined. All cultivars of *F. benjamina* recorded a survival rate of potted plants of 100%.

Regarding the average height of the plants, the analysis of the obtained data shows that, the highest value was recorded in the 'Exotica' cultivar (34.4 cm), while the 'Kinky' cultivar had the lowest value of this parameter (16.3 cm), compared to the other studied cultivars. It was found that the plant height growth in the cultivars 'Monique' and 'Exotica' was slow until February, then there were higher monthly growths, reaching values of 5.6 cm, respectively 6.7 cm in May, while the plant growth in the cultivars 'Kinky' and 'Twilight' was slow, uniform and much lower throughout the research period. The growth rate differs from cultivar to cultivar. Eight months after planting in pots, the height growth rate of the plants was between 7.3 cm in the 'Kinky' cultivar and 22.8 cm in 'Exotica' (graph 3).

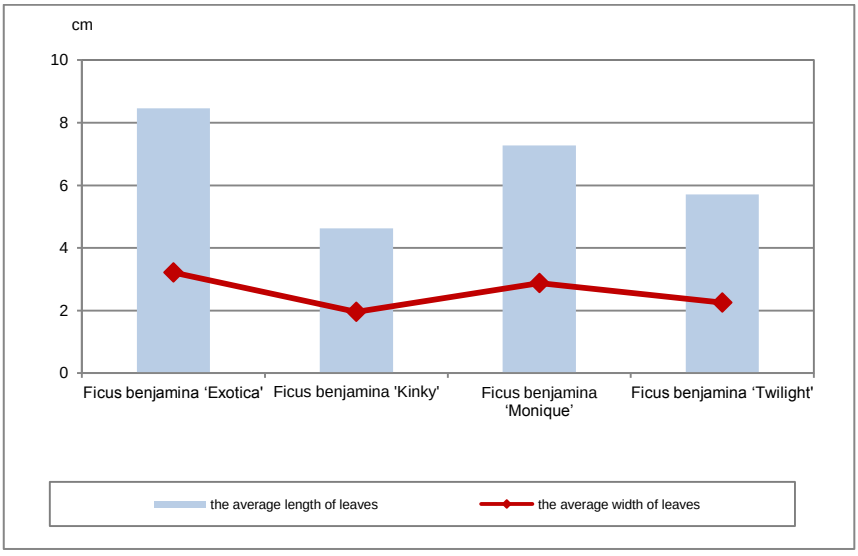
Observations and measurements were also carried out on the leaf size that varied according to the cultivar. In graph 4, it is observed that the highest values of the average leaf size were recorded in the 'Exotica' cultivar (8.4 cm length and 3.2 cm width), and the lowest values in 'Kinky' (4.6 cm length and 1.9 cm width).

The number of shoots/plant increased at all cultivars so that, at the end of the evaluation period of the plant vegetative growth, 'Exotica' had an average number of 10.3 shoots/plant, higher than the other studied cultivars. The 'Kinky'

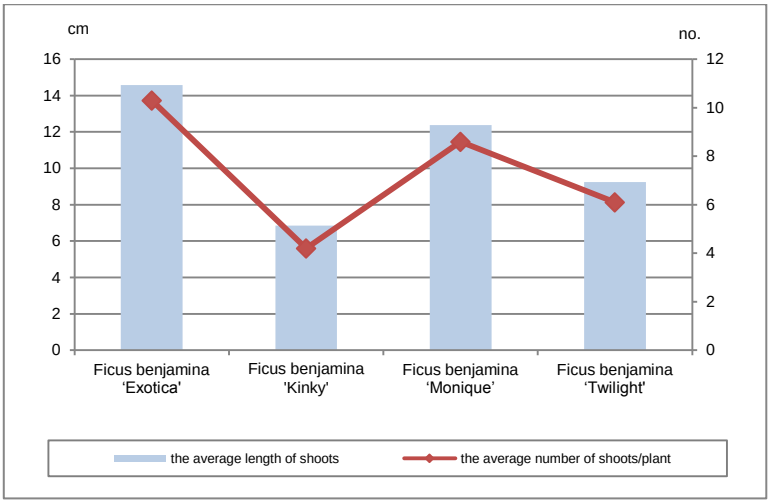
cultivar is characterized by the lowest number of shoots/plant (4.2). Regarding the average length of the shoots, it is noted that, the highest values were recorded in the 'Monique' (12.3 cm) and 'Exotica' (14.6 cm) cultivars, compared to the 'Kinky', to which shoots had an average length of 6.8 cm (graph 5).



Graph 3. The average height of plants at *Ficus benjamina* cultivars



Graph 4. The average size of leaves at the end of experiment



Graph 5. The number of shoots/plant and the shoots length at the end of experiment

CONCLUSIONS

The best response regarding the rooting percentage, number of roots per cutting and root length was found at the cuttings placed in perlite substrate, for 'Exotica', 'Kinky' and 'Twilight' cultivars, respectively in peat and perlite for 'Monique' cultivar. Eight months after planting the rooted cuttings in pots, the highest values of all the analyzed morphological characteristics (plant height, number of shoots per plant and length of shoots, length and width of leaves) were recorded in the 'Exotica' cultivar, while in the 'Kinky' cultivar, the plants had the lowest growth rate.

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LAVANDULA ANGUSTIFOLIA, *THYMUS VULGARIS*, *MENTHA PIPERITA* AND *SALVIA OFFICINALIS* WASTES – A CANTITATIVE ANALYSIS OF CRUDE FIBER CONTENT

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Keywords: *crude fiber, Lavandula angustifolia, Thymus vulgaris, Mentha piperita, Salvia officinalis*

ABSTRACT

The aim of this study is the quantitative analysis of the total crude fiber (TCF) content from four medicinal and aromatic plants wastes, Lavandula angustifolia L., Thymus vulgaris L., Mentha piperita L. and Salvia officinalis L., in an attempt to contribute to the sustainable valorization of plant waste. In this paper, the Weende method of determining the crude fibers is applied for different degrees of grinding of the samples. In order to identify the main functional groups of the insoluble components such as cellulose and lignin from the waste material, the FTIR analysis was performed. The statistical validation of the results obtained by the crude fiber extraction methods was performed by analysis of variance (ANOVA).

INTRODUCTION

Lavandula angustifolia L., Thymus vulgaris L., Mentha piperita L. and Salvia officinalis L. are medicinal and aromatic plants (MAP) of particular importance, which is why the valorization of MAP waste is of great interest for improving the sustainable development of the environment. The crude fibre (CF) is composed of lignin and cellulose, and the studies aim to evaluate their digestibility in order to simulate the digestion of ruminants, as well as the human one. In the case of plants, crude fiber comes from certain structural units such as cell walls, sclerenchyma or collenchyma (Smiechowska & Dmowski 2006). Studies have confirmed that the selected plants such as *Thymus vulgaris L.* (Mahmoodi et al. 2019), *Lavandula angustifolia L.* (Yadikar et al. 2018), *Mentha piperita L.* (Rajkumar et al. 2019) *and Salvia officinalis L* (Martins et al. 2015). have many beneficial properties for human health and thus the recovery of their waste helps to recover a high percentage of active compounds of interest.

The aim of this study is to identify the TCF content by Weende method and analyze the obtained plant material after acid and alkali treatment by FTIR Spectroscopy.

MATERIALS AND METHODS

The plant waste material is aerial parts of the 4 selected plants (*Lavandula angustifolia* L.*, Thymus vulgaris* L.*, Mentha piperita* L. *and Salvia officinalis* L.) that have been previously processed by alcohol extraction. The preparation of the plant waste material for the extraction of the crude fibers remaining after the alcoholic extraction involves drying it in the oven, for an interval of 12 hours, at a temperature of 40^0C. After drying, the plant material was chopped into 5 different grinding scales, separately using a sieve shaker device for material separation in μm range (HAVER EML 200 Pure, HAVER & BOECKER). This step aims to identify the optimum condition for obtaining a better extraction yield. The five degrees of shredding are: 5 mm, 2mm, 315 μm, 250 μm and 200 μm.

In order to indentify the total crude fiber content was applied the Weende method. This method facilitates the dissolution of the non-cellulosic components by sulfuric acid (extracts sugars and starch) (1.25%) and potassium hydroxide (extracts proteins, some hemi-cellulose and lignin) (1.25%) solutions. This method was applied to the plant material by using the crude fiber extractor (Velp Scientifica FIWE 6).

The TCF content was calculated with the formula:

$$TCF\ (\%) = \frac{F_1 - F_2}{F_0} \cdot 100 \tag{1.1}$$

where F_1 represents the crude fiber and ash mass; F_2 represents the ash mass; F_0 the initial sample mass.

All the samples were performed with 6 replications and the TCF content is expressed as a mean in Figure 1. The FTIR analysis was performed using Varian Excalibur FT-IR device, for identifying the major insoluble components present in the waste material after crude fiber extraction.

Two-way analysis of variance (ANOVA) was used to compare the means of the plant waste groups. Differences were considered statistically significant at $p < 0.05$.

RESULTS

Applying the Weende method, a total crude fiber content was obtained for each plant waste group, according to Figure 1.

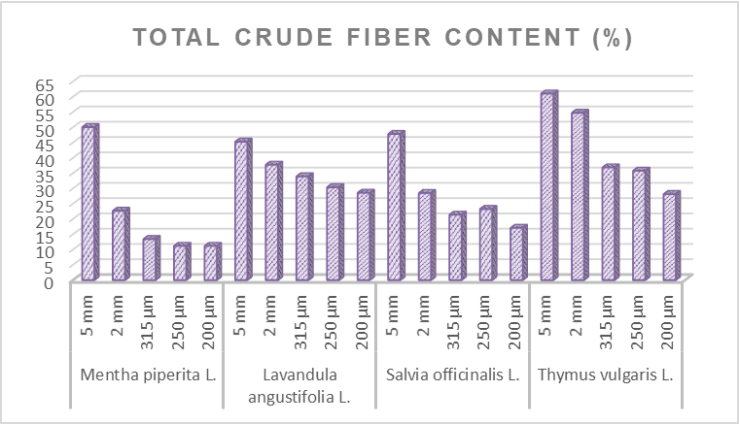

Figure 1. The Total crude fiber content

The statistical test, Two-Way Anova, showed that there were statistically significant differences between the means of the groups considered, corresponding to the 4 types of plants and to each grinding degree ($p<0.05$).

After the acid and alkaline treatment was applied, the plant waste, at 200 μm grinding degree, is illustrated in Figure 2.

a) b) c) d)

Figure 2. *Salvia officinalis* (a), *Lavandula angustifolia* (b), *Mentha piperita* (c) and *Thymus vulgaris (d)* - Crude fiber and ash - 200 μm.

The spectra resulted by FTIR analysis are presented in the Figure 3, for each plant waste. Analyzing the FTIR spectra, the difference between before and after treatment spectra could be observed. Thus, in the structure of CF is highlighted the presence of cellulose and lignin, comparative to the spectrum before treatment where could be seen and other bonds.

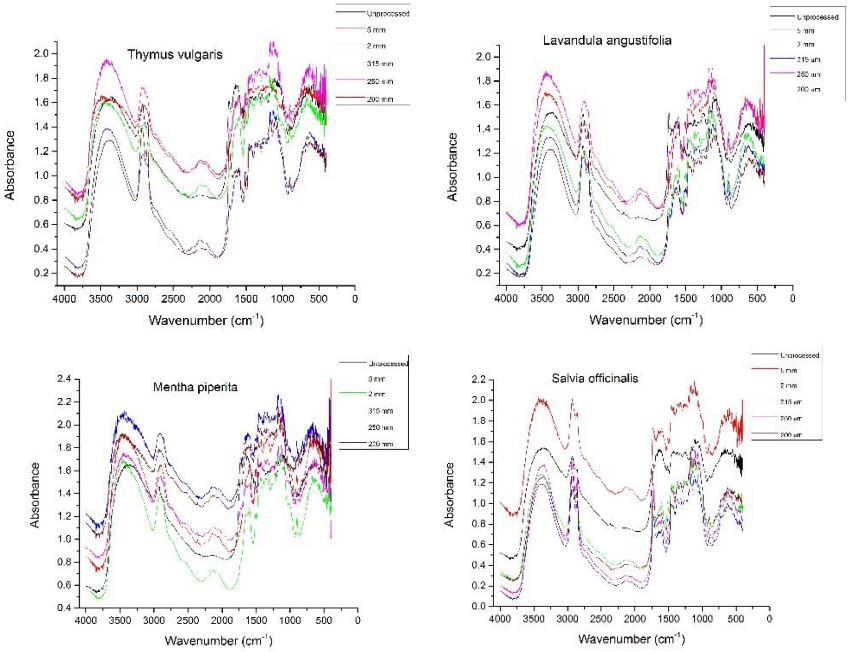

Figure 3. *Salvia officinalis*, *Lavandula angustifolia*, *Mentha piperita* and *Thymus vulgaris* – FTIR spectra.

A significant variation of the TCF between the grinding degrees was identified within the *Mentha piperita* so that for 5 mm it was obtained 50,04%, and for 200 µm it was obtained 11,16%, which highlights the importance of the grinding degree in the extraction process.

CONCLUSIONS

In conclusion, it can be noted that the cellulose is the major component in crude fiber because it cannot be digested, whereas hemicelluloses and lignin however can be digested to certain extents.

Thymus vulgaris showed the highest TCF content at 5 mm grinding degree while *Mentha piperita* showed the lowest TCF content at 200 µm grinding degree. So, all the plant material waste showed a decrease of TCF content relative to the decrease of grinding degree.

Statistical analysis performed by ANOVA indicated a statistically significant differences ($p<0.05$) between TCF content corresponding to each grinding degree, respectively to each plant.

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COMPARATIVE STUDY ON POLYPHENOLS CONTENT AND ANTIOXIDANT ACTIVITY OF SELF-SOWN PLANTS *TARAXACUM OFFICINALE* FROM SOME REGIONS OF CENTRAL GREECE

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Keywords*: Antiradical activity DPPH; dandelion; polyphenols*

ABSTRACT

Methanol extracts of leaf biomass of self-sown Dandelion (Taraxacum officinale) that are developing in five regions of Central Greece (Farkadona, Kalogriana, Tyrnavos, Makrychori and Kallipefki) were screened for the total phenols content, the flavonoid and nonflavonoid phenols content and the antiradical activity DPPH. Total phenols content, flavonoid and nonflavonoid phenols content in the methanol extracts vary from 13.42 to 22.46, from 8.84 to 15.59, and from 4.46 to 6.87 mg GAE/ g dw, respectively. The antiradical activity DPPH ranges from 11.68 to 17.22 μmol Trolox/g dw. The comparison of the results of the methanol extracts revealed that the dandelion that are developing in the region of Kallipefki region is distinguished by the highest content of total phenols and antioxidant activity. The results showed that the dandelion leaves can be used for the preparation of natural antioxidants.

INTRODUCTION

The plant Dandelion is known for a long time in the traditional medicine in China, india and many other countries as a remedy against various liver diseases and as diuretic. The extracts from the whole plants and pharmaceutical preparations from dandelion are used for treatment at stomach and liver problems, diabetes, and various forms of cancer (Singh et al. 2008). It has been found that extracts from many plant spices, herbs and medicinal plants possess antimicrobial, anti-inflammatory, anticancer and antioxidant properties. The strong antioxidant effects of plant foods are related to the high content of natural antioxidants such as polyphenols and many other compounds (Rice-Evans and Miller 1995).

Dandelion is characterised by high content of phenolic compounds (Williams et al. 1996). Many of the effects of dandelion on health are associated with their ability to scavenge and remove the harmful free radicals. The rapid production of free radicals can lead to oxidative damage of the cell membranes which cause the occurrence of many diseases (Bravo 1998).

Purpose of the present study was to determine polyphenols content and evaluated their antioxidant activity of the surface part of self-sown plants *Taraxacum*

officinale from five regions of central Greece in order that to establish new sources for the preparation of natural antioxidants.

MATERIAL AND METHODS

Plant material: The self-sown plant material consisted from the leaf biomass of dandelion, and developed in five natural areas of Thessaly (Farkadona - Trikala, Tyrnavos - Larisa, Makrychori - Larisa, Kallipefki - Larisa and Kalogriana - Karditsa). The Thessaly region is characterized by a typical Mediterranean climate with cold humid winters and hot-dry summers. The leaf mass was gathered in april - May 2018 in the phase of active growth. The samples were dark-dried, at room temperature, finely ground and kept at 4°C in dark until tested. Some soil-climate characteristics of the areas are listed in Table 1 and 2.

Table 1

Climatic characteristics of the studied regions

Regions	Average winter temperature	Average summer temperature	Average annual precipitation	Altitude
	°C	°C	mm	m
Farkadona	6.2	28.9	415	100
Kalogriana	5.7	27.8	424	100
Tyrnavos	6.2	30.1	420	100
Makrychori	5.8	28.5	415	100
Kallipefki	1.2	18.6	1280	1250

Soil analysis: The Texture of soils was determined by the bouyoucos hydrometer method (Bouyoucos 1962). Soil samples was analyzed using the following methods which are referred by (Page et al. 1982). Organic matter was analyzed by chemical oxidation with 1 mol L^{-1} $K_2Cr_2O_7$ and titration of the remaining reagent with 0.5 mol L^{-1} $FeSO_4$. Inorganic nitrogen was extracted with 0.5 mol L^{-1} $CaCl_2$ and estimated by distillation in the presence of MgO and Devarda's alloy, respectively.

Table 2

Soil characteristics of the studied regions for soil depth 0-30 cm

Regions	Organic matter	pH	EC	Texture	N-inorganic
	%		dS/m		mg/kg soil
Farkadona	2.4 ± 0.14	6.9 ± 0.34	0.17 ± 0.01	Sandy Clay	143 ± 8.7
Kalogriana	1.7 ± 0.11	7.2 ± 0.44	0.26 ± 0.02	Sandy Clay Loam	88.5 ± 6.8
Tyrnavos	1.8 ± 0.12	7.1 ± 0.53	0.26 ± 0.02	Sandy Clay	174 ± 9.6
Makrychori	2.2 ± 0.14	6.8 ± 0.38	0.22 ± 0.02	Sandy Clay Loam	187 ± 9.9
Kallipefki	3.9 ± 0.22	6.6 ± 0.37	0.16 ± 0.01	Sandy Clay	94.8 ± 7.3

Electrical conductivity, (EC) and soil pH is determined in (1:5) soil/water extract; Data represent average means and SE deviation, (n) = 4.

Preparation of plant extracts: Two g of finely ground leaves of dandelion were two rounds treated by 20 ml of 80% aqueous methanol. Samples were incubated for 24 h in the extractant at stirring. The extract was gathered after centrifugation and filtration. The pellet was re-treated with 20 ml of 80% aqueous methanol for 2 h at stirring at ambient temperature. The extract was gathered after centrifugation/filtration and the volume was made up to 50 ml with aqueous methanol and used for further chemical analysis (Kanner et al. 1994).

Analysis of plant tissues: The amount of total polyphenols (TP) was determined with the Folin-Ciocalteu (F.C.) reagent according to the method of (Singleton and Rossi 1965) using the microvariant proposed by (Baderschneider et al. 1999), and were expressed as gallic acid equivalent (GAE) in mg/g dry weight. The content of nonflavonoid phenols (NFP) was determined with the F.C. reagent after removing the flavonoid phenols (FP) with formaldehyde according to the method of (Kramling and Singleton 1969) and was expressed as gallic acid equivalent (GAE) in μg/g dry weight. Flavanoid phenols (FP) were determined as a difference between the content of total phenols (TP) and nonflavonoid phenols (NFP). Their amount was evaluated as gallic acid equivalent in μg/g dry weight.

The radical scavenging activities by antioxidants in the leaves extracts were evaluated using the stable free radical 2,2′-diphenyl-1-pycrylhydrazyl radical (DPPH•), as a reagent, according to the method by (Brand-Williams et al. 1995) and the results were expressed as μmol Trolox equivalent/g dry weight.

Statistical analysis: Data analysis was made using the MINITAB (Ryan et al. 2005) statistical package. The results are means of four parallel samples. Analysis of variance was used to assess treatment effects. Mean separation was made using Tukey's test when significant differences (P = 0.05) between treatments were found.

RESULTS AND DISCUSSIONS

Depending on the areas conditions of dandelion growth, the total phenols content in the dandelion leaves varies from 13.42 to 22.46 mg GAE/g dw (Table 3). The leaves from the Kallipefki region are characterised by the highest value, and those from Kalogriana by the lowest TP content, and the difference between them amounts to more than 40%. The total phenols content in the leaves of *Taraxacum officinale* from the studied areas has the following sequence: Kallipefki > Farkadona > Makrychori > Tyrnavos > Kalogriana. Our results on total phenols content agree with the data of some authors (Kratchanova et al. 2010), and differ from those of other researchers (Zheng & Wang 2001). Most probably, these variations in total phenols content in the dandelion leaves, could be explained with the possible differences in the genetic characteristics, the characteristics of the development region, the season of collection, the extraction method, and the nature of the extragent (Harbone 1980, Kratchanova et al. 2010).

The flavonoid phenols content in the dandelion leaves from the studied areas varies from 8.84 to 15.59 mg GAE/g dw (Table 3). The leaves from the Kallipefki region are characterised by the highest value, and those from Kalogriana by the lowest concentration, and the difference between them is 43%. The flavonoid phenols content represents from 65.9 to 69.4 % of the TP amount (Table 3). The flavonoid phenols content in the leaves of *Taraxacum officinale* has the following sequence: Kallipefki > Farkadona > Makrychori > Tyrnavos > Kalogriana. The flavonoid fraction is the major constituent of total phenols in the Dandelion leaves.

The flavonoid phenols fraction consists mainly of luteolin and luteolin 7-glucoside (Hu and Kitts 2003).

The nonflavonoid phenols content in the dandelion leaves from the studied areas varies from 4.46 to 6.87 mg GAE/g dw (Table 3). The leaves from the Kallipefki region are characterised by the highest value, and those from Kalogriana by the lowest concentration, and the difference between them is 35%. The nonflavonoid phenols content represents from 30.6 to 34.1 % of the TP amount. The nonflavonoid phenols content in the leaves of *Taraxacum officinale* has the following sequence: Kallipefki > Farkadona > Makrychori > Kalogriana > Tyrnavos. The nonflavonoid phenols fraction consists mainly of caffeic acid and m-coumaric acid (Kim et al. 2008).

Table 3

Content of total phenols, nonflavonoid phenols and flavonoid phenols in methanol extracts of dandelion leaf mass

Regions	TP	FP	NFP	FP % of TP amount
	mg (GAE) / g dry weight			
Farkadona	17.91b	12.02b	5.89ab	67.1
Kalogriana	13.42c	8.84d	4.58c	65.9
Tyrnavos	14.17c	9.71cd	4.46c	68.5
Makrychori	17.08b	11.41bc	5.67bc	66.8
Kallipefki	22.46a	15.59a	6.87a	69.4

For each chemical property, columns with the same letter of the table do not differ significantly according to the Tukey's test (P = 0.05).

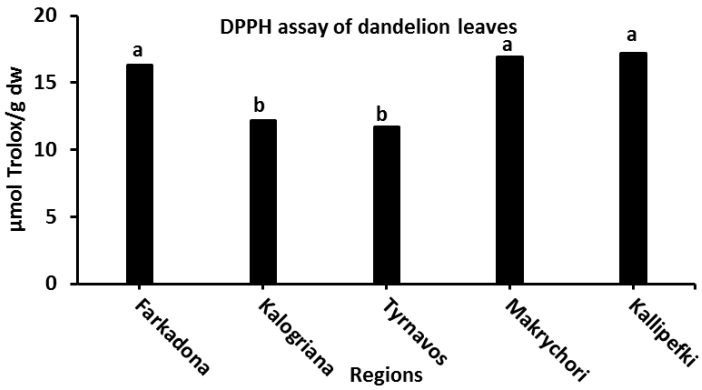

Figure 1. Antiradical DPPH activity of dandelion leaf mass, is expressed as µmol Trolox equivalent; Bar values with the same letter on the top are not significantly different according to Tukey's test (P > 0.05).

The antiradical activity in the dandelion leaves, that were assayed with the stable free radical DPPH as µmol Trolox equivalent, varies from 11.68 to 17.22 µmol Trolox / g dw, and the difference between them is 32.17% (Figure 1). The dandelion leaves from the Kallipefki region are characterised by the highest antiradical activity whereas those from the Tyrnavos region are characterised by the lowest antiradical

activity. In terms to the values of antiradical activity in the leaves of *Taraxacum officinale* they could be arranged as follows: Kallipefki (17.22), Makrychori (16.90), Farkadona (16.32) > Kalogriana (12.21), Tyrnavos (11.68) μmol Trolox / g dw, respectively (Figure 1). Our results for the high antioxidant DPPH activity of the leaf mass of dandelion agree with the results of other authors who have established higher values in comparison with other medicinal plants (Stef et al. 2009). In addition, the similar antioxidant activity in the dandelion leaves from different study areas is due to the similar conditions of their growth. The environmental conditions have a strong effect on the antioxidant capacity of polyphenols (Macheix et al. 1990).

CONCLUSIONS

The study on the dandelion leaves from five areas in central Greece shows that they are characterised by high content of polyphenols and from high antioxidant activity. Differences in the total phenols content, flavonoid phenols and nonflavonoid phenols are observed, depending on the soil and the microclimate peculiarities, affecting and the antioxidant activity DPPH. The dandelion leaves from the Kallipefki region are characterised by the highest content of polyphenols and antiradical activity.

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COMPARATIVE STUDY ON POLYPHENOLS CONTENT AND ANTIOXIDANT EFFECT FROM SOME OLIVE FRUIT VARIETIES GROWN IN CENTRAL GREECE

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Keywords*: Antiradical activity DPPH; olive fruits; phenolic fractions; total phenols*

ABSTRACT

Five olive fruit varieties (Amfisis, Chalkidikis, Kalamon, Koroneiki and Arbequine) grown in central Greece were studied for the total phenols content, phenolic fractions and the antiradical activity DPPH. The total phenols content in the olive fruit varieties studied ranged from 7.32 to 18.61 mg (GAE) / g FW, the non-flavonoid phenols content ranged from 1.27 to 5.17 mg (GAE) / g FW and the flavonoid phenols content ranged from 5.87 to 13.44 mg (GAE) / g FW. The antiradical activity DPPH• in the olive fruit varieties studied ranged from 141.2 to 261.2 μmol (Trolox) / g FW. The olive fruit varieties grown in central Greece they offer an high intake of natural antioxidants in the human organism for the prevention of free radical disease.

INTRODUCTION

Olive fruits are traditional Greek product and natural reservoir of phenolic compounds. Olive fruits are rich to flavonoids, secoiridoids and phenolic acids, which exert high antioxidant activity (Dağdelen et al. 2013). Many of the effects of olive fruits on health are associated with their ability to scavenge and remove the harmful free radicals. The rapid production of free radicals can lead to oxidative damage of the cell membranes which cause the occurrence of many diseases (Bravo 1998).

The composition of phenolic compounds in the olive fruits depends from the cultivar, cultivation techniques and climatic conditions (Vinha et al. 2005).The aim of the present study is to determine the content of phenolic compounds and the antioxidant activity at different olive fruit varieties grown in central Greece.

MATERIAL AND METHODS

Experimental: Collection of the olive fruits took place at November of 2018 at the stage of full maturation from organic olive orchards of central Greece. Two trees by each olive variety were chosen and were sampled of olive fruits one kilogram with four replicates from each tree, from all the orientations and without type of disease. These samples were stored at -18^{0}C and were further subjected to analyses.The climate in the area of central Greece is continental, with cold rainy

winters, average temperatures 5^0C, and hot summers, average temperatures 26^0C and average annual precipitation 460mm. The basic characteristics of olive fruits are shown in Table 1.

Table 1

Basic characteristics of the olive fruits studied

Varieties	Size	Color	Use	Origin
Amfisis	Big	Black	Dual use	Greece
Chalkidikis	Big	Yellowish green	Table olives	Greece
Kalamon	Big	Black	Table olives	Greece
Koroneiki	Small	Black	Oil production	Greece
Arbequine	Small	Black	Oil production	Spain

Preparation of the ethanol extracts of olive fruits: For each treatment, 50 g flesh were subjected to freeze drying for further extraction and determination of humidity. The dry mass was crushed and stored in clean bottles in refrigeration (Boskou et al. 2006). 500 mg of dry sample was extracted two times with 50 mL of 80% aqueous ethanol for 24 h at 150 rpm, the ethanolic extracts were combined and washed two times with 25 mL n-hexane in order to eliminate the oil of the ethanolic extract (Rigane et al. 2011). The separation of the phases was performed with separating funnels. Subsequently the ethanolic extract was evaporated under nitrogen, and the residue was dissolved in 50 mL of 80% aqueous ethanol, stored in clean bottles in refrigeration in the dark until its use.

Methods of analyses: Total phenols content (TP) was determined with the Folin-Ciocalteu (F.-C.) reagent according to the method by (Singleton and Rossi 1965) and the results were expressed as gallic acid equivalent (GAE) in mg g^{-1} fresh weight. The content of Nonflavonoid phenols (NFP) was determined with the F.-C. reagent after removing the flavonoid phenols (FP) with formaldehyde according to the method by (Kramling and Singleton 1969) and was expressed as gallic acid equivalent (GAE) in mg g^{-1} fresh weight. Flavonoid phenols (FP) were determined as a difference between the content of total phenols and nonflavonoid phenols. Their amount was evaluated as gallic acid equivalent in mg g^{-1} fresh weight.

The antiradical activity (DPPH•) of the ethanol extracts was determined according to the method by (Brand-Williams et al. 1995) using the stable free radical 2,2′-diphenyl-1-picrylhydrazyl DPPH•. The activity was evaluated as Trolox equivalent (TEAC) in μmol/g fresh weight.

Statistical analysis: Data were analyzed using the MINITAB (Ryan et al. 2005) statistical package. The experiment had four replications. Analysis of variance was used to assess treatment effects. Mean separation was made using Tukey's test when significant differences (P = 0.05) between treatments were found.

RESULTS AND DISCUSSIONS

In the olive fruit varieties studied, total phenols content ranges from 7.32 to 18.61 mg (GAE) / g FW (Table 2). The Kalamon variety are characterised by the highest TP content with 18.61 mg (GAE) / g FW, while the Amfisis variety are characterised by the lowest TP content with 7.32 mg (GAE) / g FW, and the difference between them amounts to 60%. Total phenols content in the olive fruit varieties studied has the following sequence: Kalamon > Chalkidikis, Koroneiki > Arbequine, Amfisis. Our results are in

agreement with the data obtained by other authors who have established differences in total phenols content in different olive fruit varieties (Boskou et al. 2006). Petridis et al. (2012) have established differences in total phenols content for the same variety under different climatic conditions.

Flavonoid phenols (FP) content in the olive fruit varieties studied ranges from 5.84 to 13.44 mg (GAE) / g FW (Table 2). The Kalamon variety are characterised by the highest FP content, while the Arbequine variety are characterised by the lowest FP content, and the difference between them is 56.5%. The flavonoid phenols content in the olive fruits has the following sequence: Kalamon > Chalkidikis, Koroneiki > Amfisis, Arbequine. The flavonoid phenols content represents from 70.7 to 82.6 % of the total phenols amount (Table 2). The flavonoid fraction is the major constituent of total phenols in the olive fruit varieties.

The nonflavonoid phenols content in the olive fruit varieties studied ranges from 1.27 to 5.17 mg (GAE) / g FW (Table 2). The Kalamon variety are characterised by the highest NFP content, while the Amfisis variety are characterised by the lowest NFP content, and the difference between them is 75.4%. The non-flavonoid phenols content in the olive fruits has the following sequence: Kalamon > Chalkidikis, Koroneiki > Arbequine > Amfisis.

Table 2

Total phenols (TP) content, flavonoid (FP) and non-flavonoid (NFP) phenols in the olive fruit varieties studied

Olive fruit varieties	**TP**	**FP**	**NFP**	**FP % of TP amount**
	mg (GAE) / g fresh weight			
Amfisis	7.32c	6.05c	1.27d	82.6
Chalkidikis	14.77b	10.44b	4.33ab	70.7
Kalamon	18.61a	13.44a	5.17a	72.2
Koroneiki	14.06b	10.12b	3.94b	72.0
Arbequine	7.82c	5.84c	1.98c	74.7

For each chemical property, columns of table with the same letter do not differ significantly according to the Tukey's test (P = 0.05).

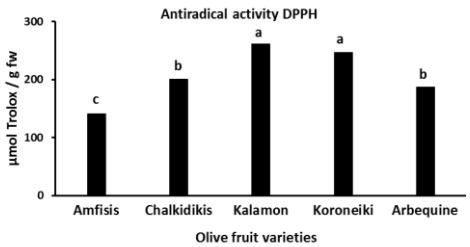

Figure 1. Antiradical activity DPPH of olive fruit varieties; Bar values with the same letter on the top are not significantly different according to Tukey's test (P > 0.05).

The antiradical activity DPPH• in the olive fruit varieties studied ranges from 141.2 to 261.2 µmol Trolox / g FW (Figure 1). The Kalamon and Koroneiki varieties exert the highest activity with 261.2 and 247.2 µmol Trolox / g FW respectively, and the Amfisis variety exert the lowest with 141.2 µmol Trolox / g FW. These values are

higher than those reported by other authors for some olive fruit varieties grown in Turkey (Gurel et al. 2014). The correlation between the antiradical activity DPPH• and the total phenols content at harvest of the olive fruits was moderate, with correlation coefficient (r^2) equal to: 0.76.

CONCLUSIONS

The study on the olive fruits varieries of central Greece shows that they are characterised by high content of polyphenols and high antiradical activity. Phenolic compounds and antiradical activity of olive fruits were studied depends strongly on the variety. The Kalamon variety are characterised by the highest content of polyphenols and antiradical activity. Olive fruits which are cultivated on the region of central Greece are a source of bioactive components that could be included in functional foods composition.

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THE INFLUENCE OF GROWTH REGULATORS ON THE DEGREE OF SETTING OF PEAR FRUITS BY THE NOIABSKAIA VARIETY

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Keywords: *Setting, growth regulator, pear, production, quality.*

ABSTRACT

The study subject of the experience was Noiabrskaia pear variety, grafted on BA 29. To study setting processes of reproductive organs, fruit production and its quality in 2017 year were experimented the following variants of treatment: 1. Control – without treatment; 2. GA_3 – 20 ppm (18.04.2017); 3. GA4+7 – 40 ppm (18.04.2017); 4. GA_{4+7} – 40 ppm (26.04.2017); 5. Prohexadion Ca (P-Ca) – 10 ppm + GA_{4+7} – 40 ppm (26.04.2017). During the research, it was established that the growth regulator GA3 in dose of 20 ppm can be included in the technology system when 30-40% of the flowers are open to increase the resistance of the reproductive organs at low temperatures, improving the physiological processes in the plant, increasing the degree of fruit setting, the amount of fruit in the pear tree crown and plantation production.

INTRODUCTION

Pear culture has an important role in the intensification of the fruits growing and in our country places second among the seed species after the apple culture.
The role of the growth regulators in fruit growing is of particular importance, because only after their correct use, these products attract the improvement of the physiological processes within the plants and the increase of the fruits production at a surface unit (Deckers & Schoofs 2004, Dennis 1973, Neamţu & Irimie 1994).

To increase the resistance to low temperatures, the degree of fruit binding and productivity is recommended to treat pear shafts with gibberelinic acid GA_3, GA_{4+7}, with Prohexadion Ca and a mixture of these growth regulators (Deckers 1994, Peşteanu et al. 2018).

Pear producers in order to increase the resistance of the generative organs at low temperatures, to the degree of fruit setting and productivity, frequently administer various mixtures of growth regulators such as GA_{4+7} and 6BA or Prohexadion of Ca and GA_{4+7}. These growth regulators are administered during the flowering period, which function as growth promoters at the cellular level and improve the degree of fruits binding immediately after flowering (Negi & Sharma 2005).

The application of growth regulators whose active ingredient is GA_3, GA_{4+7}, 6BA and Prohexadion de Ca in the intensive pear cultivation system is widely practiced in the countries where the pear is grown in order to obtain high, constant

and competitive quality productions of fruits (Flick & Hermann 1978, Lafer 2008, Silva & Herrero 2008, Vercammen & Gomand 2008).

MATERIAL AND METHODS

The researches were carried out during the year 2017, in the orchard founded, in the autumn of 2010 at the company S.R.L. "Terra Vitis".

In order to determine the efficiency of growth regulators with various active ingredients and the treatment period in the Noiabrskaia variety, in 2017 an experience with the following variants was organized (tab. 1).

The first treatment was performed on 18.04.2017, before the low temperatures occurred. On that day, in the Noiabrskaia variety, the flowering degree of the trees constituted 30 - 40% of the flowers. The following treatment was carried out on 26.04.2017, when the danger of the return of the low temperatures no longer persists.

Table 1

The scheme of the treatment experience of the pear trees of the Noiabrskaia variety with growth regulators

Variants	Application date	Commercial name of the product	Application method
Witness	18.04.2017	-	By spraying
GA_3 – 20 ppm	18.04.2017	Gobbi Gib 2LG	
GA_{4+7} – 40 ppm*	18.04.2017	Gerlagib LG	
GA_{4+7} – 40 ppm*	26.04.2017	Gerlagib LG	
Prohexadion Ca (P-Ca) – 10 ppm + GA_{4+7} – 40 ppm	26.04.2017	Regalis Plus Gerlagib LG	

* - GA_{4+7} - 40 ppm growth regulator at which various application periods have been studied

The researches were carried out under field and laboratory conditions according to accepted methods of carrying out experiments in fruit crops with growth regulators.

Statistical processing of the data was performed by the method of dispersion analysis.

RESULTS AND DISCUSSIONS

The investigations, show us, that the amount of inflorescences (tab. 2) on the variants studied in the trees of the Noiabrskaia variety ranged from 60 to 64 pcs/tree. The treatments carried out with the growth regulators provided could not influence the amount of inflorescences, because the fruit buds have differentiated in 2016.

The treatments performed on the inflorescences when 30 - 40% of the flowers were flowered (18.04) and after the frosts period (26.04) influenced the degree of fruit setting.

The lowest degree of fruit binding during the research at the Noiabrskaia variety was recorded in the control variant, where the studied index constituted 7.7%.

Within the trees of the Noiabrskaia variety, the variants treated with growth regulators have differentially increased the degree of pear binding. Significantly higher values than in the control variant were obtained when treating with GA_{4+7} - 40 ppm gibberellic acid (18.04), constituting 8.9%, or an increase by 1.2% compared to the control variant.

Table 2

The influence of growth regulators on the amount of fruits from the Noiabrskaia variety and the degree of binding in the pear plantation

Variants	Application date	The amount of inflorescences, pcs/tree	The amount flowers, pcs/tree	The amount of fruits, pcs/tree	The setting degree,%
Witness	-	61.0	427	33	7.7
GA_3 – 20 ppm	18.04	63.0	441	92	20.9
GA_{4+7} – 40 ppm	18.04	61.0	427	38	8.9
GA_{4+7} – 40 ppm	26.04	60.0	420	131	31.2
P - Ca – 10 ppm + GA_{4+7} – 40 ppm	26.04	64.0	248	206	46.0

The treatment with GA_{4+7} - 40 ppm gibberellic acid in the period after low temperatures (26.04) increased by 3.5 times the weight of the related fruits compared to the variant treated with the same product during the period when 30 - 40% of flowers were in bloom. The weight of fruits spoiled in the respective variants constituted 21.46% and 2.65% respectively.

The treatment with gibberellic acid GA_3 - 20 ppm in the period until the occurrence of late spring frosts recorded a binding degree of 20.9%, or 92 fruits of higher quality, the weight of deformed fruits in the crown of trees used for industrialization constituted 2.54%.

The highest degree of fruits binding was obtained in the variant treated with the mixture consisting of Prohexadion of Ca - 10 ppm and gibberellic acid GA_{4+7} - 40 ppm, registering values of 46.0%.

The investigations carried out revealed (tab. 3), that in the control variant of the Noiabrskaia variety, the average quantity of seeds from the fruit constituted 0.76 pcs.

The treatments performed on trees of Noiabrskaia variety with growth regulators have influenced differently the parthenocarpic phenomenon. Practically, in the variants treated with gibberellic acid GA_3 - 20 ppm and the mixture of Prohexadion of Ca - 10 ppm and gibberellic acid GA_{4+7} - 40 ppm only parthenocarpic fruits were formed, the seminal chamber and seeds were not detected.

In variants treated with GA_{4+7} - 40 ppm gibberellic acid, even after low temperatures occurred, major deviations between the obtained values were not recorded and constituted, respectively, 0.40 and 0.38 pcs/fruit.

The study carried out on the weight of deformed fruits shows us that, in the control variant, the index studied on the trees of the Noiabrskaia variety constituted 9.18%.

The weight of the deformed fruits in the variant treated with gibberellic acid GA_3 - 20 ppm during the phase when 30 - 40% of the flowers were flowered (18.04) constituted 2.54%, and in the variant treated with gibberellic acid GA_{4+7} - 40 ppm - 2.65 %.

Table 3

The influence of growth regulators on the amount of seeds in the fruits of Noiabrskaia variety and the weight of deformed fruits

Variants	Application date	The quantity of fruits, pcs/tree	The average quantity of seeds, pcs	The share of deformed fruits,%
Witness	-	33	0.76	9.18
GA_3 – 20 ppm	18.04	92	-	2.54
GA_{4+7} – 40 ppm	18.04	38	0.40	2.65
GA_{4+7} – 40 ppm	26.04	131	0.38	21.46
P - Ca – 10 ppm + GA_{4+7} – 40 ppm	26.04	206	-	55.34

When applying a treatment with gibberellic acid GA_{4+7} - 40 ppm (26.04) the weight of fruits increased to 21.46%, and in the variant where the mixture between Prohexadion of Ca - 10 ppm and gibberelic acid GA_{4+7} - 40 ppm was administered , more than half of the fruits obtained in the crown of the tree (55.34%) had deformations and were classified in the rejected category.

The smallest quantity of fruits in the trees of the Noiabrskaia variety during the research was recorded in the control variant - 33 pcs (tab. 4).

Table 4

The influence of growth regulators on average weight and productivity of pear plantation of the Noiabrskaia variety

Variants	Applica-tion date	The quantity of fruits, pcs/tree	The average weight of a fruit, g	Production		In % compared to witness
				kg/tree	t/ha	
Witness	-	33	217.3	7.2	9.0	100.0
GA_3 – 20 ppm	18.04	92	186.3	17.1	21.4	237.7
GA_{4+7} – 40 ppm	18.04	38	257.9	9.8	12.3	136.6
GA_{4+7} – 40 ppm	26.04	131	145.9	19.1	23.9	265.5
P - Ca – 10 ppm + GA_{4+7} – 40 ppm	26.04	206	81.3	16.7	20.9	232.2
LSD 0.05	-	5.7	10.3	0.77	0.94	-

Analyzing the amount of fruits according to the active ingredient used in the treatment, we find that, in all the variants exposed to treatment, there was an increase of the index in the study. If the treatment was done until frost with the growth regulators based on GA_{4+7} - 40 ppm, the amount of fruits in a tree recorded values of - 38 pcs, and with GA_3 - 20 ppm - 92 pcs. If the treatment was carried out after the freezing period with products based on GA_{4+7} - 40 ppm and a mixture of Prohexadion of Ca - 10 ppm and GA_{4+7} - 40 ppm, an increase in the value of the index in the study was recorded being respectively 131 and 206 pcs/tree.

In the trees of the Noiabrskaia variety, the highest average weight of a pear fruit was recorded in the variant treated with gibberellic acid GA_{4+7} – 40 ppm (18.04) - 257.9 g. Values lower than in the respective variant were recorded in control variant - 217.3 g, variant treated with gibberellic acid GA_3 - 20 ppm (18.04) - 186.3 g, variant treated with gibberellic acid GA_{4+7} - 40 ppm (26.04) - 145.9 g and on its last position placed variant mixture of Prohexadion of Ca - 10 ppm and GA_{4+7} - 40 ppm (26.04) - 81.3 g.

The fruit production obtained in 2017 from the trees of the Noiabrskaia variety constituted respectively 7.2 kg/tree and 9.0 t/ha.

When treating the trees of the Noiabrskaia variety with growth regulators, productions of more than 20 t/ha were registered in three variants. The combined treatment of Prohexadion of Ca - 10 ppm and GA_{4+7} - 40 ppm (26.04) produced a pear production of 16.7 kg/tree or 20.9 t/ha. The large amount of fruits (206 pcs/tree) and the low average weight of a fruit highlight the inferior quality of the fruits of the respective variant. Treatment with gibberelinic acid GA_3 - 20 ppm until frost (18.04), fruit production amounted to 17.1 kg/tree, or 21.4 t/ha. Higher values of the index in the study were obtained in the variant treated with gibberellic acid GA_{4+7} - 40 ppm (26.04), where the fruit production constituted, respectively 19.1 kg/tree and 23.9 t/ha. The treatment with the same product, only during the period until the frost (18.04), when 30 - 40% of the flowers were flowering allowed to form yields of 9.8 kg/tree or 12.3 t/ha. The lowest values of the index under study was recorded in control variants.

According to the results obtained (tab. 5) in the studied year, we can see that the quality of the pear fruits is influenced by the treatment period and the growth regulator administered.

Table 5

The influence of growth regulators on the quality of the fruits of the Noiabrskaia variety expressed by weight,%

Variants	Application date	Fruits weight, g					Scrap
		300-350	250-300	200-250	150-200	100-150	
Witness	-	31.3	30.3	25.3	2.0	2.1	9.0
GA_3-20 ppm	18.04	16.4	25.8	25.1	15.3	14.9	2.5
GA_{4+7}-40 ppm	18.04	45.5	28.2	12.7	5.5	5.5	2.6
GA_{4+7}-40 ppm	26.04	1.1	11.5	19.9	31.0	14.9	21.6
P - Ca -10 ppm + GA_{4+7}-40 ppm	26.04	-	0.5	5.5	14.8	22.1	57.1

In the Noiabrskaia variety, in the control variant, we registered a more uniform redistribution of production. In the category of fruits with the weight 300 - 350 g is assigned 31.3%, fruits with the weight 250 - 300 g - 30.3%, fruits with the weight 200 - 250 g - 25.3%, fruits with the weight 150 - 200 g - 2.0%, fruits with the weight 100 - 150 g - 2.1% and in the category discarded 9.0%.

Further studying of how the treatment period influenced the quality of production recorded that, in the Noiabrskaia variety, more convincing values were obtained in the variant GA_{4+7} gibberellic acid administered on 18.04.2017, until freezing. In this variant, the highest weight of fruits is attributed to fruits with weight

300 - 350 g - 45.5%, fruits with weight 250 - 300g - 28.2%, fruits with weight 200 - 250g - 12.7%, fruits weighing 150 - 200 g and 100 - 150 g each 5.5%, and 2.6% were found in the waste compartment.

Studying the influence of growth regulators on the quality of the fruits expressed by weight, more convincing results in the Noiabrskaia variety were recorded in the variant treated with GA_3 - 20 ppm gibberellic acid during the period when 30 - 40% of the flowers were flowered. In this case, to the fruit class weighing more than 300 g is assigned 16.4%, to the class 200 - 300 g - 50.9%, to the fruit weighing 150 - 200 g - 15.3%, the fruit with weight 100 - 150g - 14.9% and only 2.5% in the rejected category.

CONCLUSIONS

The treatments performed on the inflorescences when 30 - 40% of the flowers were flowered (18.04) and after the passage of the frosts (26.04) had a positive influence on the degree of fruits binding.

Higher quality fruits of the Noiabrskaia variety was recorded when the trees were treated with GA_3 - 20 ppm gibberellic acid growth regulator during the period when 30 - 40% of the flowers in the crown were flowering.

The GA_3 growth regulator administered in the 20 ppm dose can be included in the technological system when 30 - 40% of the flowers are opened to increase the resistance of the reproductive organs at low temperatures, to improve the physiological processes in the plant, to increase the degree of binding of the ovaries, the amount of fruits in the crown of pear trees and the productivity of the whole plantation.

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EFFECT OF BENZOIC, SORBIC AND CITRIC ACID TREATMENTS ON PHYSICOCHEMICAL AND QUALITY CHARACTERISTICS OF PEACH FRUITS DURING COLD STORAGE

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Keywords*: peaches, postharvest treatments, citric acid, benzoic acid, sorbic acid, storage*

ABSTRACT

The aim of this research was to investigate the effect of postharvest applications of 2% and 0.2% citric acid, 0.2% benzoic acid and 0.2% sorbic acid on the overall quality of peach fruits stored at 5°C for 28 days. Quality assessment of weight loss, total soluble solids, titratable acidity, total phenolic content and DPPH antioxidant activity was performed. Evaluation of physico-chemical parameters were made at 0, 7, 14, 21 and 28 days of storage. The chemical treatments efectively decreased physiological weight loss and maintained higher phenolic content and antioxidant activity in fruits as compared to the control samples. Postharvest treatment with 0.2% sodium benzoate was found most effective in maintaining physico-chemical attributes of pech fruits under low temperature storage.

INTRODUCTION

Peach (*Prunus persica* L.) is a temperate stone fruit species grown in the temperate zones of the world. The fruits show climacteric behavior, which means that the fruit continues its ripening processes after harvest, regulated by the ethylene action. Because of the relatively high respiratory rate and the fast ripening process, the peach fruits are perishable products with short postharvest life that does not exceed 3-5 days under normal environmental conditions at 20°C (Kluge & Jacomine, 2002; Miranda et al., 2019).

During the postharvest handling, elevated temperatures, low relative humidity, mechanical injuries, and diseases, might increase the ethylene production and the respiration rate which causes significant losses during distribution and commercialization (Gupta et al., 2011; Miranda et al., 2019).

The self life of peaches extends to about 2 weeks under cold storage condition (Pongener et al., 2011) while for a more efficient preservation, other technologies are required in addition to the storage at low temperatures (Miranda et al., 2019).

To extend the shelf life of fresh fruits, controlled atmosphere packaging and surface treatment with synthetic chemicals are the most widely available technologies (Geransayeh et al. 2012).

Organic acids including acetic, lactic, citric, malic, tartaric, are commonly used as antimicrobial agents to preserve foods. Their action is based on their

bactericidal capabilities and on the environment pH reduction, disruption of membrane transport and/or permeability, anion accumulation, or a reduction in internal cellular pH by the dissociation of hydrogen ions from the acid (Parish et al., 2003). Citric and ascorbic acids are commonly used in fruit and vegetable washing (Velázquez et al., 2009). Other simple organic acids, such as propionic acid, sorbic acid, benzoic acid, are widely used as food preservatives.

Sorbic acid and its salts have found wide application as yeast and mold inhibitors. Effective antimicrobial concentrations of sorbates in most foods are in the range of 0.05% - 0.30%. The use of benzoic acid as a food preservative has been limited to acidic products and most yeast and fungi are inhibited by 0.05-0.1% of the undissociated acid. Surface treatments by spraying with antimicrobial agents or by dipping fruit in antimicrobial solutions are widely practiced to prevent microbial growth (Oms-Oliu et al., 2010).

The present research was conducted to investigate the effects of postharvest treatments with organic acids (citric, sorbic and benzoic) on physicochemical and biochemical changes in peach fruits cv. Redhaven under cold storage conditions.

MATERIALS AND METHOD

Experimental procedure

For the experiment, fruits of peach cv. Redhaven were purchased from the market at early ripe stage in term of red color development and firmness. The fruits were sorted on the basis of uniformity in size, colour, and absence of visible injury and then divided into 5 lots. Fruits of first two lots were dipped for 5 mintues in solution of citric acid at 2% (P1) and 0.2% (P2) concentration while the fruits of the next two lots were dipped for 5 mintues in 0.5% benzoic (P3) and 0.5% sorbic acid (P4), respectively. Control fruits were dipped in water only. The peaches were then allowed to drain for 10 min. For study of storage behaviour, fruit samples were analyzed after 0, 7, 14, 21 and 28 days of storage for various physicochemical characteristics.

Weight loss

Weight loss was determined as the difference between initial and final weight, divided by the initial weight for each replicate. Weight loss (%) = [(initial weight - final weight)/ initial weight] x 100.

Total soluble solids and titratable acidity

To determine the total soluble solids, three fruits were randomly taken from each treatment and blended in an electrical blender. The total soluble solids was determined with a digital refractometer (Hanna Instruments, Woonsocket, USA) and the results were expressed in percentages. Titratable acidity was measured by the titrimetric method and the results were expressed as % malic acid.

Total phenolic content

Total phenolic content was assessed according to the Folin-Ciocalteu colorimetric method. For extraction, 3 g of fruit tissue was homogenized with 10 ml of methanol in an ultrasonic bath for 60 min at room temperature. After filtering, 100 µL of each extract were mixed with 5 mL of distilled water and 500 µL of Folin-Ciocalteu reagent. After 30 sec to 8 min, 1.5 mL of sodium carbonate (20% v/v) was added and the reaction mixture was diluted with distilled water to a final volume of 10 mL. After incubation for 30 min at 40 °C, the absorbance was measured at 765 nm on a Varian Cary 50 UV spectrophotometer (Varian Co., USA) and the data were reported as mg gallic acid equivalents (GAE)/100 fresh weight (fw).

Antioxidant activity

Radical scavenging activity was carried out using the DPPH (2,2-diphenyl-1-picrylhydrazil) assay. The methanolic extract (50 µL) was mixed with 3 mL of a 0.004% (v/v) DPPH methanolic solution. The mixture was allowed to stand in the dark for 30 min at room temperature and the absorbance was measured at 517 nm on a Varian Cary 50 UV-VIS spectrophotometer. The DPPH free radical scavenging ability was calculated in reference to Trolox (6-hydroxy-2,3,7,8-tetramethylchroman-2-carboxylic acid) which was used as standard reference. Results were expressed in mmol Trolox equivalents (TE)/100 g fresh weight (fw).

RESULTS AND DISCUSSION

Weight loss

Figure 1 shows the weight loss of control and treated fruits stored at 4-8^{o}C for 28 days. Weight loss of peaches significantly increased from 0 to 28 days of storage irrespective of the applied treatments. Maximum weight loss of fruits was recorded in untreated fruits (13.46%) and minimum was observed in 0.2% sorbic acid treated fruits (9.75%), followed by 0.2% benzoic acid treated fruits (10.12%). Weight loss of fruits is mainly due to transpiration, respiration and other metabolic activities (Kaur et al., 2019). Previous studies reported a decrease in physiological weight loss following sodium benzoate application on pear (Kaur et al., 2014) and 'Balanagar' custard apple fruits (Venkatram and Bhagwan, 2013) during cold storage.

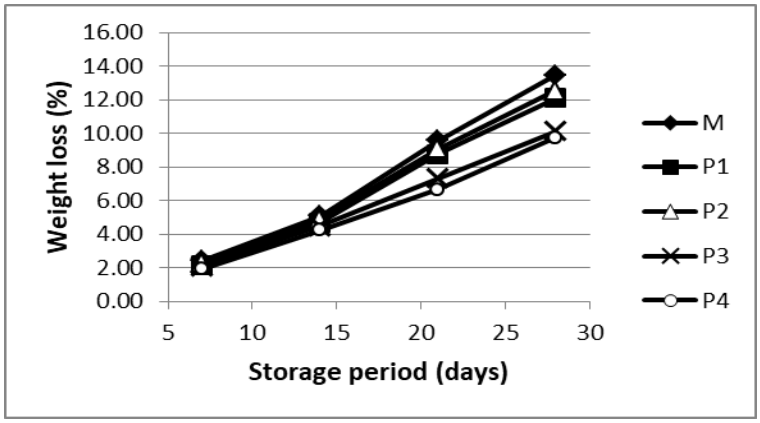

Figure 1. Variation in weight loss of peach fruits during cold storage (5-8^{o}C) in relation to postharvest treatments with different organic acids.

Total soluble solids

The results of total soluble solids (TSS) of peach fruits as affected by different treatments are shown in Figure 2. The initial TSS of fruits was 9.96%. At the end of the storage period, untreated fruits exhibited significantly higher mean TSS than treated fruits. During 28 days storage, the TSS values of peach fruits (M to P4) increased to 13.57, 12.24, 13.08, 12.33 and 12.48%, respectively. The increase in TSS during storage is mainly due to water loss, hydrolysis of starch and transformation of polysaccharides insoluble form to soluble sugars (Kaur et al.,

2019). Lower TSS of treated fruits as compared to control samples could be attributed to lower weight loss and reduction in metabolic activity of the samples.

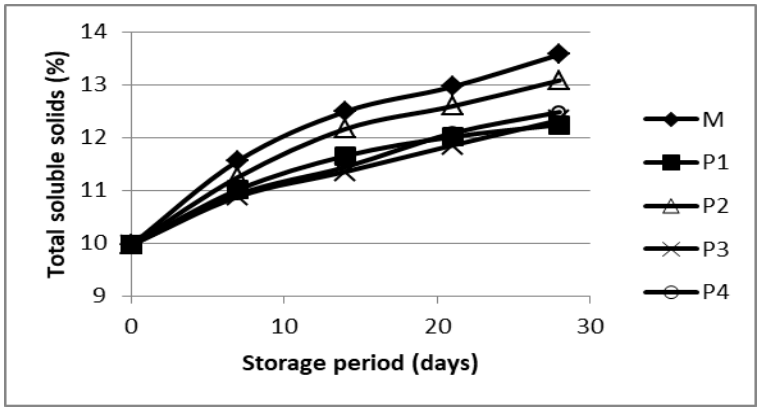

Figure 2. Variation of total soluble solids in peach fruits during cold storage (5-8^{o}C) in relation to postharvest treatments with different organic acids.

Titratable acidity

Titratable acidity averages generally decreased during the storage period as a result of the consumption of organic acids in respiratory process (Kaur et al., 2019). Miranda et al. (2019) also identified a decrease in titrable acidity of peaches during storage. In M and P2 samples, slight increases of the titratable acidity have been recorded, probably as a result of higher weight losses (Figure 3).

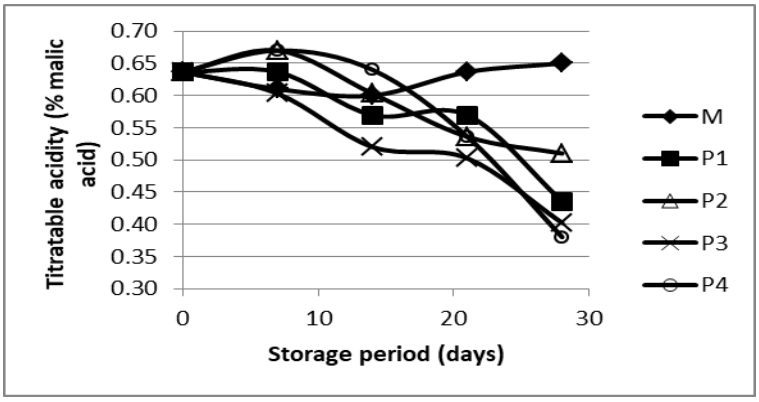

Figure 3. Variation of titratable acidity in peach fruits during cold temperature storage (5-8^{o}C) in relation to postharvest treatments with different organic acids.

Total phenolic content

Phenolics contents in peaches have been reported to vary from 28 to 111 mg GAE/100 g for white-fleshed and from 21 to 61 mg GAE/100 g for yellow-fleshed cultivars (Gil et al., 2002), while the Spanish cultivar 'Caterina' showed values of 240 and 470 mg/100 g for pulp and peel, respectively (Goristein et al., 2002). The

phenolics content of the untreated peaches was 103.36 mg GAE/100 g FW (Fig. 4) on day-0. Across treatments, the highest phenolic content was observed in 0.2% benzoic acid treated samples. The increase of total phenolics content during sorage may be attributed to water loss and to the role of ethylene in phenolic metabolism (Kaur et al., 2019).

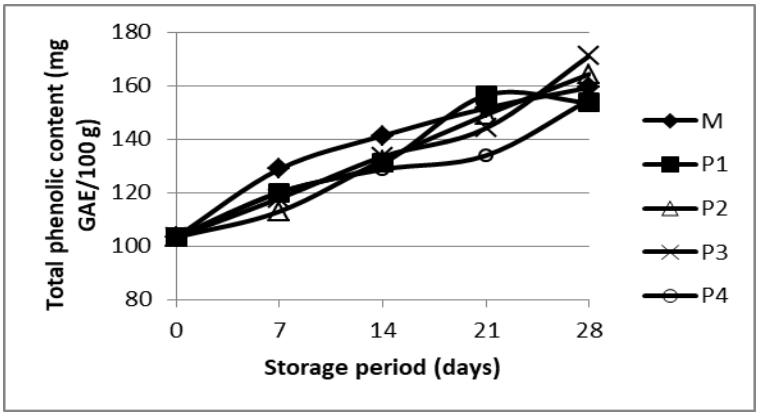

Figure 4. Variation of total phenolic content in peach fruits during cold storage (5-8^{o}C) in relation to postharvest treatments with different organic acids.

Antioxidant activity

Chemical treatment differentially affected antioxidant activity of peach fruits during 28 days of cold storage. A significant difference in antioxidant activity was observed among the treated and control samples. At the end of the storage period, DPPH antioxidant activity ranged from 0.30 an 0.55 mmol TE/100 g, with the lowest observed in control and the highest in 0.2% benzoic acid treated samples.

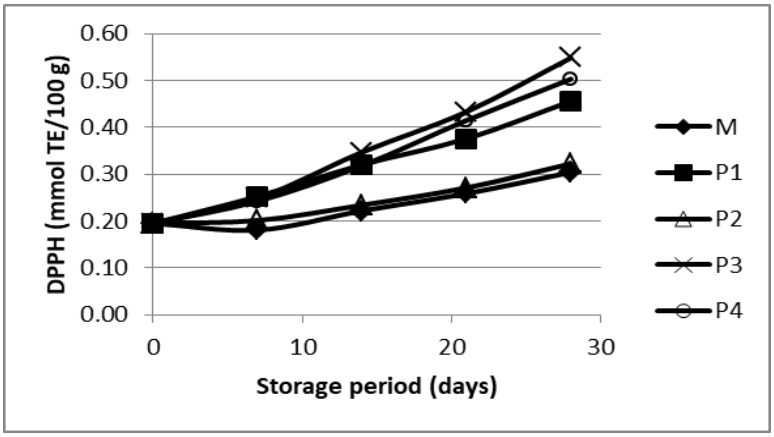

Figure 5. Variation of antioxidant activity in peach fruits during cold storage (5-8^{o}C) in relation to postharvest treatments with different organic acids.

CONCLUSIONS

Results showed that the dips of peach fruits in citric, benzoic and sorbic acid reduced weight loss of fruits during 28 days of cold storage. Titratable acidity decreased while total phenolics and antioxidant activity generally increased in all samples during storage. The treatment with 0.2% benzoic acid was found the most effective in maintaining physico-chemical attributes of pech fruits under low temperature storage.

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THE EFFECT OF CERTAIN PRESERVATIVE SUBSTANCES ON THE MICROORGANISMS FOUND ON THE FRUIT SURFACE

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Keywords*: peach, microorganisms, microbiological analysis, chemical preservatives*

ABSTRACT

Fruits and vegetables are considered vital to health as they are the supplier of vitamins, minerals, fiber and other phytochemicals essential for health. More and more consumers prefer a poorer diet in kilocalories and fats, the number of vegetarian people increasing in recent years. However, the consumption of unprocessed fruits and vegetables can have a negative effect through the onset of food infections. The surface of the fruits is populated with a diverse range of microorganisms that can come from their usual (autochthonous) microflora or can be inoculated during handling, storage. Immersion of fruits in certain preservatives can be a solution for long-term storage. The present study was carried out on peach fruits that were immersed in water and preservatives and subjected to microbiological analysis in five stages, every seven days, during which they were kept under refrigeration conditions.

INTRODUCTION

Fresh fruits have certain external protection barriers that do not allow microbial contamination. However, the richness of nutritional factors contained by the fruits represents a favorable environment and the explanation for the presence of a large variety of microorganisms represented by bacteria and fungi on the fruit bark. The main vectors involved in the fruit populating with microorganisms are air currents and soil insects such as *Drosophyla melanogaster* that inoculate the surface of fruits with G(-) bacteria such as *Pseudomonas, Erwinia, Lactobacillus*. (Ahvenainen, R. 1996, Lamikarna, O., 2000, Meng, J.H, 2002; Seema Rawat, 2015). A considerable source of the fruit contamination is the contact with the soil or with the manure stored compost. This way the fruits can be contaminated with pathogenic microorganisms such as: *Enterobacter, Staphylococcus, Shigella, Salmonella, E. coli O157: H7, Bacillus cereus,* and also with certain viruses (*type A hepatitis virus, rotaviruses, Norwalk disease virus*) (Atiqur Rahman Sarker, 2018; Zhao, T, 2001). Normal microflora on the fruits consists of molds (*Rhizopus, Aspergillus, Penicillium*) and yeasts (*Saccharomyces, Zygosaccharomyces, Hanseniaspora, Candida, Debaryomyces, Pichia*) (Corbo, M.R., 2000; McWatters, 2002; Palou, L., 2002).These microorganisms do not penetrate inside the fruit as long as their bark is healthy and intact. Any cuts that occur during post-harvest processing operations allow them to penetrate into the soft, weakly protected internal tissue (Marcia Leyva Salas, 2017).

MATERIAL AND METHODS

The experiment was carried out on peach fruits from the *Redhaven* variety purchased from the market, aiming for them to be at the stage of early maturity. After sorting on the basis of uniformity and size, 5 fruit batches were formed which were subjected to conservation treatments. For the microbiological analysis, a control batch was used that did not undergo any treatment but was kept under the same refrigeration conditions. The samples were scored as follows: M00 - untreated peaches; M - peaches dipped in distilled water for 5 minutes; P1 - peaches dipped for 5 minutes in 2% citric acid solution; P2 - immersed peaches for 5 minutes in 0.2% citric acid solution; P3 - immersed peaches for 5 minutes in 0.5% benzoic acid solution; P4 - Peaches dipped 5 minutes in 0.5% sorbic acid solution. The peaches were then allowed to drain for 10 minutes, after which they were refrigerated. Microbiological analysis was performed in five stages: immediately after washing with water and immersion in solution, after 7, 14, 21 and 28 days. The microbiological analysis of the peaches treated according to the above scheme was performed by the number of aerobic plates method. Thus, inoculation was carried out on the usual nutrient Agar environment using sterile swabs. Each wiping was made from 1 cm^2 in the equatorial plan. Every inoculated plate was kept in a thermostat for 48 hours at 30°C, the temperature allowing both bacteria and fungi to grow. After this process, the plates were analyzed by counting the number of developed colonies and their type. The microscopic examination allowed to establish the types of microorganisms that generated the colonies.

RESULTS AND DISCUSSIONS

The peach samples were analyzed and compared with the control sample (M00), which was not subject to any cleaning process, and with the (M) sample, that underwent a single washing treatment (water jet). It should be mentioned that within the analyzed samples there is a variability given by the origin of the fruits. However, the present study demonstrates whether starting from a certain microbial load, the application of preservation and storage treatments at the refrigeration temperature have a microbiostatic or microbicidal effect. Regarding the M00 sample, it was found that after the incubation period, on the surface of the environment were developed three colonies of mildew and a lawn appearance surface that covered the entire plate (photo 1). Analyzing the colonies and their appearance, we found a noticeable uniformity of the mildew colonies, which initially had a white mycelium, and as it ages, it becomes greyish colored. Under the microscope, fresh typical *Rhizopus* genus, *R.nigricans* species formations were observed. Widely spread in nature, in soil and on plant products, this species is the decaying agent of fruits and vegetables in storage units. Regarding the lawn appearance surface, it was found that it was developed by the G(-) bacteria of the *Pseudomonas* genus and G(+) bacteria of the *Bacillus* genus. After 7 days of refrigeration it was found that the G(-) bacteria, respectively those of the *Pseudomonas* genus did not develop anymore, but instead 5 colonies of mildew (*Rhizopus*), a colony of yeasts (*Saccharomyces*) and a G(+) bacteria and *Bacillus* colony developed (photo 2). The development of the yeast colony can be explained by the resistance of the spores to the refrigeration temperature and their germination in a favorable environment (nutritional and thermal conditions). It is worth noting that the grass aspect encountered in the initial phase has not been developed. After 14 days of chilling it was found that the same microorganisms are present, *Rhizopus* (1 colony), *Saccharomyces* (1 colony) and

Bacillus (2 colonies) – photo 3. It should be also noted that in the case of the mildew colony, the dimensions were smaller compared to those developed previously, which denotes the negative effect of the low temperature on the mildew. This effect is also observed in stage IV of microbiological analysis. In this case, two yeast colonies (*Saccharomyces*), 2 mildew colonies (*Rhizopus*) and a *Bacillus* colony (photo 4), smaller in size compared to those previously developed, were developed. After 28 days of refrigeration it is found that in the M00 sample only *Bacillus spp*. has survived and the resistant spores formed with very well developed turf (photo 5), typical for this genus. In conclusion, regarding the sample that did not undergo any refrigeration before eliminating the microorganisms, the refrigeration temperature exerted no microbicidal effect except on the G(-) bacteria and after 21 days on the yeasts and mildews.

Photo 1 Moo initial | Photo 2 Moo after 7 days | Photo 3 Moo after 14 days | Photo 4 Moo after 21 days | Photo 5 Moo after 28 days

The M sample was represented by peaches washed with water and exposed to the same conditions of storage. In this case it was found that initially, after washing the fruits with water, before refrigeration, on the surface of the fruits, a large number of microorganisms were isolated. After 48 hours of thermostatic conditions, a lawn appearance surface covered almost the entire environment as well. Medium-sized colonies, with slightly creased surface, was uniformly developing. Microscopic analysis revealed G(-) bacteria of the *Pseudomonas* genus that formed lawn surface typical of the genus, and G(+) bacteria of the *Bacillus* genus that formed isolated colonies subsequently covered by the lawn surface (photo 6). After 7 days of refrigeration there is a quantitative reduction of microorganisms, respectively a smaller number of colonies developed and a lawn surface developed only on the inoculation route (photo 7), qualitatively there being no differences in the sense that only *Pseudomonas* and *Bacillus* developed. After 14 days of refrigeration it was found the same reduction in the number of microorganisms, this time being able to count 10 colonies of *Bacillus* and weak lawn surface developed on the inoculation route, specific to the *Pseudomonas* genus (photo 8). After 21 days of refrigeration, 7 colonies of *Bacillus* developed and only on one inoculation route *Pseudomonas* did develop (photo 9). On this sample, after 28 days of refrigeration, only *Bacillus* colonies (photo10) were developed, their number being much reduced compared to the first stage of the microbiological analysis. In conclusion, in this case too, the only resistant microorganism was Bacillus. The longer presence of the *Pseudomonas* genus in refrigeration conditions, compared to the M00 sample, can be explained either by a higher initial load or by stimulating this bacterium as a result of immersing the fruit in water.

Photo 6 M initial | Photo 7 M- after 7 days | Photo 8 M-after 14 days | Photo 9 M - after 21 days | Photo 10 M -after 28 days

On the P1 sample, treated with 2% citric acid, it was found that initially a lawn surface was formed and covered the entire plate on the whole surface and two colonies covered and inhibited by it. Microscopic analysis revealed the same bacteria, respectively *Pseudomonas* in the case of turf and *Bacillus* in the case of colonies (photo 11). After 7 days of refrigeration there is no inhibition of the two bacteria (photo 12), however after 14 days of low temperature storage, *Pseudomonas* is completely inhibited, while *Bacillus* has developed a single colony (photo 13). After 21 days of refrigeration, a strong inhibition was observed even on the sporulated bacterium, respectively *Bacillus*, which developed only a single small colony (photo 14). Spores, resistant to low temperature, gradually adapted and, lacking another competing microflora, developed a giant colony after 28 days (photo 15), which proves that low temperature in conjunction with citric acid treatment had microbiostatic effect on the *Bacillus* genus from the peach surface.

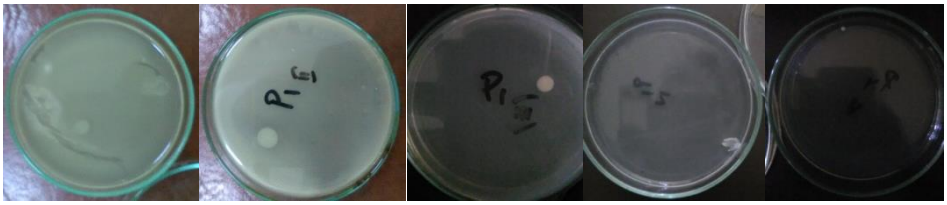

Photo 11 P1 initial | Photo 12 P1 after 7 days | Photo 13 P1 after 14 days | Photo 14 P1 after 21 days | Photo 15 P1 after 28 days

Regarding the P2 sample, it was found that initially the microbial load was similar to the one from P1, but after 48 hours developed a typical *Pseudomonas* lawn surface of the environment, and a single Bacillus colony (photo16). After 7 days of refrigeration, two types of lawn have developed, one typical for Bacillus and the other typical for *Pseudomonas* (photo 17) as well as two isolated colonies, but belonging also to the *Bacillus* genus. After 14 days, however, only *Bacillus* resisted, so it formed three typical colonies, without turf (photo 18), while *Pseudomonas* was completely inhibited. *Bacillus* spores developed under refrigeration conditions so that after 21 days they formed turf but also an isolated colony (photo 19). In this case, no changes were observed after 28 days (photo 20), which shows, as in the other samples, the good resistance of *Bacillus* spores at low temperatures. In conclusion, citric acid combined with low storage temperature had microbicidal effect on G(-) bacteria of the *Pseudomonas* genus, which was absent in both P1 and P2, but after 14 days of storage it is not possible to speak of a powerful antimicrobial effect of this acid.

Photo 16 P2 initial | Photo 17 P2 after 7 days | Photo 18 P2 after 14 days | Photo 19 P2 after 21 days | Photo 20 P2 after 28 days

The P3 sample were peaches treated with benzoic acid, after washing with water. Initially, in this case, two types of lawn surface were developed: one specific to the *Pseudomonas* genus and another specific to the *Bacillus* genus, as well as a mildew colony with all the characteristics previously described for *Rhizopus* (photo 21). After 7 days of refrigeration it was found that only *Bacillus* has withstood and formed a typical lawn surface (photo 22). Continued refrigeration led to a decrease in the number of germs so that after 14 days only few colonies developed (photo 23). These were confluent and covered about 10% of the surface of the environment. After 21 days of refrigeration, no colonies were developed (photo 24) but the low temperature along with benzoic acid treatment had a microbiostatic effect so that the resistant spores germinated and after 28 days they formed a giant colony typical of the *Bacillus* genus (photo 25). It is worth mentioning the decrease in the number of germs, registered after 21 days. In the case of this sample, it is found that benzoic acid, in conjunction with the low temperature, had a strong microbicidal effect on the mildew of the *Rhizopus* genus but also on the G(-) bacteria of the *Pseudomonas* genus that were inhibited after 7 days of refrigeration. The fact that these microorganisms did not survive the treatment is demonstrated by their absence on the surface of the fruits, throughout the period of the determinations.

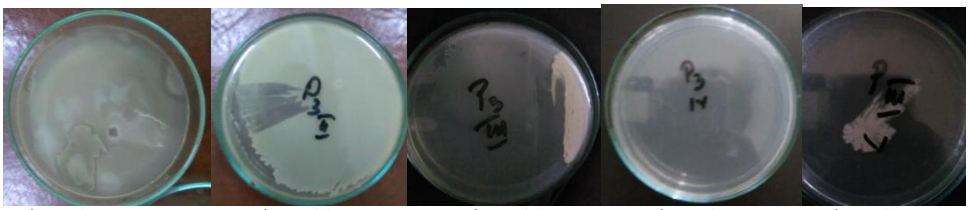

Photo 21 P3 initial | Photo 22 P3 after 7 days | Photo 23 P3 after 14 days | Photo 24 P3 after 21 days | Photo 25 P3 after 28 days

The P4 sample was represented by peaches treated with sorbic acid and in this case it is found that after 48 hours of keeping it at 30℃, in the first stage of the determination, bacteria were isolated from the *Pseudomonas* genus (turf) and *Bacillus* (colony) – photo 26. After 7 days of refrigeration it was noticed the appearance of a *Bacillus* colony and confluent colonies on the inoculation route, specific to the *Pseudomonas* genus (photo 27). The low temperature could not inhibit *Bacillus* spores which after 14 days developed a typical lawn surface that covered almost the entire environment (photo 28). After 21 days of refrigeration, in the fourth stage of the microbiological analysis, it was noticed the development of 7 colonies generated by *Bacillus* spp., their size being smaller compared to the previous stages (photo 29). The reduction of the number of spores, resistant to refrigeration,

continued so that after 28 days, a single colony developed on the surface of the environment. It is thus found that sorbic acid had inhibitory effect on bacteria of the genus *Pseudomonas*, but slightly weaker than benzoic acid (photo 30).Table 1 summarizes the evolution of microorganisms during storage at the refrigeration temperature of the 4 samples of peaches treated with preservatives, as well as those of the control.

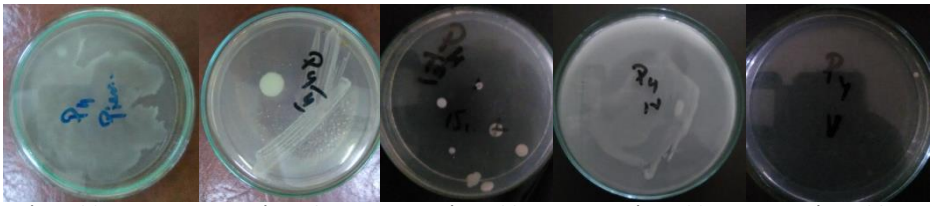

Photo 26 P3 initial | Photo 27 P3 after 7 days | Photo 28 P3 after 14 days | Photo 29 P3 after 21 days | Photo 30 P3 after 28 days

Table 1.

Evolution of microorganisms present on the surface of the peach samples analyzed

Probe	Stage				
	Initial	After 7 days	After 14 days	After 21 days	After 28 days
M00	*Rhizopus* *Bacillus* *Pseudomonas*	*Rhizopus* *Bacillus* *Saccharomyces*	*Rhizopus* *Bacillus* *Saccharomyces*	*Rhizopus* *Bacillus* *Saccharomyces*	*Bacillus*
M	*Bacillus* *Pseudomonas*	*Bacillus* *Pseudomonas*	*Bacillus* *Pseudomonas*	*Bacillus* *Pseudomonas*	*Bacillus*
P1	*Bacillus* *Pseudomonas*	*Bacillus* *Pseudomonas*	*Bacillus*	*Bacillus*	*Bacillus*
P2	*Bacillus* *Pseudomonas*	*Bacillus* *Pseudomonas*	*Bacillus*	*Bacillus*	*Bacillus*
P3	*Rhizopus* *Bacillus* *Pseudomonas*	*Bacillus*	*Bacillus*	*Bacillus*	*Bacillus*
P4	*Bacillus* *Pseudomonas*	*Bacillus* *Pseudomonas*	*Bacillus*	*Bacillus*	*Bacillus*

CONCLUSIONS

1. Fresh fruits are also a rich source of carbohydrates, vitamins and mineral salts necessary for healthy human nutrition, but at the same time they are a favorable development environment for all categories of microorganisms: viruses, bacteria, fungi.
2. Fruit microflora can be grouped into epiphytic (fruit-specific) microflora and associated microflora, which is responsible for fruit alteration, and that can lead to up to 20% losses of the global production.
3. Bacteria such as *Pseudomonas* genus, *Bacillus*, as well as fungi of the *Rhizopus* genus and *Saccharomyces*, were isolated from the surface of peach fruits that were not subjected to any cleaning process. Keeping these fruits under refrigeration conditions has led to the inhibition of some microorganisms, the only ones that have been resistant are the sporulated bacteria of the *Bacillus* genus.

4. Washing only with water did not lead to a considerable elimination of the microorganisms, the mildews were removed, but the G(-) bacteria persisted on the surface of the fruit, being inhibited under refrigeration conditions after 21 days.

5. The usage of preservatives, in conjunction with the action of the low temperature has lead to a considerable decrease of the number of microorganisms, as well as to the destruction of the least resistant ones (fungi).

6. The spores *Bacillus* spp. show a high resistance to the action of the conservation agents and also to the low temperature, so that after 28 days they are still viable and can generate colonies on the culture environment.

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THE VOCATION FOR A QUALITY VITICULTURE IN OLTENIA IS NOT ENOUGH REVALUATED

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Keywords*: area, grapes, DPH*

ABSTRACT

Upon the ground of the scientific researches performed during a long period of time the vocation for quality owned by the Oltenian vineyards is pointed out as well as the contribution they might be able to provide among the assets of the national viticultural patrimony. The modalities through which the Oltenian viticulture could be reconstructed are outlined.

INTRODUCTION

Oltenian vineyards do stand among the most ancient ones from this part of Europe. A lot of viticultural areas from Oltenia do offer insofar climate and paedology are concerned many assets due to which throughout the flown time many plots from this part of our country had once become famous in virtue of the red, aromatic and white wines of a high quality which had respectively been obtained upon them. Oltenian viticulture has pemanently represented about 20-30% of the national viticultural patrimony. Throughout time the culture of this plant has indeed encountered a lot of vicissitudes but it has always succeeded in overcoming them. The most recent among such vicissitudes has been constituted by the political events which have occurred in 1989 when a new modality of production had been adopted due to which the structure of the chosen vine sorts had been modified and the areas dedicated to this culture as well as their obtained outputs had even come to be respectively reduced. In the present work we are spotting some issues related to the vocation for quality owned by the Oltenian vineyards, to the current status of this patrimony and to the actions which ought to be taken in view of the reconstruction of the Oltenian viticulture so that the truly convenient outputs could be ensured.

MATERIAL AND METHODS

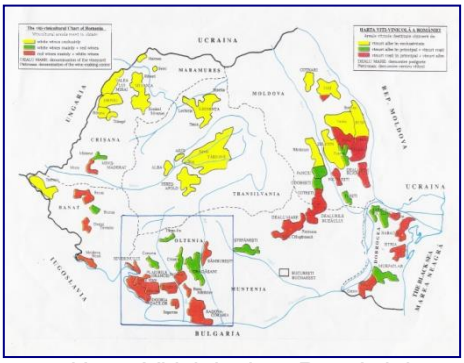
In order to realize the proposed strategy we have relied upon the scientific studies performed throughout the flown time in what does concern: the acknowledgement of the statute of Oltenian viticultural areas as being the abode of viticulture itself, the chosen structure of the vine sorts cultivated upon them, the physical structure of their viticultural plantations and the quality of the harvests which have been obtained throughout time.

RESULTS AND DISCUSSIONS

1. Viticultural areas from Oltenia acknowledged as being the abode of viticulture itself

The observations, researches and studies performed during the flown time in Romania have pointed out the fact that *Vitis vinifera ssp. Sylvestris* is usually present in the water meadows of wide rivers as well as in the hill-shaped and mountainous zones which do exist in almost all of the historical regions of our country: Moldova, Muntenia, Oltenia, Banat, Crişana and less in Transylvania. (Emil Pop, 1931, Teodorescu C.I., 1939, Iacob M. and coll., 1997, Popa A. and coll. 2010).

Vitis Sylvestris (Gmel) în România
(după E.Pop)



Harta Vitivinicolă a României
(după Macici M.)

In Romania the dissemination area of *Vitis vinifera ssp. Sylvestris* does superpose itself to the one of *Vitis vinifera Linné*. Yet this latter does exceed it in latitude and altitude due to the highly selective culture made of it (Teodorescu Şt. and coll., 1987, Popa A. and coll., 2007, 2008). Specialized literature does remark the fact that *Vitis vinifera ssp. Sylvestris* does exist in 30 localities; the first images below have been realized in 1967 by Professor I.C. Teodorescu and Eng. Cristian Vladu, PhD at Peştişani, Gorj.

Vitis vinifera ssp. Sylvestris
(Vânju Mare-Stârmina, 2007)

Vitis vinifera ssp. sylvestris-butuc
(Cetate, Dolj)

Table A

Geographical elements and climate features of the 11 locations where in 2008 have been identified some *Vitis Vinifera ssp. Sylvestris* plants

Nr.	Locality	Geographical elements			Climate features					
		Longitude	Latitude	Altitude	Average annual temperature (^{0}C)	Absolute maximum temperature (^{0}C)	Absolute minimum temperature (^{0}C)	Annual sum of active temperatures (^{0}C)	Annual duration of sun brightness (h)	Annual amount of precipitations (mm)
1.	Domogled-Caraş Severin	26^{0}20'E	42^{0}52'N	70	11,0	42,1	-23,0	3209	2352	661
2.	Băile Herculane	23^{0}20'E	42^{0}52'N	70	11,0	42,1	-23,0	3209	2352	661
3.	Cetate-Dolj	22^{0}50'E	44^{0}55'N	80	11,0	41,5	-30,0	3398	2486	625
4.	Vânju Mare-Stârmina	22^{0}50'E	44^{0}55'N	86	11,2	42,2	-29,2	3388	2457	634
5.	Craiova-Bucovăţ	23^{0}52'E	44^{0}14'N	192	10,9	40,5	-36,4	3403	2354	522
6.	Şerbăneasa-Vâlcea	24^{0}22'E	45^{0}06'N	237	10,2	40,6	-27,0	3173	2281	705
7.	Pădurea Cetăţuia-Rm. Vâlcea	24^{0}22'E	45^{0}06'N	237	10,2	40,6	-27,0	3173	2281	705
8.	Tismana-Gorj	22^{0}55'E	45^{0}04'N	312	9,3	39,2	-23,2	3325	2279	754
9.	Rm. Vâlcea	24^{0}22'E	45^{0}06'N	237	10,2	40,6	-27,0	3173	2281	705
10.	Olămeşti-Vâlcea	24^{0}15'E	45^{0}12'N	450	10,4	39,0	-20,0	3214	2293	725
11.	Cozia-Vâlcea	24^{0}22'E	45^{0}18'N	1577	9,0	29,6	-23,6	3040	2174	728

Since 2007 we have identified the presence of *Vitis vinifera ssp. Sylvestris* and have begun its study in 11 areas from Oltenia-Romania. We have presented in table A their respective geographical coordinates and climate features.

It has been ascertained as a fact that the areas where *Vitis vinifera ssp. Sylvestris* is present are situated at altitudes which do stand between 70m (Domogled and Băile Herculane) and 1577 m (Cozia-Vâlcea). These areas do benefit from a continental temperate climate submitted to some Mediterranean influences. The average annual temperature does oscillate between 9^0C (Cozia-Vâlcea) and $11,2^0$C (Vânju Mare-Stârmina). The absolute maximum temperature does oscillate between $29,6^0$C (Cozia-Vâlcea) and $42,2^0$C (Vânju Mare-Stârmina) while the absolute minimum temperature does oscillate between -20^0C (Olăneşti-Vâlcea) and $-36,4^0$C (Craiova-Bucovăţ). We do have to precise the fact that usually the absolute maxima temperatures are to be recorded for once every 7-8 years while the absolute minima temperatures are to be recorded for once every 10-15 years. The annual sum of the active temperatures (of more than $+10^0$C) is a considerable one and it is a sufficient one for the accomplishment with good outputs of the growth and fruit-bearing processes for vine. A great duration of sun brightness is to be recorded (one among the greatest which do occur in Romania) which is indeed adequate for the accomplishment under favourable circumstances of the delicate process of photo-synthesis. Precipitations are not abundant ones yet they are enough supply for the requirements of vine. In Oltenia the *Vitis vinifera ssp. Sylvestris* does usually live in a symbiosis with the sweet chestnut tree, the almond tree, the fig tree or either with the *Fagus aylvatica, Alunus glutinosa, Robinia pseudoacacia, Quercus species* etc. The vine plants which we have identified at Vânju Mare – Stârmina and at Cetate-Dolj do present some impressive dimensions – their aggregate of leaves does respectively cover indeed the crown of the trees with which they are living in symbiosis. At Domogled-Caraş Severin it does exist under the form of homogeneous populations grouped upon a small area. The identified vine plants are easy to spot due to their obvious morphological features (leaf and grapes). Generally its grapes are smaller, they have different colours, they are rather rare upon the cluster and their ripening is not an uniform one.

The current presence of *Vitis vinifera ssp. Sylvestris* in Oltenia does stand as a strong evidence for the long lasting existence of this plant upon these counties – especially due to the climate circumstances which are offered to it here – and most of all it does explain the empirical improvements through natural ways that the local inhabitants have tried upon it for thousands of years long thereby reaching for the local and autochthonous vine kinds that we are aware of nowadays.

1. Oltenia does have its own kinds of vine

Until the disaster caused by the phylloxera upon the Oltenian viticultural areas had been exclusively cultivated the autochthonous kinds of vine: Braghină, Crâmpoşie, Gordan, Tămâioasă, Fetească albă, Negru vârtos (Corb), Negru moale (Seina), Vulpea as well as the indigenous (local) ones such as: Berbecel, Românie, Slăviţă, Teişor. Upon the grounds provided by these kinds and taking thousands of years to create them the Oltenian practitioners of viticulture have come to shape some vine sorts which are impossible to reproduce in our own days and from which they had once obtained wines that were able to render famous many among our vine plots in virtue of their intrinsic qualities. The white wines which were unique indeed through their composition assets and their sensitive features had usually been obtained from the famous sort of kinds made of : Crâmpoşie, Gordan, Braghină 30%,

Tămâioasă 10% while the red wines (especially the ones from Oreviţa and Golul Drâncii) had been obtained from: Negru vârtos (Corb) 30%, Negru moale (Seina) 30%, Berbecel (Aurel) 10% to which sometimes Vulpea did come to be added. After the disaster caused by the phylloxera some actions have been taken in view of restoring the vine plantations from Oltenia. Due to them only the autochthonous kinds of vine have been chosen for cultivation: Crâmpoşie, Fetească albă and Tămâioasă românească to which after 1900 have been joined the (still autochthonous) kinds of Fetească regală (Dănăşană), Fetească Neagră and Tămâioasă *rosé*. A lot of European kinds are as well chosen for cultivation some among which have indeed found here a new home:Cabernet Sauvignon, Merlot, Sauvignon, Pinot noir, Italian Riesling. After 1972 the scientific researchers from the Station for pentru Viticulture and Oenology of Drăgăşani do indeed offer us a new endowment through their valuable creations: selected Crâmpoşie, Cabernet Sauvignon 7, Victoria, Tămâioasă Românească 104, Novac, Negru de Drăgăşani, Azur, Călina. During the recent years in Oltenia have also been inserted into cultivation the kinds of: Pinot Gris, Chardonnay, Syrah, Cabernet Franc etc.

Throughout time it is the wines obtained from the autochthonous and local kinds of vine which have ensured the distinct identity of the Romanian viticulture. Today when our country does belong to the European community its viticulture is joining the unity through diversity concept. In view of preserving the uniqueness of our viticultural identity it is necessary for us to ground our strategy mostly upon the cultivation of the autochthonous kinds of vine – including the one of the newly created kinds – to which we should add the foreign kinds about which the fact is proven that they do indeed prefer the paedological and climate circumstances that they do find in our country. Upon the grounds constituted by all of these kinds of vine we should outline for each of our viticultural areas the precise types of wine which – due to their intrinsic compositional assets as well as to their sensitive qualities – could dispose of the unique touch of authenticity which could in no way be realized somewhere else in the viticultural world.

3. Structure of the Oltenian viticultural patrimony, obtained harvests, quality of resulted wines

The surfaces cultivated with vine in our country had always been considerable – throughout time Romania has always been situated among the former 5-7 upside positions in the world. Before the disaster caused by the phylloxera in 1884 at the level reached for in 1880 the Ancient Kingdom had 137176 ha cultivated with vine.

After the Romanian space had been completed it was a natural consequence that the viticultural surfaces should be amplified – especially during the period from 1927 till 1939 when the rythm carried on by the planting process had reached to its maximum with 369041 ha planted with vine in 1939. Yet unfortunately during this period our viticultural areas have increased their surface mostly due to the planting of directly productive hybrids. In 2000 the viticultural surface was in our country of 236432 ha. Until 2007 (when Romania has joined the EU) the viticultural surface had decreased to 181198 ha and as a further consequence of the actions taken in view of modernizing the country it has remained practically the same until 2018 with its 182825 ha.

Table 1

Oltenian viticultural surfaces throughout time (ha)

Viticultural area	Year						
	1880	1927*	1933*	1939*	2000	2007	2018
Total of the national viticultural patrimony (Romania)	137176	269674	328417	369041	236432	181198	182825
Dolj	9113	5847	10705	12902	14602	11098	12343
Gorj	7360	1072	2609	4294	4640	3880	3754
Mehedinţi	4146	3826	7763	9898	7637	5274	4802
Olt	8246	6149	9134	10746	7566	7273	7150
Vâlcea	12300	9720	11613	8141	5033	3634	3928
Total for Oltenia	41165	26614	41824	45981	39478	31159	31977
Proportion of Oltenian viticultural surfaces in the national patrimony (%)	30	10	12,7	12,5	16,7	17,2	17,5

* The Great Romania (Ancient Kingdom, Basarabia, Transylvania, Bucovina

During the same period in Oltenia the surface cultivated with vine does oscillate between 26614 ha (1927) and 45981 ha (1939). Today 31977 ha of vine may be found in this province. In 1880 the Oltenian viticulture did represent 30% of the viticultural patrimony held by the Ancient Kingdom. Yet afterwards and till our own days the Oltenian viticulture did represent a variable percentage of the national viticultural patrimony which did fluctuate between 10% (1927) and 17,5% (2018). In Table 2 is presented the structure of the viticultural plantations from Oltenia (noble vines and d.p.h.) for the period from 1880 till the present day (2018).

Table 2

Structure of Oltenian viticultural plantations throughout time (ha)

Area	Year							
	1880		1927		1933		2018	
	Noble vines	DP H	Noble vines	DPH	Noble vines	DPH	Noble vines	DPH
Dolj	9113	-	3872	2407	5000	5705	4300	8044
Gorj	7360	-	392	794	689	1920	5	3749
Mehedinţi	4146	-	1312	2676	1103	5986	976	3826
Olt	8246	-	1169	873	5549	3574	1690	5461
Vâlcea	13300	-	8952	1037	8404	587	2168	1760
Oltenia	41165	-	7953	7787	20745	17772	9139	22840
Total	41165	-	8582,3		38517		31979	
% of noble vines and of D.P.H.	100	-	50,52	49,48	53,85	46,15	28,36	71,64

Until the disaster caused by the phylloxera the whole of the Oltenian viticultural patrimony (41165 ha) had only been composed of indigenous and noble kinds of vine standing upon their own roots. After the disaster caused by the phylloxera the d.p.h. have appeared. Until now their extent did oscillate between 46,15% (1933) and 71,64% (2018). As a consequence the wines obtained by both the state and the viticultural practitioners are all of them - openly speaking - a real mess.

Should we analyze the current structure of the Oltenian viticultural patrimony, the obtained harvests and the quality of the resulted wines we would be constrained to ascertain the fact that from the existing total of 31977,95 ha only 9138,73 ha are occupied by noble kinds which are officially recommended and authorized. Or this does represent 29% of the total surface and the rest of it is occupied by the d.p.h. that is to say 71% of the same total surface. For the noble kinds the ones for white grapes do represent 94% while the black kinds for red wines do hold only 6% and this fact does occur in a viticultural region which does indeed own a great vocation for obtaining high quality red wines.

In our days the Oltenian viticultural plantations composed of noble kinds do indeed provide as raw material grapes from which could be obtained the respective percentages of: 73,6% of pure kind wines and of their mixed variants, 19% of wines that do bear a geographical indication and 7,6% of wines that do own a controlled origin denomination as well as quality degrees. In our days the grape kinds destined for a fresh consumption do scarcely occupy 1,15% only (3685 ha) from the total Oltenian viticultural surface (of 31978 ha).

As a consequence in 2018 – which has been a favourable viticultural year – from the Oltenian viticultural surfaces occupied by noble kinds (9136 ha) have been obtained 159472 hl of wine so the output has been the one of 17,4 hl/ha – which does not ensure a minimal profitability. In the same year have been obtained 114722 hl of white wines (71,9%), 6221 hl of *rosé* wines (3,9%) and 38750 hl of red wines (24%). Insofar the quality categories are concerned the recorded data have been: 115696 hl of pure kind wines and of wines issued from mixed varieties (72,1%); 26908 hl of wines that do bear a geographical indication (16,9%) and 17432 hl of wines that do own a controlled origin denomination as well as quality degrees (10,9%). Therefore it is our opinion that within a viticultural area which does indeed own a great vocation for obtaining high quality red wines the current respectively obtained quantities of wines which do pertain to the superior degrees of quality (IG and DOC) are not enough and ought have been larger. In the same year 2018 the wine production obtained from the grapes of the plantations of directly productive hybrids has risen to 288843 hl that is to say larger by 129373 hl than the total quantity of the noble wines. Insofar colours are concerned the wines issued from directly productive hybrids are white in a ratio of 31,5% and red in a ratio of 68,5%. Here we are due to ascertain the fact that the individual viticultural practitioners who had reconstructed their own plantations after the disaster caused by the phylloxera have preserved their initial choice of the red wines. We are also due to remark the fact that within the wine production issued from the directly productive hybrids 283004 hl of wine (98%) has been obtained from inter-specific hybrids while only 5869 hl (2%) has been obtained from prohibited grapes issued from directly productive hybrids.

Table 3

Surface and structure of Oltenian viticultural plantations in 2018

Department	Total surface (ha)	Of which D.P.H. (ha)		Of which noble kinds (ha)		Total	Of which noble kinds upon quality categories (ha)			Table grapes	
		Ha	%	White	Red		V+VV	IG	DOC	Ha	%
Dolj	12343,95	7996	64,77	4223	77	4300	2762,8	1373	164,2	25	0,2
Gorj	3754	3749	99,86	5	-	5	5	-	-	-	-
Mehedinţi	4801,76	3535,19	73,62	738	238	976	374,34	306,34	295,59	101	2,1
Olt	7150,53	5297,97	74,09	1560,73	129	1689,73	1425,17	59,02	205,54	83,50	1,16
Vâlcea	3927,71	1683	42,84	2063	105	2168	2136,89	-	31,11	159	4,04
Total	31977,95	22261,16	69,61	8589	549	9139	6704,2	1738,36	696,44	368,5	1,15
%	100	-	69,5	94	6	29	73,6	19	7,6	-	1,15

Table 4

Production of noble wines in Oltenia – 2018

Department	Total (hl)	Of which											
		White wine (hl)				*Rosé* wine (hl)				Red wine (hl)			
		Total	V	IG	DOC	Total	V	IG	DOC	Total	V	IG	DOC
Dolj	16676	6012	368	3405	2239	5273	4911	-	320	5433	2970	1843	620
Gorj	-	-	-	-	-	-	-	-	-	-	-	-	-
Mehedinţi	31848	14458,5	558,1	8542,8	5357,6	697	-	-	697	16692,7	302	11252,7	5138
Olt	39977	30884	28886	567	1431	-	-	-	-	9093	6736	732	1625
Vâlcea	70971	63368	63361,9	-	6,1	251	251	-	-	7352	7352	-	-
Total	159472	114722,5	93174	13081,6	9033,7	6221	5162	-	1017	38570,7	17360	13827,7	7383
%	100	71,9	81,2	11,4	7,8	3,9	82,9	-	16,3	24	45	35,8	19,1

DOC – high quality wines that do own a controlled origin denomination: 17432 hl (10,9%)
IG – wines that do bear a geographical indication: 26908 hl (16,9%)
V – wines: 115696 hl (72,2)

We also have to remark the fact that the wines issued from directly productive hybrids are not explicitly prohibited from human consumption but instead it could not be traded – so that it could only be the object of its producer's consumption at home as well as the one of an exchange of products which might occur among the individual viticultural practitioners. However the illicit sale-purchase of such wines could eventually in no way be excluded. The current output in wine of the grapes'harvest issued from directly productive hybrids is the one of 12,6 hl/ha. Therefore from the total surface of 22840 ha occupied by the directly productive hybrids only 288843 hl of wine are obtained. Or this is indeed a small output (12,6 hl/ha) – and this goes furthermore for a product which by itself does ensure no prosperity at all to the individual viticultural practitioners and which does as well constitute a serious handicap insofar the practice of trading wines in Romania might be concerned.

The fact is obvious that in Oltenia its effectively existing vocation for a sustainable viticultural practice is not revaluated enough as it ought to be since in Oltenia the areas which do obviously own an intrinsic viticultural potential are simultaneously numerous and considerably extensive. From the Danube to the Parâng Mountains, from the majestic „Iron Gates" of the Danube to the crossing of the river Olt and even further on a multitude of micro-climate variants are to be found which are all of them preferred by the vine plant and wherefrom may be obtained all of the possible types of wines (white, aromatic, red, *rosé*, dry, demi-dry or sweet wines, aged distillations of wines etc.) but as well table grapes of the best possible quality.

All of the necessary knowledge required for the reconstruction of viticulture in Oltenia are ready at our hands and fortunately we do as well dispose of several means which do pertain to the organisational and financial spheres (in spite of the fact that they are rather insufficient). During the next 10-15 years it is necessary for us to modify the structure of the vine plantations by cultivating some high quality kinds should they be either autochthonous ones or foreign ones as well as to increase the surfaces of the plantations occupied with noble kinds should they be white or either especially black ones. We ought simultaneously to reduce the surfaces of the plantations that are currently occupied by the directly productive hybrids. It is the right time for the output in wine of a hectare of viticultural plantation to reach for a minimum level of 30 hl/ha so that a certain profitability could be awaited for – should it even be a minimal one. Should we take the above mentioned actions only until 2030 the Oltenian viticulture could be able to occupy the same extension of surface as it does in our present days (31978 ha) but the revaluation degree of the viticultural potential would be a convenient one insofar the matter of quality might be concerned but as well insofar the issue of its required profitability might be involved.

Therefore the Oltenian viticultural surface should remain the same as it is now (31978 ha) but the surface of the plantations occupied with noble kinds could be able to reach for the level of 20854 ha (65%) while the one held by the directly productive hybrids could decrease to 11133 ha (35%). Among the noble kinds the proportion between the white kinds (8588 ha) and the black ones (8416 ha) should be improved so that the black kinds would come to represent 26,3% and the white ones 27% while the table grapes should be obtained from 12% of the whole viticultural surface of Oltenia.

Table 5

Wine production issued from D.P.H. in Oltenia – 2018

Department	Of which											
	Wine issued from D.P.H. (hl)				Wine issued from inter-specific hybrids (hl)				Wine issued from prohibited hybrids (hl)			
	Total (hl)	White	*Rosé*	Roşu	Total (hl)	White	*Rosé*	Red	Total (hl)	White	*Rosé*	Red
Dolj	62369	19937	-	42432	60700	18652	-	42048	1669	1285	-	384
Gorj	54170	36830	-	17340	54170	36830	-	17340	-	-	-	-
Mehedinţi	88424	1885	-	78539	80424	1885	-	78539	-	-	-	-
Olt	87680	28100	-	59580	87680	28100	-	59580	-	-	-	-
Vâlcea	4200	4210	-	-	-	-	-	-	4200	4200	-	-
Total	288843	90952	-	197891	283004	85497	-	197507	5869	5485	-	384
%	100	31,5	-	68,5	100	30,2	-	69,8	100	93,5	-	6,6

Table 6

Oltenian viticultural surfaces, productions of wine and of table grapes which could be obtained in the perspective of 2030 as consequences of: improving the structure of vine plantations through chosen directions for production, reducing by 50% the areas occupied by D.P.H. and reaching for a minimum wine output of 30 hl/ha

Department	Surface ultivated with vine (ha)	Of which						% of D.P.H. from total surface	Total for noble wines (hl)	Noble wines upon quality categories (hl)			Quantity of table grapes (t)
		Noble white kinds (ha)	Noble black kinds (ha)	Kinds for table grapes (ha)	Total for noble kinds (ha)	DPH (ha)	% of noble black kinds			V+VV	IG	DOC	
Dolj	12344	3285	3569	1500	8354	3990	42	32	250620	125310	87717	37593	15000
Gorj	3754	1000	830	50	1880	1874	22	50	56400	28200	19740	8460	500
Mehedinţi	4802	800	1235	1000	3035	1767	41	37	91050	45525	31867	13657	10000
Olt	7151	1503	2000	1000	4503	2648	44	37	135090	67545	47281	20263	10000
Vâlcea	3928	2000	782	300	3082	846	25	21,5	92460	46230	32361	13869	3000
Total	31978	8588	8416	3850	20854	11133	35	35	625620	312810	218967	93843	38500
%	100	27	26,3	12	65	-	-	35	100	50	35	15	-

Consequently at the level of 2030 in Oltenia should be obtained 625620 hl of wine from which 312810 hl (50%) of pure wine and wine issued from some mixed varieties (V+VV), 218967 hl (35%) of wines that do bear a geographical indication (IG) and 93343 ha (15%) of wines that do own a controlled origin denomination as well as quality degrees (DOC). The plantations destined to table grapes should simultaneously produce a total amount of 38500 tons of grapes able to be revaluated in the terms of commodity production. Since the European Community does not at all support financially the reducing of the surfaces occupied by the directly productive hybrids and instead of them the planting of some noble kinds these actions to be taken ought to be the deeds of the Romanian state which ought to become aware of the fact that its viticulture is indeed a perpetual source of income which furthermore is going to be obtained from areas which could in no way be otherwise useful to some other agricultural cultivations than the one of vine.

CONCLUSIONS

Should we take into consideration the viticultural and wine-making potential of which Oltenia does indeed dispose and the vocation for quality usually held by its areas but as well the *de facto* status of its viticultural patrimony we would estimate as being necessary some decisive actions to be taken in view of restoring this highly valuable patrimony into the greatness it once had and of adequately connecting it to the current requirements which are issued by the actually functioning common market of wine.

1. The revision of the delimiting made upon the areas which are favourable for the cultivation of vine and - inside of them - the outlining of the precise plots which could indeed own a vocation for obtaining high quality wines bearing a controlled origin denomination;

2. Changes to be brought in the structure of the cultivated vine sorts in the sense of an equilibrium to be reached for in what does concern the existing proportions among on one side the white kinds and on the other side the black and aromatic kinds;

3. Until 2030 the reducing by 50% of the surfaces cultivated with directly productive hybrids. The Romanian state could take a decisive part in this achievement;

4. The appropriate applying of the specific technologies of vine cultivation so that the obtained harvests of grapes could ensure the realization of an output in liquid wine of at least 30 hl/ha;

5. The extension of the areas cultivated with vine kinds which do provide grapes destined to their consumption as fresh fruits;

6. The choice to be made of the predilect insertion into the cultivating process of the autochthonous kinds – should they be ancient ones or newly created;

7. For each of the Oltenian vineyards the shaping of the wine types which could be easily recognized as being issued from the respectively concerned unique viticultural area in virtue of their composition assets and of their sensitive qualities;

8. The modernizing of the actual press houses and the building of some new ones which could be able to offer the effective possibilities to control as well as to influe upon all of the technological elements which could indeed be decisive in what does concern the quality of wine ;

9. The association of individual viticultural practitioners in the frame of cooperatives through which they could benefit from the possibilities of respectively

applying some modern technologies for the cultivation of vine and more effectively revaluating their concerned productions of grapes and wine;

10. The building inside of this zone of one or two complex oenological plants the main objectives of which should be to process and to appropriately revaluate the side products issued from the wine-making process (marc of grapes, yeasts, grape'seeds) in view of obtaining fodder for the animals, alcohol destined to industrial use, tartric acid, oils, tannins, colouring substances etc.);

11. The creation of some uval stations where could be carried on the course of treatments with grapes and must;

12. At the level of each among the Romanian provinces the respective organizing of some periodical exhibitions, demonstrations and contests in what does concern grapes and wines.

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THE INFLUENCE OF OSMOSIS TREATMENT ON THE DRYING PROCESS OF APPLES

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Keywords*: osmosis, apple, hot air drying*

ABSTRACT

The main cause of perishability of fruits and vegetables is their high water content. Many methods or combination of methods were used in order to increase their shelf life, osmotic dehydration being one of them. In this study, cubes of 10 mm were cut from peeled apples and subjected to osmotic dehydration at 30°C and 50°C and over a range of 1 – 3 hours in two sugar based osmotic solutions (30% and 50%). The evolution of water activity (a_w), dry matter (DM) and total sugars parameters during osmotic dehydration of apple cubes were monitored. Fresh apple was considered control. It was found that osmosis pretreatment proved to be beneficial for the final characteristics of dried apple.

INTRODUCTION

Preserving food to extend its shelf-life, while ensuring its safety and quality, is a central preoccupation of the food industry sector (Yadav & Singh, 2014). Fruit preservation is the key to minimizing fruit deterioration, eradicating waste, loss of farm revenue, ensuring availability all year around, and providing safe, nutritive, and qualitative fruits or fruit products to the consumers (Akharume et al., 2018).

Drying is one of the most used preservation methods. It consists of the removal of a large portion of water from a product (Inyang et al., 2017), resulting from the simultaneous heat and mass transfer process due to the application of heat. It is widely applied in reducing the moisture content of vegetables, fruits, herbs, grains, spices, oil seeds, wood and other agricultural products with high moisture content (Onwude et al., 2016).

One way of producing dried fruits of good quality is to use a pretreatment, such as osmotic dehydration, able to reduce energy consumption and improve food quality (Mandala et al., 2005). Osmotic dehydration is a pretreatment process, which depends upon the phenomenon of diffusion of moisture from food materials by immersing in a hypertonic solution. It involves dehydration of fruit slices in two stages, removal of water using as an osmotic agent (osmotic concentration) and subsequent dehydration in a dryer where moisture content is further reduced to make the product shelf stable (Inyang et al., 2017). During the osmotic dehydration

process, fruits are placed in an osmotic solution of edible solute, usually an aqueous solution of sucrose, glucose, maltodextrin, corn syrup, sodium chloride, starch concentrates, fructose (Akharume et al., 2019).Osmotic dehydration is usually followed by other drying methods such as air drying, deep fat frying, freeze drying, etc. to produce better quality final product (Ahmed et al., 2016).

The purpose of this paper was the realization of a comparative analysis of several methods of drying apples, using various pretreatments that best preserve the qualities of apples.

MATERIAL AND METHODS

Sample preparation

Apples were purchased from a local supermarket. Samples were washed thoroughly, peeled and cut into cubes of 10 mm. The samples were then immersed in a citric acid solution (1%) for 5 minutes in order to prevent browning. Samples were gently blotted with tissue paper to remove adhering surface solution.

Osmotic dehydration

Aqueous sugar solutions of required °Brix (30 and 50 °Brix) were used as osmotic dehydration media. Trials were conducted by keeping the solution temperatures (30°C și 50°C) with agitation of 90 rpm, method adapted after Bera & Roy (2015). After pre-treatment application, the samples were immersed into the osmotic solutions in Erlenmeyer flasks (1:4 (w/v), and maintained at constant temperature. Samples were removed from the solution at 1, 2 and 3 hours after immersion, drained and the excess of solution on the surface was removed using absorbent tissue paper. After 3 hours of osmotic dehydration, the samples were hot air dried at 60°C, for 24 h. As control samples, fresh apple (for the samples dehydrated by osmosis) and apple cubes dried in air, at room temperature (for the samples dehydrated by osmosis combined with hot air) were used.

Water activity index was determined using a water activity meter (Novasina), humidity was determined using a thermobalance (Precisa) and the level of sugar was measured as Brix° by a Krüss Refractometer. Ascorbic acid content was determined with HPLC – Agilent Technologies 1200 Series equipment, using an ZORBAX Eclipse XDB-C18 (4.6x50 mm, 1.8µm) column with Rapid Resolution HT and a detector UV-DAD detection wavelength 244 nm, reference wavelength off. As mobile phase was used a solution of 0.05% aqueous formic acid. The injection volume was 2 µl, with 4 min post time, flow rate at 0,5 ml/min at 30 °C in column compartment. The samples were analyzed in triplicate and were expressed in mg/100g.

RESULTS AND DISCUSSIONS

A decrease of aw was registered with the increasing concentration of the osmotic solution for both temperature conditions (Figure 1). The lowest value for a_w index was obtained for the apple samples maintained in the 50% sugar osmotic solution. Regarding the dry matter (%) of the analysed samples (Figure 1), it increased with the time of maintaining in osmotic solution and with the increasing concentration of the solution. This fact represent a high water loss which can be attributed to the large osmotic driving force between the fruit and the surrounding medium.

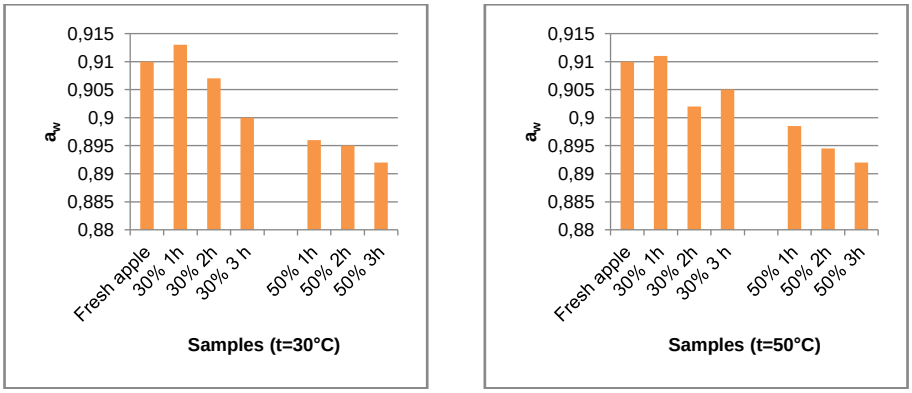


Figure 1. Graphical representation of a_w index for the analysed samples

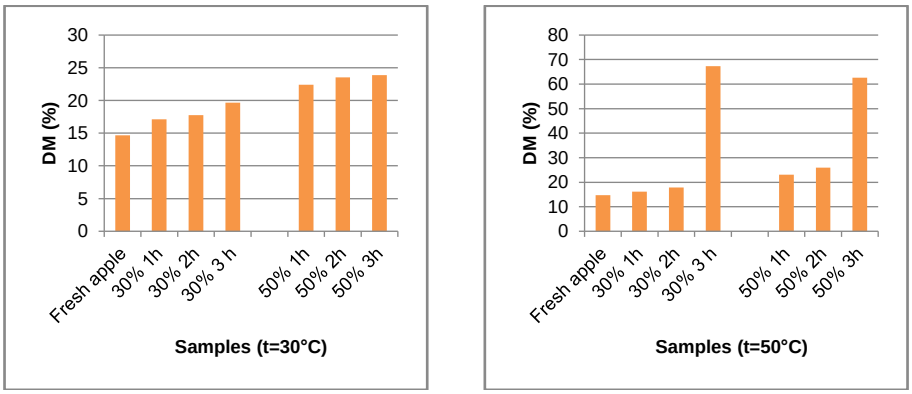


Figure 2. Graphical representation of DM for the analyzed samples

The level of sugar was measured as Brix°, and the results are presented in Figure 3. It was observed an increase in the value of sugar level directly proportional to the retention time in the osmotic solution, but also to the increase of its concentration. These results are in agreement with the results obtained from the determination of the dry matter of the analyzed samples.

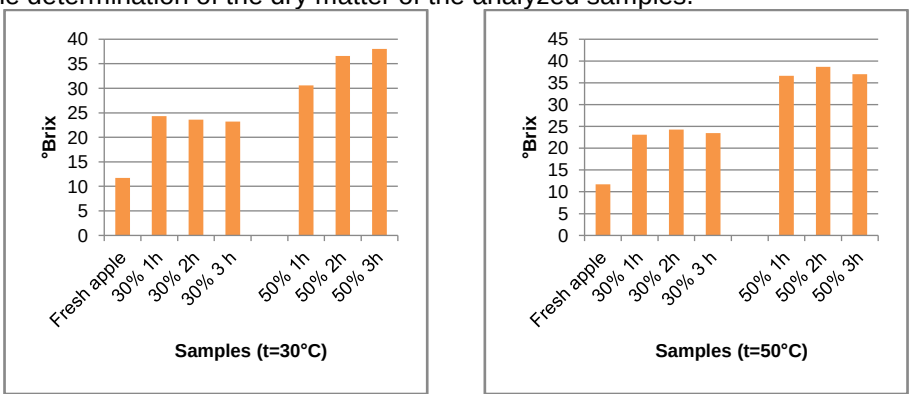


Figure 3. Graphical representation of °Brix for the analyzed samples

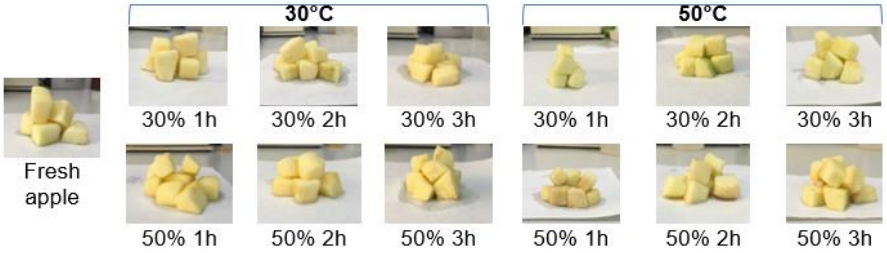
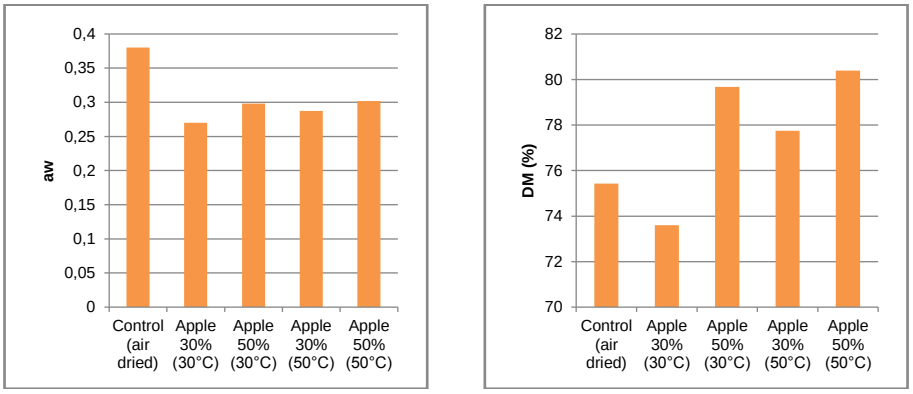


Figure 4. Appearance of apples after treatment with osmotic solution of concentration 30% and 50%, at the temperature of 30°C and 50°C

The samples pretreated with osmosis and hot air dried (at 60 °C) had similar values of water activity (Figure 5a). The values recorded for the samples treated with hot air were lower than the value obtained for the control sample (apple dried in air, at room temperature).



(a) (b)

Figure 5. Graphical representation of the values of a_w (a) and dry matter (b) of the dried apple samples

The dry matter content (Figure 5b) had values between 73% and 80%, these values the being directly proportional to the concentration of the osmotic solution but also to the temperature at which the osmosis pretreatment was performed.

Ascorbic acid content was reported to the dry matter of the samples. The highest value for ascorbic acid content (Figure 6) was obtained for the fresh apple sample. The processing using osmosis at 30 °C demonstrated to be beneficial in comparison with drying without any pretreatment (Control) regarding the ascorbic acid content.

The concentration of ascorbic acid for the other osmosis treated samples was influenced by the temperature of the immersion solution, the most drastic reduction being registered for the sample pretreated at 50 °C.

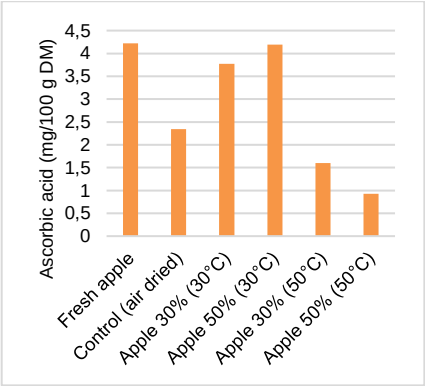


Figure 6. Ascorbic acid content of the analyzed samples

CONCLUSIONS

The samples pretreated by osmosis, showed an increase of the values of the water activity index and of the total dry matter, which was directly proportional with the increase of the retention time in the solution but also with the sugar concentration of the solution, compared with the control sample (fresh apple).

Osmosis represents an additional treatment in drying process, which is beneficial to the final product, regarding physical-chemical, sensorial and nutritional quality.

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STUDY OF PEDCLIMATIC FACTORS THAT CHARACTERIZE THE VITICOL AREA FROM CORCOVA- MEHEDINȚI

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Keywords: *soil, texture, vines*

ABSTRACT

Through the soil profile opened in the studied area, a typical eutricambosol, baticalcaric, formed on slope disintegration-alteration materials (deluvial-colluvial materials) consisting of medium-fine materials, with clay-sandy / clay-loam texture, with erosion was identified, with weak surface erosion.

INTRODUCTION

The studied perimeter is represented by a moderately inclined sloping field anthropically modeled by terracing between which a series of micro-depressions appear.

From a geomorphological point of view, the land is part of the unit of the Getic Piedmont, the subunit of the Piedmont hills of Coșușteі. It generally has a slightly undulating flat relief (with hillsides weak tilt that present a southern exposure) but which also has micro-depressions spread throughout the whole surface (Irimia L., 2012).

From a geological point of view, the area, which includes the land that is the subject of this study, is of Levantine and Dacian age, and the parent rock is represented by deposits of clays and clay consisting of medium - fine or fine materials (Toti M., 2015).

Climatically, the area is fits in the climatic province of temperate continental type with weak Mediterranean hue, with mild winters and cooler summers, with insufficient but uneven rainfall distributed throughout the vegetation period. According to the data recorded by the weather station Drobeta Turnu-Severin, the multiannual average temperature is 10.5 ^{o}C, the multiannual average precipitations have a value of 589 mm, the prevailing winds both in frequency and intensity are those of NV-V and NE. The weakest are from S-SV and N.

The pedoclimatic conditions, presented briefly, oriented the solification process towards the formation of dominant soils usually grouped in the class of cambisols generally represented by eutricambosoils and districtambosoils.

MATERIAL AND METHOD

Soil sampling: soil samples were collected on pedogenetic horizons in modified settlements and in natural settlements (Florea N., Canarache A., 1987).

• The collection of soil samples in a modified settlement, for the physical-chemical-biological characterization, was done in bags, on the thickness of 10-15 cm of each horizon or sub-horizon of the soil;

• Sampling in unmodified settlements for the characterization of the physical and hydrophysical properties was done in metal cylinders of known volume (100 cm^3) at the momentary soil moisture.

RESULTS AND DISCUSSIONS

Typical eutricambosol, with lute-sandy/luto-clay texture, formed on "in situ" disaggregation-alteration materials represented by deluvial-colluvial deposits consisting of medium materials (clay), having as parental material underlying unconsolidated or weakly consolidated preholocene rocks hopobasice (Sistemul Roman de Taxonomie a Solurilor, 2003), (Photo 1).

Characterization of morphological traits:

The texture conditions the development of the root system and, through this, the absorption of water and the mineral nutrition of the vines, exercising a major influence on the quantity and quality of the production.

0 - 60 cm = horizon (A + B)d, light gray-brown color, 10YR4/5 has fragments of horizon B, clay-sandy texture, glomellular structure, friable, wet, frequently thin roots, gradual passage;

60 - 90 cm = horizon Bv, yellowish-brown color, 10YR8/3 clay-sandy texture, angular polyhedral structure, friable, wet, rare thin roots, gradual passage;

90 - 130 cm = horizon C, light yellowish-brown color, 10YR4/5 sandy-clay texture, unstructured, very friable, moderate effervescence.

Characterization of chemical properties (Table 1):

Table 1

Chemical properties of typical eutricambosol

Specification	Horizon			Remarks
	(A+B)d	Bv	C	
Depth (cm)	0-60	60-90	90-130	
pH	7,3	7,2	7,8	Low alkaline reaction
Humus (%)	0,72	0,42	0,18	Poor insurance
P (ppm)	5,7	7,6	7,6	Very poor insurance
K (ppm)	130	100	58	Medium insurance
$CaCO_3$ (%)	0,38	0,04	0,38	

The soil is characterized by low alkaline pH, low humus content, very low mobile phosphorus content, medium mobile potassium content, a loamy / sandy-clay texture, a rapid global drainage.

The sandy soils (clay content less than 13%) have high porosity, strong aeration, warm up easily and speed up the ripening of grapes, being indicated for the cultivation of early maturing table varieties. These soils have low nutrient retention capacity and low fertility. They are less suitable for the cultivation of wine varieties, because the grapes accumulate small amounts of sugars and anthocyanins, and the acidity of the gravy is deficient.

Characterization of physical properties (Table 2):

On the Horizon (A + B)d, the apparent density is low, the porosity is high, unpaved, the weaning coefficient is small, high permeability.

On the Horizon Bv, the apparent density is low, the porosity is high, unadjusted, the weaning coefficient is high, the permeability is high.

On the horizon C, the apparent density is low, the porosity is high, unadjusted, the weaning coefficient is high.

The requirements regarding the thickness of the soil layer differ depending on the vigor and the production directions of the vine varieties.

Table 2

The analytical data obtained from the collected samples

Specification	Horizon		
	(A+B)d	Bv	C
Depth (cm)	0-60	60-90	90-130
Coarse sand (2-0,2 mm)	9,6	5,5	13,8
Fine sand (0,2-0,02 mm)	46,8	45,5	72,2
Dust (0,02-0,002mm)	7,1	14,1	6,1
Clay (< 0,002 mm)	36,5	34,9	7,9

Photo 1. - Eutricambosol

CONCLUSIONS

Against the background of the conditions generated by the natural factors (lithology, relief, groundwater, climate), of the metabolism of different varieties and rootstocks and the various levels of technologies, the action of the soil on the development and production of vines and its quality materializes due to the physical properties and chemical (Oşlobeanu et al., 1991).

The seasons are pleasant: the early and relatively short summers, the hot summers, sometimes droughts, the rainy autumns with the second maximum (November, December) of rainfall, and the winters are mild with sleet and snow and sometimes with floods in the cold season (Popa A. et al., 2015).

The vine, as a mesophyte species, has moderate claims to soil moisture (Irimia L., 2012). It adapts to both humid and well-watered soils, but the requirements vary depending on the phenophase and the biological nature of the varieties. The highest water consumption is recorded in the phenophases of growth of shoots and berries, when the IUA values must be between 60-80%. Moderate requirements for soil moisture are recorded during grape ripening, when IUA values must be 50-60%. The deficit or excess of water, at any time of the vegetation period, exerts an unfavorable influence on the growth and fruiting potential of the vine.

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COMPARATIVE STUDIES ON THE ACCUMULATION OF SOME METABOLITES AT *SALVIA OFFICINALIS* PLANTS MULTIPLIED BY *IN VITRO* CULTURE AND BY CONVENTIONAL METHODS

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Keywords: *conventional methods, "in vitro", metabolites, sage*

ABSTRACT

The aim of this study was to carry out comparative studies concerning accumulation of primary and secondary metabolites at Salvia officinalis plants obtained by "in vitro" culture and by conventional methods. Although biochemical investigations revealed some differences between the plants regenerated by the two culture technologies in terms of bioproductivity characteristics, we consider that both multiplication methods can be successfully used to obtain sage plant material, a potential source of bioactive compounds.

INTRODUCTION

Salvia officinalis (garden sage) is a perennial subshrub from the *Lamiaceae* family. This plant originates from the Mediterranean region and is widely used in pharmaceutical and food industries as well as in cosmetics (Khan et al. 2010, Garcia et al. 2013). The leaf extract of the plant possesses antibacterial, antifungal, antiviral, anti-inflammatory, antitumor and hypoglycemic activity (Longaray Delamare et al. 2007, Keshavarz et al. 2011). The pharmacology action of sage is a result of the presence of essential oil, di- and triterpenes, phenolic acids, flavonoids and tannins (Azimova & Glushenkova 2012, Kontogianni et al. 2013).

Considering the economic importance of this species, the researches conducted in this work were oriented in the direction of quantitative evaluation of some primary and secondary metabolites at *Salvia officinalis* plants obtained by *in vitro* culture and by conventional methods.

MATERIAL AND METHODS

The biological material derived from the *Salvia officinalis* species has been multiplied *in vitro* and by conventional methods.

The plants obtained formed two comparative lots:

1. the lot with plants obtained *in vitro* - micropropagation technology (V1);
2. the lot with plants obtained by conventional techniques (V2).

For biochemical determinations was sampled the plant material from *herba*. Option for analysis of plant material from *herba* left from the presence of phytocomplex that characterize it for a series of active principles conferring the

possibility of a comparative study of material obtained (conventional cultures and plants regenerated *in vitro*).

Biochemical investigations on plant material were designed to measure:

- *the dry matter content* (%) by dehydration of the plant material at 105 °C, up to a constant mass;

- *the content of chlorophyll and carotenoid pigments*; their extraction was performed with 80% acetone and was followed by reading the optical density at three wavelengths: 440.5 nm, 644 nm and 662 nm. In the measurement of the pigment content in mg/g of green substance, the Tvet calculation formulas were used;

- *the soluble carbohydrate content* (spectrophotometric dosage determination after the colour reaction with anthrone reactive);

- *the phenolic compounds* (colorimetric determination based on the reaction with Folin-Ciocalteu reactive).

Each biochemical analysis was performed in three repetitions, the results represent the average/variant.

RESULTS AND DISCUSSIONS

Among the most important vegetal compounds from biological point of view are vegetal pigments. The content in vegetal pigments depend on species, environmental conditions and culture technology.

The most spreading from the vegetable kingdom are the chlorophyllian and carotenoids pigments.

The content of chlorophyllian pigments varies depending on the species and phenophase, increasing from flowering period to maturing phase. The carotenoids pigments enter in the structure of photoreceptor antenna of the photosystem II, but it also accumulates in chromoplasts, contributing to the realization of the mature leaf color. The carotenoids pigments content has an upward dynamics during the growing season.

In the experiments carried out by us, in the first stage was determined the content of the plants obtained by the two methods in chlorophyllian pigments. The graphic representation of that (figure 1) shows that, at biological material obtained *in vitro* (V1), both chlorophyll "a" and chlorophyll "b" has lower average values (0,284 mg chlorophyll „a”/g green substance, respectively 1,607 mg chlorophyll “b”/g green substance) compared to the values registered at plants obtained by the conventional method (V2)(0,426 mg chlorophyll „a”/g green substance, respectively 2,576 mg chlorophyll „b”/g green substance).

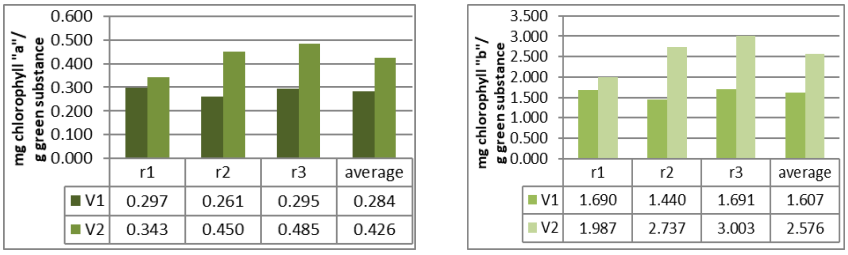


Figure 1. The content of the chlorophyllian pigments from the plant depending on the method of obtaining the biological material

The quantitative evaluation of the carotenoids pigments at *Salvia officinalis* species depending on the method of obtaining the biological material is shown in figure 2. It is noted that, in average, the values obtained in the case of *in vitro* regenerated plants are lower (0,464 mg/g green substance) than those obtained by conventional methods (0,767 mg/g green substance).

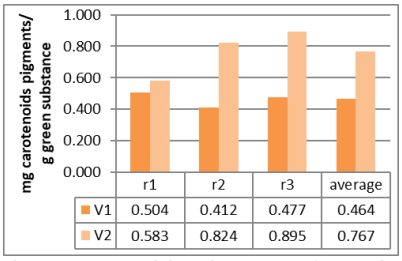


Figure 2. The content of the carotenoids pigments from the plant depending on the method of obtaining the biological material

It calculated the main indices of the chlorophyllian assimilation in plants, namely the report of chlorophyll "a" and chlorophyll "b", as well as the report chlorophyll/carotene. The report chlorophyll "a"/chlorophyll "b" has the maximum value at the beginning of the vegetation period and decreases towards the end of it, this modification being due to the decrease the content in chlorophyll "a " during the vegetation period.

In the case of the experiences made by us, both indicators show the preponderance of chlorophyll "b", respectively of the pigments chlorophyllian in the plants analyzed (figure 3).

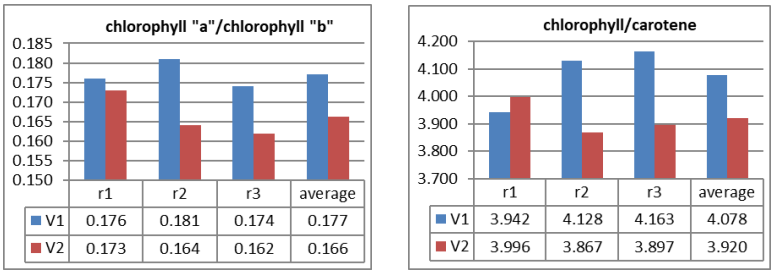
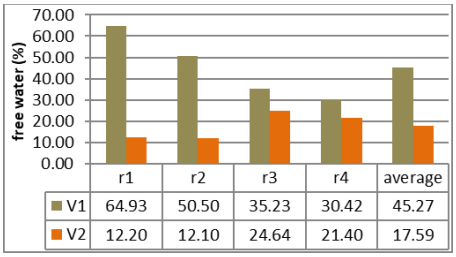


Figure 3. Indicators of the chlorophyllian assimilation within the two experimental variants

Evaluation of the free water and total water content of the plant in the two experimental variants highlights their superior values for *in vitro* regenerated plants (V1) compared to those obtained by conventional methods (V2). The average value of free water quantity is 45.27% for V1 variant and 17.59% for variant V2. On average, the total water content is 77.66% for *in vitro* regenerated plants and 62.68% for plants obtained by conventional methods (figure 4).



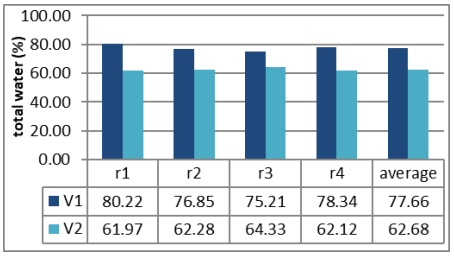
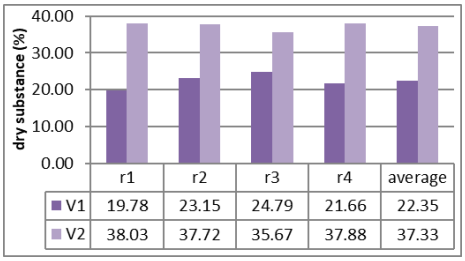


Figure 4. Free water content and total water from the plant within the two experimental variants

Evaluation of dry substance and bound water content from the plant within the two experimental variants highlights superior values of the vegetative mass and of the bound water quantity in the case of the plants obtained by conventional methods compared with those obtained *in vitro* (figure 5). The average value of the bound water quantity is 32,39% in the case of variant V1, respectively 45,09% in the case of variant V2. On average, the dry substance content is 22,35% at the plants obtained *in vitro* and 37,33% at the plants obtained by conventional methods. Within each variant (V1/*herba* of plants regenerated *in vitro* - V2/*herba* of plants from conventional cultures), we find that there is a direct correlation between the dry substance and bound water content from the plant.



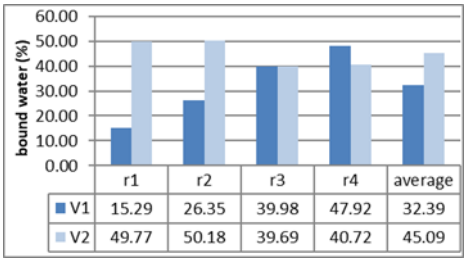


Figure 5. The dry substance and bound water content from the plant within the two experimental variants

The glucides, primary products of photosynthesis, have been determined within of plants results from the two culture techniques. The values obtained were superior to samples from conventional culture plants compared to *in vitro* regenerated plants. On average, the soluble glucides content registered values by 4,86% at the plants obtained *in vitro* and 7,03% at the plants obtained by conventional cultures (figure 6).

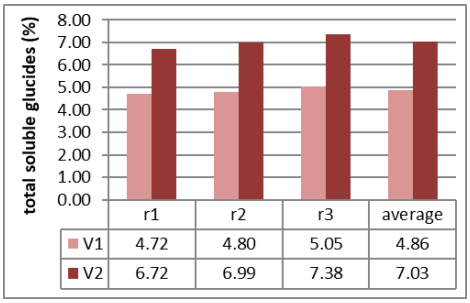
Because the characteristics of bioproduction that interested to be kept especially at the *Salvia* plants refers to the content in active principles, the ethanolic extracts derived from the plants investigated biochemically were analyzed quantitatively for evaluating the content in polyphenols.

Polyphenols are secondary metabolites widely distributed in the plant kingdom, currently being identified more than 8000 phenolic structures in all plant organs. Phenolic compounds such as phenolic acids, flavonoids and simple proanthocyanidins form some of the most important phytochemicals from plants. The main functions attributed to these compounds are related to protecting the plant

against pathogens, limiting the damage caused by UV radiation and a strong antioxidant effect.

From the pharmaceutical point of view, polyphenols represent an important group of compounds. Recent nutrition studies have shown that regular consumption of polyphenolic antioxidants from vegetables, fruits and juices derived from them has a positive effect in the prevention and treatment of a wide range of pathologies, including cancer, stroke, coronary artery disease and neurodegenerative diseases, such as Alzheimer's disease. Polyphenols, including those found in green tea and wine, have a wide range of biological activities, including antioxidant action, and therefore these bioactive compounds can be considered as therapeutic agents.

In the case of the experience made by us, the quantitative analysis of the total polyphenols in the *herb* of *Salvia officinalis* revealed superior values for variant V2 (9.44% polyphenols) (Figure 6).



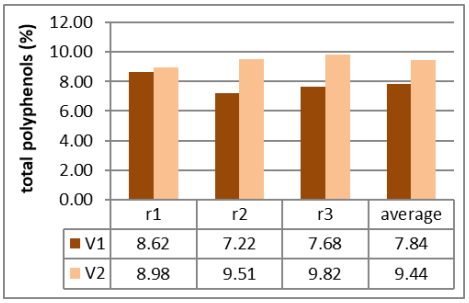


Figure 6. The soluble glucides and total polyphenols from the plant depending on the method of obtaining the biological material

In conclusion, we can say that although the comparative study of samples (*herba* from conventional culture and *in vitro* regenerated plants) revealed some differences in the bioproductivity characteristics, both cultivation technologies can be successfully used in order to obtain plant material of sage that can be used as a potential source of bioactive compounds.

CONCLUSIONS

The quantitative evaluation of chlorophyllian and carotenoids pigments to *Salvia officinalis* species depending on the method of obtaining biological material showed that, on average, the values obtained in the case of *in vitro* regenerated plants were inferior to those registered at the plants obtained by conventional method.

Evaluation of the bound water content and the dry substance in the plant within the two experimental variants highlights the higher values of the vegetative mass and the quantity of water bound in the case of plants obtained by conventional methods compared to those regenerated *in vitro*.

The quantitative analysis of soluble carbohydrates and total polyphenols in *Salvia officinalis herba* revealed superior values in the case of plants from conventional culture compared to those regenerated *in vitro*.

Although biochemical investigations revealed some differences between in *vitro* regenerated plants and those obtained by conventional propagation in terms of bioproductivity characteristics, we consider that both culture technologies can be successfully used to obtain sage plant material, a potential source of bioactive compounds.

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THE QUALITY STATUS OF THE REDDISH PRELUVOSOL FROM ARDS SIMNIC

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Keywords*: soil,fertility, suitability.*

ABSTRACT

This paper presents the study of the degree of soil fertility through its agrochemical properties, respectively its content in macroelements and microelements as soil is the main source of nutrients for plants. In this regard we determined from the reddish preluvosol located at ARDS Simnic in 2018 the main macro- and microelements, as well as the soil reaction on the profile of this soil.The soil reaction is moderately acidic, so the soil must be improved agrochemically;The humus content and the total nitrogen content shows that the soil has a low supply level with nitrogen and a lower fertility.Phosphorus content indicates a good supply level for field crops and poor for horticultural crops;The potassium content shows that the soil is medium provided with this element for field crops and poorly supplied for horticultural crops.

INTRODUCTION

The soil as a three-phase dynamic system is in a continuous evolution on which the very existence of life on our planet depends. In this evolutionary process a very important role is played by the continuous interactions between its three phases: solid, liquid and gaseous. As a result of this continuous interaction, the nutrients necessary for their growth and development are made available to the plants (Dodocioiu & Mocanu, 2009).

Soil is therefore the main source of nutrients for plants.

Nutrients removal from the soil through their absorption in plants by leaching or other processes related to natural soil dynamics, entail the reduction of contents of mobile forms of nutrients and the gradual decline in their production capacity. For these reasons, there is an objective need to compensate by applying mineral and organic fertilizers, both for consumption with crops and for decreasing the mobility of nutrients through natural processes (absorption, fixation, immobilization, etc.) (Borlan & Hera, 1994).

Hence the urgent need to periodically study the degree of soil fertility through its agrochemical properties, respectively its content in macroelements and microelements.

MATERIAL AND METHODS

In this regard we determined from the reddish preluvosol located at ARDS Simnic in 2018 the main macro- and microelements, as well as the soil reaction on the profile of this soil.

Macroelements and some agrochemical properties were determined, namely:

- total nitrogen (%) by Kjedahl method;
- humus (%) by wet oxidation after Walkey and Black method modified by Gogoasa;
-pH potentiometric in aqueous suspension in a ratio of 1: 2.5;
-cations of Ca, Mg, K, Na, after Schollenberger Cornescu. The dosing was performed by photometry in the flame;
- total exchange acidity (H) by percolation with sodium acetate;
- total cation exchange capacity (T) calculated by summing the exchangeable cations and total cation exchange acidity (T = SB + H);
- calcium carbonate ($CaCO_3$) by the Scheibler method;
- total phosphorus (P) by disaggregation with sulfuric acid, perchloric acid according to the Nikolov method;
- mobile phosphorus by the Egner-Rihm-Domingo method;
- mobile potassium by flame photometry;
-contents in total microelements (Zn, Cu, Fe, Mn, Pb, Cr, Ca, Ni, Cd) by mineralization with nitric acid, hydrochloric acid and oxygenated water and dosing by spectrometry and atomic absorption, and the interpretation was made after Order 756 of 03.11.1997 of MADR.

The analysis methods are the methods developed by the National Institute of Pedology, Agrochemistry and Environmental Protection in 2011 (Dumitru & Manea, 2011).

RESULTS AND DISCUSSIONS

The analytical data regarding the reaction of soils and the contents in macro and microelements are presented in Table 1 and Table 2.

Table 1 presents the main agrochemical properties and the content in main macroelements (N, P, K) for the 8 genetic horizons of the soil.

The soil reaction expressed by pH value has increasing values from the soil surface to its depth.

Thus for the Ap and Apt surface horizons (0-29 cm; 29-43 cm) the pH value is 5.08-5.33 indicating the moderately acid reaction type, and in the deep horizons Cn and Ck (215-250 cm) the pH value reaches 6.71-7.79, the soil reaction being neutral and weakly alkaline.

The pH of the soil has direct implications on the mobility and accessibility of nutrients in the soil and can delineate an area of plant nutrition for optimum pH 6.0 - 6.5: area which is characterized by a higher solubility and optimal accessibility for the majority of nutrients from the soil (Buzatu & Dodocioiu, 2015).

Agrochemical improvement is therefore necessary.

Table 1

The agrochemical properties and the content in main macroelements of the reddish preluvosol from ARDS Simnic

Horizon	Depth (cm)		pH	H (%)	SB (me/100g soil)	H (me/100g soil)	T (me/100g soil)	V %	$CaCO_3$ %	Nt mg/kg	P_{AL} mg/kg	K_{AL} mg/kg
	horizon	Sample										
Ap	0-29	5-20	5.08	2.68	12.06	6.05	18.11	65.3	-	0.072	52.2	125
Apt	29-43	29-43	5.33	2.23	11.09	4.90	15.99	68.2	-	0.071	32.3	104
AB	43-61	43-61	6.32	1.49	13.40	2.26	15.66	84.4	-	0.037	6.0	101
Bt_1	61-90	61-80	6.59	1.22	14.22	2.02	16.24	86.3	-	0.034	1.1	122
	90-120	95-110	6.53	1.11	15.24	2.36	17.60	85.7	-	0.022	2.0	97
Bt_2	120-161	130-145	6.16	1.01	14.89	2.44	17.33	84.6	-	0.016	-	-
BC	161-215	185-200	6.11	0.76	16.19	2.26	18.45	86.5	-	-	-	-
Cn	215-235	215-230	6.71	-	14.80	1.30	16.10	90.7	-	-	-	-
Ck	235-250	235-250	7.79	-	17.94	-	-	100	1.4	-	-	-

Table 2

Content of microelements - total forms of the reddish preluvosol from ARDS Simnic

Horizon	Depth (cm)		Zn (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Mn (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Cd (mg/kg)
	horizon	sample									
Ap	0-29	5-20	42.5	17.4	21649	758	10.6	27.1	37.6	28.9	0.145
Apt	29-43	29-43	44.3	18.7	21069	660	3.58	25.1	26.5	25.6	0.147
AB	43-61	43-61	41.6	17.9	23356	514	5.36	23.4	28.9	28.0	0.106
Bt_1	61-90	61-80	47.7	17.6	29399	439	13.1	26.8	30.4	30.9	0.071
	90-120	95-110	55.1	18.2	27035	522	17.0	24.7	30.3	23.6	0.169
Bt_2	120-161	130-145	49.9	16.2	29022	558	25.91	24.7	26.1	31.3	0.239
BC	161-215	185-200	48.2	15.5	26011	449	13.3	25.6	32.3	24.5	0.166
Cn	215-235	215-230	48.1	13.0	24949	440	7.16	23.2	24.3	29.5	0.179
Ck	235-250	235-250	42.9	14.2	23750	419	6.99	20.6	21.9	24.7.	0.170

The humus content varies in the opposite direction of the soil reaction, having higher value at surface horizons (2.68-2.23%) and very small at deeper horizons. As the degree of fertilization of the soil is usually assessed by the content of nutrients in the surface horizons, with values of 2.23-2.68% humus, the soil is medium supplied with nitrogen.

The sum of the bases has small values in the surface horizons Ap and Apt, 12.06 me/100g soil and 11.09 me/100g soil, and medium values 15.24- 17.94 me/100 g soil in the deeper horizons, which makes the value T to be lower 16.03-18.17 me/100g soil and indicates a mesobasic soil (Lacatusu, 2000).

The total nitrogen content has higher values in the upper horizons (0.072 mg/ kg) and lower in the deep ones (0.016 mg/kg). It correlates with humus content indicating the existence of poor soil in nitrogen.

The content of mobile phosphorus is between 52.2 mg/kg and 2.0 mg/kg, being equally higher in surface horizons and lower in deep horizons. After the phosphorus content in the surface horizons (32.3.2-,52.2mg/kg), the soil can be considered well supplied for field crops and poorly supplied for horticultural crops.

Mobile potassium has values between 125 mg/kg in surface horizons and 97 mg/kg in deep horizons. After the content of mobile potassium in the horizons of the surface, the soil has a medium degree of insurance with potassium for field crops and weak for intensive crops.

It can be observed for all the determined microelements that there are no significant oscillations between the content of microelements from the superficial and deep horizons, as in the case of the macroelements.

The content of microelements in total forms is presented in Table 2.

The zinc content has values between 41.6 and 55.1 mg/kg, indicating according to Order 756/03.11.1997 (Table 3), the existence of a low content below the normal values, being very probable the appearance of zinc deficiency especially for the maize crop, as well as for beans, onion, peas, peaches.

Table 3

Reference values for traces of chemical elements (metals) in soil (according to Order 756 / 03.11.1997)

Traces of elements	Normal values	Alert thresholds / Types of use		Intervention thresholds / Types of use	
		Sensitive	Less sensitive	Sensitive	Less sensitive
Cd	1	3	5	5	10
Co	15	30	100	50	250
Cr	30	100	300	300	600
Cu	20	100	250	200	500
Mn	900	1500	2000	2500	4000
Ni	20	75	200	150	500
Pb	20	50	250	100	1000
Zn	100	300	700	600	1500
Fe	27500				

The copper content registers values between 13.2-18.7 mg/kg, it highlights the existence of a quantity of copper below the normal level of the soils that is of 100 mg/kg, being possible the appearance of copper deficiency especially in the sunflower and fruit trees crops.

Iron content fluctuates around 21,069-29,399 mg/kg, falling within normal values.

Manganese is present in this soil in quantities of 419-759 mg/kg, being below normal values, the deficiency of manganese can occur in sugar beets, potatoes, apples, peaches, vines.

Cobalt is found in this soil in quantities of 3.58-25.91 mg/kg being within normal limits;

Nickel content ranges from 21.9-37.6 mg/kg being slightly above the normal limit in soils, but well below the occurrence of the toxicity alert threshold (75 mg/kg).

Lead is contained in quantities of 24.7-29.5 mg/kg being slightly above the normal limit (20 mg/kg) but below the toxicity alert threshold (50 mg/kg).

Cadmium is present in quantities of 0.071-0.239 mg/kg being below the normal limit (1 mg/kg), so there is no problem of toxicity.

Using these agrochemical indicators and taking into account some physical properties of the soil, the following bonitation notes are obtained:

- 56 points for the arable - favorability class III;
- 63 points for the orchard - favorability class II;
- 64 points for the vine - favorability class II.

CONCLUSIONS !!!

Following the agrochemical study on the reddish preluvosol from ARDS Simnic to establish the quality status, the following conclusions are obtained:

1. The soil reaction is moderately acidic, so the soil must be improved agrochemically;

2. The humus content 2.68-2.23% and the total nitrogen content 0.072 mg/ kg shows that the soil has a low supply level with nitrogen and a lower fertility.

3.Phosphorus content indicates a good supply level for field crops and poor for horticultural crops;

4. The potassium content shows that the soil is medium provided with this element for field crops and poorly supplied for horticultural crops.

5. The content in microelements reveals the following aspects:

- there is a content below the normal limit for zinc, copper, manganese, being possible the appearance of deficiencies in these elements;
- the content of iron, cobalt, chromium, nickel, lead and cadmium is within normal limits, not being toxic.

The soil has a low to middle fertility degree, being suitable for vineyards and fruit trees, falling in the second class of suitability.

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MICROPROPAGATION OF STRAWBERRY CV. MAGIC

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Keywords*: Fragaria x ananassa, meristem culture, growth regulators, shoot multiplication, multiplication rate*.

ABSTRACT

'Magic' is one of the Romanian strawberry cultivars widely grown in recent years, mainly due to its high yields and excellent flavor. Therefore, micropropagation of large quantities of planting material from this cv. is at high demand. In order to test the ability of cv. 'Magic' for large scale micropropagation, meristem-derived plantlets were cultured on solid Murashige and Skoog medium supplemented with N^6-benzyladenine and indole-acetic acid. The number of shoots formed per meristem-derived plantlet varied largely in successive subcultures, with an average multiplication rate during the first three subcultures of 5.44, 17.05 and 21.5, respectively. The length of micropropagated shoots (revealing their vigour) was found to be strongly dependent on their number. Almost all the developed shoots were vigorous enough for further multiplication by subculturing them on fresh MS medium every four weeks.

INTRODUCTION

Cultivated strawberry (*Fragaria* x *ananassa*) is an important fruit species worldwide for both fresh consumption and food processing. Strawberries have traditionally been a popular fruit for its fabulous flavor and delicious taste, and are highly valued as dessert fruit. Also, they are a rich source of vitamins and minerals (Hasan et al., 2010; Jhajhra et al., 2018; Naing et al., 2019).

Propagation of strawberry is achieved either through runners or by *in vitro* micropropagation. Vegetative propagation using stolons is slow and allows the spred of specific diseases, particularly strawberry viral diseases. Strawberries are affected by over 30 viruses and phytoplasmas, many of which can greatly reduce yield, rapidly spread in the field, and may not cause obvious symptoms (Martin & Tzanetakis, 2006). The yield reduction caused by some viruses may be up to 80% (Thompson & Jelkman, 2003). Therefore the runners of strawberry are not always suitable for this type of cultivation due to their vulnerability and susceptibility to pathological agents.

From 1972, when Adams reported the micropropagation of strawberries and concluded that "it would seem to be possible to obtain an unlimited number of plantlets from a single meristem", *in vitro* propagation via meristems allow to achieve the large scale multiplication of disease-free plants and faster cloning of desired genotypes in a very short span of time. Meristems, generally obtained from runners of virus-free plants, are commonly used to establish *in vitro* cultures, which

are employed for mass propagation (Scott & Zanzi, 1981; Boxus, 1989; Martinelli, 1992; Bourrain, 2010; Rattanpal et al., 2011; Jhajhra et al., 2018).

Micropropagation has been extensively used for the rapid production of many strawberry cultivars (Haddadi et al., 2010; Madhavrai et al., 2014; Bhat et al., 2016) and several studies have attested the tissue cultured plants being more advantageous than those by conventional propagation in terms of fruit yield, vigor, the number of runners and leaves per plant (Swartz et al., 1981; Cameron et al., 1985; Theiler-Hedtrich & Wolfensberger, 1987; Karhu & Hakala, 2002; Singh el al., 2004; Zebrowska et al., 2015). Furthermore, meristem regenerated plants usually maintain the genetic characteristics of the parent plant (Sansavini et al., 1982; Nehra & Kartha, 1994; Bhandari & Roy, 2015).

In vitro culture of meristems and the establishment of micropropagation protocols are important tools for obtaining the large amounts of planting material from old or new valuable strawberry cultivars. Therefore, in recent years, considerable efort has been made to develop *in vitro* propagation of the commercial strawberry in order to produce virus-free plants of high quality (Biswas et al, 2007; Haddadi et al., 2010; Naing et al., 2019).

Several recent studies have shown that the proliferation rate of meristem-derived shoots depends, in each genotype / cultivar, on different concentrations of plant growth regulators in the *in vitro* culture medium. In this respect, we initiated a study aiming at investigating the requirements of one of the most valuable Romanian strawberry cultivar for a good proliferation rate together with a proper vigour of the micropropagated plantlets.

MATERIAL AND METHODS

The meristems from 'Magic' cultivar (*Fragaria x ananassa* Duch.) were excised from runner tips of greenhouse-grown plants in the Tissue Culture Laboratory of the Research Institute for Fruit Growing, Piteşti.

In vitro culture initiation. Runner tips of cultivar 'Magic' were pre-sterilized by washing in tap water to which 2-3 drops of Domestos were added. Subsequently, they were disinfected successively with 96% ethanol for 5 minutes and with 6% calcium hypochlorite for 10 minutes. After sterilization, the biological material was rinsed in three baths of distilled water.

Meristems with 2-3 leaf primordia and sizes of 0.1-0.3 mm were excised from the sterilized runner tips and distributed individually into Pyrex glass tubes of 20-25 cm^3, containing 10 ml of culture medium sterilized by autoclaving.

The culture medium containing Murashige-Skoog (1962) macroelements, microelements and vitamins, 20 g L^{-1} sucrose, 0,1 mg L^{-1} giberellic acid (GA_3) and 1 mg L^{-1} benzyladenine (BA) was solidified with 7 g L^{-1} agar. The pH of the culture medium was adjusted to 5.7 with 0.1 N KOH before autoclaving for 20 min at 121 ºC. Combinations of BA (0.5 or 2.0 mg L^{-1}) and IBA (0.1 or 1.0 mg L^{-1}) were used to induce plantlet formation from *in vitro* cultured meristems.

Multiplication of meristem-derived plantlets. Meristem-derived plantlets were transffered into Ehrlenmayer flasks of 100 cm^3 capacity, containing 30 ml of Murashige-Skoog (MS) medium supplemented with BA (0.4 mg L^{-1}) and IAA (0.2 mg L^{-1}). Dextrose was used as carbon source in the culture media (40 g L^{-1}). In all experiments the culture media were solidified with 8 g × dm^{-3} agar. The pH of the culture medium was adjusted to 5.7 before autoclaving for 20 minutes at 121 ºC.

The *in vitro* cultures of meristem-derived plantlets were incubated in a growth chamber at 22-24°C, under a photoperiod of 16 hours light / 8 hours darkness, and a light intensity of 40 µmol m^{-2} s^{-1}.

Shoot multiplication. Regardless of the experimental variant of culture medium on which they formed, the shoots multiplied from the meristem-derived plantlets were transferred in glass jars of 350 ml on medium MS containing 0.4 mg L^{-1} BA and 0.2 mg L^{-1} AIA, the medium currently used in the laboratory for large scale micropropagation of strawberry cvs, and also the most similar in composition with the medium which gave the best results in obtaining meristem-derived plantlets. The transfer was carried out when the shoots reached a length of 1-2 centimeters.

In order to correctly *interpret* the results of multiplication in the first, second and third subcultures, and to avoid major statistical errors, four shoots were placed in each glass jar, in at least six repetitions.

The *in vitro* cultures of shoots were incubated, identically to the meristem-derived plantlets, in growth chamber at 22-24°C, under a photo-period of 16 hours light / 8 hours darkness, and a light intensity of 40 µmol m^{-2} s^{-1}.

Observations were made every four weeks, at the time of shoots separation from the formed clusters and their subcultivation of fresh medium (with the same composition). The multiplication rate was calculated from the ratio between the number of shoots formed per explant (single shoot) cultivated *in vitro* and the number of initial shoots in each subculture on the culture medium used for multiplication.

Data for both multiplication of meristem-derived plantlets and subsequent shoot multiplication during three subcultures were analyzed for significance by the standard analysis of variance with mean separation by Duncan's test ($p > 0.05$).

RESULTS AND DISCUSSIONS

The best frequency of viable plantlet formation from meristems of strawberry cultivar 'Magic' (100%) was achieved in MS media containing 0.5 mg L^{-1} BA + 0.1 mg L^{-1} IBA, but percentages of at least 80% have been also obtained with any other combination of growth regulators.

On the MS medium supplemented with 0.4 mg L^{-1} BA and 0.2 mg L^{-1} IAA, the meristem-derived plantlets developed tiny shoots in four to six weeks. In the first subculture, the number of shoots formed by meristem derived-plantlets (Figure 1) ranged from 1 to 19, with an average of 5,34 (as shown in Figure 2). The average length of shoots was 0.99 cm, with the length of individual shoots depending on their number in the formed clusters.

In the following subcultures, a significant increase in the number of shoots developed from single shoots was found, with an average of 17 shoots per cluster in the 2nd subculture, and 21.5 shoots per cluster in the 3rd subculture, respectively (Table 1 and Figure 2). These results are consistent with those reported in many other strawberry cvs. (Haddadi et al., 2010; Quiroz et al., 2017; Naing et al., 2019).

While a significant increase in the average length of shoots developed from single shoots was found in the second subculture as compared to the first subculture, no significant differences in the average length of shoots was found between the third and respectively the second subculture. Thus, as shown in Figure 2, the average length of shoots measured after four weeks from the initiation of subcultures was 1.79 cm in the 2nd subculture, and 1.85 cm in the 3rd subculture, respectively. As in the 1st subculture, the length of individual micropropagated shoots in the subsequent two subcultures was dependent on their number in the formed clusters.

Figure 1. Shoots micropropagated from meristem-derived plantlets in cv. ‘Magic’.

Table 1

Average number of shoots formed by meristem-derived plantlets of cv. ‘Magic’, and the average length of the shoots in successive subcultures

	Soluble solids content (SSC) %	Anthocyanins mg/100 g sp	Total polyphenols mg de acid galic (GAE) / 100 sp	Antioxidant activity mmol Trolox / 100 g s.p.
V3	70%	7.44	96.68	3.92
V4	68%	3.24	65.28	3.45

* Means followed by the same letter are not significantly different (Duncan test, p>0.05)

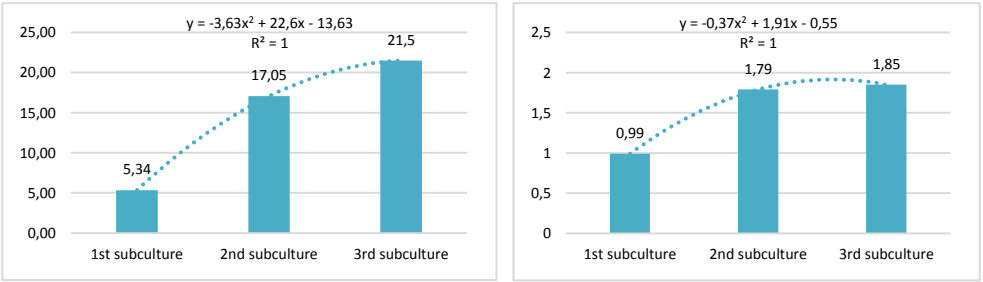

Figure 2. The increase of shoot number per clusters formed from meristem-derived plantlets during three successive subcultures.

According to the results obtained by Moieni et al. (2018) in experiments with seven strawberry cvs. (‘Alpine’, ‘Camarosa’, ‘Gaviota’, ‘Pajaro’, ‘Paros’, ‘Sarian’ and ‘Selva’), the best medium for high regeneration of normal plantlets and low regeneration of abnormal plantlets varied in different cultivars. Also, the results of many studies have shown that there is a strong and intricate interaction between plant growth regulators, culture conditions and cultivar. Several parameters used during the *in vitro* phase can affect the behavior of micropropagated strawberry, e.g. plant genotype, mineral formulation, type and concentration of hormone in the medium (Mozafari & Gerdakaneh, 2012; Adak et al., 2009; Rattanpal et al., 2011). Therefore, additional studies should be carried out for establishing the most optimal

micropropagation rates of cv. 'Magic' in successive subcultures, without affecting the viability of shoots, their rooting ability, and genetic stability.

CONCLUSIONS

High rates of micropropagation were obtained during three successive subcultures of meristem-derived plantlets of cv. 'Magic', with an average number of over 17 and respectively 21 shoots formed per cluster in the 2nd and 3rd subcultures.

The overall results of our study showed that the *in vitro* micropropagation on MS medium containing a combination of BA and IAA in low concentrations (0.4 mg L^{-1} and respectivelly) is applicable in commercial production of virus-free strawberry plants with stable fruit quality in strawberry cv. 'Magic'.

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DETERMINING THE AGE OF MATURE *PLATANUS X ACERIFOLIA* WILLD THROUGH NONINVASIVE METHODS

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***Key words**: regeneration, London Plan Tree, trunk health,*

ABSTRACT

Urban vegetation in general, but especially urban trees offer a diverse series of benefits: social (leisure opportunities), aesthetic (embellishing urban landscaping), climatic (decreasing pollution, decreasing the intensity of strong winds), ecologic (ensuring a habitat for the fauna and flora within urban areas, soil protection) and economic (supplying additional products, increasing value of real estate, diminishing damage produced by strong winds or flash floods generated by torrential rain).

Determining the tree age of the main species found in green urban areas, as well as monitoring their heath state represents an essential condition for ensuring an efficient management for them. The categories of green urban areas represented by street front lines are the most exposed to various disturbing factors, like exhaust fumes, thus repetitive inventories can supply information regarding the physiological state of such trees.

The here-by study aims to identify the ages of historic-value secular trees of Platanus x acerifolia Willd. present in The Plane Park of Bucharest.

INTRODUCTION

The methods determining tree age are not always effective. Most are invasive and bring damage to tree trunks. Examining the wood structure using a resistograph (including the annual ring alignment) is considered correct.

The resistograph can be used to determine tree age, although the method is complex, costly and has limitations, such as the tangential drilling of the ring's structure, rotting within the trunk and the limited length of the impulse. Additionally, invasive methods are time-consuming and costly.

The best known non-invasive methods available are the age-determining charts conceived amongst others by SIEWNIAK and KUSCHE (1994) and MITCHELL (1979).

However, age determining using charts is often prone to errors. The main disadvantage seems to be the insufficient correlation of the tree's age with the diameter of the trunk (measured 130cm above the ground).

HENRY and AARSSEN (1999) and WHITE (1998) presented a non-invasive method to verify tree age by combining elements from the age chart with dendrochronological calculus.

Heavily used to determine tree age is also the Pressler drill, however it cannot be used in all cases.

From the dendrometric measurements of the plane trees we can conclude that many specimens (40) of the total had, at the beginning of the experiment, a diameter exceeding 75 cm, thus making very difficult, if not impossible the use of the Pressler drill. Being elderly trees, it was possible that the inside of the trunk was also affected, which would have made inefficient the annual ring determination using a Pressler drill (fig. 1).

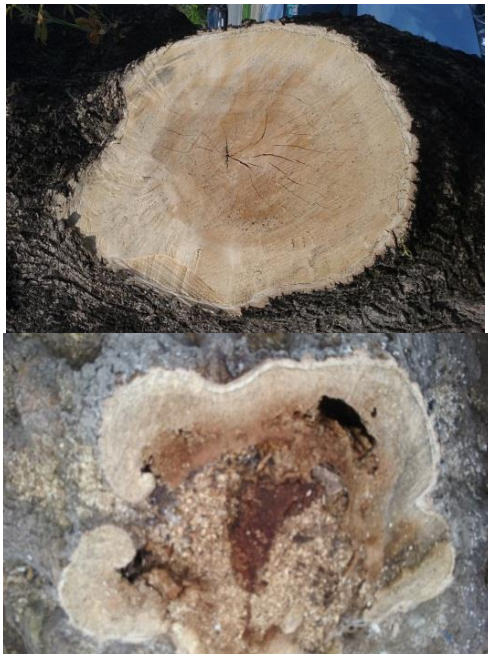

Fig 1. Section through a healthy tree and a degraded one

The most important growth factors of annual ring are climate factors. RICHARDSON (1964) has established the positive effect of light intensity and the length of the photoperiod over the growth of the annual ring. FORWARD and NOLAN (1961) have determined the growth differences according to the amount of light. LABYAK and SCHUMACKER (1954) have observed that branches from the lower part of the stem do not contribute to the growth of the stem because, through reduced photosynthesis activity, they do not provide the required carbohydrates quantity.

The structure of the annual ring is influenced by the presence of foliage (VAGNOV and colab, 2006). The size of the annual ring drops in years with massive defoliation (hail, massive attack by defoliating insects). The size of the annual ring is also influenced by species (FEKEDULEGN and colab. 2002).

Through the system “Tree age calculator” (http://www.tree-guide.com/tree-age-calculator) one can estimate the age of different tree species using the values of circumference or stem diameter. The trunk circumference is measured at a height of 1,00 – 1,50 m. It is not possible to conduct an exact determination of tree age because the growth of the width of the trunk is influenced by too many factors (soil conditions, solar light, rain etc.). Age estimation in elderly trees is based on an extensive enquiry of data pertaining to trees conducted by baumportal.de. An exact tree age determination in not possible based on width growth, because too many

factors (soil conditions, solar light, rain etc.) play a smaller or larger role. However, an approximation is possible. For trees with a diameter smaller than 20 cm, the estimated value is smaller than their real age. For trees with a diameter above 20 cm or more, the calculus instrument allows for a better estimate, between ±10%.

MATERIALS AND METHODS

Age determining through non-invasive methods was conducted for 47 specimens of *Plataus x acerifolia* Willd., species which also names the place – The Plane Park of Bucharest, amongst which there are secular trees, is represented by 31 monumental specimens, of different health state. These 31 specimens are included in the list of protected trees, administered by the Romanian Academy.

Each specimen was individually analyzed using a scheme created according to the principles of Durable management, being attributed an individual chart of analysis containing aspects of tree morphology (basic anatomic elements: trunk, branch radius), internal structure of the trunk (based on conducted tomographic analysis), health state and aesthetic aspect. The time frame for the study refers to a 9 year interval (2008-2017).

On the plot, there was identified the trunk remains of a removed plane tree and an analysis was conducted to determine its annual growth. That is 3,478 mm radially, that is 6,96 mm in diameter, thus determining the age of the tree. Knowing the diameter of the analyzed trees, the age of the specimens was determined (Ø:0,696 mm = years). The oldest plane tree (H-Pa-45) is 194 years of age.

RESULTS AND DISCUSSION

Table 1 shows that there are differences pertaining to the two age estimates of the trees.

Analyzing the distribution of the tree in table 1 it is noticeable that the specimens with small differences (<10 years) between determinations but also the trees with larger differences (>15 years) are present in all the sectors. A first observation would be that the soil on which the plants grew did not influence their development or does so very little.

Smaller differences are observed in younger specimens (under 100 years old, age determined based on annual rings), while large differences are observed in tree over 150 years old.

Thus we can conclude, that through the passing of time, the cumulative effect of different elements (crown volume, number of branches, health state, climate conditions, human intervention, etc.) have reflected in the growth and development if the trees.

Using the values of the diameter and the circumference of the plane trees, with the help of “tree-age-calculator” system, the age estimate in table 2 was possible.

It can be observed that between the values calculated according to the two parameters (diameter and trunk circumference), for a number of 38 specimens (80,85%) there are no differences, for 8 specimens there is a difference of 1 year (17,02%) and for one specimen there is a difference of 3 years (2,13%).

Table 1

Age estimate of plane trees through different methods

No.	Tree code	Trunk diameter (cm)	Calculated ages (years)		Difference ±years
			Ø : 0,956	Sistemul „tree-age-calculator”	
1	Pa 01	105	151	137	14
2	Pa 02	101	145	132	13
3	Pa 03	99	142	129	13
4	Pa 04	102	146	133	13
5	Pa 05	101	145	132	13
6	Pa-06	91	131	119	12
7	Pa 07	93	134	121	13
8	Pa 08	86	124	112	12
9	Pa 09	88	126	115	11
10	Pa 10	58	83	76	7
11	Pa 11	77	111	100	11
12	Pa 12	84	121	110	11
13	Pa 13	75	108	98	10
14	Pa 14	85	122	111	11
15	Pa 15	111	159	145	14
16	Pa 16	84	121	110	11
17	Pa 17	127	183	166	17
18	Pa 18	51	73	66	7
19	Pa19	46	66	60	6
20	Pa 20	84	121	110	11
21	Pa 21	76	109	99	10
22	Pa 22	82	118	107	11
23	Pa 23	106	152	138	14
24	Pa 24	118	170	154	16
25	Pa 25	81	118	106	12
26	Pa 26	119	171	155	16
27	Pa 27	99	142	129	13
28	Pa 28	127	183	166	17
29	Pa 29	32	46	42	4
30	Pa 30	79	113	103	10
31	Pa 31	109	157	142	15
32	Pa 32	116	167	151	16
33	Pa 33	93	134	121	13
34	Pa 34	99	142	129	13
35	Pa 35	113	162	147	15
36	Pa 36	67	96	87	9
37	Pa 37	97	141	126	15
38	Pa 38	78	112	102	10
39	Pa 39	88	126	115	11
40	Pa 40	69	99	90	9
41	Pa 41	81	116	106	10
42	Pa 42	92	132	120	12
43	Pa 43	85	122	111	11
44	Pa 44	99	142	129	13
45	Pa 45	107	154	139	15
46	Pa 46	129	185	168	17
47	Pa 47	135	194	176	18

Table 2

Age estimate of plane trees using “tree-age-calculator”

No.	Tree code	Stem diameter (cm)	Age I (years)	Stem circumference (cm)	Age II (years)	Difference ±years
1	Pa 01	105	137	330	137	0
2	Pa 02	101	132	316	131	1
3	Pa 03	99	129	312	129	0
4	Pa 04	102	133	320	133	0
5	Pa 05	101	132	316	131	1
6	Pa-06	91	119	286	119	0
7	Pa 07	93	121	293	122	1
8	Pa 08	86	112	270	112	0
9	Pa 09	88	115	276	115	0
10	Pa 10	58	76	182	76	0
11	Pa 11	77	100	243	101	1
12	Pa 12	84	110	264	110	0
13	Pa 13	75	98	237	98	0
14	Pa 14	85	111	267	111	0
15	Pa 15	111	145	350	145	0
16	Pa 16	84	110	264	110	0
17	Pa 17	127	166	399	166	0
18	Pa 18	51	66	158	66	0
19	Pa 19	46	60	144	60	0
20	Pa 20	84	110	273	113	3
21	Pa 21	76	99	240	100	1
22	Pa 22	82	107	258	107	0
23	Pa 23	106	138	332	138	0
24	Pa 24	118	154	372	154	0
25	Pa 25	81	106	255	106	0
26	Pa 26	119	155	375	156	1
27	Pa 27	99	129	310	129	0
28	Pa 28	127	166	400	166	0
29	Pa 29	32	42	101	42	0
30	Pa 30	79	103	248	103	0
31	Pa 31	109	142	341	142	0
32	Pa 32	116	151	363	151	0
33	Pa 33	93	121	291	121	0
34	Pa 34	99	129	311	129	0
35	Pa 35	113	147	355	147	0
36	Pa 36	67	87	210	87	0
37	Pa 37	97	126	305	127	1
38	Pa 38	78	102	245	102	0
39	Pa 39	88	115	278	115	0
40	Pa 40	69	90	218	90	0
41	Pa 41	81	106	253	105	1
42	Pa 42	92	120	288	120	0
43	Pa 43	85	111	267	111	0
44	Pa 44	99	129	312	129	0
45	Pa 45	107	139	335	139	0
46	Pa 46	129	168	404	168	0
47	Pa 47	135	176	424	176	0

CONCLUSIONS

Many of the age determining methods for trees are not always efficient, many are invasive and deteriorate the trunk of the tree.

Examining the structure of the wood (including the alignment of the annual rings) using the resistograph is considered correct, but has its limitations, like tangential drilling of the ring structure, rot inside the trunk and limited length of the impulse.

The best known non-invasive methods available are the age calculus chart, charts resulted after numerous experiments, often prone to errors, due to insufficient age correlation with trunk diameter (measure 130 cm above ground). Age determining cand be conducted using a Pressler drill, however it cannot be used in all cases.

With the “tree-age-calculator” system one can determine age correctly enough.

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VARIABILITY OF POMOLOGICAL CHARACTERISTICS OF MEDLAR GENOTYPES (*MESPILUS GERMANICA* L.) IDENTIFIED IN SOUTH-WESTERN AREA OF ROMANIA

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Keywords*: Mespilus germanica L., genotypes, pomological characteristics, medlar*

ABSTRACT

Medlar is a rustic fruit species, with great ecological plasticity that is found today in cultivation on small areas, although the fruit of this species has been shown to have nutritional and medicinal properties. After being identified in spontaneous and semi-cultivated flora of southwestern Romania, 10 medlar genotypes were taken under study. Variability of morphological characteristics analyzed in the identified genotypes, indicates wide opportunities possibilities of selection of genotypes of interest, both for fruit-growing and ornamental purposes. Genotypes identified in this study respond well to ecological characteristics of the area, which is a very important advantage for medlar culture. These will be evaluated in detail for reproduction studies.

INTRODUCTION

Medlar (*Mespilus germanica* L.) is a species that belongs to *Rosaceae* family, the Pomoideae subfamily, being native to eastern Mediterranean area. It has already been cultivated about three thousand years ago in the Caspian Sea region of northern Iran (Veličković et al. 2013), but it is still cultivated today on restricted areas although the fruit of this species has been shown to have nutritional and medicinal properties. Medlar fruit is known to have antioxidant properties and a high polyphenol content (Haciseferogullari et al. 2005). Medlar fruit is also rich in sugars such as fructose and glucose (Glew et al. 2003a, Glew et al. 2003b), linoleic acid and palmitic acid (Ayaz et al. 2008), organic acids such as malic acid and citric acid (Glew et al. 2003a, Glew et al. 2003b) as well as potassium (6962 ppm), calcium (1186.3 ppm), magnesium (1070.08 ppm) and phosphorus (763.4 ppm) (Kalyoncu et al. 2013). In wild state, medlar grows in all regions of Europe with a temperate climate. In culture it is best represented in Poland, Germany, Belgium, England and north-eastern France. It is also grown in Crimea, Caucasus, Iran, Asia Minor, Turkestan, Central Asia and North America. In Bulgaria, medlar is most commonly found near houses. In Romania, medlar is cultivated only in gardens near the house, being very rarely encountered in culture, especially in fruit-tree collections where quince is cultivated. Medlar is an attractive plant and it can be marketed as fresh fruit or included in industrial processing under different forms (Glew et al. 2003 a). On

Romania's territory, medlar is found in several areas favorable to growth and fruit-setting, namely in south-western Romania, especially in Gorj, Mehedinți, Dolj, Teleorman, Vâlcea, Caraș-Severin counties. Medlar is a rustic fruit species, with high ecological plasticity (Cosmulescu et al. 2018). The aim of this study was to determine pomological features of medlar genotypes selected from spontaneous and cultivated flora in Oltenia region. Medlar is a rarely grown species in Romania, with prospects of extension in culture due to fruit quality and wide opportunities of capitalization both for fresh consumption and processed under different forms.

MATERIAL AND METHODS

Materials. 10 medlar genotypes identified in south-western Romania were taken under study. Genotypes identified come from the following areas: Ezeriș (E1) - Caraș-Severin County, Turnu Ruieni (T1) - Caraș-Severin county, Craiova (C1) - Dolj county, Nanov (N1) - Teleorman county, Bârsești (B1) - Gorj county, Mătăsari (M1, M2) - Gorj county, Drăgășani (D1) - Vâlcea county, Strâmba-Jiu (S1, S2) - Gorj County, identified in both spontaneous and semi-cultivated flora, near houses, private gardens, forests. The identified genotypes are in a perimeter within the following geographical coordinates: latitude 44°45´20" (Strâmba Jiu) and 45°23´58" (Ezeriș) / longitude 21°52´37" (Ezeriș) and 24°19´16" (Drăgășani).

Methods. Setting out from the name of locality where they were identified, genotypes were coded with letters and numbers, the letter representing the initial of locality where they were identified, and the number is genotype number in respective locality. Habitus of genotypes was described according to classification criteria of fruit tree species (Cosmulescu, 2014). Thus, the identified genotypes were divided into two groups, namely: 5 of the identified genotypes belong to the group of trees proper, which are characterized by a single main stem and 5 genotypes in the form of a shrub that are characterized by the presence of 2 up to 8 main stems. Determinations were made on pomological characteristics of the analyzed genotypes regarding: the habitus of plants, main stems, growths on stems. Determinations were made regarding growth characteristics: tree collar circumference (cm), shrub circumference at a distance of 1 m above the soil (m), tree height (m) and approximate age of genotypes (years)

RESULTS AND DISCUSSIONS

Pomological characteristics of ten medlar genotypes (Mespilus germanica L.) identified and taken in the study are presented below (Figure 1).

'M1' genotype was identified in Gorj County, Mătăsari village, at an altitude of 310 m. It grows in the form of a shrub, medium vigour, with 6 main stems, the shrub height being 3 m, and the age approximately 70 years. The shrub circumference is 4.50 m at a distance of 1 m from the ground. The shape of leaves is lanceolate, light green, pubescent, the average length of leaves is 10.7 cm, and the leaves width is 4.90 cm. Fruits are small, hemispherical, each fruit ends with 5 sepals, fruits colour is brownish, the average fruit weight was 3.15 g, the average fruit diameter is 18.43 mm, and fruit volume is 4.38 cm^3.

'M2' genotype was identified in Mătăsari village, Gorj County, a hilly area, with an altitude of 300 m. It grows in the form of a shrub, medium vigour, having 8 main stems, the shrub height is 4.50 m, and age is about 50 years. The shrub circumference is 6.12 m at a distance of 1 m from the ground. Leaves are dark green, lanceolate, pubescent on the lower side, the average leaf length 11.24 cm, and the

average leaf width was 3.94 cm. The fruits are reddish brown, the average weight is 8.42 g, the average diameter is 24.62 mm, and fruit volume is 8.41 cm^3.

'D1' genotype has been identified in Drăgăşani, located at the southern limit of Vâlcea County, at an altitude of 275 m. It grows in the form of a shrub, high vigour, has 2 main stems, the shrub height is 6.30 m and the age of about 60 years old. The shrub circumference is 2.70 m. at a distance of 1 m from the ground. The leaves are lanceolate in shape, dark green colour and pubescent on the underside. The fruits are large, spherical in shape with a large calyx cavity, of brownish-brown colour. The average fruit weight was 24.29 g, the average diameter was 37.20 mm, and the fruit volume was 24.75 cm^3.

'S1' genotype - identified in Strâmba-Jiu village, located in the southwestern area of Gorj County, at an altitude of 150 m. It grows in the shape of a shrub, medium vigour, it has 7 main stems, the shrub height is 300 cm and the age of about 83 years; the shrub circumference is 5.50 m at a distance of 1 m from the ground. Leaves are light green, lanceolate, are pubescent on the lower side, the average leaf length is 8.34 cm, and the average leaf width is 3.37 cm. The fruits are small brown-reddish, the average fruit weight is 13.42 g, the average diameter is 29.85 mm, and fruit volume is 13.48 cm^3.

'S2' genotype

Identified in Strâmba-Jiu village, located in the southwestern area of Gorj County, at an altitude of 143 m. It grows in the shape of a shrub, medium vigour, it has 8 main stems, the shrub height is 4.50 m and the age is about 50 years old. The shrub circumference, at a distance of 1 m from the ground, was 4.24 m. Leaves are light green, lanceolate, pubescent on the lower side, the average leaf length is 8.59 cm, and the average leaf width of is 3.52 cm. The fruits are reddish brown, average weight is 10.91 g, average diameter is 28.28 mm, and fruit volume is 10.57 cm^3.

'E1' genotype

Identified in Caraș-Severin County, Ezeriș village, at an altitude of 219 m. It grows in the shape of a tree, low vigour, the height is 3.40 m, and the age about 6 years old. The trunk circumference is 26.11 cm, at 10 cm from the ground, diameter of 8.31 cm, trunk height is 67 cm, and in terms of growths on the stem, 4 tree framings were identified. The leaves have a lanceolate shape, dark green, being pubescent on the underside. The average leaf length was 9.92 cm, and the average width was 4.13 cm. Fruits are large, having an elongated conical shape, the fruit colour being brownish-brown. The average fruit weight is 20.34 g, the fruit diameter is 31.47 mm, and fruit volume is 20.42 cm^3.

'T1' genotype

Identified in Caraș-Severin county, Turnu Ruieni village, at an altitude of 290 m. It grows in the shape of a tree, low vigour, the height of 2.90 m, and the age of about 4 years old. The trunk circumference, at 10 cm from the ground, is 22.17 cm, and diameter is 7.06 cm. Canopy shape is a vessel, with a trunk height of 70 cm. Leaves are lanceolate, dark green, pubescent on the underside. The average leaf length was 8.8 cm and the average width was 3.5 cm. Fruits are large, conical elongated shape, brownish-brown in colour. The average fruit weight is 36.68 g, diameter of 44.15 mm, and fruit volume was 32.17 cm^3.

'C1' genotype

Identified in Dolj County, Craiova, at an altitude of 100 m. It grows in the shape of a tree, low vigour, with the height of 4.00 m, having 4 growths on the stem, and the age of 7 years old. The trunk circumference, at 10 cm from the ground, is 39

cm, and diameter is 12.73 cm. Leaves are lanceolate, dark green colour and they are pubescent on the underside. The average leaf length is 9.70 cm and the average width is 3.96 cm. Fruits are large, almost spherical, with a very large calyx cavity, on whose edge there are 5 inserted sepals, reddish brown colour. The average fruit weight was 21.55 g, fruit diameter was 37.65 mm, and fruit volume was 22.48 cm^3.

'N1' genotype

Identified in Teleorman County, Nanov village, at an altitude of 43 m. It grows in the shape of a tree, low vigour, with the height of 3.00 m, and the age of about 3 years old. The trunk circumference, at 10 cm from the ground, is 23 cm, and diameter is 7.32 cm. Canopy shape is vessel, stem growths, and 3 framings have been identified. Leaves have a lanceolate shape, dark green, being pubescent. The average leaf length is 12.18 cm, the average leaf width is 5.60 cm. Fruits are large, with a very large calyx cavity, on whose edge there are 5 inserted sepals, reddish brown colour. The average fruit weight is 21.86 g, fruit diameter is 36.12 mm, and fruit volume is 20.9 cm^3.

'B1' genotype

Identified in Gorj County, Bârsești village, located at an altitude of 208 m. It grows in the shape of a tree, low vigour, the height of 2.20 m, and the age of about 6 years old. The trunk circumference, at 10 cm from the ground, is 28 cm, and diameter of 8.91 cm; trunk height being 37 cm, with 3 framings. The leaves are lanceolate in shape, dark green colour, pubescent on the underside. The average leaf length was 10.26 cm. The fruits are large, having an elongated conical shape, brown-reddish, brownish colour. The average fruit weight is 16.96 g, fruit diameter is 30.21 mm, and fruit volume is 17.51 cm^3.

M1

M2 D1

S1

S2

E1

T1

C1 N1 B1

Figure 1. Growth characteristics of medlar genotypes

CONCLUSIONS

Variability of morphological characteristics analyzed in genotypes studied, indicates wide opportunities of selecting the genotypes of interest, both in terms of fruit-growing science and ornamental value. Genotypes identified in this study respond well to ecological characteristics of the area, which is a very important advantage for medlar culture. It is highly important that these identified genotypes to be considered and evaluated in detail for breeding studies.

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RESULTS REGARDING CHEMICAL CONTROL OF METCALFA PRUINOSA SAY

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Keywords: *chemical control, host plants, efficacy*

ABSTRACT

Metcalfa pruinosa (Say 1830) known as citrus flatid plant-hopper, is native from eastern North America, an invasive species that extends its area from the south - eastern Canada to Florida (Mead, 2014), spreading later to other continents such as: Central America and Caribbean, South America, Asia and Europe (Strauss, 2010).

We proposed to test the chemical efficacy of five insecticides (Calypso 480 SC 0,5%, Movento 100SC 0,2%, Nurelle D 50/500 EC 0,2%, Karate Zeon 0,5%, Mavrik 2F 0,5%, used against mobile forms (adults and larvae) of the species Metcalfa priunosa, the treatments being carried out on following plants: Inula sp., Salvia sp., Iris sp., Solidago canadensis, Helianthus tuberosus, Prunus cerasifera, Amorpha fruticosa, Yucca filamentosa from the "Al. Buia" Botanical Garden.

Following the application of the treatments and the 2 weeks in which it was monitored their effect , the most effective product proved to be Nurelle D 50/500 EC with a 100% efficiency in the first 24 hours, followed by Karate Zeon and Mavrik 2F.

INTRODUCTION

Metcalfa pruinosa (Say 1830), known as citrus flatid plant-hopper, is native from eastern North America, an invasive species that extends its area from the south - eastern Canada to Florida (Mead, 2014), spreading later to other continents such as: Central America and Caribbean, South America, Asia and Europe (Strauss, 2010).

The invasion of new territories is accidentally carried out by passive transport of adults or eggs with infested plants or by beekeepers who deliberately introduce it for honey secretion (MIHAJLOVIĆ, 2007).

Another way of spreading can be through the active flight of adults, but only at small spatial scales: for example, the estimated rate of natural spread of the cicada in Vienna is 0.2-0.5km/ year (KAHRER et al., 2009).

Long-distance propagation of this species is achieved by vehicles that often park along the road near plants (Lauterer, 2002), and in public spaces where the biological reserve of this species is abundant, spreading can be achieved accidentally by people (Strauss, 2010).

Limiting the spread of the species in urban green spaces is difficult to achieve (Girolami and Mazzon, 1999, cited by Preda & Skolka, 2009).

In the United Kingdom and the Czech Republic Metcalfa pruinosa has been eradicated by applying insecticide treatments (Malumphy and Lauterer, cited by Strauss, 2009). In the Czech Republic 0.1% Sumithion was used to combat it (Lauterer, 2002).

MATERIALS AND METHODS

The obervations and species monitoring were carried out during the period May-September 2019, the researchs being made in the "Al. Buia" Botanical Garden.

The purpose of the research is the testing of five products in the chemical control of this pest, products with different active substances: Calypso 480 SC (Tiacloprid 480 g/l), Movento 100SC (Spirotetramat 100 g/l), Nurelle D 50/500 EC (Cypermethrin 50 g/l + 500 g/l chlorpyrifos), Karate Zeon (50 g/l lambda-cihalotrin), Mavrik 2 F (Tau-fluvalinate 240 g/l).

RESULTS AND DISCUSSIONS

Based on these considerations we set out to test the chemical efficacy of five insecticides (Calypso 480 SC 0,5%, Movento 100SC 0,2%, Nurelle D 50/500 EC 0,2%, Karate Zeon 0,5%, Mavrik 2F 0,5%, used against the mobile forms (adults and larvae) of the species Metcalfa priunosa, the treatments being performed at the plants: *Inula* sp., *Salvia* sp., *Iris* sp., *Solidago canadensis* L., *Helianthus tuberosus* L., *Prunus cerasifera* Ehrh., *Amorpha fruticosa L*, Yucca filamentosa L. from the Botanical Garden.

Insecticides have a systemic effect on the mobile forms, these being affected through contact and after ingestion.

The application of insecticides was carried out on 24.07.2019 with an atomizing sprayer. Observations on the number of adults and live larvae / plant were made before the application of the treatment and at 24, 48, 72 hours, 7 days and 14 days after the treatment application. The results obtained from the application of the treatments are presented in the below graphs.

Following the application of the treatments and the 2 weeks in which was monitored their effect on the larvae and the live adults , the most effective product proved to be Nurelle D 50/500 EC with 100% efficiency in the first 24 hours, followed by Karate Zeon and Mavrik 2F.

Calypso 480 SC and Movento 100SC products, in the first 72 h had a low efficiency, at the following countings, at 7 and 14 days, the number of adults on certain plants was constantly increasing, which is why the two products had the lowest results compared with the above products.

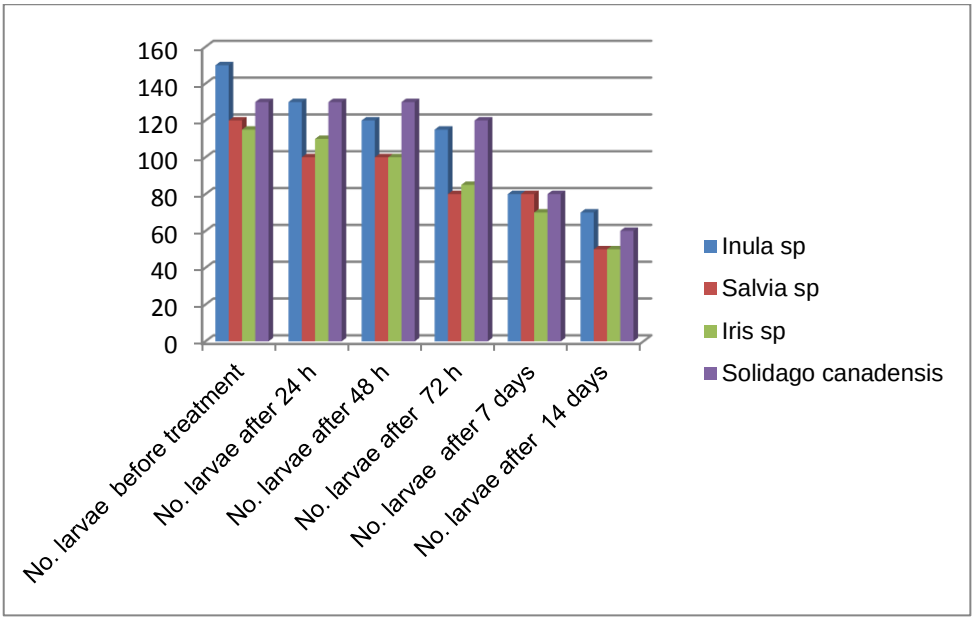

Figure 1. The efficacy of the Calypso 480 SC insecticide on larvae

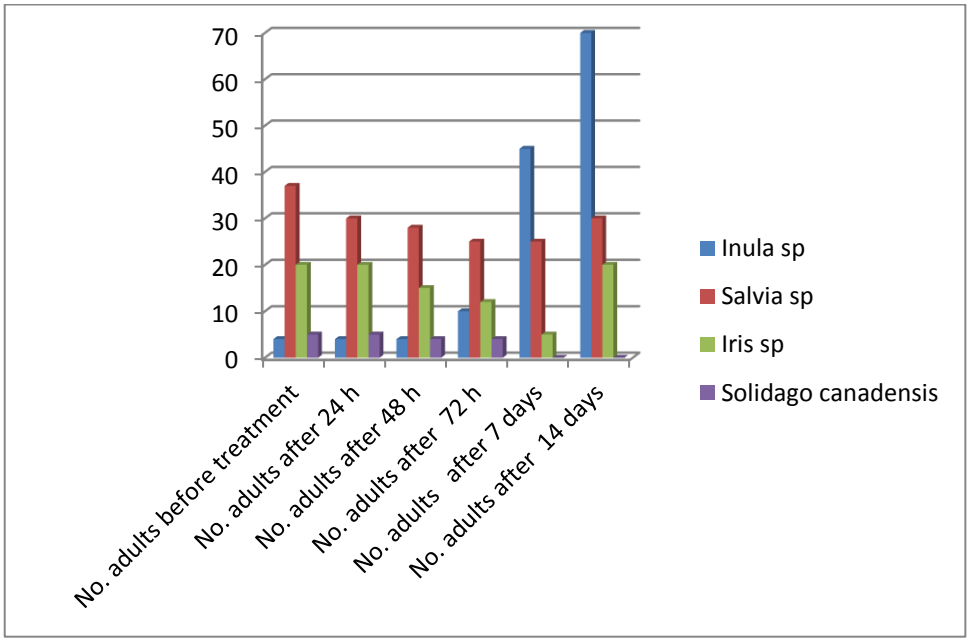

Figure 2. The efficacy of the Calypso 480 SC insecticide on adults

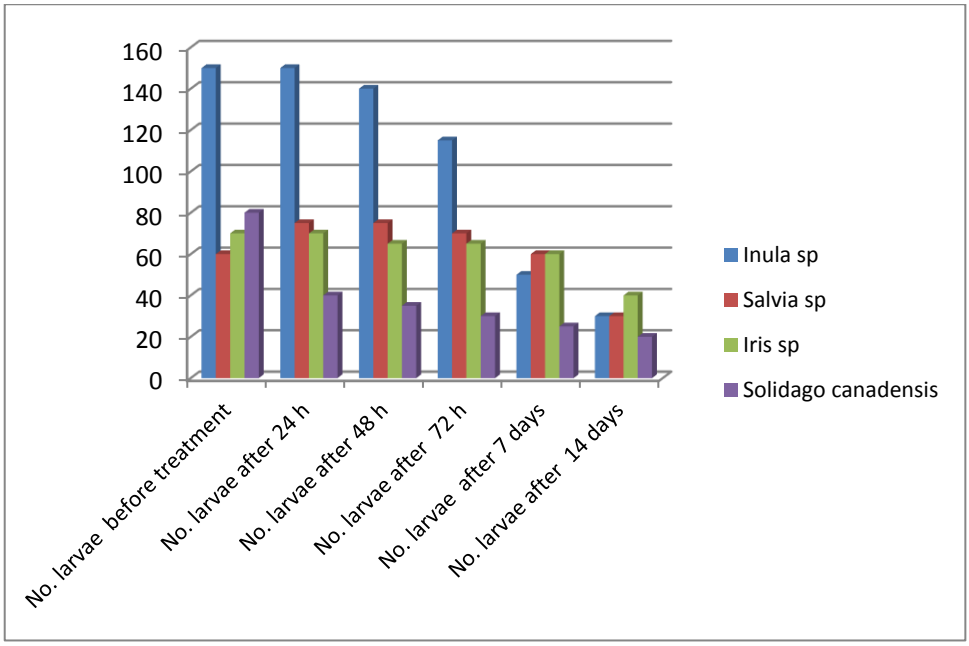

Figure 3. The efficacy of the Movento 100SC insecticide on larvae

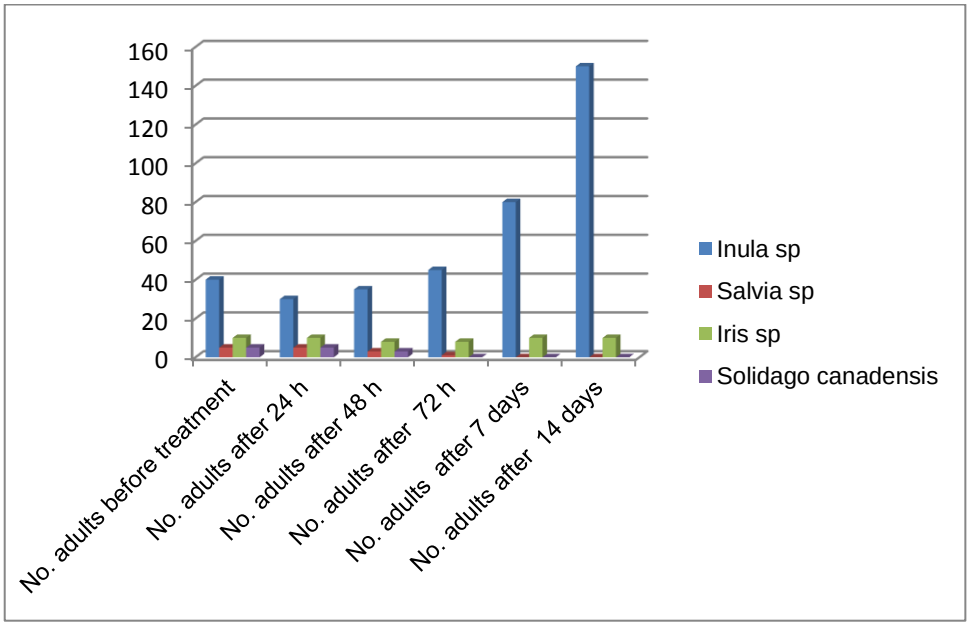

Figure 4. The efficacy of the Movento 100SC insecticide on adults

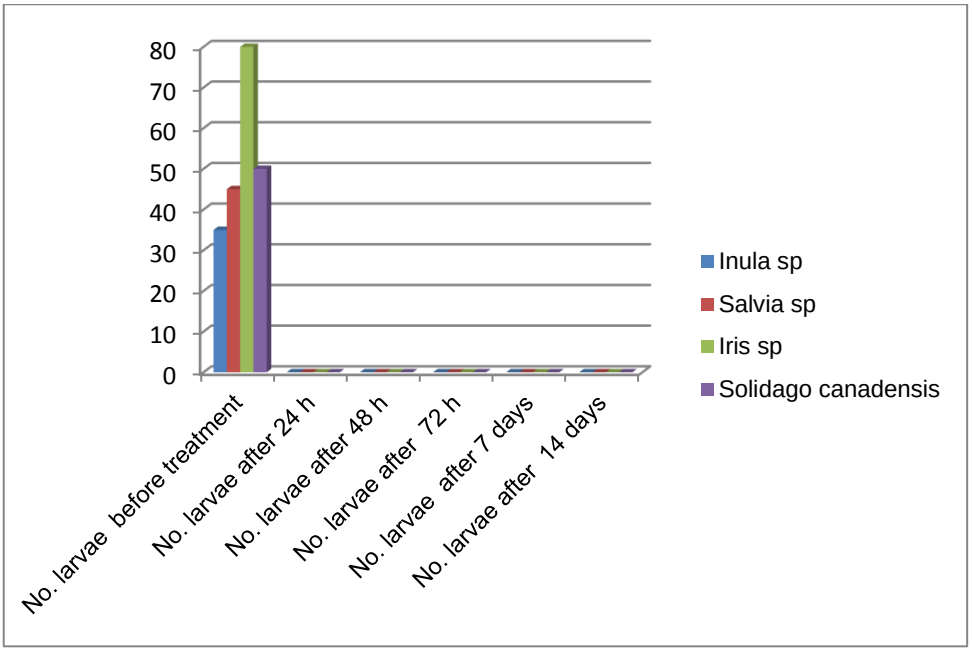

Figure 5. The efficacy of the Nurelle D 50/500 EC insecticide on larvae

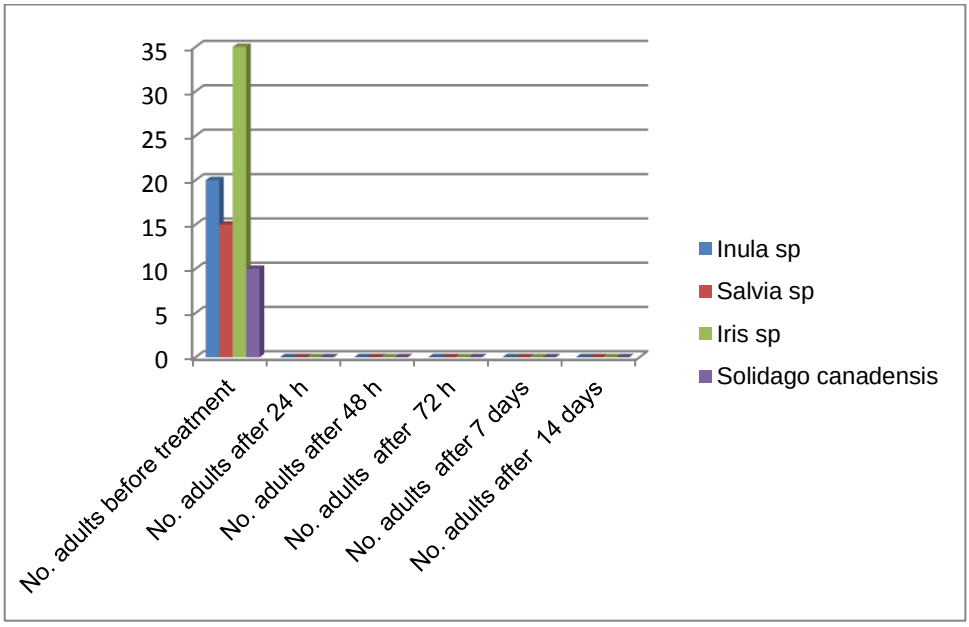

Figure 6. The efficacy of the Nurelle D 50/500 EC insecticide on adults

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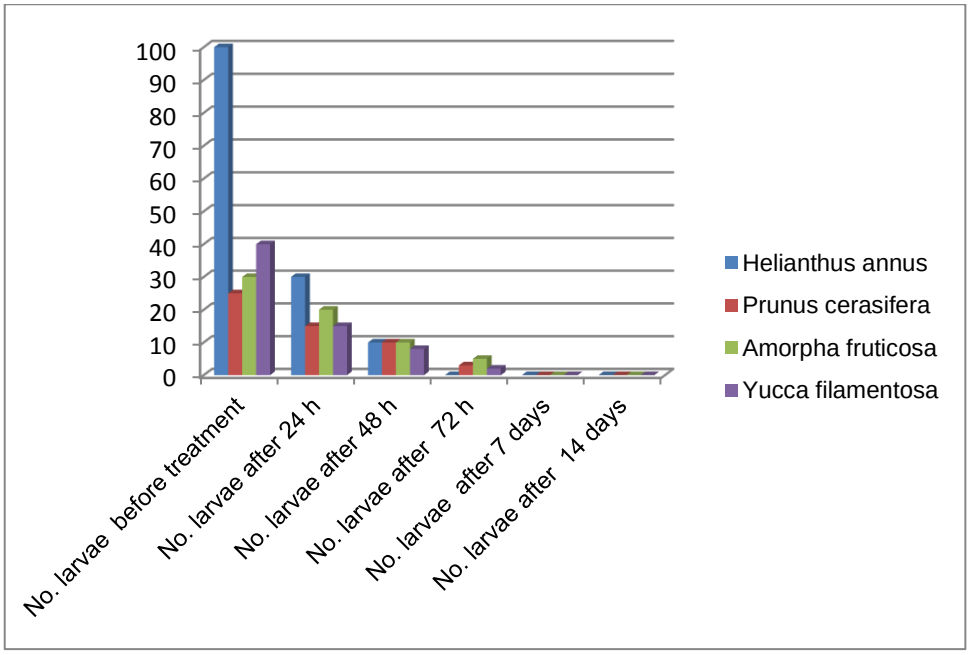

Figure 7. The efficacy of the Karate Zeon insecticide on larvae

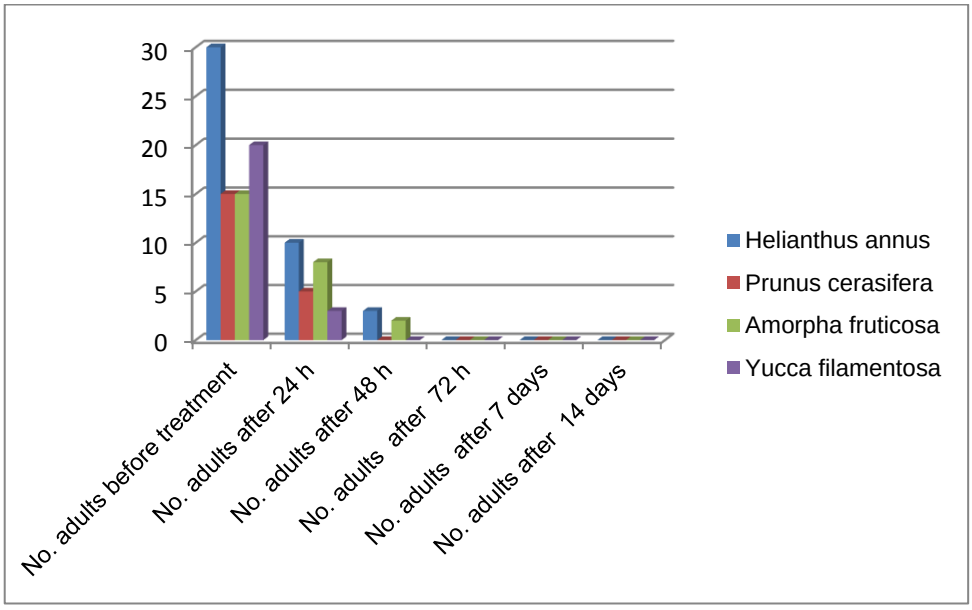

Figure 8. The efficacy of the Karate Zeon insecticide on adults

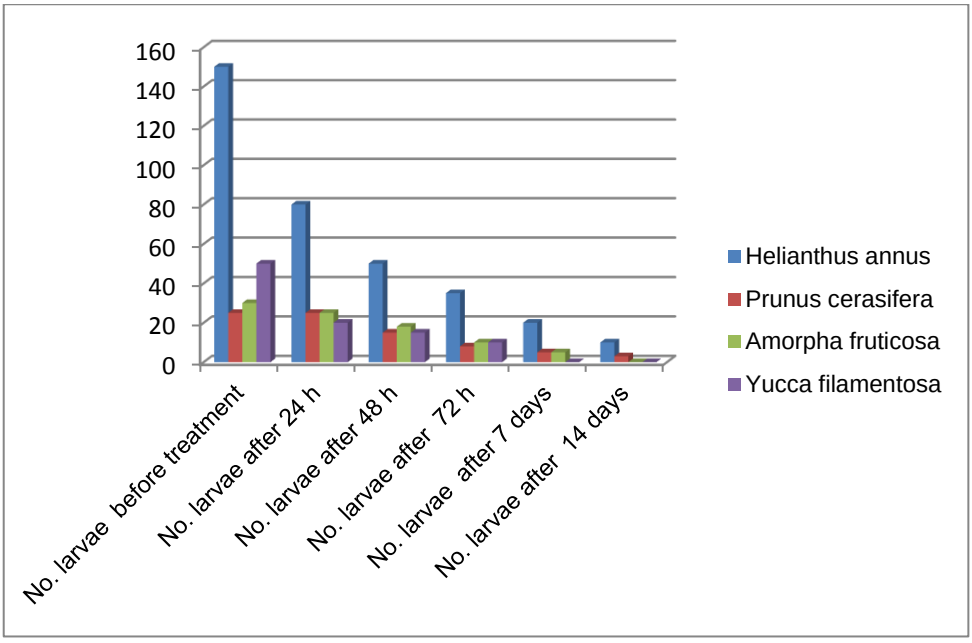

Figure 9. The efficacy of the Mavrik 2F insecticide on larvae

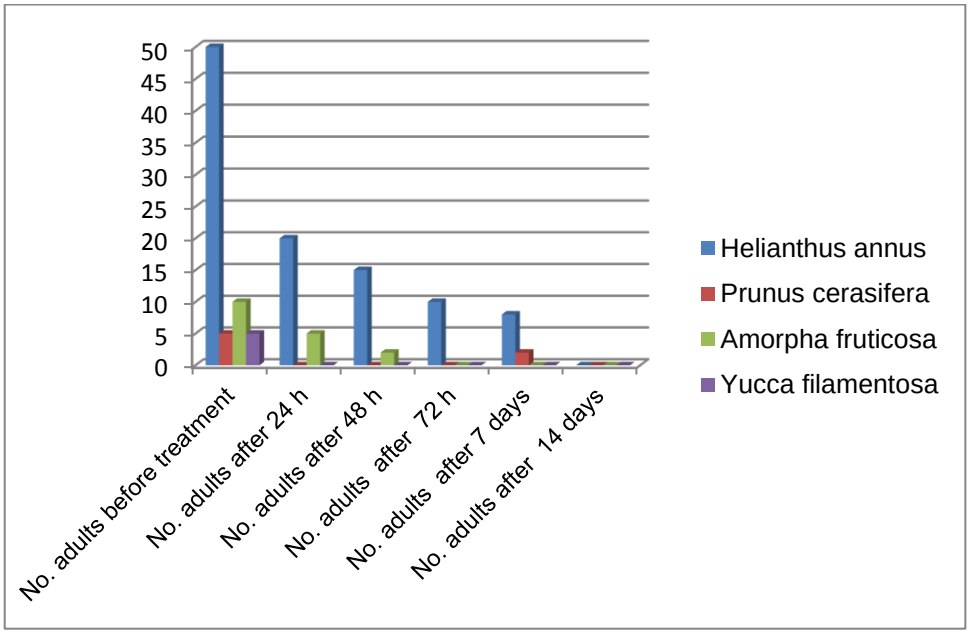

Figure 10 . The efficacy of the Mavrik 2 F insecticide on adults

CONCLUSIONS

Following the treatments performed and the monitoring of their effect against the mobile stages of the Metcalfa pruinosa species, the most effective product is Nurelle D 50/500 EC, followed by Karate Zeon and Mavrik 2F which maintain their effect for a long time.

Calypso 480 SC and Movento 100SC products showed a low efficacy in the first 72 h.

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CONTROL OF THE MAIN QUALITY PARAMETERS AND THE QUALITY INDICATORS OF SOME WINES IN DRĂGĂŞANI VINEYARD

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Keywords*:wine, indicators of quality, vineyard*

ABSTRACT

This study aims to analyze the quality and authenticity of some wines obtained in the Drăgăşani vineyard. For this purpose, white, aromatic and red wines obtained from Romanian and French varieties cultivated in Drăgăşani were analyzed. Quality and naturalness of wine can be determined by analyzing the main parameters (alcohol, total acidity, extract, ash) and calculating the most important indicators of quality (ratio alcohol / glycerol, alcohol / extract, extract / ash Halphen and Gautier). Following this analysis it was found that all wines are authentic, natural and of exceptional quality.

INTRODUCTION

Wine is a product widely consumed and establishing its authenticity is one of the most important aspects in quality and food safety.

Wine is a polyphasic system of substances, some of which come from grapes, and most are formed during alcoholic and malolactic fermentation, as well as during the aging process of wines (Gheorghiță M. & al., 2002). The chemical composition of the wine comprises over 500 associated substances in an extremely complex and inconsistent manner, some pass through grapes in an unchanged state (acids: tartaric, malic, citric, carbohydrates, mineral substances, etc.), others are formed during alcohol fermentation, or other fermentative processes (alcohols, lactic and succinic acids, etc.), and others occur as a result of reactions that occur either between the substances in the nascent state or on the basis of the existing ones (esters, acetals) (Băducă C., 2016).The authentication, identification of frauds and determination of the conformity of the product with the specifications inscribed on the label are requirements of the consumers and of the European Community. In order to solve this problem optimally, the development and harmonization of the analytical methods valid at national and European level, as well as the establishment and enlargement of the database necessary to improve the efficiency of the wine control represent priorities at international level (Banu C. & al., 2013).Capitalizing on the wine potential of Romania, in order to obtain sustainable competitive advantages on foreign markets, requires the creation and promotion of an identity of Romanian wine, based on analytical investigations that certify the quality and natural chemical composition of the wines (Stoica Felicia, 2015).

MATERIAL AND METHODS

For this study we have analyzed the following white wines and flavored, obtained both from traditional varieties Romanian vineyard Drăgăşani (Crâmpoşie selecţionată, Fetească regală and Tămâioasă Românească) and varieties of foreign origin - French (Sauvignon and Muscat Ottonel).The red wines analyzed in terms of quality and authenticity was obtained from Romanian grape varieties - Negru de Drăgășani, but also foreign varieties such as Cabernet Sauvignon and Merlot.

For the calculation of alcohol - glycerol, ash - extract, alcohol - extract ratios, Halphen, Gautier and the main parameters defining the aroma of wines, we determined in the Oenology laboratory of the Faculty of Horticulture the alcoholic concentration of wines, the contents in glycerol, ash and dry extract by OIV methods, as well as the aroma characteristics at INCC Rm. Valcea, by gas chromatography (Muntean Camelia, Băducă C., Stoica Felicia, 2001).

Using these data, the ratios between the weight of the dosage alcohol and the glycerol, the alcohol and extract ratios, the ratios between the weight of the non-reducing dry extract and the ash were calculated.

In order to determine the alcohol-glycerol ratio, the alcoholic degree is multiplied by 10 to obtain the amount of alcohol by volume. The amount of alcohol by volume is then multiplied by 0.79 (molecular weight) to obtain the amount of alcohol by weight. Then, by mathematical calculation, the ratio of the weights of the two elements is determined. The limits of variation of this report are between 5.5 and 13.5, with an average of 8.5 for Romanian wines.

For the determination of the extract - ash ratio, the extract is considered 100%, and the ash represents as% of the extract. There is no linear relationship between the reduced extract and ash.

To determine the ratio R_R, alcohol - extract, the alcoholic degree is multiplied by 10 to obtain the amount of alcohol by volume. The amount of alcohol by volume is then multiplied by 0.79 (molecular weight) to obtain the amount of alcohol by weight. The variation limits of the R_R ratio are 4.3-5.5, for white wines and 3.6 - 4.5 for red wines.

The Halphen ratio is Total Acidity (g / L) / Alcohol (% vol.). The values for this ratio range from 0.2-0.8 for natural wines.

The Gautier index representing the sum of alcohol% vol. and the total acidity g / L shows values between the legal limits 13-17 (Banu et al, 2013). These relationships are taken into account especially when determining the degree of naturalness of the wines and the compositional balance of the products.

RESULTS AND DISCUSSIONS

The main composition characteristics of the white and aromatic wines obtained in the Drăgăşani vineyard are presented in Table 1.

According to the data entered in Table 1 the analyzed wines have alcoholic degrees, between 10.6% vol. (Crâmpoşie selecţionată) and 13.1% vol. (Sauvignon). Fetească regală wine exceeded by 0.4% vol. and those flavored with 0.5-0.8% vol. the threshold of 12.0% vol.

With the exception of Muscat Ottonel wine, the total acidity showed values of over 4 g / L in H_2SO_4 or over 6 g / L in în $C_2O_6H_6$ in all other varieties, being in accordance with the Norms of application of L.V.V. in current.

The close relationship between Gay-Lussac and glycerol-pyruvic fermentation is faithfully reflected in the glycerol contents. This explains the higher

proportions of glycerol (10.0 g / L and 10.10 g / L) in the wines of Sauvignon and Tămâioasa Românească, where the alcoholic strengths were 13.1% vol. and 12.8% vol. (Stoica Felicia, 2008). In the other wines, the glycerol contents were between 6.8 g / L (Crâmpoşie selecţionată), 9.1 g / L (Fetească regală) and 9.81 g / L (Muscat Ottonel).

Table1.

THE MAIN COMPOSITION CHARACTERISTICS OF WHITE AND AROMATIC WINES

Composition characteristics	Wines				
	Crâmpoşie selecţionată	**Fetească regală**	**Sauvignon**	**Muscat Ottonel**	**Tămâioasă românească**
Alcohol % vol.	10.6	12.4	13.1	12.5	12.8
Total acidity g/L H_2SO_4	4.10	4.30	4.15	3.95	4.26
Glycerol g/l	6.84	9.10	10.0	9.81	10.10
Non-reducing extractg/L	19.08	22.18	23.26	23.18	23.17
Ash g/L	1.79	2.06	2.18	2.16	2.26
Glycerol x100/Alcohol	8.37	9.65	9.89	9.98	9.98
Alcohol/Extract	4.3	4.27	4.44	4.41	4.33
Total acidity / Alcohol	0.38	0.35	0.31	0.31	0.33
Ash x 100/ Non-reducing extract	7.81	9.29	9.37	9.28	9.53
Indice Gautier %volAlcohol+ Tot. acidity, g/L	14.05	16.22	17.23	16.35	16.96

The non-reducing extract presented values determined by the genetic nature of the variety, but also by some interventions in the primary vinification. The qualitative level of the raw material, but also the slight maceration applied to the vinification of the grapes of Sauvignon, Tămâioosă Românescă and Muscat Ottonel determined the highest contents in the extract of their wines (23.26 g / L and 23.17 g / L respectively). For the other wines, the extract showed values between 19.08 g / L (Crâmpoşie selecţionată) and 22.18 g / L (Fetească regală).

The contents in mineral substances (ash) follow, in general, proportionally the sizes of the non-reducing extract, being over 2 g / L in Sauvignon wines, Fetească regală, Muscat Ottonel and Tămâioasă Românească and below 2 g / L for theCrâmpoşie selecţionată wine (1, 79 g / L).

The glycerol ratios compared to the alcohol dosage, apart from Crâmpoşie selecţionată, are slightly below 10% or even above this threshold considered as ideal (in the case of the Tămâioosă Românească and Muscat Ottonel wines).

The proportions of ash with respect to the non-reducing extract between 9.29 (Fetească regală) 9.37 (Sauvignon) and 9.75 (Tămâioasă Românească) are considered as expressing favorably the relations between the two oenological sizes.

The Gautier index representing the sum of alcohol% vol. and the total acidity g / L shows values between the legal limits 13-17. Only in the case of Sauvignon wine this index exceeds the maximum value due to higher contents in both alcohol and total acidity.

The natural and high quality character of white and aromatic wines also results from the values of glycerol ratios × 100 / alcohol and ash × 100 / non-reducing extract

Ratios glycerol × 100 / alcohol and ash × 100 / non-reducing extract were close to the ideal level (10%) for Tămâioosă Românească, Muscat Ottonel and Sauvignon wines, with values between 9.34 and 9.88 for the report glycerol × 100 / alcohol and between 9.29 and 9.75 for the ash ratio × 100 / non-reducing extract, signifying important criteria for the quality and compositional balance of the products.

As for the alcohol / extract ratio, all the wines analyzed fall within the legal limits 4.3-5.5, with no suspicion of alcohol forgeries, and the values of the Halphen ratio fall within the limits of 0.2-0.8.

It can be concluded, from the values obtained for the five quality indices, that all wines are authentic, natural, without illegal additions of alcohol.

Regarding red wines, based on the chemical analyzes performed in the oenology laboratory and with the help of mathematical calculations, the following results presented in Table 2 were obtained.

Table 2

THE MAIN COMPOSITION CHARACTERISTICS OF RED WINES

Composition characteristics	Wines		
	Cabernet Sauvignon	Merlot 2012	Negru de Drăgăşani 2012
Alcohol % vol.	13,3	13,0	11,1
Glycerol g/l	9,7	8,9	7,9
Non-reducing extract g/l	28,3	28,1	24,6
Ash g/l	3,30	2,75	1,75
Alcohol / Glycerol	9,17	8,66	7,86
Extract / Ash	11,66	9,71	8,49
I $D0_{420}$+ $D0_{520}$	1,96	1,49	0,54
$TD0_{420}$ / $D0_{520}$	0,62	0,49	0,56

In terms of color quality, it is at the level of current requirements when the ratio of yellow pigments and red pigments (D0420 nm / D0520 nm) lies between 0.50 and 0.60 within a color intensity that does not drop below 0.8

As can be seen from the data contained in table 2, the wines of both Cabernet Sauvignon and Merlot wines, obtained in the Drăgășani vineyard, are noted by a total alcoholic degree which never decreased below 12 vol.%, but achieved in exchange values over 13 vol.%.

Glycerol is the most important by-product of alcoholic fermentation, both in terms of quantity and the influence it exerts on the organoleptic properties of wine. It has a beneficial influence on the taste characteristics of the wine, giving them the nuances of softness, fineness, harmony and suppleness, due to its softness and sweet taste (equal to glucose).

Glycerol, a component with an essential role in red wines in shaping the taste asperity printed by tannin, is always present in large quantities without ever being below 7 g / 1, but can reach 11 g / L.

The alcohol - glycerol ratio for Cabernet Sauvignon and Merlot has values between 8.66 and 9.17, and for wines from Negru de Drăgăşani it has a low value of 7.86.

Along with numerous organic constituents, in the wines are also found the mineral substances mainly from grapes, having, to a large extent, an endogenous origin.

Within the different categories of wines, red and aromatic ones are richer in endogenous mineral substances due to the contact between the two phases of the mustard - the maceration process - knowing that the solid parts of the grapes are richer in these constituents.

In terms of mineral content, Cabernet Sauvignon and Merlot wines (3.30 g / 1 and 2.75 g / l respectively) are detached and the one obtained from Negru de Drăgăşani with a value of 1.75 g / l. The proportion of ash compared to the reduced extract also knows certain oscillations, it records lower values in the wine of Negru de Drăgăşani located below the limit considered ideal (10%) and very good values to those obtained from Cabernet Sauvignon and Merlot (11.66% and 9.71%).

The color intensity is detached from Cabernet Sauvignon wine, which has a very intense coloring. As a value of this parameter the next wine after Cabernet Sauvignon is Merlot followed by Negru de Drăgăşani.

The tonal values indicate the existence of a favorable balance between the proportions of the yellow pigments - orange and the red– violets ones, which represent certain premises for a positive evolution of the coloring of the wines during the aging. All in all, the coloration of these wines is intense, vivid, bright and sustainable in the studied centers.

It can be concluded, from the values obtained for the five quality indices, that all wines are authentic, natural, without illegal additions of alcohol.

CONCLUSIONS

Studies have shown to be very convincing that all the wines analyzed, from the Drăgăşani vineyard are of exceptional quality, highlighted both by the harmonious chemical composition and by the very pleasant organoleptic properties.

White wines have been proven, both by their balanced composition and by their satisfactory qualities and that the varieties they come from are capable of using the excellent natural conditions in the area, and as such it is necessary to extend them in culture.

Studies carried out in the Drăgăşani vineyard, on semi-aromatic and aromatic wines, have shown that the wines of Sauvignon, Muscat Ottonel and Tămâioasa Românească have an exceptional oenological potential.

As for the red wines of Cabernet Sauvignon and Merlot, they achieve an exceptional quality, highlighted both by the harmonious chemical composition and by the very pleasant organoleptic properties.

The variety of Negru de Drăgăşani has proved, both by the balanced composition of the wines and by the satisfactory qualities that it is able to use the excellent natural conditions in the area, and as such it is necessary its extension in the culture.

All the control parameters of the counterfeit, the reports Alcohol / Glycerol, Alcohol / Extract, Extract / Ash, the Gautier index and the Halphen report, through the values obtained for all the wines analyzed from the Drăgăşani vineyard, indicate that we are in the presence of some natural, authentic wines, high quality and kept, according to the category they belong to.

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EXPERIMENTAL STUDY REGARDING THE CLASSIFICATION OF SEEDS AND THE DETERMINATION OF THE FLOATING SPEED FOR THE DESIGN OF THE VACUUM CLEANER AND THE PNEUMATIC TRANSPORT INSTALLATIONS.

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Keywords*: hybrid, maize, floating, speed.*

ABSTRACT

The purpose of the present paper is to determine the sieves for the classification of the hybrid maize variety Pioneer AQUAMAX P9911. On the other hand, by calculating the floating speed, a more rigorous projection of the fans can be started. Thus, the fans used to clean the seeds and those used for their transportation can be more accurately dimensioned.

INTRODUCTION

The raw materials used in the milling and bakery as well as in the beer industry contain different impurities that are not accepted in the products, as they negatively affect both the manufacturing process and the quality of the finished products. By separating the impurities, we can obtain quality raw materials [Alexandrescu 2019, Medan & Basarman 2017].

Obtaining quality raw materials free of impurities means choosing sieves with the correct size of their holes so that the separation could be realized as best as possible. The problem of separating impurities can be considered a classification operation, if the mixture of seeds and impurities is considered to be a meeting of separate entities [Sorică 2011]. The classification is represented as a technological operation of separating one or more components called fractions, different under certain essential aspects, which allow process differentiation [Ţucu 2007]. In order to realize the separation of impurities, certain technical methods are used. They separate the impurities on the basis of the following principles: size difference; different aerodynamic characteristics; different specific mass; form differences; different magnetic properties; combinations thereof and other less widespread or known principles.The vacuum cleaner uses size difference; different aerodynamic characteris [Bâlc G. et al. 2016].

MATERIAL AND METHODS

The Pioneer AQUAMAX P9911 hybrid maize variety was selected for the study. It is a semi tardive Aquamax hybrid, FAO 410 (126-132 days), with excellent production capacity, adaptation to water and thermal stress.The Pioneer AQUAMAX P9911 hybrid has the following agronomic characteristics: tall plant; medium

insertion of the cob; long and compact corn cob; toothed grain. The Pioneer AQUAMAX P9911 hybrid is resistant to stem and cob rot, good drought tolerance, it loses water quickly to maturity. The recommended density on non-irrigated land is 60,000-65,000 crops / ha and on irrigable land is 70,000-78,000 crops/ha[www. verdon.ro/seminte-cereale/seminte-porumb-pioneer-p9911-aquamax-80000-boabe.html\].

RESULTS AND DISCUSSIONS

From the corn cultivation, the cobs were chosen from four different parts of a 1ha plot.

Table 1

Minimum values of Pioneer P 9911 variety grains ordered in ascending order

No.crt	Minimum values of Pioneer P 9911									
1-10	4.16	4.21	4.26	4.29	4.33	4.34	4.37	4.37	4.38	4.39
11-20	4.39	4.41	4.42	4.43	4.44	4.44	4.45	4.49	4.51	4.52
21-30	4.52	4.53	4.53	4.54	4.54	4.54	4.55	4.57	4.58	4.60
31-40	4.61	4.62	4.63	4.66	4.66	4.66	4.68	4.68	4.68	4.69
41-50	4.69	4.70	4.71	4.73	4.73	4.73	4.74	4.76	4.78	4.79
51-60	4.80	4.80	4.81	4.83	4.84	4.87	4.87	4.89	4.90	4.92
61-70	4.93	4.93	4.93	4.94	4.94	4.94	4.97	4.97	4.98	5.01
71-80	5.01	5.01	5.02	5.02	5.04	5.05	5.07	5.07	5.08	5.08
81-90	5.09	5.09	5.14	5.14	5.15	5.15	5.15	5.17	5.17	5.26
91-100	5.26	5.27	5.28	5.28	5.33	5.34	5.36	5.40	5.41	5.42
101-110	5.47	5.48	5.48	5.48	5.49	5.55	5.56	5.58	5.60	5.62
111-120	5.69	5.70	5.71	5.74	5.77	5.80	5.94	5.99	6.13	6.13
121-130	6.14	6.15	6.18	6.20	6.24	6.28	6.31	6.32	6.49	6.57
131-140	6.58	6.67	6.67	7.02	7.33	7.33	7.42	7.49	7.52	7.58

Digital rollers are used to measure the dimensions with an accuracy of up to 0.01 mm.

We divide the string into ten classes, so $\lambda = 10$

$$\lambda = \frac{a_{max} - a_{min}}{n} = \frac{7{,}58 - 4{,}16}{10} = 0.342$$

The classes are $[a_{min}; a_{min} + \lambda)$; $[a_{min} + \lambda; a_{min} + 2\lambda)$;.... $[a_{min} + 9\lambda; a_{min} + 10\lambda]$.
or [4.16 ; 4.502); [4.502; 4.844); [4.844; 5.186); [5.186; 5.528); [5.528; 5.87); [5.87; 6.212); [6.212; 6.554); [6.554; 6.896); [6.896; 7.238); [7.238; 7.58].

Table 2

The percentage of the measurement results

No. crt.	Class									
0	1	2	3	4	5	6	7	8	9	10
No.	18	32	39	17	10	8	5	4	4	3
p[%]	12,86	22.86	27.86	12.14	7.14	5.71	3.57	2.86	2.86	2.14

From a graphical point of view, the variation of the string is represented by a rectangular system of axes clases and p [%],. Constructing successively through rows of rectangles, the curve results, which shows the frequency of repetition of the measured dimension, for a certain class of the researched material [Ţucu 2007].

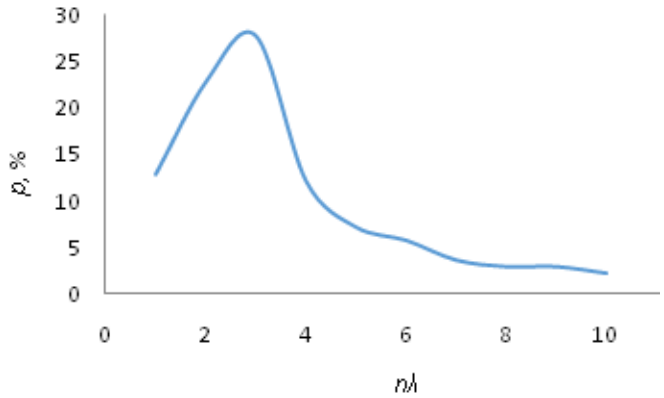

Figure 1 The chart that shows the frequency of repetition of the measured dimensionfor a particular class of Pioneer P9911 corn variety

The determination of floating speed and bearing coefficient for maize grains for Pioneer P9911 variety

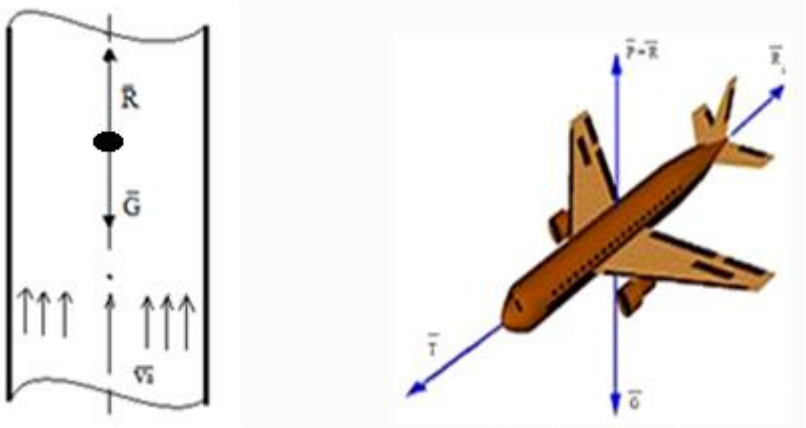

Figure 2. Analogy between the float of a flying machine and of a corn kernel by means of a rising air stream

Where: P-bearing; G- strength of weight; Ri-resistance to advancement; T-traction.

The mass of a corn grain is $0.39 \cdot 10^{-3}\,kg$.

$$S=\sqrt[3]{(abc)^2}=97.81 \cdot 10^{-6}\,m^2$$

a,b,c, the characteristic dimensions of the grain: *a = 6,24; b = 8,92; c = 17,38.*

$$v_p = \sqrt{\frac{mg}{k \cdot \gamma_a \cdot S}} = 12.73\ m/s$$

v_p- floating speed; *g* - gravitational acceleration, *g = 9.81 m/s*^{2}*;* *m* - mass of a corn grain, *m=0.39* $\cdot$ *10*$^{-3}$ *kg; K* - coefficient of resistance depending on the dimensions, shape and character of the grain surface *K =0.20;* γ_a - the specific weight of the air, γ_a *= 1.205 kg/m*^{3}.

$$k_p = \frac{g}{v_p^2} = 0.060$$

Where k_p is the coefficient of bearing.

CONCLUSIONS

This method can be used to classify the seeds of the maize variety in particular and to classify other seeds in general as wheat, barley, oats, rice, peas, sunflower and others.
Losses can be reduced under growing food needs as the global population grows.
By determining the floating speed and the bearing coefficient, the design of the fans and the pneumatic transportation installations can be improved therefor resulting the reduction of the electricity consumption .
At lower speeds of upstream air than the floating speed of corn kernels, dust in the vacuum cleaner can be removed.
At higher speeds of upward air flow the grain mass can be transported with pneumatic transportation installations.

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AGRICULTURAL POTENTIAL OF KONYA AND ITS IMPORTANCE FOR TURKEY: ASSESSMENT ON SOIL, WATER AND AGRO-PRODUCTION POTENTIAL

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Keywords*: Konya (Turkey), Agro-Land Potential, Water Resources Potential, Agricultural Production.*

ABSTRACT

In this paper, agricultural status of Konya and its importance in Turkey were examined. In this regard, main data relevant to farm areas, current land size, crop patterns, production areas and production were obtained from records of Turkish Statistical Institute (TSI) for Konya and Turkey, respectively. Data of Konya were compared with Turkey. In results, agricultural potential of Konya is very important role to play in food security for Turkey in both today and in future.

INTRODUCTİON

Drought has known one of the most common environmental factors limiting agro-production worldwide. Agriculture is the single 70% of fresh water user sector in the world (Gerbens-Leenes & Nonhebel 2004). Arid and semi-arid climate accounts of 26% at worldwide (Akman 1990). Konya region is also within the semi-arid environments of world and is exposed to agricultural drought. In recently, water resources are under the great pressure resulting from incrases in cultivation areas of high water consuming or water requirement crops as well as addition of such kind of crops into the current crop pattern. That situation has led to hydrological drought in this region (Topak et al. 2008; Topak 2008; Topak & Acar 2012).

In addition to low rainfall amount, none uniform rainfall event has observed during plant growth season in region. Therefore, due to these climatic conditions, t number of crops grown with current rainfall in Konya plains (wheat, barley, oat, rye, chickpea, lentil etc.) is limited and the yield of these plants is low. The reason of selection of those crops growing in this region based on rainfall is seasonal water consumption values are low with around 400-500 mm. Annual rainfall (300-350 mm) of region does not meet whole water requirement of these plants so yield is low. High water consuming crops such as corn, sugar beet, vegetables, sunflower, carrot, potato and clover cannot be cultivated in this region under rain fed conditions. Therefore, those plants have grown with irrigated conditions in region. In this present study, first land and soil potential, farming areas and yields of crops growing under rain fed and irrigated conditions of Konya were evaluated and then those were comparatively analyzed by general of Turkey.

MATERİALS AND METHODS

Konya is located in Middle Anatolia Region (Figure 1) and has a surface area of 40 838 km^2. It is the largest city in Turkey in accordance of land size. Konya is situated between 36^o 41' and 39^o 16' northern latitudes and 31^o 14' and 34^o 26' east longitudes, with an average 1016 m above sea level. Middle Anatolia is the driest region in Turkey. About 50% of region has rainfall between 250 mm and 400 mm. The other 50% of that has rainfall between 401 mm and 500 mm (Çağlayan & Ayhan 2018). Although Konya is accepted as semi-arid climate, rainfall amount is similar to rainfall of arid climate in most parts (280-320 mm) (Topak et al. 2008). Therefore, the large land size of plain has annual rainfall of 300-350 mm, mean of 323 mm, (Anonymous 2019a) accounting minimum rainfall of Turkey (Figure 2).

Figure 1: Konya Province in Turkey

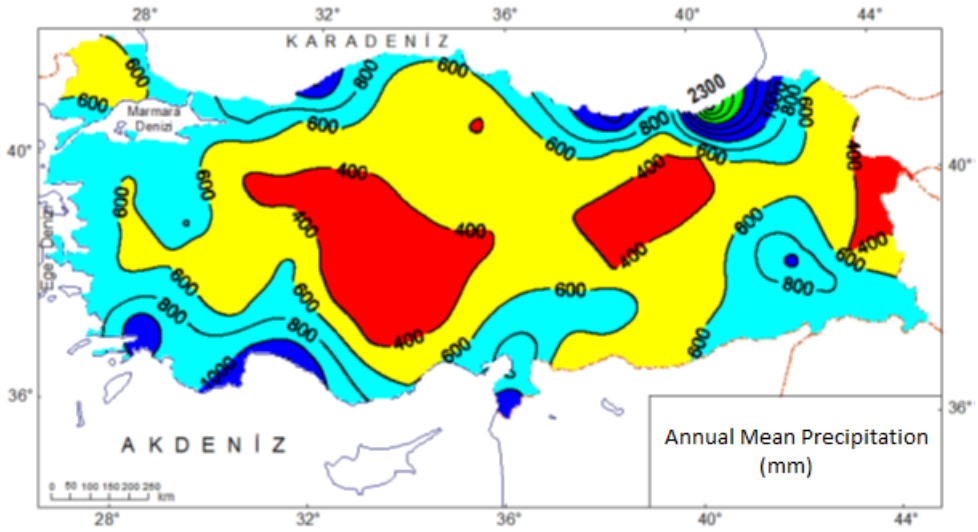

Figure 2: Long year rainfall patterns of Turkey (Türkeş 2010).

Although Konya region has approximately 2 million hectares of cultivated land, it faces a lot of water scarcity problems due to having limited water resources

(2% available water potential of Turkey) and low precipitation, 320 mm/year. Konya has great plains as well as large agro-poetantial but it has semi-arid climate with agricultural drought. In this study, data releant to agricultural land and water resources potentials, crop pattern and production amount were obtained from records of Turkish Statistical Institute (TSI) and General Directorate of State Hydraulic Works (GDSHW).

RESULTS AND DISCUSSION

Soil and water resources

According to TSI (2018) data, 1.9 million ha of about 23.2 million ha of agricultural land of Turkey is within Konya province. Agricultural land potential of Konya accounts about 8.1 % of agricultural land potential of Turkey.

Current land size under production and fallow area for years of 2010, 2015 and 2018 in both Konya Province and Turkey are given in Table 1. In periods 2010 -2015, actively cultivated and fallow areas were about 20 million ha and 4 million ha, respectively in Turkey. In 2018, while actively production area decreased to 19.7 million ha, amount of fallow land decreased to 3.5 million ha. According to these data, about 15% of the agricultural area in Turkey was allocated for fallow during periods 2010-2018. The actively agricultural production area in Konya was 1.27 million ha in 2010, 1.36 million ha in 2015 and 1.5 million ha in 2018. According to these data, actively agricultural production area in Konya province increased as 230000 ha during periods 2010-2018. On the other hand, while 860000 ha agricultural land was left fallow in 2010, it decreased to 560000 ha in 2015 and 383000 ha in 2018. According to this data, Konya Province accounts as about 8% of total actively production area in Turkey.

The Konya region has annual 4.5 billion m^3 of renewable water resources: approximately 3 billion m^3 of surface and 1.5 billion m^3 of groundwater resources (Anonymous, 2019b). This amount corresponds to 2% of annual water resources potential of Turkey. In result, Konya has large agricultural land, but water resources are limited resulting from low rainfall.

That limited water resources have used drinking-use, industry and agricultural purposes in Konya. Approximately 90% of water has been used in agriculture. Today, almost 500000 ha of agricultural land have been opened for irrigation in Konya province. Approximately 70% of water use is met from groundwater reservoir, but this is not sustainable (Topak & Acar 2011) since annual amount of water extracted from the groundwater is much higher than the amount of water entering the aquifers during the year (Topak & Acar 2010). This situation will threaten sustainability of water resources of Konya in future.

Table 1.

Current production areas in Konya Province and Turkey

Year	TURKEY					KONYA				
	Production area (ha)				Fallow area (ha)	Production area (ha)				Fallow area (ha)
	Field crop	Vegetable	Fruit	Total		Field crop	Vegetable	Fruit	Total	
2007	16944960	814786	29087004	20668446	4218947	1264292	22949	36298	1323539	817277
2010	16333002	801598	3010580	20145180	4249025	1217431	17242	35764	1270437	806484
2015	15723021	808171	3283848	19819638	4113976	1301513	20766	41292	1363666	560301
2018	15435979	783632	3462387	19686685	3512733	1423737	30022	53484	1507327	383502

Crop production

Production amounts of some important crops were obtained from TSI records in order to underline importance of Konya Province in Turkey. Cultivated area and annual production amounts of strategic field crops actively produced in both Turkey and Konya Province were taken from TSI (2019) data for 2010, 2015 and 2018 and are given in Table 2 and 3. In Table 2, wheat production area has decreased by 800000 ha, barley production area by 300000 ha, dry bean planting area by 20000 ha and sugar beet sowing area by 20000 ha in 2018 in Turkey compared to year of 2010. On the other hand, sunflower cultivation area increased 100000 ha, chickpea cultivation area 60000 ha, red lentil area 30000 ha, clover cultivation area 65000 ha and silage corn cultivation area 175000 ha. In examine 2010-2018 production period, although none changes have observed in productions of wheat (20 million tons) and barley (6.6 million tons), production of other crops have increased. By comparison to 2010 values, yield increments in grain maize, chickpea, sunflower and sugar beet fresh root were found as 1.4 million tons, 100000 tons, 630000 and 1 million ton in 2018, respectively. Alfalfa and silage maize growing for animal feeds increased as 6 and 11 million tons in 2018.

Those important crops resulted total productions of 79.5, 93.3 and 99.5 million tons in the years of 2010, 2015 and 2018, respectively in Turkey.

In Table 3, in exception of dry bean, farming area of other crops increased in Konya during 2010-2018 periods. By comparison to 2010 with 2018, increments in production area for wheat, barley, grain corn, chick pea, sunflower, potato and red lentil crops were found as 15000 ha, 20000 ha, 90000 ha, 14000 ha, 50000 ha, 6000 ha and 2000 ha, respectively. In addition, production areas of alfalfa and silage corn crops increased as 8000 ha and 21 000 ha, respectively. By examine during periods 2010-2018, yield of all crops increased excluding the grain dry bean crop in Konya province. The maximum yield increase was found in grain corn and the yield of such crop increased from 100 000 t to 1.1 million ton with one million ton increment. In addition, yield increments in sunflower, potato, and fresh sugar beet root were found as 250000 tons, 300000 tons and 500000 tons, respectively. The total yield increases of these plants for 2010, 2015 and 2018 were as 8.92 t, 11.8 t and 13.6 t, respectively for Konya province.

Table 2.

Cultivation areas and productions of common field crops under cultivation in Turkey

Year	Production Area (ha)										
	Wheat	Barley	Grain Maize	Dry Bean	Chickpea	Sunflower	Potato	Sugar Beet	Red Lentil	Clover	Silage Corn
2005	9250000	3300000	600000	141200	557800	490000	152800	335812	386700	375000	180000
2010	8103400	2799700	594000	103381	455690	551400	138866	329167	211600	568810	284473
2015	7866887	2602939	688170	93584	359304	568995	153879	274487	207469	662046	410541
2018	7299269	2478276	591900	84804	514416	648934	135937	307153	243065	635105	461043
	Production (Ton)										
2005	21500000	8600000	4200000	210000	600000	865000	4060000	15181250	520000	2100000	7600000
2010	19674000	6650000	4310000	212000	530634	1170000	4513450	17942110	422000	11676115	12446450
2015	22600000	7380000	6400000	235000	460000	1500000	4760000	16022780	340000	13949960	19684600
2018	20000000	6600000	5700000	220000	630000	1800000	4550000	18900000	310000	17544946	23197536

By assessment of yield of those crops, Konya province accounted of 11.2%, 12.6% and 13.7% of production of Turkey for 2010, 2015 and 2018, respectively. In evaluation of yield of crops, that province had contribution in 10% of wheat, 12% of barley, 25-30% of dry bean and 28% of sugar beet of Turkey. In 2018, Konya province had 20% of grain corn, 16% of sunflower, and 13% of potato production of Turkey. Similarly, it has yields of fresh 7.5% alfalfa and 7.5% of silage corn of Turkey. By this evaluation, Konya is very important role to play in agro-production in current and future and also is the most important region of Turkey in regard to food security.

In Table 3, sugar beet, potato, grain and silage corn, sunflower, dry beans, clover and vegetables are growth by irrigation. Partial barley and wheat cultivation is also performed at irrigation condition.

Table 3.

Cultivation areas (ha) and production amounts (tons) of important field crops cultivated in Konya province.

Year	**Wheat (ha)**	**Barley (ha)**	**Grain Maize (ha)**	**Dry Bean (ha)**	**Chickpea (ha)**	**Sunflower (ha)**	**Potato (ha)**	**Sugar Beet (ha)**	**Red Lentil (ha)**	**Clover (ha)**	**Silage Corn (ha)**
2005	715891	325034	10292	14204	49387	5400	5872	73530	1270	17612	6680
2010	675770	253985	15482	20429	21396	23404	8595	77306	1085	18907	9787
2015	719393	241645	54886	19185	19888	46037	12678	71493	1350	22362	23153
2018	689623	274480	107463	14811	35152	72756	14833	77203	3172	26885	30774
	Annual Production (Tons)										
2005	1343977	731333	78199	29693	55957	7700	145575	3832166	2177	517832	283678
2010	1515303	554870	103430	69446	28843	46764	321482	4935320	2254	918113	433602
2015	2554256	853627	558190	72869	29747	210307	493748	4570731	2238	1121331	1348829
2018	2037936	856917	1104538	53439	48845	296591	611957	5536267	3307	1293399	1823238

CONCLUSION

In accordance of our assessment mentioned above, Konya province is semi-arid climate exposing agricultural drought. In current, irrigation has performed at 25% farmland and land size under rain fed farming is about 1 million ha in Konya. Total 13-14% of field-crop-production of Turkey has obtained in Konya province. In that regard, it is obvious that such province has great contribution for food security of Turkey at current and at future. Therefore, crops growing under rain fed system should be supported financially by government for economical and sustainable agro-production. Sustainable use water supplies is vital important for Konya province so agricultural water management strategies should base on the water saving agro-activities.

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THE VEGETAL EXTRACT IMPACT ON THE MAIN PATHOGENS THAT AFFECT THE GRAPEVINE PLANTS

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Keywords*: grapevine, Plasmopara viticola, Uncinula necator, Bothrytis cinerea*

ABSTRACT

The grapevine plants are affected annually by different pathogens which can significantly reduce the grape production. Due to the perennial nature of this plant and certain climatic factors favorable to the development of pathogens, the viticulturists are forced to use pesticides intensively to combat them. An alternative to pesticides can be the vegetal extractobteined from fifferent plant species or trees which are not toxic to grapevines and humans. This paper presents the phytotherapeutic effect of some vegetal extracts on Plasmopara viticola, Uncinula necator and *Botrytis cinerea pathogens.*

INTRODUCTION

The grapevine plants are annually subjected to stress factors suffering a debilitating process, becoming susceptible to the pathogens attack, which can lead to premature drying of grapevines. The affected trunks vegetate weaker, the budbreak it is delayed and sometimes during the vegetation period, the plants that are apparently healthy they withered. Because the grapevine plants occupy the soil for a long period, the viticulturists are forced to use intensely the pesticides to combat pathogens and pests. These, though used rationally, can negatively affect the environment and the human health. The recent evolution in epidemiology and toxicology show that pesticides can negatively affect the farmers health through by disease like cancer, neurological and reproductive disorders (Alain et al., 2012). Because of these reasons, the researchers used various plants to obtain extracts with the role of combat the pathogen agents (*Plasmopara viticola, Uncinula necator* and *Botytis cinerea*) which cause damage in grapevine plantations. Also, nanotechnology is already used in agriculture for treatment of some plants diseases. The use of nanoparticles can increase the effectiveness of commercial pesticides by reducing the amount of their application at a significantly lower level than the doses necessary for crops, which leads to an improvement of the environment.

MATERIAL AND METHODS

In this study are presents the research regarding the extracts effect obtaining from different plants species on the *P. viticola, U. necator* and *B. cinerea* pathogens of grapevine plants (at Gamay, Burgund, King Roby, Cabernet Sauvignon, Carménère, Syrah, Merlot, Auxerrois, Riesling, Chasselas, Isabela, Sauvignon blanc and Muscat Ottonel varieties).

The methods for extraction were different from study to study. For example Aziz A et al. (2003) have extracted and purified the Laminarin from the marine brown algae *Laminaria digitata* by the firm Goëmar as described by Klarzynski; Gamal et al (2017) have extracted the pure jojoba oil under cold conditions; Mendoza L. (2013) extract anthocyanins from grape berry with methanol.

RESULTS AND DISSCUTIONS

The phytoterapeutic effect of vegetal extract

Deagostin et al. (2010) tested the sage extract on grapevine plants infected with P. viticola in greenhouse and obtained a high level of pathogen control. In the field those observe that the sage extract has induced reduction of 94 % of the disease incidence. In 2007, the extract reduce only partial the downy mildew on leaves (less than 30 %) probable as a result of long period with rain between the two consecutive treatments. In general, the sage extract effectively controls the downy mildew and can be a promising alternative to copper in organic viticulture.

Looking for new alternatives for the *P. viticola* control, the researcher have extract essential oil from *Cinnamomum* sp.*, Eucalyptus globulus, Origanum majorana, Melaleuca* sp.*, Mentha balsamea Wild, Origanum vulgare* and *Thymus vulgaris* species and as a control they used the Ridomil Gold MZ fungicide. For a good application on plants, the oil was mixed with water and Tween 80 (0.5%) detergent. After testing the antifungal effect on spores founds on culture medium and in the field on grapevine plants, the results showed that the oils obtaining from *Cinnamomum sp. and Eucalyptus globulus* had the strongest impact on *P. viticola* pathogen inhibition(Fialho și colab., 2017).

In order to combat the downy mildew, Yigal et al. (2005) obtained an oilt paste from *Inula viscosa* leaves. These has been proven to be efficient at application on plants in the field controlling the pathogen for 7 days after exposure to natural conditions.

Due to major damage made by principal pathogen agents on grapevine plants it is necessary the use of the natural products which are biodegradable and less toxic. An alternative approach at pesticide utilisation are elicitor compounds to stimulate the defence of grapevine. A grapevine particularity is richness in stilbenes (polifenolic compound) who are majorly involved in grapevine defence. The grapevine plants from field and greenhouse (Merlot varieties) were treated with stilbene extracts obtained from *Vitis vinifera* cane. As control was used Bouille bordelaise. For testing the antifungal effect of the extract from grapevine cane on *P. viticola* pathogen were used 6 plants on treatment and the experiment was replicated in 3 sets. It has been observed that the extract is as effective as the copper sulphate from Bouille bordelaise. The effects from the field were not just as efficient. It has been observed that, the stilbene extract applied on the grapevine plants, in greenhouse, it offered them considerable protection against *P. viticola* pathogen, identical to that provided by Bouille bordelaise. The stilbene extract was also able to prevent grapevine plant infection, from the field, with *P. viticola* but to a lesser extent (Richard et al., 2016).

Chovelon in 2006 tested the aqueous extract of *Salix alba* and a solution of synthetic salicylic acid for controlling the *P. viticola* pathogen. The study was conducted on vines (Alphonse Lavallée variety) grown in vegetable pots, and the control was left untreated. The results showed that both synthesized salicylic acid (which cannot be used in organic farming because it is synthetically obtained) as well as the aqueous extract of *S. alba* are have antifungal caracter. But the extract (simply or diluted) was more effective than the highest dose of synthetic salicylic acid. Because the aqueous extract contains a small amount of salicylic acid it is considered that the other molecules from the extract have contributed to the control process.

To combat the pathogen *P. viticola*, Kast and Bleyer (2006) made extracts from different organs of the species: *Hedera helix* (leaves*), Calendula officinalis* (flowers), *Quercus* sp. (bark), *Rosmarinus officinalis* (leaves), *Verbena officinalis* (whole plant), *Salvia officinalis* (leaves), *Gentiana* sp. (root), *Rumex acetosa* (whole plant), *Rhamnus frangula* (bark), *Achillea millefolium* (flowers), *Solidago* sp. (whole plant), *Achillea millefolium* (whole plant), *Avena sativa* (leaves), *Primula veris* (root), *Sambuca nigra* (flowers), *Sesamum indicum* (seeds), *Aesculus hippocastanum* (leaves), *Viola tricolor* (whole plant), *Medicago sativa* (whole plant), *Tanacetum parthenium* (whole plant), *Viscum album* (whole plant), *Salix* sp. (bark), *Rheum rhabarbarum* (root). The researchers applied treatments with extracts against downy mildew in laboratory, greenhouse and vineyard conditions and found that the most effective were the extracts obtained from the species *Hedera helix*, *Quercus* sp., *Primula veris, Rhamnus frangula, Solidago* sp., *Salix* sp. because they reduced the infection by up to 90% in the experiments carried out in the laboratory and greenhouse and up to 40% in the field.

Due to the repeated use of pesticides, the pathogens have become resistant to these, requiring alternative control strategies. In the treatment of pathogens B. cinerea and P. viticola a variant could be laminarin (β-1,3-glucan) derived from brown algae *Laminaria digitata*. aminarine applied in concentrations of 0.5 and 1 g / l reduces the development of pathogens *B. cinerea* and *P. viticola* by 50 % and 70% respectively on detached leaves and grapevine plantles grown *in vitro*. When applied to whole plants, laminarine reduced the infection with *P. viticola* on the leaves up to 75%(Aziz și colab., 2003).

Researchers in order to identify phytochemicals that are harmless or less toxic to human health, but which can be applied as preventive measures at the onset of disease, made seed extracts from seeds of *Annona squamosa* and *Annona reticulate*. These were applied to grapevine plants (in the field) and the sprayed leaves were not affected by the pathogens *P. viticola* and *U. necator*, compared to the untreated leaves that were heavily infected with these pathogens(Sonali, 2018).

Ferreira et al. (2016) have patented a product in the field of biology that can be used as a fertilizer, growth enhancer, fungicide, insecticide and as a dietary supplement in the veterinary and medical field. They studied a polypeptide extracted from seeds, cotyledons and seedlings of *Lupinus*, which can be applied directly to plants by spraying. The polypeptide appears in the plant life only in a short period and has a pronounced antifungal activity. The protein that containing this polypeptide was tested on grapevines that were infected with *U. necator* and maintained in greenhouse conditions. The leaves on which the polypeptide was applied remained healthy for two months after treatment and the treated plants showed an increased vigor and new leaves developed without symptoms. The protein was also tested on

spores in a culture medium where was observed a decrease in spore germination and in filament length.

In the summer of 2015 and 2016, the efficiency of azadirachtin, jojoba oil, *Reynoutria sachalinensis*, azoxistrobin + diphenoconazole, crescoxmethyl, propiconazole and sulfur was evaluated in the control of powdery mildew caused by *U. necator* (Schlecht.). The laboratory study showed that all the extracts and fungicides tested significantly reduced pathogen's conidia germination. The application of the extracts, by spraying, on the grapevines reduced the severity of the disease compared to the infected control. Plants extracts tested as well as the fungicide had a high effect in reducing the disease; no significant differences were found in the effect of the extracts between the compounds tested in both seasons. Moreover, the treatment of grapevines with *Reynoutria* extract had the highest increase in peroxidase, polyphenol oxidase activity and phenol content compared to other treatments after 9 days from the spraying (Gamal and Kamal, 2017).

The absence of grapevine varieties resistant to pathogens has increased researchers' interest in identifying new control agents. Thus were tested several yeasts, bacteria, plant extracts (tea tree), an fungicide based on enzymes and electrolyzed acid water on grapevines plants in the greenhouse to control the powdery mildew. The infected leaves were collected from an untreated Pinot gris plantation after which they were touched by healthy plants for inoculation. Five replicates of one plant with 8-10 leaves were used. It turned out that the tea extract was not as effective as sulfur and from the natural products only the fungicide based on enzymes had a good efficacy (Dario et al., 2006).

Also in order to identify a new method of controlling pathogens, Reynolds (2005) tested for two years canola oil which is a hybrid of rape and jojoba wax (Simmondsia chinensis). It has been used for the control of *U. necator* and B. Cinerea pathogens in grapevines varieties. To determine the phytotoxicity were tested 6 concentrations (v / v) of jojoba wax: 0%, 0.1%, 1%, 2%, 5%, and 10% on 4 blocks and 4 treatment replicates. The wax was emulsified with 1.0% v / v Triton X-207 nonionic sulfantide. Two controls were used, one sprayed with water and other sprayed with a mixture of water and sulfactant. The results obtained from the use of wax and oil were compared with those obtained from the application of a commercial product (Kumulus S - micronized sulfur). The tests for the control of powdery mildew were performed on the Auxerrois and Riesling varieties and those for combating gray rot on the Riesling variety. The wax and oil protected the plants against rot and powdery mildew in 60-100% proportions. The treatment is prophylactic, because only the plants covered with oil remained free of pathogens during the entire study period.

Phytopreparates are the means of perspective in the biological control of plant diseases, have an efficient, harmless impact on the environment and humans and they decompose down rapidly into agrocenosis. In support of this theory, Miclea (2012) developed tinctures in order to fight the *B. cinerea* pathogen. The pathogen was collected from 4 grapevines varieties (Chasselas, Isabela, Sauvignon blanc and Muscat Ottonel). For treatment were used hydroalcoholic extracts with *Aloe paradisiacum*, *Aloe marlothi*, *Aloe arborescens*, *Satureja hortensis*, *Helleborus purpurascens*, *Aristolochia clematitis*, *Sambucus nigra*, *Allium sativum*, *Tagetes* sp., propolis, applied in three concentrations (4%, 6%, 8%). The extracts showed different inhibitory action depending on the variety, the tincture used, the concentration and the source of the pathogen. Thus, in the case of the Muscat

Ottonel variety the strongest inhibitory effect of the fungus *B. cinerea* had the tinctures of *Aristolochia clematitis* and *Allium sativum* followed by extracts of *Tagetes* and propolis and in the case of the Sauvignon blanc variety, the most effective treatments were the *Allium sativum*, *Tagetes* sp., *Aloe arborescens* tinctures.

Mendoza et al. (2013) studied the *in vitro* antifungal effect of anthocyanins from marc resulting from Cabernet Sauvignon, Carménère and Syrah varieties (from two vineyards: Misiones de Rengo and Miguel Torres) on the *B. cinerea* pathogen. The results showed that the extracts obtained from marc had a different content of anthocyanins depending on the variety and the grape harvest area (location, climate, harvesting technology). The highest content in anthocyanins it had the Syrah variety and therefore also the most pronounced antifungal character. Compared to the control, a commercial fungicide (iprodione), the extracts (excluding those from the Miguel Torres plantation) showed antifungal activity similar to the fungicide.

CONCLUSIONS

To control of the *P. viticola* pathogen were used whole plants or different organs of them from the species: *Salvia officinalis*, *Cinnamomum* sp.*, Eucalyptus globulus, Origanum majorana, Melaleuca* sp.*, Mentha balsamea Wild, Origanum vulgare* și *Thymus vulgaris*, *Inula viscosa, Hedera helix, Calendula officinalis, Quercus sp., Rosmarinus officinalis, Verbena officinalis, Salvia officinalis, Gentiana sp., Rumex acetosa, Rhamnus frangula, Achillea millefolium, Solidago sp., Achillea millefolium, Avena sativa, Primula veris, Sambuca nigra, Sesamum indicum, Aesculus hippocastanum, Viola tricolor, Medicago sativa, Tanacetum parthenium, Viscum album, Salix sp., Rheum rhabarbarum Laminaria digitata, Annona squamosa* and *Annona reticulate.*

Plants of the *Annona squamosa, Annona reticulate, Lupinus* sp.*, Reynoutria sachalinensis, Simmondsia chinensis* species were used to control the *U. necator* pathogen*.*

To control of the *B. cinerea* pathogen were used the plants*: Laminaria digitata, Simmondsia chinensis, loe paradisiacum, Aloe marlothi, Aloe arborescens, Satureja hortensis, Helleborus purpurascens, Aristolochia clematitis, Sambucus nigra, Allium sativum, Tagetes sp.*

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AN INNOVATIVE METHOD FOR THE ISOLATION OF VALUE-ADDED PRODUCTS FROM WINERY WASTE

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Keywords*: Natural antioxidants; Winery wastes; Non-toxic surfactant; Cloud Point Extraction (CPE); Polyphenols*

ABSTRACT

Extraction of natural antioxidants from plant sources and food industry or agricultural wastes with classic extraction techniques requires enormous volumes of toxic organic solvents. The use of non-toxic surfactants for the removal of organic substances from wastes in temperatures over the cloud point is considered a promising alternative. This study examines the possibility of using a food grade surfactant (lecithin) and a cloud point extraction (CPE) procedure for the isolation of value-added products (polyphenols) from winery wastes. The best results during CPE procedure were achieved when the temperature was maintained at 40°C and pH was adjusted to 3. The use of multiple CPE steps (up to 3) increases the percentage of total recovery of phenolic compounds. The extracted phenolic substances showed high antioxidant activity.

INTRODUCTION

Wine making has been around for thousands of years. It is not only an art but also a science. Wine making is a natural process that requires little human intervention. During the process of wine production, grapes are usually harvested from August to the end of October and they are being transported to the various wineries. There, they are drained, molded and fermented in winemaking tanks. Thereafter, the wine produced is bottled and marked. The last procedure usually runs from February to the beginning of summer. Liquid and solid wastes of seasonal character are produced during the vinification process. Wine liquid wastes have high pollutant character, but at the same time they have high concentration of antioxidants (phenolic compounds) that exert favorable effects on human health.

Until recently, the extraction of phenolic compounds from wastes was not only complicated and costly but also not friendly to environment because it requires large quantities of toxic and flammable organic solvents (Katsoyannos et al., 2006). Other methods (e.g. liquid-solid phase extraction, etc.) are not satisfactory for analytical purposes or for industrial production of phenolic antioxidants for dietary applications because they lead to lower phenolic recovery and require expensive equipment or high energy demand. Surfactants appear as a good solution to the above mentioned problems because inexpensive equipment is needed, the temperatures used and the energy consumption are relatively low, and there is no

need for organic solvents. Additionally, when the surfactants used are of low or no hazard (edible), there is no need for separation of polyphenols from them, and, therefore, the cost of procedure is greatly reduced.

The Cloud Point Extraction (CPE) is a relatively new and innovative technique for the isolation of value-added products from food industry wastes. The method is fairly straightforward. Initially, the surfactant is added to the aqueous solution containing the substances to be extracted and analyzed. At a specific temperature and surfactant concentration a phase separation takes place. One of the phases is the surfactant rich phase, which contains almost all of the surfactant and a small amount of water. The other phase is called the water rich phase. The phenolic compounds are concentrated in the small volume surfactant-rich phase.

The aim of the present work was to apply CPE, using lecithin as surfactant, for the separation of phenolic compounds from the liquid fraction of winery wastes.

MATERIAL AND METHODS

Winery waste samples

The samples, derived from variety Merlot was supplied from wineries of Zitsa (Epirus, Greece). It was centrifuged (10 min at 4000 rpm) and filtered to remove solids and finally refrigerated (at 6^{o}C) until use.

CPE procedure

The procedure used was adapted from Chatzilazarou et al. (2010). Prior to CPE 5% NaCl were added to the sample in order to facilitate the phase separation process. The mixture of sample (10 ml), salt and lecithin (at concentrations 2, 5, 10 and 20% by volume), contained in tapered glass tubes were vigorously agitated for 1 min followed by equilibration at 40^{o}C and pH value of 3 (using citric acid) for 40 min in a water bath. Then, the sample was centrifuged (5 min at 3500 rpm) and finally the phases were separated by decanting (1st extraction step). The surfactant-rich phase was highly viscous. The volumes of the water and surfactant phases were recorded after centrifugation, and used for the calculation of the polyphenol recovery. After decanting, the non extracted phenols contained in the water phase were extracted using the same procedure (2nd extraction step).

Determination of phenol recovery

The phenol recovery from the initial sample was calculated according to Gortzi et al. (2008).

Determination of total polyphenols

Polyphenols were photometrically determined by the Folin-Ciocalteu procedure according to Chatzilazarou et al. (2010).

Determination of the effect of pH, temperature and surfactant concentration on CPE efficiency of the wastes

The effect of pH value on the CPE efficiency was investigated in the pH range of 2.5-5.0 using 5% of lecithin during CPE procedure. The temperature effect was investigated in the range 35-55^{o}C again using 5% of lecithin during CPE procedure. The effect of % surfactant concentration (2, 5, 10, and 20%) on the efficiency of CPE was determined by % recovery of phenols from wine. The phases

were combined after each step (i.e. 1, then 1+2 and, finally, 1+2+3) before the determination of total polyphenol content.

Determination of the antiradical activity

The antiradical activity of the phenols entrapped in the surfactant phase (after the 3rd step) were estimated according to the DPPH method of Tsaknis and Lalas (2005).

Rancimat method

The extracted phases (after the 3rd step) were accurately weighed at a concentration of 3000 ppm in purified sunflower oil and their activity was determined using a Rancimat 679 (Metrohm Ltd., Herisau, Switzerland), along with another sample of sunflower oil without antioxidant (control). The surfactant phase (including phenolic antioxidants) was dissolved in oil using a vortex mixer. The conditions were set at 90^{o}C and 15 L/h. The protection factor (PF) was calculated: PF = (induction period with antioxidant)/ (induction period without antioxidant). The higher the PF value is, the better the antioxidant activity.

Statistical analysis

Results are displayed in Tables as means of three determinations and standard deviation (SD) (in parenthesis), of three simultaneous assays in all methods. Statistical significance (at $P<0.05$) of the differences between mean values was assessed by ANOVA test using SPSS (SPSS Inc., Chicago, USA) software.

RESULTS AND DISCUSSION

Lecithin was chosen as a surfactant since it is a food grade and non toxic natural product and, additionally, of relatively low cost. Since it is edible, no separation of recovered phenolic substances from the surfactant system is required. The surfactant phase (rich in phenolic antioxidants) formed can be dispersed either in aqueous media, in fatty phases or in biphasic systems (emulsions), as the emulsifying properties of lecithin are known and well documented. Optically, the separation of the phases (surfactant / micellar and aqueous) into winery waste is shown in Figure 1.

Figure 1: Separation of phases of winery waste. The dark phase is the surfactant rich phase.

Effect of pH on the efficiency of the process

The effect of pH on CPE efficiency was investigated in the pH range of 2.5-5.5 using 5% of lecithin during CPE procedure. The results are shown in Table 1. Adjusting pH to lower values appears to be a regulatory factor in achieving equilibrium and thus to achieve a higher recovery rate. The optimal value was 3 (Table 1) but with no significant difference ($P < 0.05$) from the lowest value (2.5). However, for ease of process, speed and economy of materials it was decided to adjust its value to 3 (from the initial pH value: 5.4 for winery waste) for the rest experiments.

Table 1. Recovery rate (%) from winery waste using lecithin (5% in one stage) in pH range 2.5 to 5.5

pH	Recovery rate (%) from winery waste
2.5	64.1 (1.8)
3.0	65.0 (2.0)
3.5	61.0 (1.5)
4.0	57.1 (1.6)
4.5	50.6 (1.3)
5.0	45.1 (1.2)

Effect of temperature on the efficiency of the process

Heating during the application of the process is a critical parameter since it involves the risk of destruction of phenolic substances (oxidation or thermal degradation) and consequently a decrease in their recovery rate. Thus, heating, should be carried out at as low a temperature as possible. Of course, lower temperatures mean less energy consumption with obvious cost and environmental benefits. Therefore, the temperature effect was investigated in the range of 35-55^{o}C using 5% lecithin during the CPE procedure.

Table 2. Recovery percentage (%) from winery wastes using lecithin (5% in one stage and pH 3) in a temperature range of 35 to 55°C.

Temperature (^{o}C)	Recovery rate (%) from winery waste
35	48.2 (1.0)
40	65.0 (1.0)
45	63.1 (0.8)
50	58.6 (2.0)
55	52.6 (1.9)

As shown in Table 2, setting the temperature at 40^{o}C gives a significant ($P < 0.05$) greater recovery rate. At a lower temperature, recovery is significantly lower (25.8% for winery wastes), indicating that the clouding is not sufficiently carried out and therefore the extraction, i.e. the surfactant-rich phase, probably dissolves in its volume water (resulting in the creation of a single phase) instead of being separated.

At higher temperatures than 40^{o}C, although the phenomenon of clouding occurs, the rate of recovery is lower due to faster oxidation or thermal degradation of phenolic substances. So, for the efficiency of the process, speed and economy, it was decided to adjust the temperature to 40^{o}C for the rest of the experiments.

Effect of the percentage of surfactant on the efficiency of the process

The effect of % surfactant concentration (2, 5, 10 and 20%) on the efficiency of CPE was determined by % recovery of phenols from winery wastes. The recovery rate (Table 3) has been calculated based on the initial polyphenol content of the wastes (4.1% for winery wastes).

As expected, the increase in concentration of surfactant (lecithin) resulted in an increased recovery of phenolic compounds. According to the results, the highest percentage of phenolics has been recovered by the first recovery step. However, in order to recover the remaining phenolic substances, a second and a third CPE step was carried out. This way a complete recover of polyphenols was possible. If the purpose of the treatment is to save time, then the use of a large amount of surfactant (20%) in one CPE step is necessary. Otherwise, the use of small quantities of surfactant and many CPE steps would be appropriate.

Table 3: Recovery rate (%) from winery wastes using lecithin (at concentrations 2, 5, 10, 20% v/v, pH 3 and 40^{o}C) in multi-stage CPE

Lecithin concentration	Recovery stage	Total recovery percentage (%) from winery waste
2%	1st	51.7 (1.9)
2%	2nd	69.3 (2.1)
2%	3rd	85.1 (2.5)
5%	1st	65.0 (2.0)
5%	2nd	80.4 (2.9)
5%	3rd	90.1 (2.7)
10%	1st	79.7 (2.1)
10%	2nd	87.5 (2.0)
10%	3rd	92.4 (2.0)
20%	1st	89.0 (2.8)
20%	2nd	94.9 (1.3)
20%	3rd	99.2 (1.9)

Determination of the antiradical activity

In order to determine the antiradical activity of the isolate by mean of CPE procedure polyphenols, their antioxidant activity was tested by the DPPH method. The results (Table 4) showed that the compounds isolated from the wastes with the CPE procedure had a very high [significant ($P<0.05$) in all cases] antiradical activity.

Table 4: Disappearance (%) of DPPH from the surfactant layer/s (containing the phenolic compounds)

Lecithin concentration	Percentage (%) disappearance of DPPH free radical from winery waste
2%	67.2 (2.3)
5%	71.5 (2.5)
10%	80.2 (2.1)
20%	88.7 (2.9)

Rancimat method

In order to examine the protection by the phenolic compounds extracted from the waste by the CPE method, the surfactant rich phases were added to a real food (sunflower oil). The results for the Protection Factor (PF) are shown in Table 5.

The PF was proportional to the sample content in polyphenols. All samples showed a PF greater than 1(meaning antioxidant action) and the differences were statistically significant ($P < 0.05$) in all cases.

Table 5: Protection Factor from the surfactant layers (containing the phenolic components) after the treatment of winemaking.

Lecithin concentration	Protection Factor from winery waste
2%	1.8 (0.1)
5%	2.1 (0.1)
10%	2.5 (0.2)
20%	2.9 (0.1)

CONCLUSIONS

Lecithin is a natural product and an edible surfactant and, therefore, no separation of recovered phenolic compounds from the surfactant phase is required. The best results during CPE procedure were achieved when the temperature was maintained at 40^{o}C and pH was adjusted to 3. The use of multiple CPE steps (1st, 2nd, and 3rd) increases the percentage of total recovery of phenolic compounds. However, whether they will be used depends on both the cost of the surfactant and the available process time of the industry. Extracted phenolic substances showed high antioxidant activity.

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THE DRIVING OF APPLE TREES IN THE SHAPE OF A SLENDER SPINDLE

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Keywords*: apple trees, variety, slender spindle crown*

ABSTRACT

The paper relates to fruit growing, namely to a process for formation of apple tree crown in the shape of a slender spindle. The process of training the central axis on the apple was applied to the Granny Smith apple variety, grafted onto the M9 rootstock, with the slender spindle-type crown, the planting distances being 0.8 m per row and 3.2 m between rows. We used vigorous planting material with branches anticipated at the height of 50-80 cm and with well-developed and unshavened shaft, with viable buds along the entire length of the shaft, well-developed root system, excellent graft and root growth without traces of necrosis. Before planting, the trellis was installed and fixed 5 wires spaced 50, 80, 160, 240, 320 cm from the ground. The results of invention allow to form conical and narrow canopies, with a vertical central axis, weakly curved and well garnished with a single level of semi-skeletal and fruit bearing branches, which decrease in length from the base to the top of the tree.

INTRODUCTION

Modern fruit growing is based on the results obtained in the last decades in the theoretical and practical research carried out in the big cultivating countries (Germany, Holland, Poland, Switzerland, France, Italy) and in our country. The high-volume crown shapes are progressively replaced by the flattened or palm-shaped shapes. The varied variety of forms has biological origins (varieties, rootstocks, etc.), climate (luminosity, heat, precipitation, etc.) and soil, but it also certainly responds to factors such as tradition and maximum productive potential and economic.

Due to the multiple varieties / rootstocks, the numerous planting distances, as well as the ways of grouping the trees due to the diversity of the existing biological material (crowned trees, knip-baum, etc.), numerous researches have been imposed on systems of management of the trees. Among the driving systems experienced at the apple we mention the flattened shapes (palm with oblique arms, palm with horizontal arms, palm with free flattened, vertical cord, etc.), the free shapes (Slanke spil, Super spindle system, North Dutch axle etc.) and the shapes in two oblique planes (Tatura Trellis, "V-system" or V-Guttingen system) that demonstrate this great diversity (Ghena et al. 2004; Babuc et al. 2015).

The diversity of the seeding material, the methods and the technical possibilities as well as the climatic conditions in the area must be studied in the

formation of the tree crown, which will be the basis of the culture systems in the future. Indifferent of the culture system, for the stimulation of fruiting at planting, preformed trees, from anticipated shoots, of 1 and 2 years are used. In order to increase the productivity of the work, simple driving systems with a high degree of mechanization of the works or crops of the low-sized trees are chosen, which allow to maximize the manual work (the cutting of the trees, the cutting and the harvesting of the fruits). The culture system is oriented towards the continuous improvement of the assortment from the qualitative, quantitative and constant point of view in order to meet the demands of the integrated production. Such a system can be highlighted by the coherence of the relationships existing between the varieties, rootstocks, the crown conductance, the crown shape and the planting distances (Balan, 1996; Balan et al. 2001).

MATERIAL AND METHODS

The experience was organized in the fruit-growing area of the center of the Republic of Moldova, at the "Elit Fruct" in Criuleni district. The process of training the central axis at the apple was applied to the Granny Smith apple variety, grafted onto the M9 rootstock, with the slender spindle-type crown, the planting distances being 0.8 m per row and 3.2 m between rows. Before planting, the trellis was installed and fixed 5 wires spaced 50, 80, 160, 240, 320 cm from the ground. The first wire was fixed to the drip irrigation hose. We used vigorous planting material with branches anticipated at the height of 50-80 cm and with well developed, unobstructed shaft (Balan et al. 2018).

The planting material was of high quality: viable buds along the entire length of the shaft; well-developed root system; excellent breeding between rootstocks and rootstocks without traces of necrosis. Tree planting was done in the pits, early spring and they were tied to the second wire (fig. a), and when the dismounting began, the shaft inclined and tied to the three wire in an arched position (fig. b). When the shoots have reached the length of 20-25 cm, on the axis is chosen a shoot, which tends to the vertical, and the rest of the vertical shoots is suppressed to the ring (fig. c). In July the shaft of the extension of the shaft of the tree is fixed in the vertical position of the fourth wire to consolidate its position (fig. d).

The soil is maintained by artificial grass, the orchard is irrigated by drip, and Watermark translators are used to monitor soil moisture. The water is distributed by buses with droplets fixed 40 cm from the ground in the direction of the line. The strips, 2.5 m wide, with weeds are mowing as needed and remain as mulch. The experiences are presented linearly and include 4 repetitions of 8 trees each. The evidence and appreciation of the important characters and properties of trees from a biological and technological point of view or carried out under field and laboratory conditions according to the method of stationary and biological research (Moiseicenko, 1994).

RESULTS AND DISCUSSIONS

The research concerns a process for forming the slender spindle-shaped crown of the apple tree (Balan et al. 2018). The main role in the formation of the slender spindle, at the apple, is the directing of the central axis and the preservation of the pyramidal shape, with the width of the crown at the base of 1-1,5 m, and at the top of 0,5-0,6 m. The shafts driven by the slender spindle have a height of 3-3,5 m, and the side branches are perfectly subordinated to the shaft.

*Spring cutting of the central axis.*When used for planting, crowned trees, one or two years old with normal or anticipated branches, the spring at the time of dismantling, choose 3-4 branches (snakes) evenly distributed in space at a distance of 10-15 cm between them, for the first floor and an extension branch of the central axis that shortens if it exceeds the length of 60 cm and is subordinated to the axis.

When in the crown design area we have well-developed branches to choose 3-4 branches to form the floor, but the extension of the central axis is vigorously developed and unpaved with anticipated branches, it shortens to 20-25 cm above the plane cutting the branches from the floor. Depending on the growth force, the central axis is cut in half or one third of the length (Babuc et al. 2015).

The disadvantages of this powerful shortening are the formation of vigorous shoots at the top, those below will be shorter, and the lower part usually remains unobstructed. Next, the vertical hulp branches from the shaft or by transfer cuts to a lateral branch with the required position are suppressed. Thus, the accumulated organic mass in the photosynthesis process is eliminated, the entry of the trees on the fruit is delayed, which denotes the insufficient efficiency of shortening the branch of the central axis extension.

Central shaft imitated during spring. If the shaft of the tree is too vigorous without branches, the extension of the shaft is suppressed to a lower branch, which tends vertically, above the last branch of the group chosen for the formation of the first floor(Ghena et al. 2004).

Shortening the vigorous shaft to a lower branch presents difficulties in steering the trees upright, it delays reaching the optimum height for the designed crown and as a result the productivity of the trees decreases.

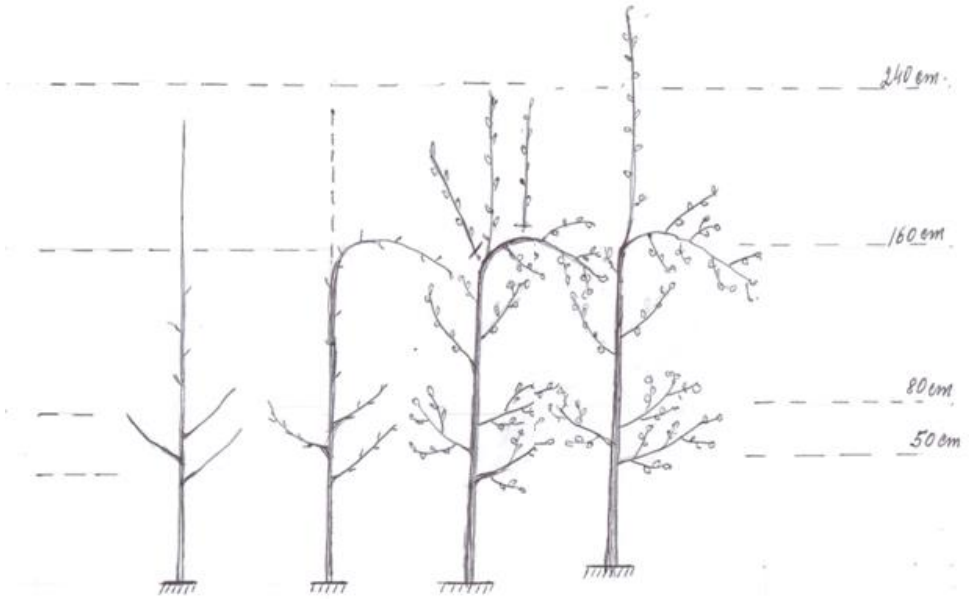
The essence of the process of forming the slender spindle-shaped crown of the apple tree. The driven trees according to the invention have a small trunk of 0.5-0.6 m and a well developed shaft, high of 3-3.5 m, uniformly lined with semi-skeletal branches and fruit branches, predominantly with an oblique position to the horizontal, decreasing their force from the base of the crown to its tip.

Central axis driving through by arching is used when the shaft is strong, unobstructed, and the branches on it are poorly developed. In this case, the shaft does not shorten, but is driven by arching. In the spring, at break-up, the tree binds in an arched position, either by wire or the other tree. The place of the bending remains ascending, and the inclined branch becomes descending. The buds from the curved area emit vigorous shoots, and the buds from the descending area form fruit branches, which differentiate floral buds.

From the shoots appearing on the shaft, a central shaft extension shaft is selected, which tends to the vertical and is allowed to grow freely, with the cutting of the vertical shoots at the ring reaching their length of 20-25 cm, fixing the extension shaft in an upright position , in July. The arched shaft, garnished with fruit-bearing branches 2-3 years, is then cut to the stem.

The purpose is to trim the shaft with vigorous annual growths and fruit branches in the descending area.

The result of the invention allows the formation of conical and narrow crowns, with a vertical central axis, weakly curved and well trimmed with a single level of semi-skeletal branches and fruit branches, which decrease in length from the base to the top of the tree using rational photosynthesis products and early entry of the trees on the fruit.



a) b) c) d)

The present invention is explained by the following figure:

Figure. Process for training the central shaft at the apple. a) Tree planted in autumn or spring; b) The spring at the dismantling of the shaft is connected in arched form; c) When the shoots have reached the length of 20-25 cm, on the axis is chosen a shoot, which tends to the vertical, and the rest of the vertical shoots is suppressed to the ring; d) In July, the shaft of the extension of the shaft of the tree is fixed upright.

CONCLUSIONS

The central shaft drilling procedure was applied to the Granny Smith apple variety, grafted onto the M9 rootstock, and planted at a distance of 3.2 x 0.8 m.

The central axis is driven by arching when the axis is strong and unobtrusive, and the branches on it are poorly developed. In this case, the shaft does not shorten, but is driven by arching in order to trim the shaft with vigorous annual growths and fruit branches in the descending area.

In the spring, at the break, the shaft of the tree is tied in an arched position, either by the wire or the other tree. The place of the bending remains ascending, and the inclined branch becomes descending. The buds from the curved area emit vigorous shoots, and the buds from the descending area form fruit branches, which differentiate floral buds.

From the shoots sprouted on the shaft one is chosen, which tends to the vertical and is allowed to grow freely, to replace the shaft, and the rest of the vertical shoots is suppressed in the ring. The arched shaft, garnished with fruit-bearing branches 2-3 years, is then cut to the stem.

The driven trees according to the invention have a small trunk of 0.5-0.6 m and a well developed shaft, high of 3-3.5 m, uniformly lined with semi-skeletal

branches and fruit branches, predominantly with an oblique position to the horizontal, decreasing their force from the base of the crown to its tip.

ACKNOWLEDGMENT

The paper relates to fruit growing, namely to a process for shaping the slender spindle crown of the apple tree. The process, according to the invention, comprises arcuation of the highly developed trunk without branches with its fixation in horizontal position in spring in the first year after planting at the onset of the awakening of buds, selection of an extension shoot of the central axis with arched-cane pruning of vertical shoots when they reach a length of 20- 25 cm, fixation of the extension shoot in vertical position, in July

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RESEARCH ON THE EFFICIENCY OF THE EXTRACTION VEGETABLE OIL USING A MULTIFUNCTIONAL HOUSEHOLD ROBOT

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Keywords*: household, robot, optimization, oil, extraction. efficiency*

ABSTRACT

The present paper presents a new multifunctional system of agricultural machinery with an emphasis on the production of a vegetable oil press. Its aim is to increase the efficiency and reliability and also to reduce weight. The solution presented in the paper also shows a series of accessories that can be attached coaxially instead of the pressing module to a planetary gearbox, thus making it portable and with a high efficiency.

INTRODUCTION

The food industry offers a wide variety of machines and installations depending on their destination. Among them, vegetable oil pressing machines are of particular importance for the household, they are of different constructions, such as hydraulic pressing machines with cylinders, or mechanical machines with screws.

The mechanical presses with a screw have the following advantages: - they have a smaller structure, compared to a hydraulic pressing system, - they work without other accessories such as plates, or press strips, - they have a higher refining capacity.

Figure 1. The mechanical oil press with special screw [Năsui 1997]

In the current context of individual agricultural production and the existence of small farms, it is necessary to make machines that should increase productivity, efficiency and availability [Bâlc & Șugar 2013].

Sunflower oil, or from soybean seeds, parsley seeds, etc. they can be extracted by cold pressing on machines of different capacities and of suitable sizes [Burnete et al. 2008].

MATERIAL AND METHODS

The operating principle is based on the mechanical pressing of the fried seeds by means of a semicircular spiral screw of the same step, but with two outer diameter steps The seeds placed in a funnel at the inlet are taken up by the larger diameter screw and inserted into the pressing area, where they are ground through the teeth from the front channels to the outlet, thus creating a strong pressure that heats up by rubbing the mass of the material.

The high pressure and the created temperature pushes the oil in the back direction, forcing it to flow through the outlet holes, and the slurry residues are pushed forward through the front channels in the space created in the pressing area to the outlet site [Tisan 2009].

Theoretically and experimentally it was established that there should be a correlation between the construction elements of the press head, which is made with a spherical shape and the adjustment of the pressing chamber with the help of an adjusting device, after which it is locked with the existing cylindrical screw. The working condition that determines the technological parameters at which the extraction of the oil from seeds is realized, depends on this adjustment [Sokolova 1980].

The principle of building the press is the following: inside a closed space, called the pressing chamber, the milled material arrives at the same time as the pressing is performed by the helical screw [Alexandrescu et al. 2019].

The pressing space is made up of the hole bushing assembly and the pressing screw. The pressure in the pressing chamber is caused by the approach of the pressing head to the spherical end of the helical screw, pushing the milled material through the front with grooves, and the extracted oil must flow through the side holes. By intense and strong mixing, as well as the friction due to the grinding in the pressing chamber, a high temperature is created.- below 70^0 C.

This results in a better grinding quality than the hydraulic presses. The material entering the pressing chamber is pressed by the action of the helicoidal screw, and the oil is separated as a consequence of the pressure and flows through the holes of the pressing chamber [1996, KOMET Oil production plant IBG].

At the beginning of the pressing process, in order to increase the temperature and to prevent the press from blocking, we need to heat the surface of the press head to a temperature of 60-70^0 C with an electric ring-type heater, which will be removed after the flow has started. In isolated cases we can heat the press head with another heating system [1999, STIMEL].

After this pressing process in the ejected residue in cylindrical form there is a low percentage of oil of maximum 5%. Through this procedure we obtain a natural oil that resembles the natural fresh fruit juice. The juicer will be adjusted according to the type of seeds used, the type and degree of dryness. At the beginning, the adjustment of the pressing head is made, and the gap between the end of the screw and the pressing chamber must be blocked.

The multifunctional household robot has multiple uses in small farms in order to mechanize difficult operations. It performs the following operations such as: squeezing vegetable oil and juices, chopping, filling and crushing the seeds, braiding the wire mesh, mixing and cleaning the seeds, transporting materials and handling tasks [Năsui 1997].

The multifunctional household robot is of a simple construction, composed of a basic planetary gearbox type module, to which, through a fast system, different modular subassemblies can be coupled which perform any of the operations presented above [Năsui & Tisan 2003]. In this way, the household robot becomes a juicer, chopper, crusher, braider, mixer, elevator, winch,

In the oil press, from Figure 2 in order to perform the squeezing process it is necessary to initiate the process by heating the press head to a temperature of about 60^0 C, when the oil exits the seed kernels.

Electric heating is obtained with ceramic heating cuffs 6. In order to obtain the best parameters at the level of the current requirements, we have introduced the following constructive and functional improvements.

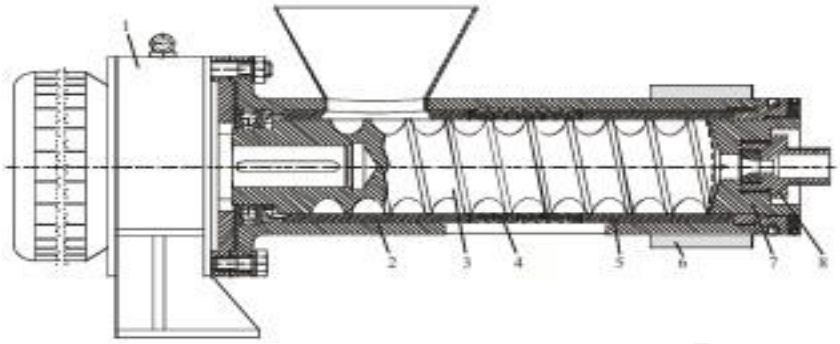

Figure 2. A section through the press with the special screw [Năsui 1997]

The weight reduction was achieved by attaching the press itself directly to the output side of the planetary gearbox 1, which also became a support. The output part of the gearbox is coaxial with the clamping screw, and the fixing and support of the speed reduction equipment is also the press support.

Thus we obtain a construction with the lowest possible weight and high efficiency. In order to increase the durability, especially of the screw, which is the main piece together with the squeeze plug, we have introduced the following improvements: the spherical screw head has been made much more durable by the use of crimped boards, or with superficial thermo-chemical treatments. Increasing the extraction degree when squeezing and reducing the price was obtained by modifying the bush in two parts, a smooth one 5 and the one of squeezing 4 with holes, both centered by the body 2. The grinding and compaction parts were improved by introducing a set 8 of nozzles, compaction, replaceable depending on the desired degree of squeezing.

These can be easily replaced being small in size and easy to assemble and dismantle.

The increase of the degree of extraction, as a basic functional parameter was observed in a screw with the tip of a variable step and with an asymmetrical profile different from the circular one, as well as a variable play on the working length.

In this regard, we can easily adjust the space in which the pressing is located in the milling room to the desired size, thus resulting in the modification of the oil extraction [Năsui & Tisan 2003].

RESULTS AND DISCUSSIONS

With this oil press we tried to establish the dependencies between certain technological and functional parameters.

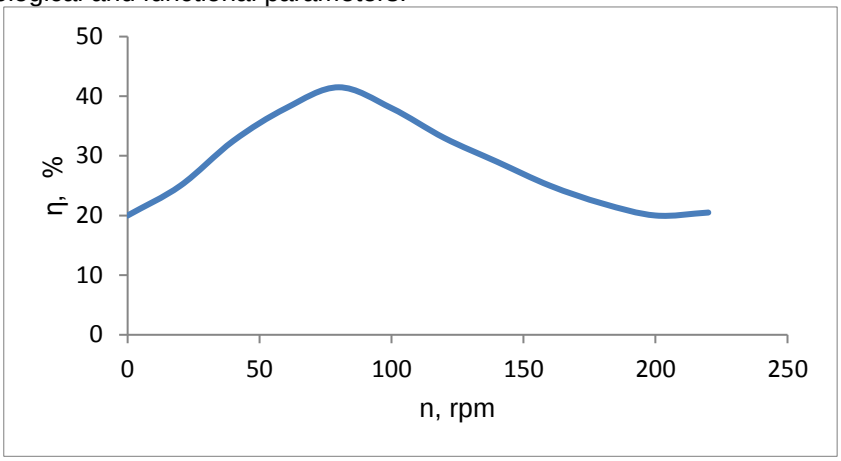

Figure 3. Function of efficiency η [l liters of oil per 100 kg sends] to rotational speed

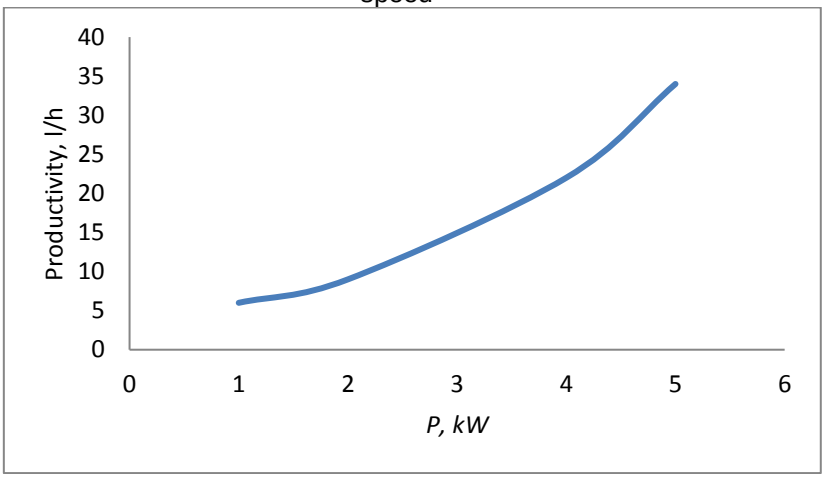

Figure 4. The productivity according to the power absorbed

The planetary reduction equipment that can be with drive motors of different speeds, or constructive variants regulates the different working efficiencies, according to figure 4. By efficiency we understand the quantity of oil extracted from 100 kg of powdered seeds.

The tests aimed to establish the optimum oil extraction speed, as well as the choice of a simple planetary gear reducer structure to ensure the working conditions, respectively the required speed and output moment.

Also, an optimal correspondence was reached between the speed of the screw, its diameter and the starting temperature, which could trigger the squeezing process.

The tests were performed on two prototype sizes of oil presses, one with 55 mm diameter screw and the other with 80 mm screw. We found a variant of the electric motor used in the home and other destinations such as woodworking and cutting machines.

We can observe in figure 3 the existence of a high extraction efficiency at the screw speed of 80 rpm, deduced experimentally. The energy efficiency and the productivity of pressing are shown in Figure 4.

The most important advantages of the presented solution are: the low extraction temperature at which the oil retains its natural characteristics;the resulting residues are very good for animal feed; the small percentage of sediments and impurities in the oil; the possibility of having strict hygiene conditions; high efficiency of 5 -10 liters / 100 kilograms of seeds; productivity 3 -10 liters / hour depending on the type of seeds; threaded shaft speed 93.7 rpm; ambient temperature 100 - 300^0 C; reduced electricity consumption; the total mass of about 50 kg with the planetary gearbox.

CONCLUSIONS

The solution presented in the paper represents the optimal variant, both in terms of construction and functionality due to the methods that contribute to ensuring the technological parameters and working conditions.

The machine also allows its use as a household appliance of a complex household type.

Thus we can change the oil pressing module with other modules such as: squeezing, wire mesh, fruit chopper, seed conveyor, mixer , winch etc.

Due to the constructive simplicity and versatility this machine is easy to handle and it is also portable due to its reduced weight and the small size

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EFFECTS OF *Satureja hortensis, Ocimum basilicum, Mentha piperita* ESSENTIAL OILS TREATMENTS ON HEALTHY AND POTATO VIRUS Y INFECTED POTATO PLANTS (cv. CHRISTIAN)

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Keywords*: potato virus Y, essential oils, inoculation*

ABSTRACT

The effects of the treatments with essential oils from 3 aromatic plants Satureja hortensis, Ocimum basilicum, Mentha piperita on pigments content, minituber yield and infection level were evaluated after potato virus Y mechanical inoculation. These treatments applied on positive potato plants reduced significantly the number of minitubers, increasing their weight, while leaf pigment content also increased. The stronger effects were obtain using Satureja hortensis essential oils treatments. Concerning the effect of the treatments on the infection level, all the treated plants wtih Satureja hortensis, Ocimum basilicum oils presented after PVY mechanical inoculation, values of absorbances at 405nm significantly lower than the untreated and inoculated controls

INTRODUCTION

Potato virus (PVY) (*Potyviride*) is one of the most important viruses of potato (*Solanum tuberosum L*.) (Ragsdale et al. 2001). High PVY level can cause stand loss, reduced yields, undersized tubers and reduced quality (Bădărău et al. 2010). Thus, efforts to control PVY are essential when producing potatoes for market or seed (Bădărău et al. 2010).

Phenolic compounds and other well-known constituents of *Satureja hortensis, Ocimum basilicum, Mentha piperita* plants (Family *Lamiaceae,* order *Lamiales)* have antioxidant activity (Bedoux G. et al. 2010). They are also antimicrobial and antiviral, wich protects the plants. Oils extracted from these plants introduced in healthy and infected potato plants could be implicated in the stress signaling process (Triantaphyllou et al. 2001; Bădărău et al. 2010). Plant cells have defensive responses to pathogen attack associated with changes in oxidative metabolism (Hammerschmidt et al. 2005). One of the consequences of stress is an increase in the cellular concentration of reactive oxygen species (ROS), which are subsequently converted to hydrogen peroxide (H_2O_2). These ROS, particularly H_2O_2, play versatile roles in normal plant physiological processes and in resistance to stresses. H_2O_2 produced in excess is harmful, but lower concentrations are

beneficial. Genetic and physiological evidence suggests that H_2O_2 acts as a signaling second messenger, mediating the acquisition of tolerance to both biotic and abiotic stresses and providing information about changes in the external environment (Quan et al.,2008). Another molecule that participates in response to both biotic and abiotic stresses is ascorbic acid (AA), which acts as an antioxidant, protecting the cell against oxidative stress caused by environmental factors and pathogens. As a direct scavenger of ROS, protecting or regenerating carotenoids or tocopherols, AA is the major redox buffer in plants, and is present at high concentrations in most plant cell compartments, including the apoplast (Noctor 2006). Changes in AA content can modulate PR gene expression and systemic acquired resistance, acting as a signal transducing molecule (Noctor 2006; Pastori et al. 2003). Moreover, AA is a regulator of cell division, cell elongation and growth (Kerk et al. 1995). Considering that compounds from *Lamiaceae* plants oils have antiviral and antioxidant activity (Bedoux et al. 2010; Triantaphyllou et al. 2001) and that H_2O_2 and AA have been implicated in signaling gene expression against biotic and abiotic stresses (Foyer et al. 2005; Noctor et al. 2006), the objectives of this work were to evaluate the effects of treatments with *Satureja hortensis, Ocimum basilicum, Mentha piperita* oils, hydrogen peroxide and AA on some indicators of healthy and mechanical inoculated potato plants with potato virus Y.

MATERIAL AND METHODS

Plant material. *Solanum tuberosum L*. microplants cv. Christian, tested virus free, were obtained from the Biotechnology Department of National Institute of Research and Development for Potato and Sugar Beet Brasov. Single node cuttings were propagated in test tubes on Murashige and Skoog (Murashige et al. 1962) medium, at 20±1°C under a 16 h photoperiod (fluorescent lights, 400–700 nm), in sterile conditions. The microplants were transferred to greenhouse conditions 30 days after the single-node subculture step. For obtaining positive material, a part of these plants were mechanically inoculated, using a PVY secondary infected plant from Record variety (Bădărău et al. 2010)

ELISA test. A press with smooth roles was used for preparation of leaf samples. The antiserum and conjugated used for viruses detection were obtained in our laboratory (Bădărău et al. 2010). The analysis was performed following essentially the protocol described by Clark and Adams (1977) (100 μl from each reactive solutions). Microplates were filled with substrate solution (p-nitrophenylphosphate) incubated 1 hour and the absorbance values were estimated at 405 nm (A_{405}) on PR1100 reader. The samples having A_{405} values exceeding the cut-off (two times the average of healthy controls) were considered virus infected.

Chemical treatments. *Solanum tuberosum L*. microplants were transplanted to pots and after 10, 20 and 30 days. All plants (excepting the controls) were injected with *Satureja hortensis, Ocimum basilicum, Mentha piperita* oils (ratio oil/suspension=1/100) 100μl each plant. For 7 days after the first injection, the plants were sprayed twice weekly with 10 mL per plant of either 1 mM H_2O_2 or 3 mM AA at pH 5.6 (Bădărău et al. 2010). Controls and plants treated only with natural oil were sprayed with distilled water. Four virus infected (positive) and healthy (negative) plants were sprayed in randomized arrays for each chemical treatment, and each treatment was performed in four independent experiments.

Statistical analysis. Data were analyzed by ANOVA and Duncan's Multiple Range Test and scored as significant if $P<0.05$.

RESULTS AND DISCUSSIONS

Effects of treatments with *Satureja hortensis, Ocimum basilicum, Mentha piperita* oils and H_2O_2 or AA, were compared on absorbance values obtained after testing (by DAS ELISA technique) healthy and inoculated plants (cv. Christian) with potato virus *Y*(PVY). The effects of treatments was evaluated 40 days after the last transplanting (Figure 1). Compared with their positive controls, with chemical treatments, the inoculated plants showed significant decreases of the absorbance values (Figure 1).

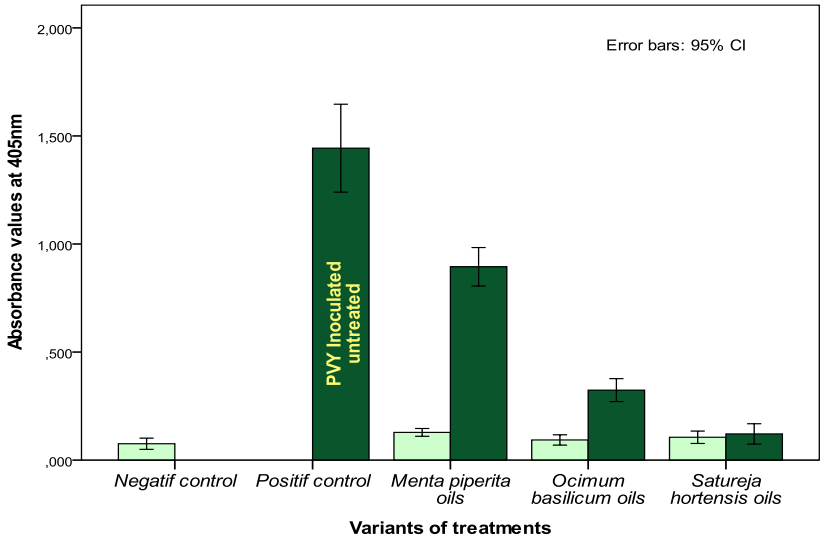

Figure 1. Absorbance (optic density) values at 405nm of healthy (□) and infected (■) potato plants inoculated with potato virus Y(PVY), following treatments with essential oil (dilution 1/100) and H_2O_2 (1 mM), AA (3 mM) or water (controls). Data are means ± SD of four experiments (n=4). Columns with different letters differ significantly by ANOVA and Duncan's test ($P<0.05$).

Treatments with *Satureja hortensis oils* and H_2O_2 or AA significantly decreased the absorbance values (A_{405nm}) of samples prelevated from virus PVY infected plant leaves to levels similar to uninfected. No significant differences were induced by these treatments in the uninfected plants (Figure 1). The *Ocimum basilicum* and *Menta piperita* oils had lower effect on plants responses to inoculation compared with *Satureja hortensis*(Figure 1). Our data show potential benefits of *Satureja hortensis, Ocimum basilicum, Mentha piperita* oils on the *Solanum tuberosum L*. plants inoculated with PVY. The effects of these oils were amazing, the A_{405nm} values being significantly decreased.

Final harvests were carried out at 90 days after transplanting. The number of tubers produced by positive control plants was significantly higher than the uninfected control (by 45%) (Figure 2). In uninfected plants no significant differences were obtained by the treatments relative to their controls (Figure 2). However, all the treatments significantly reduced the number of tubers produced per plant (by 20, 27

and 23% respectively) in the positive plants compared to their control (Figure 2). Interestingly, this reduced number of tubers was similar to that produced in uninfected plants subjected to any of the treatments (Figure 2).

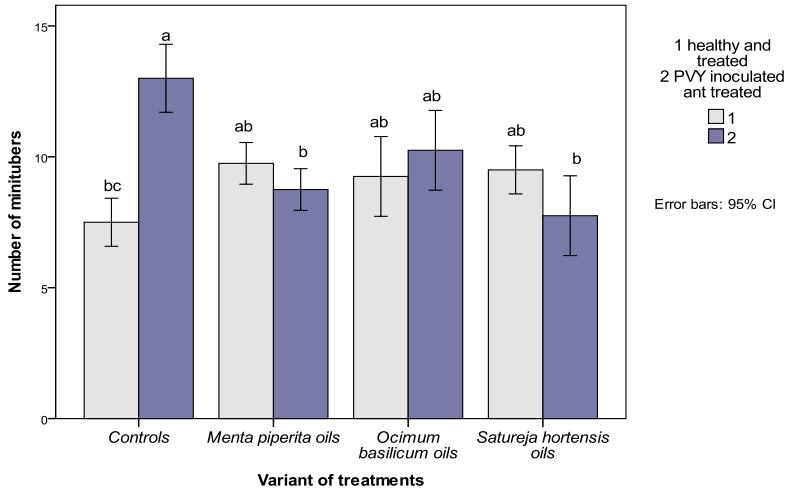

Figure 2. Number of tubers produced by plants healthy or infected plants with potato virus Y, following the chemical treatments. Columns with different letters differ significantly by Duncan's test (P<0.05).

Tuber weights of the uninfected control plants were significantly higher (by 72%) than the positive control (Figure 3). However, *Satureja hortensis* oil treatments significantly increased the weight of tubers (by 85%) in the positive plants compared to their control (Figure 3) The chemical treatments of positive plants resulted in tuber weights that were either not significantly different to, or greater than, those of uninfected controls (Figure 3). Significant reduction by the chemical treatments of the weight of tubers harvested was observed in the uninfected plants compared with their control, this effect remaining significant for the plants treated only with *Satureja hortensis* oil (Figure 3).

Hydrogen peroxide is a diffusible signal-transducing molecule and its accumulation is perceived by the plant as a signal of environmental change, alerting the cell of both biotic and abiotic threats (Noctor et al. 2006). It also alters the concentrations and redox status of intracellular antioxidants, such as ascorbate (Foyer et al. 2005). The results of the present study demonstrated that plants mechanical infected with potato virus *Y* (PVY), suffered significantly harmful effects on the number and weight of tubers produced.

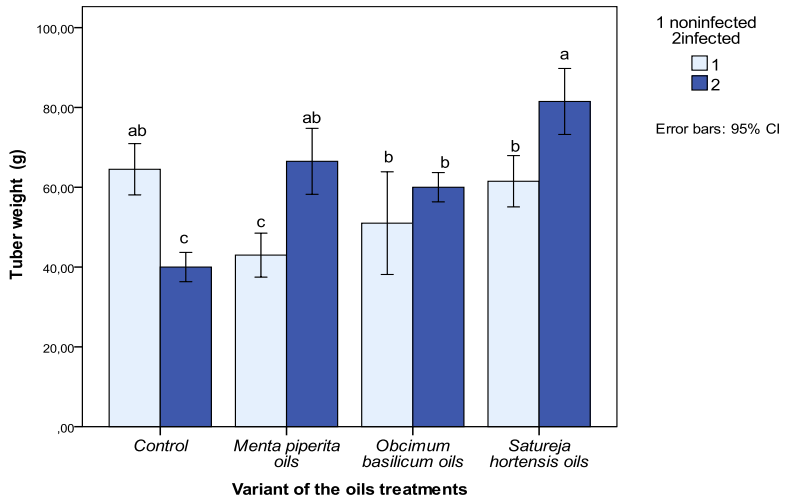

Figure 3. Weight of tubers produced by plants healthy or infected plants with potato virus Y(PVY), after the chemical treatments. Columns with different letters differ significantly by Duncan's test (P<0.05).

Under greenhouse conditions, 90 days after transplanting, the infected plants produced a higher number of tubers than the uninfected controls, relative to uninfected controls. Increased number and reduced weight of tubers is a characteristic response to stress in potato and could be due to disturbance of plant hormones involved in tuber formation (Fernie et al. 2001). It has been suggested that a physiological balance of antioxidant components is necessary in order to obtain protection to generalized stress; however, antioxidants are not always accessible to some of the sites where they are most needed in times of stress (Foyer et al. 2005). Our results agree with this statement, since the *Satureja hortensis* and *Ocimum basilicum* essential oils suspensions and AA/H_2O_2 treatments induced significant anti-stress effects only in the positive plants.

CONCLUSIONS

The results of the present study demonstrated that potato plants mechanical infected with PVY suffered significantly harmful effects on on the number and weight of tubers produced. These effects were reduced by injecting the plants with *Satureja hortensis, Ocimum basilicum, Mentha piperita* oils and spraying with H_2O_2 or AA.

Satureja hortensis oils treatments demonstrated a strong effect as potato plants mechanically inoculated with PVY and injected with these oils presented absorbance values significantly lower than the untreated and inoculated controls.

The elucidation of the precise role played by *Satureja hortensis, Ocimum basilicum, Mentha piperita* essential oils treatments in addition with H_2O_2, AA on potato virus *Y* infected and healthy plants awaits further investigation

ACKNOWLEDGMENT

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RESEARCHES ON THE INFLUENCE OF CROP YELD ON THE QUALITY PRODUCTION IN THE SÂMBREȘTI VINEYARD

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Keywords*: grapevine, crop yeld, quality, ripering*

ABSTRACT

For obtaining high quality wines, type D.O.C. (Controlled Origin Designation), Sîmburești, from any of the two studied varieties, which are part of the traditional vineyard assortment, one of the express requirements provided by the wine and wine legislation in our country, is to limit the yield to 8 tonnes / hectare for the variety Cabernet Sauvignon and 9 tonnes / hectare for Merlot variety. It is clear from the data obtained in this study that in one case (Cabernet Sauvignon clone 169, year 2018) the legal requirement regarding the classification of the yield within the legal limit for obtaining a D.O.C Sâmbureș type wine was strictly observed. In these conditions, to obtain a grape production that corresponds qualitatively from the point of view of obtaining grape productions that correspond to the requirements for obtaining D.O.C. different solutions can be considered: be a fruit load of maximum 9 nodes/m^2; be a delay of the harvest up to more advanced stages of maturity compared to what we applied in this study; either performing a clusters thinning operation at veraison to the market or later, during the ripering but before reaching full maturity

INTRODUCTION

Crop yield is widely recognized as an important factor in the quality of resultant wines (Chapman D. e.a., 2004). Yield control has become a major concern in viticulture. The removal of bunches before maturation, an unthinkable practice in the past, has become a classic technique for vineyards that want to obtain the highest quality possible and ensure a good longevity of the vines. The concept of sustainability will continue to influence the evolution of viticultural practices in the future (Murisier F. e.a., 2012). Grapevine yield formation extends over two consecutive years (seasons 1 and 2). The inflorescence formation (around flowering in season 1) is crucial as it is involved in the formation of both the bunch number per vine and the berry number per bunch in season 2, that account for about 60% and 30% of year-to-year yield variation of grapevine, respectively. Light, temperature, water and nitrogen availability are known to affect this early stage (Guilpart N. e.a., 2014). Grapevine yield and fruit composition largely depend on vine water status, which can be manipulated, especially in semiarid climates, by irrigation strategies and training systems (Mirás-Avalos J. e.a., 2017). Seasonal fluctuations in yield, grape composition and wine attributes, largely driven by variable climatic conditions, are major challenges for the wine industry aiming to meet consumer expectations for consistent supply, wine style and product quality (Clingeleffer P.R., 2010).

MATERIAL AND METHODS

In order to study the effect of the yield on the quality of the grapevine production, we conducted an experiment that consisted of applying three pruning treatments, respectively three nodes loads on the plant after the winter pruning. The experience was realized in a commercial plantation from the vineyard Sâmburești, plantation established in 2010, with two varieties from the mass assortment of the vineyard: Merlot and Cabernet. At the Merlot variety we studied clone 181, and from the Cabernet Sauvignon variety we studied clones 169, 338 and 685. At all clones, the planting distances are identical: 2.25 x 1 m, which means a density of 4545 vines/ha, and the pruning system was identical (Guyot). The three different loads taken in the study were 9, 12, 15 nodes/m^2, which means 20, 27 and 34 nodes/plant.

The pruning were made in March 2017 and March 2018, because the study was conducted during two wine years, the experience being identical in the two years of study. The pruning were made under the same conditions as for production.

RESULTS AND DISCUSSIONS

În tabelele 1 și 2 sunt prezente rezultatele studiului efectuate în anii 2017 și respectiv 2018.

Table 1

Results of the study of the 2017 vintage year

Variety/ Clone	Load crop nodes/m^2	Clusters/ plant	Average mass of grapes (g)	Crop kg/plant	Crop kg/ha	Sugars g/L	Titratable acidity g/L H_2S0_4
Merlot 181	9	12	185,9	2,23	10.128	226	4,16
	12	15	178,4	2,67	12.162	208	4,28
	15	18	169,5	3,05	13.866	194	4,95
Cabernet Sauvignon 169	9	13	142,4	1,85	8.413	232	4,10
	12	16	130,6	2,09	9.497	210	4,64
	15	20	120,2	2,40	10.926	195	5,05
Cabernet Sauvignon 338	9	15	130,6	1,96	8.903	228	4,20
	12	20	120,4	2,41	10.944	205	4,60
	15	25	116,5	2,91	13.237	191	5,20
Cabernet Sauvignon 685	9	16	126,8	2,03	9.220	220	4,24
	12	22	120,1	2,64	12.008	198	4,90
	15	27	112,6	3,04	13.817	187	5,40

The results show that as the fruit load increases, the number of grapes per plant increases and the production of grapes per vine, respectively per hectare. Thus, for the smallest load (9 nodes/m^2 which means 20 nodes/plant), the number of grapes harvested varies between 12 (Merlot variety) and 16 (Cabernet Sauvignon clone 685) in 2017 and between 12 (Cabernet Sauvignon clone) 169) and 15 (Cabernet Sauvignon clone 685). So in all 4 cases, in both years, the number of grapes harvested was lower than the number of nodes left on the plant after pruning.

Comparing the data from 2017 with those of 2018, it is noted that for all three clones of Cabernet Sauvignon, for all fruit loads, the number of grapes was lower in 2018 compared to 2017, with one exception, the mean nod load, of 12 nodes/m^2, in which the number of grapes/plant was the same in both years. In the Merlot variety,

the number of grapes was higher in the first two loads of fruit and equal to the maximum load of 15 nodes/m^2. Regarding the average mass of the bunches, it is noted that in both years and in all the loads of fruit, the Merlot grapes were larger by 30-40 g or even more than the Cabernet grapes. At the Merlot variety the average mass of grapes was between 160.2 g and 170.2 g in 2018 and between 169.5 g and 185.9 g in 2017, so the grapes from 2018 were smaller than in 2017. It is also noted that at the minimum load of 9 nodes/m^2, the difference in size between the two wine years was the largest, of 13.7 g. At the load of 12 nodes/m^2 the difference was 13, 0 g, and at 15 nodes/m^2 the difference was smaller, only 9.3 g/grape.

Table 2

Results of the study of the 2018 vintage year

Variety/ Clone	Load crop nodes/m^2	Clusters/ plant	Average mass of grapes (g)	Crop kg/plant	Crop kg/ha	Sugars g/L	Titratable acidity g/L H_2S0_4
Merlot 181	9	13	170,2	2,21	10.056	228	4,10
	12	16	165,4	2,64	12.027	211	4,22
	15	18	160,2	2,88	13.105	196	4,75
Cabernet Sauvignon 169	9	12	140,8	1,69	7.479	238	3,96
	12	15	128,8	1,93	8.790	214	4,50
	15	19	121,1	2,30	10.457	196	4,80
Cabernet Sauvignon 338	9	14	132,2	1,85	8.411	230	4,16
	12	20	121,3	2,42	11.026	208	4,62
	15	24	118,1	2,83	12.882	192	5,30
Cabernet Sauvignon 685	9	15	125,9	1,89	8.583	222	4,20
	12	21	120,7	2,41	10.971	201	4,80
	15	25	114,3	2,85	12.987	188	5,22

Comparing the data on the average mass of the grapes to the Cabernet Sauvignon clones according to the fruit load, it is found that for all 3 clones, the difference in the size of the grapes between the minimum and the maximum load was greater in 2017 compared to 2018. Thus, in clone 169, in 2017, the difference is 22.2 g (15.59%) and 19 g (13.99%) in 2018. In clone 338 the average mass difference of grapes between the load of 9 and the 15 nodes/m^2 was 14.8 g (10.7%) in 2017, and in 2018 it was 14.1 g (10.66%). At clone 685 in 2017 the difference was 14.2 g (14.20%) and in 2018 the difference was 11.6 g (9.2%), this being the smallest difference.

The increase of the fruit load at 12 nodes/m^2 has led to an increase in the number of grapes/plant but also to a decrease in their average size. For Merlot, the average mass of grapes at this fruit load was 178.4 g (2017) and 165.4 g (2018). In the 3 clones of Cabernet Sauvignon the average mass of grapes at the load of medium fruit varied between 120.1 g (685) and 130.6 g (169) in 2018 and between 120.7 g (685) and 128.8 g (169) in 2018. Therefore, the imitation of variation was 10.5 g in 2017 and 7.1 g in 2018.

The results obtained during the 2 years of study show that the values of the main parameters of composition of the grapes (sugars and total acidity) were significantly influenced by the levels of production resulting from applying different

cutting varieties with different fruit load (figure 1,2). The most important finding is that for all the clones and varieties studied in both wine years, as the yield increases, the sugar content decreases.

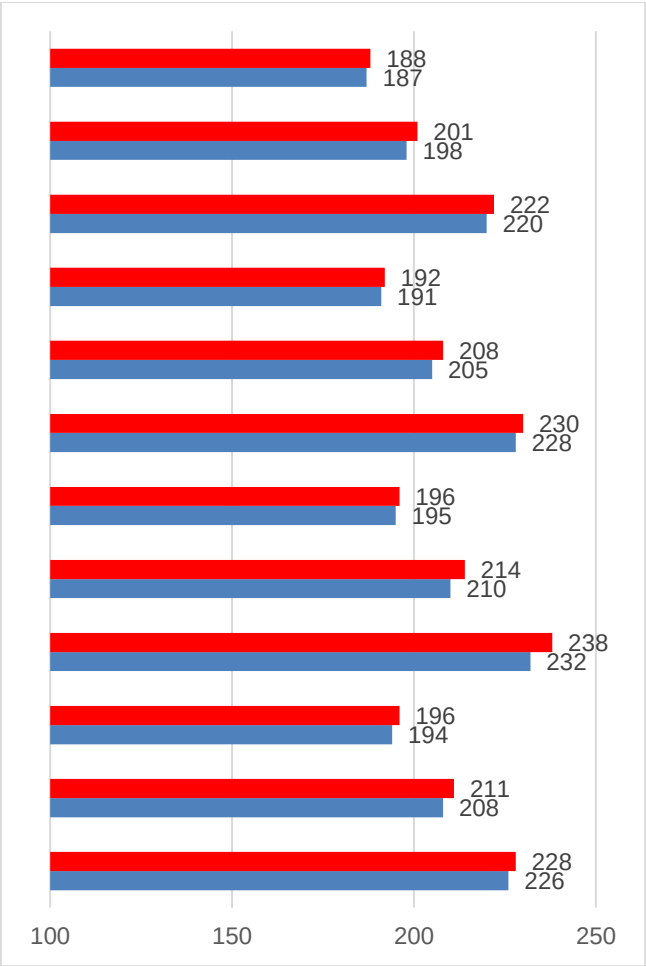

Figure 1 - Sugar content (g/L) depending the pruning

At the fruit load of 12 nodes/m^2, at clone 685, in 2017, it was the only case where the sugar content was less than 200 g/L. The highest content was in 2018, at clone 169 (214 g L). Therefore, the variation limits of the differences were 16 g/L, as opposed to the sugar contents of the 9 nodes/m^2 variants where it was 18 g/L. At the fruit load of 15 nodes/m^2, which was equivalent to the largest grape productions regardless of clone, variety or year of production, the lowest sugar contents were recorded, in all cases below 200 g/L, the lowest content being at clone 685 in 2017 (187 g/L). Moreover, in this clone, which was the most productive of the 3 Cabernet Sauvignon clones, in both years of the study the sugar content was below 190 g/L, which is a definite proof of the fact that the large grape yields they are not favorable to the quality, respectively the accumulation of sugar in grapes.

Data on total acidity shows that it has a reverse evolution towards sugar content, which means that it has increased each time the yield has increased and the sugar content has decreased. In 2017, the values of total acidity, expressed in g/L H_2SO_4 ranged between 4.10 g/L (Cabernet Sauvignon clone 169, fruit load of 9 nodes/m^2) and 5.40 g/L (Cabernet Sauvignon clone 685, fruit load of 15 nodes/m^2). In 2018, total acidity values ranged from 3.96 g/L (Cabernet Sauvignon clone 169, fruit load 9 nodes/m^2) and 5.30 g/L (Cabernet Sauvignon clone 338, fruit load 12 nodes/m^2). Therefore, the minimum value of the total acidity was at the same variant as in 2017, however the highest value was for another clone of Cabernet Sauvignon with the maximum load of fruit.

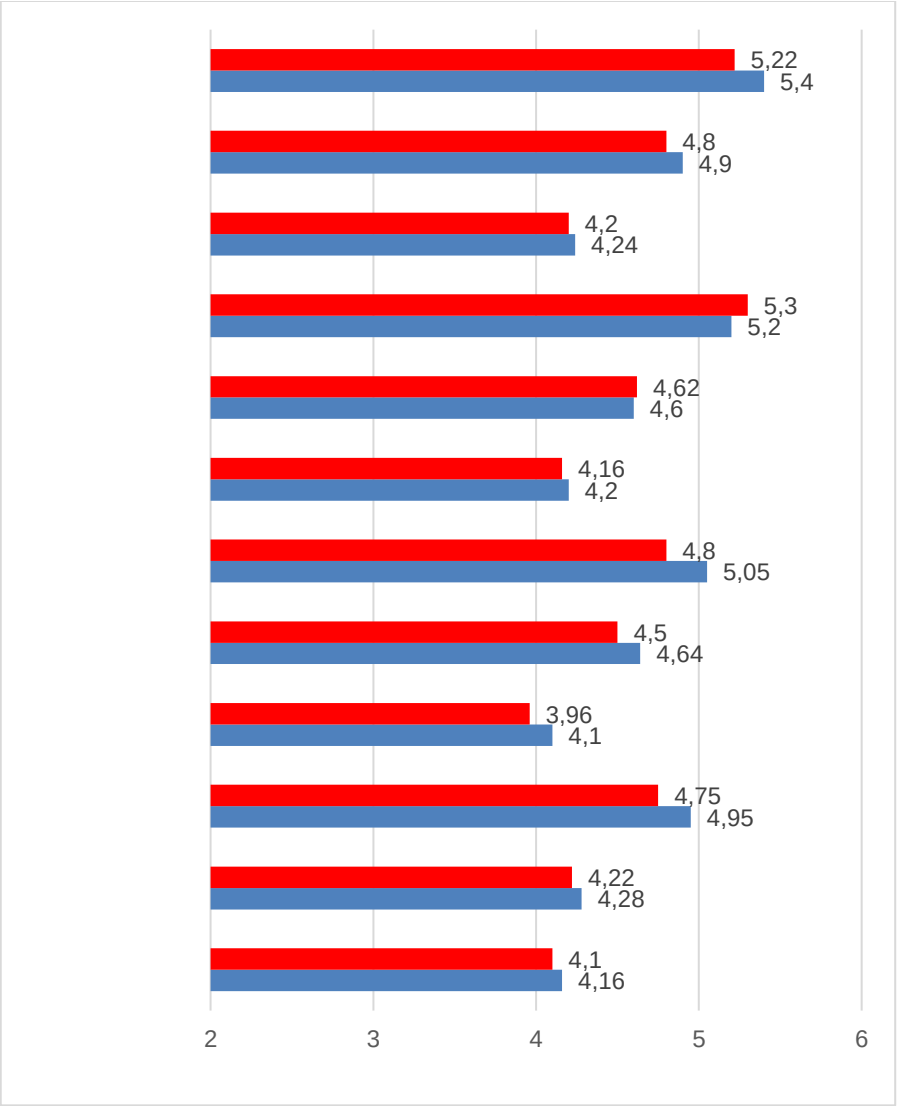

Figure 2 – Total acidity of grapes (g/L H_2SO_4) depending the pruning

CONCLUSIONS

There was a strong interaction between the load of fruit and the number of grapes on the plant, but there was not in any variety and in any of the 2 years of study a directly proportional relation between the increase of the load and the increase of the number of grapes on the plant. In all the variants, the increase in the number of grapes per vine was accompanied by the decrease of their average mass in all cases, the Merlot grapes were significantly larger than those of Cabernet Sauvignon, the differences being quite large, going in some cases up to 60 g or more, the smallest difference being about 30 g/grape. With few exceptions, grapes from 2017 had a higher average mass than those from 2018, which would lead to higher grape production, most of the time, in 2017.

The increase of the yield was not favorable for the increase of the quality of the production of the wine-growing. In the present study we considered only the sugar content and total acidity of grapes at the time of harvest (so-called technological maturity). For this reason, the maximum load of fruit, of 15 nodes/m^2 which led to very high yields, led to sugar contents below 200 g/L, even down to 187 g/L. From such sugar contents are obtained wines with moderate alcoholic country of 11-12% vol., Much which is characteristic of the quality wines obtained in the vineyard Sâmburești. Also the cutting variants with a load of 12 nodes/m^2, have a sugar content of 205-210 g/L, sometimes even less, also unsuitable for obtaining strong, rich, structured, generous Sâmburești wines.

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RESULTS OF THE MONITORING OF *Xanthomonas campestris* pv. *vesicatoria* (DOIDGE) DYE IN ROMANIA IN 2018

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Keywords*: monitoring, quarantine, samples, analyzes*

ABSTRACT

The National Phytosanitary Authority ensures the phytosanitary protection of Romania and the European Community by applying measures aimed at preventing the introduction, establishment and spread of harmful quarantine organisms to plants. As part of the monitoring activity, tomato and pepper represent two of the main crops monitored and in this sense, since 2011, the "Monitoring program for quarantine viruses in tomato and quarantine bacteria in tomato and pepper" is implemented annually, these crops being susceptible to being infected with Xanthomonas campestris pv. vesicatoria listed as a quarantine organism. The monitoring covers internal production, intra-Community circulation and imports from third countries. One of the official measures applied was to intensify the inspections in order to verify the phytosanitary requirements.

INTRODUCTION

Bacterial spot of tomato and pepper is caused by the *Xanthomonas campestris* pv. *vesicatoria* (DOIDGE) DYE bacteria which, according to national and international legislation, is a quarantine organism regulated in Annex II, Part A, Section II of HG 563/2007, with subsequent amendments and which transposes Directive 2000/29/EC (Official Monitor of Romania, Part I, No. 468 bis/12.VII.2007, Decision for the approval of the methodological norms for applying the Government Ordinance No. 136/2000 regarding the protection measures against the introduction and spread of the quarantine organisms harmful to plants or plant products in Romania).

The host plants with economic importance covered by the monitoring program carried out by the National Phytosanitary Authority are *Lycopersicon lycopersicum* and *Capsicum annuum* (https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2014.3720).

The sampling is carried out according to the "Monitoring program for tomato quarantine viruses and tomato and pepper quarantine bacteria" and "Instructions for sampling plants, plant products and other related objects", elaborated by the National Phytosanitary Authority as follows:

• Seeds: tomato - 10,000 seeds, pepper - 1,000 seeds and hybrids - at least 2,000 seeds;
• Plants: only plants with symptoms, no more than 5 plants on the same plot.

Symptoms produced by this harmful quarantine organism are generally represent by spots that can have different shapes, colors and sizes and can occur at any time during the vegetation period (SEVERIN and ILIESCU, 2006).

On the tomato leaves appear circular or irregular spots, with a hydrous appearance, initially green, then brown and necrotic, arranged along the lateral nerves or on the edge of the limb, surrounded by a chlorotic halo, and in the case of a strong attack occurs the leaf burn. Spots are formed also on the stem, the tissue is suberified and irregular warts and cracks occur. On the fruit initially, small, crusty spots with yellow or white halo are observed, later they grow, becoming brown, prominent or deep, with a rough appearance and surrounded by a green halo and in case of a strong attack white-brown cracks appear.

To pepper, the spots on the leaves are small, circular, initially green then become necrotic, irregular and sometimes surrounded by chlorotic halo, and in severe infections the leaves may fall (AIELLO *et al.*, 2013). On the fruit occurs circular, whitish, prominent spots with a rough surface. (SEVERIN and ILIESCU, 2006).

Figure 1. Tomato symptom

Figure 2. Pepper symptom

Figure 3. Seedlings symptom

Figure 4. Stem symptom

The means of transmission of this bacteriosis are represented by: infected seeds, seedlings, vegetal debris (JONES *et.al.*, 1986), soil, rain or irrigation drops, but also from the weeds of the *Solanaceae* family that may be alternative hosts (SILVA *et al.,* 2013).

The bacterium can spread over short distances through bacterial exudate that leaks from the lesions of the attacked organs, with the help of rain or irrigation water spray, aerosols and contaminated tools (https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2014.3720).

On longer distances the spread is made during the trade only through the seeds and infected seedlings, the bacteria resistant to the surface but also within the seed from a few months to 10 years (SEVERIN and ILIESCU, 2006).

Infected seedlings are the source of primary infections, and secondary infections occur during the vegetation period via exudates, water droplets, tools, machinery and even workers' equipment (https://efsa.onlinelibrary.wiley.com/doi/ epfd / 10.2903 / j.efsa.2014.3720).

A real danger that favors the spread of this phytobacteriosis, according to the studies carried out by BLACK *et al.* in 2001, it is represented by the seeds kept by farmers from tomato and pepper contaminated crops and used as plant material in the following years. This phenomenon is also common for our country farmers who use their own seed that they keep from previous culture.

The period between the infection and the appearance of the first symptoms can vary from 8 days to 2-3 weeks, depending on the environmental factors, the type of soil and the age of the plant.

The optimum conditions during the incubation period of the bacteria favors the appearance of severe symptoms of the disease. A high atmospheric humidity between 87-97% and a temperature of 23-28 ° C favors the appearance of obvious symptoms, while a low humidity between 50-70% and temperatures of 15-20 °C do not produce symptoms of obvious disease (SEVERIN and ILIESCU, 2006).

MATERIAL AND METHODS

In our country responsible for carrying out the phytosanitary controls are the phytosanitary inspectors from the County Phytosanitary Offices and the Border Inspections Points.

The National Phytosanitary Laboratory is responsible for the detection and identification of harmful organisms by analyzing the samples of plants and plant products taken by the territorial and border inspectors.

The analyzes were performed in the bacteriology laboratory of the National Phytosanitary Laboratory.

The analysis methods used in the laboratory for the detection and identification of the quarantine organism *Xanthomonas campestris* pv. *vesicatoria* are in accordance with the working protocol PM 7/110 (1) of 2013 of the European and Mediterranean Plant Protection Organization EPPO.

These are: antibody staining by indirect immunofluorescence IFI (RENAR accredited method), isolation on semi-selective culture medium (McGUIRE *et al*., 1986) and non-selective medium (SEVERIN and CORNEA, 2009), PCR multiplex, ELISA tests, biochemical tests and pathogenicity tests to confirm the positive results in the quarantine greenhouse of the laboratory (on young and sensitive plants of tomato or pepper for 3 weeks at 25^0C and high humidity) or in the laboratory on green bean pods.

RESULTS AND DISCUSSIONS

The total area cultivated with tomato and pepper increased from 36374.65 ha tomato and 14643.61 ha pepper in 2016, to 38178.55 ha tomato and 15113.15 ha pepper in 2017, and in 2018 were cultivate 39208.55 ha tomato and 14893.87 ha pepper.

As a result of the phytosanitary inspections carried out during the year 2018, 63 seed samples from the internal production were analyzed (37 pepper samples and 26 tomato samples).

Regarding the plants from the internal production (seedlings, whole plants, parts of plants, fruits), a number of 109 samples (50 pepper samples and 59 tomato samples) were analyzed and following the laboratory analyzes were detected positive, infected with *Xanthomonas campestris* pv. *vesicatoria*, 10 samples (8 tomato samples and 2 pepper samples).

Tabel 1

Results of the monitoring of *Xanthomonas campestris* pv. *campestris* internal production

County	Host plant	Quantity inspected (kg)	No inspections	No samples taken	No positive sample	Contaminated quantity (kg)
SEED						
Bacău	Solanum	13	1	1	0	0
Buzău	Solanum	379	3	16	0	0
Cluj	Solanum	20	1	9	0	0
Cluj	Capsicum	15	2	33	0	0
Ilfov	Capsicum	33,20	4	4	0	0
Hunedoara	Solanum	0,35	3	0	0	0
TOTAL		**460,55**	**14**	**63**	**0**	**0**
PARTS OF PLANT						
County	Host plant	Total area /inspected area (ha)	No inspections	No sample taken	No positive sample	Contaminated area (ha)
Bacău	Capsicum	2/2	1	3	0	0
Călărași	Capsicum	82 / 8,29	9	2	0	0
Galați	Capsicum	496 / 10	4	4	0	0
Ialomița	Capsicum	1141,86 / 14,16	8	17	0	0
Iași	Capsicum	963/ 0,315	3	1	0	0
Ilfov	Capsicum	521 / 1,68	35	2	0	0
Olt	Capsicum	1575 / 16	17	18	2	0,26
Olt	Solanum	2795 / 56	132	34	1	0,1
Suceava	Solanum	0,1 / 0,1	2	3	0	0
Vrancea	Solanum	1100/ 5,95	51	25	7	0,63
TOTAL		**8676/ 114,49**	**262**	**109**	**100**	**0,99**

In the intra-Community circulation and import were analyzed and the results obtained were negative 7 seedlings samples (6 tomato samples and 1 pepper sample) and 23 seed samples (8 pepper samples and 15 tomato samples) and none was detected positive with *Xanthomonas campestris* pv. *vesicatoria.*

Tabel 2

Results of the monitoring of *Xanthomonas campestris* pv. *campestris* intra-Community circulation and import

Intra-Community/Import						
Country	Host plant	No inspections	Quantity inspected pieces/kg	No Samples taken	No positive sample	Contaminated quantity (kg)
SEEDLING						
Turkey	Solanum	4	10000	1	0	0
Turkey	Capsicum	2	1376	1	0	0
Greece	Solanum	5	53500	4	0	0
Italy	Solanum	1	768	1	0	0
SEED						
Holland	Capsicum	4	25,63	5	0	0
Hungary	Capsicum	3	0,015	1	0	0
Italy	Capsicum	1	0,1	1	0	0
Slovakia	Capsicum	1	0,5	1	0	0
/	Capsicum	1	0,015	0	0	0
TOTAL		**10**	**28,78**	**8**	**0**	**0**
Holland	Solanum	4	10,35	4	0	0
Hungary	Solanum	2	0,108	2	0	0
Italy	Solanum	9	33,22	7	0	0
Bulgaria	Solanum	3	0,204	0	0	0
Poland	Solanum	2	62	1	0	0
Germany	Solanum	1	482,18	0	0	0
Slovenia	Solanum	1	0,07	0	0	0
France	Solanum	1	2,5	1	0	0
TOTAL		**23**	**590,632**	**15**	**0**	**0**

Compared to the years 2016-2017, in 2018 the number of samples detected positive following the laboratory analyzes performed was higher (2 tomato samples in 2016, 3 tomato samples in 2017 and 10 samples in 2018 - 2 pepper samples and 8 tomato samples), which led to the intensification of the controls carried out both in the territory and to the photosanitary border inspections.

The strict application of the quarantine measures provided by the legislation in force is one of the main measures that can be taken in the case of the detection and identification of this phytobacteriosis.

CONCLUSIONS

During 2018, 63 seed samples and 109 plants samples (seedlings, whole plants, parts of plants, fruits) were analyzed for from internal production, of which 10 were detected positive following the laboratory analyzes infected with *Xanthomonas campestris* pv. *vesicatoria* (8 tomato samples and 2 pepper samples).

In the intra-Community circulation and import, a number of 7 seedlings samples and 23 seed samples were analyzed and no sample was found positive for *Xanthomonas campestris* pv. *vesicatoria*.

The intensification of the phytosanitary controls in the country and at the borders has led to an increase in the total number of samples received and analyzed at the National Phytosanitary Laboratory but also to the increase of the number of samples detected positive in the laboratory analyzes.

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LABORATORY ANALYSES METHODS FOR DETECTION AND IDENTIFICATION OF BACTERIA *XANTHOMONAS CAMPESTRIS* PV. *VESICATORIA* (DOIDGE) DYE

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Keywords: *analyses, screening, imunofluorescence, isolation, pathogenicity*

ABSTRACT

The bacterium called generic Xanthomonas campestris pv. vesicatoria responsible for the production of the disease "Bacterial spot of tomato and pepper" is a quarantine organism listed in the national and international legislation in force, HG 563/2007 which transposes Directive 29/2000 / EC. The only laboratory in Romania authorized to performed analyses for quarantine organisms is the National Phytosanitary Laboratory within the National Phytosanitary Authority. In order to detect and identify this bacterium are followed the provisions of OEPP working protocol PM 7/110 (1) of 2013. Both seeds and plants with or without obvious symptoms can be analyzed. A sample can be considered positive for Xanthomonas campestris pv. vesicatoria only if all the tests in the detection and identification scheme are positive.

INTRODUCTION

Xanthomonas campestris pv. *vesicatoria* bacterium is responsible for the production of the bacterial spot of tomato and pepper and is systematically classified in the Kingdom of Monera, Phylum Proteobacteria, Class Gamma Proteobacteria, Order Xanthomonadales, Family Xanthomonadaceae, Genus *Xanthomonas*, Species *Xanthomonas euvesicatoria* Jones *et.al*.(2004), *Xanthomonas vesicatoria* (e.g. Doidge 1920) Vauterin *et. al.*(1995), *Xanthomonas perforans* Jones *et.al.* (2004) and *Xanthomonas gardneri* (e.g.Šutic1957) Jones *et.al.* (2004) (https://efsa.onlinelibrary. wiley.com/doi/epdf/10.2903/j.efsa.2014.3720**,** 2014).

It is listed as a quarantine organism under the name of *Xanthomonas campestris* pv. *vesicatoria* (Doidge) Dye in Annex II, Part A, Section II of GD 563/2007, with subsequent amendments and which transposes Directive 2000/29/EC (Official Monitor of Romania, Part I, No. 468 bis/12.VII.2007, Decision for the approval of the methodological norms for applying the Government Ordinance No. 136/2000 regarding the protection measures against the introduction and spread of the quarantine organisms harmful to plants or plant products in Romania).

The host plants with economic importance for this phytobacteriosis are *Lycopersicon lycopersicum* and *Capsicum annuum* (https://efsa.onlinelibrary.wiley. com/doi/epdf/10.2903/j.efsa.2014.3720, 2014).

Symptoms produced on different organs of plants are represented by spots with different shapes, sizes and colors (SEVERIN and ILIESCU, 2006).

On tomato leaves appear circular or irregular spots, hydrous, first green, then brown and in time become necrotic, surrounded by a chlorotic halo. Spots are formed also on the tomato stems, the tissue is suberified and irregular warts and cracks appear, and on the tomato fruits small, crusty spots appear at first, with yellow or white halo, which subsequently grow, becoming brown, prominent or deep, rough, surrounded of green halou. In case of a strong attack, white-brown cracks appear.

Figure 1. Tomato leaves symptoms

Figure 2. Tomato fruits symptoms

At the beginning, on pepper leaves appear small, circular, green spots, which become necrotic and irregular and can be surrounded by a chlorotic halo (AIELLO *et al.,* 2013). On the fruit, circular, whitish, prominent spots with a rough surface are formed (SEVERIN and ILIESCU, 2006).

Figure 3. Pepper leaves symptoms

Figure 4. Pepper fruits symptoms

MATERIAL AND METHOD

The samples analyzed come from internal production, intra-Community circulation and import and are taken by the territorial or border phytosanitary inspectors, or were samples analyzed following the requests of the natural or legal persons.

The methods of analyses performed for the detection and identification of this bacterium must be in accordance with the national and European legislation in force.

The bacteriology laboratory of the National Phytosanitary Laboratory is responsible for performing the analyses for this quarantine pathogen.

For the analyses carried out were followed the provisions of the EPPO protocol PM 7/110 (1) of 2013 regarding the detection and identification of the *Xanthomonas* spp. (*Xanthomonas euvesicatoria*, *Xanthomonas vesicatoria*, *Xanthomonas perforans* și *Xanthomonas gardneri)* wich cause bacterial spot of tomato and pepper.

Both seeds and plants with or without obvious symptoms were subjected to laboratory analyses.

The analyses methods used in the bacteriology laboratory are: indirect immunofluorescence IFI, isolation on non-selective and semi-selective culture media, multiplex PCR test, BIOLOG and API tests based on biochemical particularities, ELISA test and pathogenicity test on plant, in the greenhouse, or on bean pods, in the laboratory (EPPO PM 7/110 (1), 2013).

RESULTS AND DISCUSSIONS

The initial screenig method used for the detection of the bacterium is the indirect immunofluorescence IFI, which consists of antibody staining, this method being RENAR accredited since 2013 (ASRO- SR EN ISO 17025, 2018).

Polyclonal antisera are used for staining, following the requirements of the OEPP diagnostic protocol PM 7/97 (1) *Indirect immunofluorescence test for plant pathogenic bacteria.* (EPPO PM 7/97 (1), 2009).

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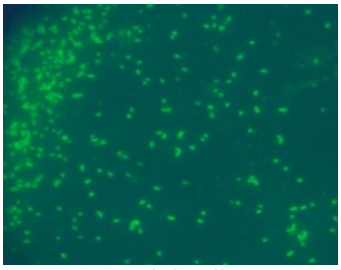

Figure 5. Bacterial cells seen at the epifluorescence microscope

Another method of screening is isolation on different non-selective culture media: YGCA -yeast-glucose-calcium carbonate-agar, NA -nutrient agar and YPGA - yeast-pepton-glucose-agar (SEVERIN and CORNEA, 2009) and when is possible to develop saprophytic populations, semi-selective medium mTMB agar is used (McGUIRE *et al*., 1986).

This method is the basis of the following analyses to be performed for the identification of bacteria, being used for both detection and identification of bacteria.

Bacterial colonies that develop on non-selective culture media are mucilaginous, round, glossy, prominent and yellow, color given by xanthomonadine, a pigment characteristic only to xanthomonas (SEVERIN and ILIESCU, 2006). They show cultural differences depending on the media they grow, as follows: on YGCA and YPGA the colonies are bright yellow, circular, with entire margin, wet, shining, mucoid and slightly raised, while on NA the colonies are yellow, round, with the margin bordered, smooth, shining, prominent, convex and have 1 cm after 4 days of incubation (PATEL *et. al.,* 1950).

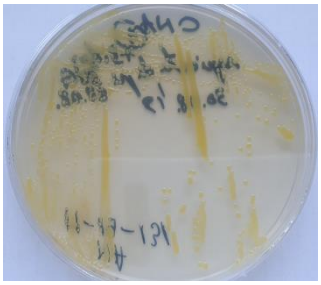

Figure 6. Bacterial colonies on non-selective media NA

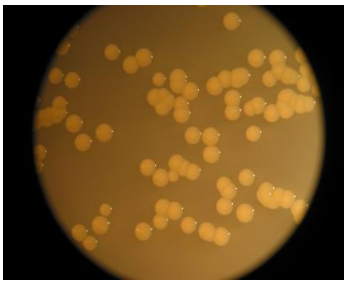

Figure 7. Bacterial colonies on non-selectiv media YPGA

On the semi-selective medium mTMB the colonies are yellow, round, convex and slightly mucoid, and after 3-7 days a clear halo is formed around colony. Purification of bacterial colonies obtained on semi-selective medium is performed by subculturing the individual pigmented yellow colonies on a non-selective medium (EPPO PM 7/110 (1), 2013).

Suspected bacterial colonies grown on culture media are further analyzed in molecular biology by multiplex PCR test to confirm screening test results.

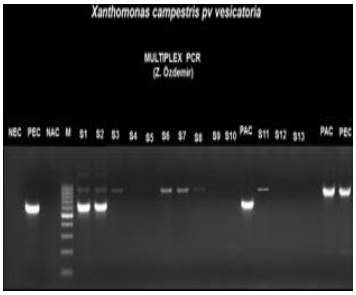

Figure 8. Multiplex PCR test results

Bacterial colonies that have a positive result from the molecular biology tests can be subculture on the BUG Agar culture medium (Biolog Universal Growth Agar) to be analyzed also regarding the use of carbon sources using the BIOLOG microorganisms identification system.

The BIOLOG system (OmniLog) uses 96 well microplates that contain a wide range of carbon sources and which, following inoculation with a pure culture, generate a specific pattern. The results obtained after incubation at 33^0C for 22-48 hours is entered in the program and is compared with the database of the identification system that contains over 2900 species of bacteria and filamentous fungi (https://www.biolog.com/products-portfolio-overview/microbial-identification/, 2019).

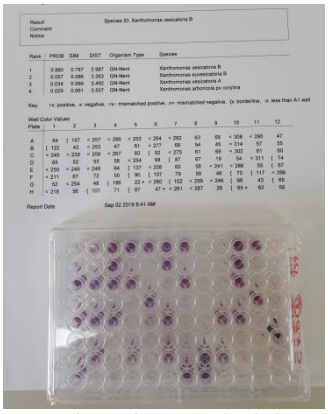

Figure 9. Microplate and Biolog result generated by the system

Also for the identification of bacteria can use biochemical tests, API system based on biochemical particularities and ELISA test.

The pathogenicity test to confirm the positive results was performed in the quarantine greenhouse or in the laboratory on green bean pods.

In the greenhouse the pathogenicity test for *Xanthomonas campestris* pv. *vesicatoria* was made by inoculation with at least 10^7 ufc / mL bacterial suspension of a pure culture at young tomato plants of susceptible cultivars Moneymaker.

The plants were grown at a temperature of 25^0C and humidity of 70-80% for 3 weeks.

Figure 10. Pathogenicity on tomato in the greenhouse

Figure 11. Pathogenicity on bean pods

CONCLUSIONS

For the detection and identification of bacteria *Xanthomonas campestris* pv. *vesicatoria* , seed and symptomatic or asymptomatic plants can be analyzed.

Performing the analyses according to the flow diagram of the OEPP working protocol PM 7/110 (1) from 2013 allows the laboratory to identify this pathogenic phytobacteriosis on tomato and pepper.

Obtaining positive results only for a part of the laboratory analyses provided by detection and identification scheme should not be interpreted as a positive end result.

A sample can be considered positive for *Xanthomonas campestris* pv. *vesicatoria* only if all the tests in the detection and identification schemes are positive.

Bacterial colonies obtained by isolation on the culture medium must be pathogenic and the disease be reproduced on the test plants at the pathogenicity test.

The reisolation and identification of the bacteria, obtained from test plants that present symptoms, completes the positive pathogenicity test.

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ON *EUSCORPIUS CARPATHICUS* (LINNE, 1767) IN ROMANIA – RETROSPECTIVE, PERSPECTIVES AND TWO NEW RECORDS

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Keywords*: Euscorpius carpathicus, literature, knowledge*

ABSTRACT

This paper presents the current state of knowledge of Euscorpius carpathicus in Romania and future directions of study.

INTRODUCTION

Euscorpius carpathicus is one of the most attractive and interesting invertebrates in the fauna of Romania. Starting with its discovery and description by Linné in 1767 until presently, it has been the subject of study for many Romanian and foreign researchers.

The aim of the paper is to analyze the degree of knowledge of this species, to identify the gaps in knowledge and prefigure the future directions of study.

MATERIAL AND METHODS

In order to achieve the assumed goal, we made bibliographic documentation and studied the available literature. The starting point was the work Bibliographia Arachnologica Romanica - Dumitrescu (1979).

RESULTS AND DISCUSSIONS

Systematics and taxonomy

The knowledge of the species from a systematic point of view can be divided into two periods:

1. the period of classical, morphological studies based on trichobothriotaxy analysis. This period is chronologically marked by the works of Vachon (1973, 1975, 1976), Vachon & Jaques (1977), Bonacina (1983), Fet & Soleglad (2002).
2. the modern integrative period, based on the analysis of trichobothriotaxy and molecular markers. This period is marked by the works Gantenbein et al. (1999) and Fet et al. (2002).

Based on morphological and molecular features, it is established that the species *Euscorpius carpathicus* is present only in Romania.

Faunistic – geographical distribution – biogeography

The first faunistic documents on the species *Euscorpius carpathicus* are linked to the names of Zottu and Călinescu; some of the publications are still inaccessible: Zottu 1907, 1927 in Dumitrescu (1979); Călinescu 1922 in Dumitrescu (1979), Călinescu (1940), Călinescu 1956 in Dumitrescu (1979); Călinescu & Călinescu (1930). There can be also mentioned other authors: Berbece, Bobirnac, Bogdan, Bunescu, Caporiaco, Jana, Ionescu in a series of publications about fauna and biogeography – Călinescu & Bunescu (1950), Caporiaco (1950), Bunescu 1959 in Dumitrescu (1979), Berbece (1961), Bogdan (1964), Călinescu & Jana 1964 in Dumitrescu (1979), Bobirnac & Ionescu (1974). The most recent publications belong to Gherghel et al. (2016) and Covaciu-Marcov & Ferenti (2019).

According to literature, *Euscorpius carpathicus* presents a disjunct geographical distribution, being reported in the vicinity of Deva town, Banat Mt., the Olt River Defile – Cozia Mt., in the vicinity of Turnu Măgurele town, in the Curvature Carpathians – Buzău Hills and Mountains.

We also add two other collection points: Repedea Valley, Latoriţa Mt. (N 45º 22.351′; E 023º 57.387′; alt. 643m); in the proximity of Cernaia locality – Gorj County.

Euscorpius carpathicus is present in areas with sub-Mediterranean climate Covaciu-Marcov & Ferenți (2019 and included reference).

Ecology, biology

Gherghel et al. (2016) established the overwintering behavioral ecology of *E. carpathicus* and associated its presence with bushes and clay cracks in the banks of different rivers.

Anatomy and histology

Data on the anatomy/histology of *Euscorpius carpathicus* are scanty and of a rather general nature. As a result of the documentation effort, the following publications were found: Roșca (1947), Polis (1990), Farley (1999), the last two as synthesis works that refer to other bibliographic sources.

Based on optic and / or electron microscopy, the studied literature provides information on the structure of the venom gland, eyes, middle intestine muscles, coxal excretory organ, trichobothria and pectens, vegetative nervous system and neuro-endocrine system.

The venom

Studies regarding the physiological action of *Euscorpius carpathicus* venom on tissues and organs (capillaries and heart, smooth and striated muscles, kidney) in various vertebrates (frog, dog, cat, bat) were published by Grădinescu & Roșca (1946,) Roșca & Pora (1950), Roșca (1951, 1957a, 1957b).

The performed experiments show the hypotensive action of scorpion venom, opposed to the hypertensive effect of other scorpion species.

Discussions

The study of the specialized literature shows insufficient knowledge of the species *Euscorpius carpathicus*, insufficiency which is transposed in the following directions of study:

Geographical distribution and biogeography: a) verifying (in the field) the predictability of the Maxent model used by Gherghel et al. (2016); b) confirmation/invalidation of species presence in some locations considered unusual/inappropriate to the biological requirements of the species – Turnu Măgurele, which would bring data on the ecological valence and adaptability of the species; c) long-term surveillance of the presence of the species in all locations

already reported, possible modification of the characteristic area in the context of climate change and numerous anthropogenic actions; d) assessing the protection status based on long-term surveillance of geographic distribution, area changes, modifications of the population size; e) determining the age of the species and its biogeographical origin.

Systematics: a) Is *Euscorpius carpathicus* the only scorpion species in Romania? This question is to be asked as Vignoli & Salomone (2008) mention other two scorpion species in Romania; b) Does the species undergoes clinal variation?

Biology and ecology: a) reproduction biology; b) feeding and defensive behaviours; c) life span and biological rhythm; d) inter and intraspecific relations – pray, predators, parasites; e) patterns of spatial distribution.

Anatomy and histology: a) for a better knowledge of the species; b) for comparative studies with other species, with phylogenetic implications.

Venom – considering the hypotensive action of *Euscorpius carpathicus* venom, future medical and pharmacological studies would be of interest in the production of natural medicinal products of animal origin.

CONCLUSIONS

The knowledge of the species *E. carpathicus* and adequate documentation remain topical issues.

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BIOMETRIC AND MORPHOLOGIC OBSERVATIONS ON *TILIA CORDATA* MILL. (TILIACEAE) LEAVES

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Keywords*: biometric measurements, lamina, mathematical calculation, research model, Tilia cordata*

ABSTRACT

The paper presents a research model of leaf investigation, based on biometric measurements and morphologic observations. In literature there are only few examples of this type of biometrical investigation and analysis model applied on spontaneous and even cultivated forms of plants. The article comprises biometrical and morphologic investigations on Tilia cordata Mill. (Tiliaceae) leaves. The measurements and observations were performed on 40 mature leaves of the studied species, including linear measurements, percentage ratio, angular measurements and other measurements such as: the semi-sum of secondary pairs of veins and the leaf surface as well. The biometric measurements were the basis of a mathematical calculation of the average values on Tilia cordata leaves.

INTRODUCTION

Tilia cordata is a high tree - 20-30 m tall - with strong roots. The stem has a gray and smooth bark up to 20-30 years forming after a blackish rhytidome, with narrow longitudinal cracks with and extensive branches. It has a globular-conical crown and a dense foliage.

The cordate leaves have a cordate, sometimes truncated base. The upper leaf surface is glabrous, excep for the middle vein zone, where the hairs are grouped in tufts. The lower surface is pubescent.

The flower peduncle starts from the median rib of an accompanying bract. Fruits are small nuts, spherical in shape, with thin walls (Mitchell & Wilkinson 1982, Prodan & Buia 1961, Sava 2014, Săvulescu 1957; Fig. 1).

The origin of this species is in China and Japan, but in Romania it is widespread on hills and plain areas, but it is also widely grown as an ornamental plant.

MATERIAL AND METHODS

The morphological observations and biometric measurements were performed on 40 mature leaves of *Tilia cordata* Mill. collected in October 2018 from „Ovidius" University Campus Park, Constanța, Romania. The methods and terms for leaf description, size, margin and venation follow the leaf architectural system of Givulescu 1999, Mouton 1966a, b, 1976 and Roth & Dilcher 1978. The terminology of foliar architecture was taken from Melville 1976, Dale et al. 1971, Dickinson et al.

1987. The biometric method was adapted to spontaneous species or cultivars (Bercu 2005, Bercu 2013a, b, Bercu, 2015).

Figure 1. Natural view of *Tilia cordata* Mill. (A). Leaves and flowers (B).

A total of 16 measurements were carried out for each of the 40 leaves, with a total of 640 determinations.

The biometrical measurements, which had been calculated, are: the linear measurements: L- leaf length, l- leaf width, h- the height of the maximum width of lamina; A- the tip length, I-I'- the apex width; Lp- the petiole length, followed by the percentage ratios: L/l- the finesse of leaf; A/L- the acuminate ratio, h/L- the ovality ratio; A/I-I'- the lamina apex finesse. The angular measurements: α- the apical angle, β- the emergent angle between the secondary and primary veins, ɣ- the emergent angle between tertiary and primary veins. The semi-sum of secondary pairs of veins (Np) and the lamina surface (S) were also determined.

RESULTS AND DISCUSSIONS

Biometric measurements. The biometric measurements of the 40 leaves represented the base for the mathematical calculation of average values for selected parameters, such as:

Liniar measurements:

$$\overline{L_{TC}} = \sum_{i=1}^{n} \frac{L_{Tc}}{n} = \frac{L_1 + L_2 + \ldots\ldots\ldots + L_n}{n} = \frac{120 + 130 + \ldots\ldots + 121 + 98}{40} = 134.85 mm$$

$$\overline{l_{TC}} = \sum_{i=1}^{n} \frac{l_{TC}}{n} = \frac{l_1 + l_2 + \ldots\ldots\ldots + l_n}{n} = \frac{100 + 110 + \ldots\ldots + 118 + 96}{40} = 95.275 mm$$

$$\overline{h_{TC}} = \sum_{i=1}^{n} \frac{h_{TC}}{n} = \frac{h_1 + h_2 + \ldots\ldots\ldots + h_n}{n} = \frac{55 + 50 + \ldots\ldots + 25 + 24}{40} = 44.125 mm$$

$$\overline{A_{TC}} = \sum_{i=1}^{n} \frac{A_{Tc}}{n} = \frac{A_1 + A_2 + \ldots\ldots\ldots + A_n}{n} = \frac{15 + 25 + \ldots\ldots + 25 + 19}{40} = 41.77\,mm$$

$$\overline{I - I'_{TC}} = \sum_{i=1}^{n} \frac{I - I'_{Tc}}{n} = \frac{I - I'_1 + I - I'_2 + \ldots\ldots\ldots + I - I'_n}{n} = \frac{30 + 20 + \ldots\ldots + 30 + 30}{40} = 30.05\,mm$$

$$\overline{Lp_{TC}} = \sum_{i=1}^{n} \frac{Lp_{Tc}}{n} = \frac{Lp_1 + Lp_2 + \ldots\ldots\ldots + Lp_n}{n} = \frac{40 + 18 + \ldots\ldots + 62 + 45}{40} = 45.10\,mm$$

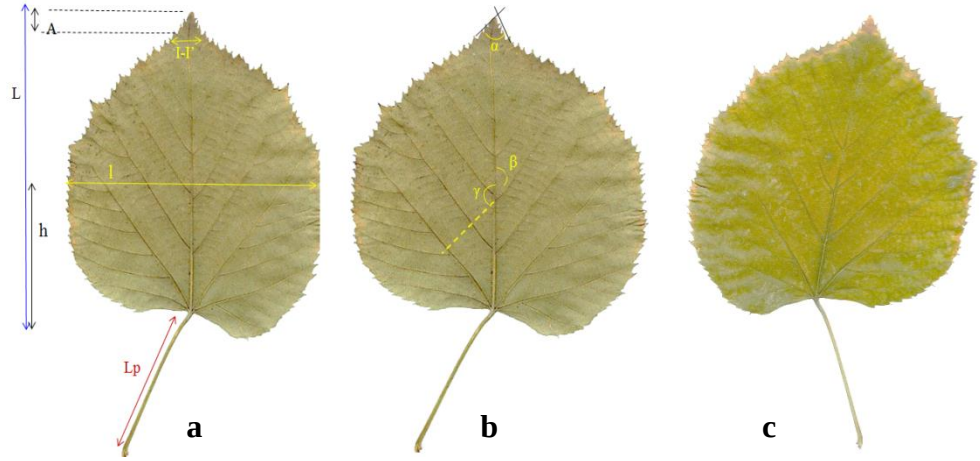

Figure 2. *Tilia cordata* leaf: lower lamina surface with liniar (a) and angular measurements (b). Upper lamina surface (c).

Percentage ratios**:**

$$\overline{\frac{L}{l_{TC}}} = \sum_{i=1}^{n} \frac{\frac{L}{l_{Tc}}}{n} = \frac{\frac{L}{l_1} + \frac{L}{l_2} + \ldots\ldots\ldots + \frac{L}{l_n}}{n} = \frac{1.20 + 1.18 + \ldots\ldots + 1.02 + 1.02}{40} = 1.095\%$$

$$\overline{\frac{A}{L_{TC}}} = \sum_{i=1}^{n} \frac{\frac{A}{L_{Tc}}}{n} = \frac{\frac{A}{L_1} + \frac{A}{L_2} + \ldots\ldots\ldots + \frac{A}{L_n}}{n} = \frac{0.125 + 0.19 + \ldots\ldots + 0.20 + 0.19}{40} = 0.397\%$$

$$\overline{\frac{h}{L_{TC}}} = \sum_{i=1}^{n} \frac{\frac{h}{L_{TC}}}{n} = \frac{\frac{h}{L_1} + \frac{h}{L_2} + \ldots\ldots\ldots + \frac{h}{L_n}}{n} = \frac{0.125 + 0.19 + \ldots\ldots + 0.20 + 0.19}{40} = 0.374\%$$

$$\overline{\frac{A}{I - I'_{TC}}} = \sum_{i=1}^{n} \frac{\frac{A}{I - I'_{Tc}}}{n} = \frac{\frac{A}{I - I'_1} + \frac{A}{I - I'_2} + \ldots\ldots\ldots + \frac{A}{I - I'_n}}{n} = \frac{0.50 + 1.25 + \ldots\ldots + 0.83 + 0.63}{40} = 1.559\%$$

Angular measurements:

$$\overline{\alpha_{TC}} = \sum_{i=1}^{n} \frac{\alpha_{Tc}}{n} = \frac{\alpha_1 + \alpha_2 + \ldots\ldots\ldots + \alpha_n}{n} = \frac{35 + 40 + \ldots\ldots + 92 + 85}{40} = 61.60^{o}$$

$$\overline{\beta_{TC}} = \sum_{i=1}^{n} \frac{\beta_{Tc}}{n} = \frac{\beta_1 + \beta_2 + \ldots\ldots\ldots + \beta_n}{n} = \frac{38 + 30 + \ldots\ldots + 60 + 59}{40} = 47.025^{o}$$

$$\overline{\gamma_{TC}} = \sum_{i=1}^{n} \frac{\gamma_{Tc}}{n} = \frac{\gamma_1 + \gamma_2 + \ldots\ldots\ldots + \gamma_n}{n} = \frac{125 + 106 + \ldots\ldots + 109 + 109}{40} = 114.075^{o}$$

Other measurements:

$$\overline{Np_{TC}} = \sum_{i=1}^{n} \frac{Np_{Tc}}{n} = \frac{Np_1 + Np_2 + \ldots\ldots\ldots + Np_n}{n} = \frac{8 + 11 + \ldots\ldots + 8 + 9}{40} = 8\,\mathrm{sec}ondaryveins$$

$$\overline{D_{TC}} = \sum_{i=1}^{n} \frac{D_{Tc}}{n} = \frac{D_1 + D_2 + \ldots\ldots\ldots + D_n}{n} = \frac{3.5 + 3.5 + \ldots\ldots + 3 + 3.5}{40} = 3.18 teeth/cm$$

$$\overline{S_{TC}} = \sum_{i=1}^{n} \frac{S_{Tc}}{n} = \frac{S_1 + S_2 + \ldots\ldots\ldots + S_n}{n} = \frac{80.42 + 95.81 + \ldots\ldots + 95.66 + 63.03}{40} = 69.36 cm^2$$

Morphologic observations. Laminas are predominantly classifiable in mesophyll class size (S = 45.05-98.88 cm²), ocasionally notophyll (S = 36.91-38.72 cm²) and microphyll (<12.43 cm²; Fig. 2a) with a narrowly acuminate apical angle (α-average 61.60°; Fig. 2b). According to Mouton 1966a and Givulescu 1999, the leaves size classes are the following: leptophyll (S = 0-0.25 cm²), nonophyll (S = 0.25-2.25 cm²), microphyll (S = 2.25-20.25 cm²), notophyll (S = 20.25-40.00 cm²), mesophyll (S = 40.00-182.25 cm²), macrophyll (S = 182-1640.20 cm²) and megaphyll (over S = 1640.20 cm²).

The percentage ratio of all *Tilia cordata* leaves indicate a high leaf finesse (average L/l = 1.095%), with a moderately fine apex (average A/l-l'= 1.559%). All laminas were classifiable as subcordate with the maximum average width in the lower third – average h = 44.125 mm, with cordate and slightly truncated base. The margin of the lamina is serrate with an average of 3.18 teeth/cm (Fig. 2a-c). The lamina has a membranous texture. The cylindrical petiole is green, relatively short and glabrous, with a total length between 18-87 mm.

Laminas have a dark-green ventral surface and a slightly light-green dorsal surface. The ventral surface is almost glabrous with hairs grouped in tufts, hairs with 7 ramifications, located in the area of the primary rib zone.

The lower surface is pubescent (multiple-celled hair branches, grouped in tufts, 7 ramifications in each one; Fig. 3a, b).

The mid vein is straight and lamina venation is simple, craspedrodromous (Andrei 1997, Givulescu 1999). From the primary veins a number (Np) of around 8 secondary veins branch (Fig. 2a, b) and a number of tertiary veins.

The emergent angle between the primary and the secondary veins (β) is narrowly acute for all leaves (β = 30-65°; Fig. 2, b), decreasing from the leaf base to the apex of the leaf.

The tertiary veins are constantly oblique in relation to the the secondary ones, forming an obtuse angle with the primaries (ɣ = 100-142°; Fig. 2, b) and increasing from the apex to the base.

Lamina dimensions are L = 75-130 mm; l = 79-118 mm.

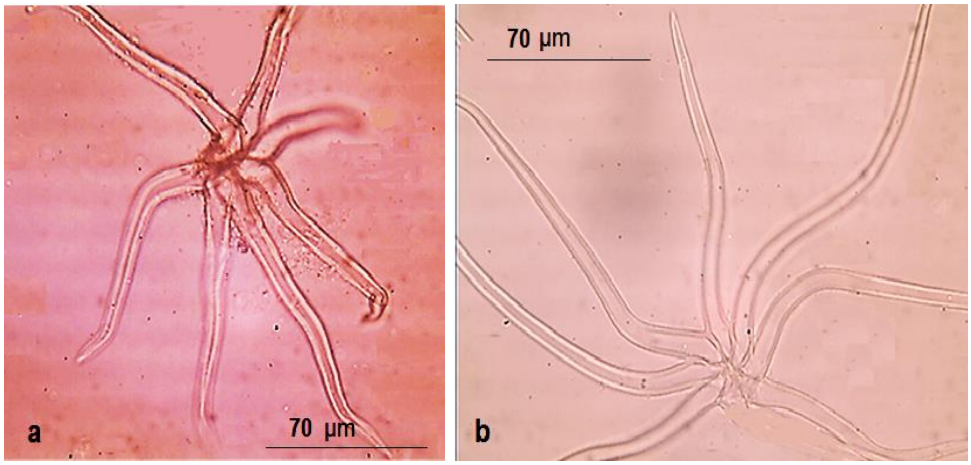

Figure 3. Hairs on *Tilia cordata* leaf blade: upper surface (a), lower surface (b).

CONCLUSIONS

Concerning lamina surface (S), the leaves are classifiable in mesophyll, occasionally notophyll and microphyll size classes. The linear measurements of *Tilia cordata* laminas showed high values of leaf length (L) and lower for the apex length (A). The leaves have acutely to moderately fine apex (α). The percentage ratio of all leaves indicate a high leaf finesse (L/l) and apex finesse (A/I-I'). Lamina has simple craspedodromous venation. The apex is narrowly acuminate. The emergent angle between primary and secondary veins (β) is narrowly acute whereas that between tertiary to the primary ones (ɣ) is obtuse. The leaves have a membranous texture. The petiole length (Lp) is low.

These morphological and biometric features, especially the ovality ratio, the membranous texture, leaf dimensions, the venation type and the mostly mesophyll size leaves, allow *Tilia cordata* to be adaptable to conditions in semiarid and arid zones.

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THE ROLE OF VEGETATION IN MICROCLIMATE IMPROVEMENT IN JUPITER-NEPTUN-OLIMP SEASIDE RESORTS

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Keywords*: Comorova Forest, Green space system, Microclimate improvement, Tourism*

ABSTRACT

The present study is focused on the complex microclimatic impact of Comorova Forest on the adjacent touristic resorts: Jupiter, Neptun and Olimp. These are the only Romanian seaside resorts which benefits from a unique microclimate, being located between the forest and two paramarine lakes.

The research aims to identify the current benefits and threats within the relationship between local green infrastructure and the urban areas. The study is based on a landscape assessment of the natural areas and the neighbouring resorts, based on several criteria: biodiversity, vegetation units, green spaces types, ecosystems and their impact on the microclimate. A risk for degradation of natural areas generated by urban regulations failure has been revealed, disturbing the ecological, functional and aesthetic balance that characterize the green-blue resorts. The study contributes to the improvement of knowledge in the field of landscape analysis and planning regarding ecosystem services and social benefits provided by coastal forests.

INTRODUCTION

Jupiter, Neptun and Olimp resorts are situated between Neptun Lakes and Comorova Forest, two semi-natural ecosystems, which have a major contribution to maintain an ecological and climatic balance in the urban area. Comorova forest was planted between 1890 and 1910, with the support of the Romanian Academy and the Royal House of Romania, in order to create a shelterbelt to combat desertification and to experience the evolution of a coastal forest ecosystem.

At that time, as today, it was the only forest on the Romanian territory located on the Black Sea shore. The initial area of the forest was over 800 ha, and during the interwar period, the forest stretched to the commune August 23, with an area of over 1000 ha. Part of the forest was cleared in 1967-68 to allow the construction of Jupiter, Neptun and Olimp resorts. Gradually, the forest was populated, especially spontaneously, with different species of mammals, birds and reptiles, many of which are currently protected species. Today, the area of the forest is about 500 ha, and according to a decision from 2004 of the local authorities, the Comorova forest was included inside the build-up area. The botanical, environmental and landscape value of Comorova forest is particularly high because of the fact that Constanta County is deficient in the forestry sector.

Neptun Lakes were set up in the late 1960s, on the site of the former Comorova Marsh, located between the forest and the Black Sea shore. Being

located along the network of paramarine lakes with great avifaunistic potential, the lacustrine ecosystem "hosts" different species of ornithological interest. Aquatic birds are found especially in areas where marsh and hydrophilic vegetation are highly developed. The lake's banks are partially degraded and the existence of the floodable zones led to the increase of the marsh vegetation on the edges of the lakes which attract the local avifauna. A threat to lakes is the pollution of the water and soil on the banks, as well as the numerous improvised constructions on the ridge between the sea and the two water areas.

MATERIAL AND METHODS

Within the study on the favourable microclimatic impact of the vegetation on the Jupiter-Neptun-Olimp coastal resorts, the structure of the dendrological vegetation, the green space system and the impact of the vegetation on the microclimate are analysed. The structure of the vegetation and its impact on the climatic variables were analysed based on the observations on the field, by interpreting satellite images, but also after assessing specialized scientific literature regarding the current state of knowledge in the approached theme.

According to the dominant species, to the ratio between spontaneous and planted specimens, the density and the vertical layering, seven vegetation units have been identified: forest vegetation – planted and spontaneous, agricultural lands – mostly planted, urban vegetation – relatively dense and mostly planted, natural reserve (*Quercus pedunculiflora*) – spontaneous, lacustrine vegetation – planted and spontaneous, marsh vegetation – spontaneous and maritime sand vegetation – spontaneous (Figure 1). Considering the ecological characteristics of each vegetation units, the microclimatic impacts and benefits on the resorts have been assessed.

RESULTS AND DISCUSSIONS

The forest vegetation (Figures 1, Figure 3) resembles that of the steppe forests of the southern part of Dobrogea, being similar to the Western-Pontic and Balkanic forests, considering the presence of indigenous deciduous species (Skolka et al. 2005). At the same time, the vegetation is atypical for the region, due to the share and variety of exotic deciduous and coniferous species, generally of Mediterranean or North American origin. Although it is a planted forest, initially with a large percentage of deciduous trees (especially the *Quercus* genus), over time, the vegetation has evolved spontaneously, and the species structure has changed significantly (Figure 2). Following studies on the flora-fauna relationship, it was found that the proportion of the coniferous specimens has increased, to the detriment of the deciduous vegetation (Răduleţ & Chisamera 2004). The researchers consider that the change in the structure of the local fauna, influenced by the anthropogenic factors, has generated this phenomenon.

The dominant species include:

Coniferous trees: *Pinus nigra, Juniperus virginiana*;

Deciduous trees: *Quercus pedunculiflora, Quercus pubescens, Tilia tomentosa, Acer platanoides, Acer campestre, Betula pendula, Fraxinus ornus;*

Deciduous shrubs: *Crategus monogyna, Cornus mas, Ligustrum vulgarae;*

The other species identified:

Coniferous trees: *Pinus sylvestris, Thuja orientalis, Pseudotsuga menziesii;*
Deciduous trees: *Ulmus minor, Ulmus pumila, Carpinus orientalis, Gleditsia*

triacanthos, Acer tataricum, Prunus mahaleb, Robinia pseudacacia, Koelreuteria paniculata, Pyrus pyraster;
Deciduous shrubs and lianas: *Cotinus cocgygria, Viburnum lantana, Clematis vitalba;*

Figure 1. The main vegetation units in Neptun resort

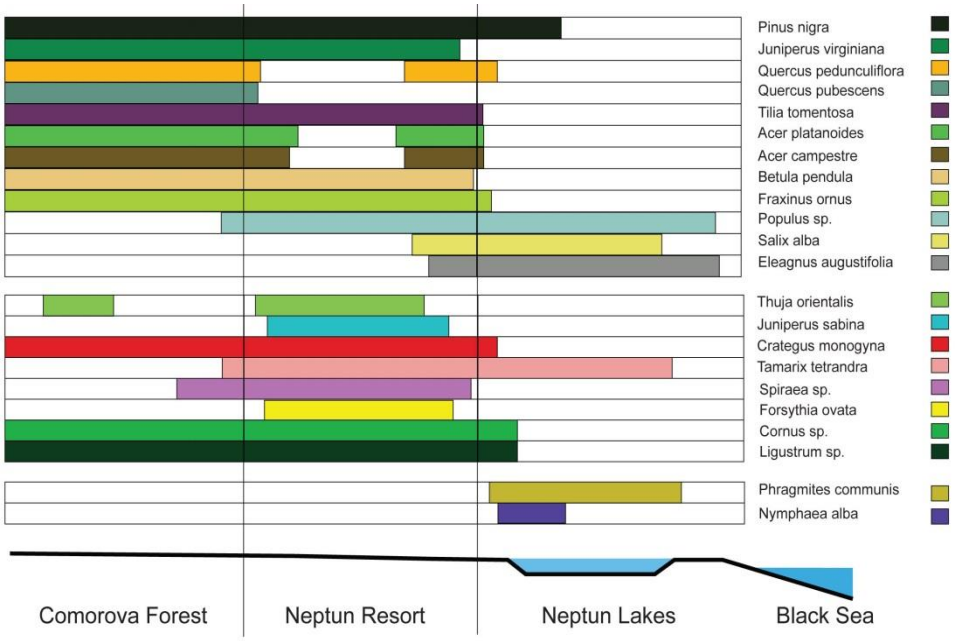


Figure 2. The distribution of the dominant dendrological species in Neptun

The vegetation of the resorts is mostly planted, dating from the works of arrangement of Mangalia North chain of resorts during the late 1960s. The vegetation comprises species used in the urban spaces on the Romanian coast, an important part being also found in the Comorova forest (Figure 1, Figure 2). The green space system of the resort includes road tree alignments, the green areas adjacent to the accommodation units and forested areas, located on certain portions, between the resort and the lake zone (the camping and the State Protocol area). In the last years, in the spaces related to hotels, restaurants and terraces, many exotic species have been introduced, including palm trees, which do not fit in the aesthetic and ecological context.

The dominant species include:

Coniferous trees: *Pinus nigra, Juniperus virginiana;*

Deciduous trees: *Tilia tomentosa, Acer platanoides, Acer campestre, Betula pendula, Fraxinus ornus, Populus sp. (P. nigra, P. alba, P. tremula)*;

Deciduous shrubs: *Crategus monogyna, Cornus mas, Hibiscus syriacus, Ligustrum ovalifolium, L. vulgarae, Spiraea sp.;*

Other species:

Coniferous trees: *Pinus sylvestris, Thuja orientalis, Larix decidua;*

Deciduous trees: *Ailanthus altissima, Gleditsia triacanthos, Robinia pseudacacia, Koelreuteria paniculata, Prunus cerasifera, Salix alba;*

Coniferous shrubs: *Juniperus sabina, Thuja occindetalis*

Decidouos shrubs: *Berberis vulgaris, Cotinus coggygria, Forsythia ovata;*

The vegetation in the Neptune Lakes area I and II is divided into three units (Figure 1, Figure 2):

a. The lacustrine vegetation, found in the green area adjacent to the lakes, is planted and includes the following species: Trees: *Salix alba, Eleagnus augustifolia, Populus simonii; Shrubs: Tamarix tetrandra;*

b. Palustrine and hydrophilic (spontaneous) vegetation: Palustrine species: *Phragmites communis*; Hydrophilic species: *Nymphaea alba*;

c. The vegetation of the marine sands (spontaneous, located on a narrow strip, between the shores of the lakes and the beach).

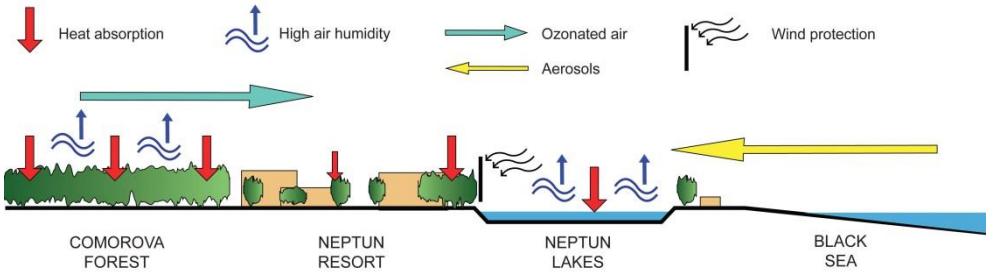
Within the resort there is a small botanical natural reserve (1,2 ha), which contains around 30 exemplaries of *Quercus pedunculiflora* secular trees, planted at the end of the 19th century. These are located between Lake Neptune II and the hotels Histria, Callatis and Traian. The tree clump, with 20-30 specimens, is a portion of the old forest stretch, before the deforestation carried out for building of Neptun, Olimp and Jupiter resorts. In 1970, the trees were declared a monument of nature (Figure 3).

Figure 3. The green space system of Olimp-Neptun-Jupiter resorts

The location of the resort, between the forest and the lakes, is a very beneficial one, and also unique on the Romanian coast (Figure 3). The presence of the forest brings to the resort a strong ozonized air, similar to the mountain forests and together with the lakes it helps to maintain a thermal balance during the summer.

Through the processes of evaporation of lake water and evapo-transpiration of the forest vegetation, the relative humidity of the air increases (Figure 4).

Figure 4. The impact of the vegetation on the microclimate in Jupiter, Neptun and Olimp



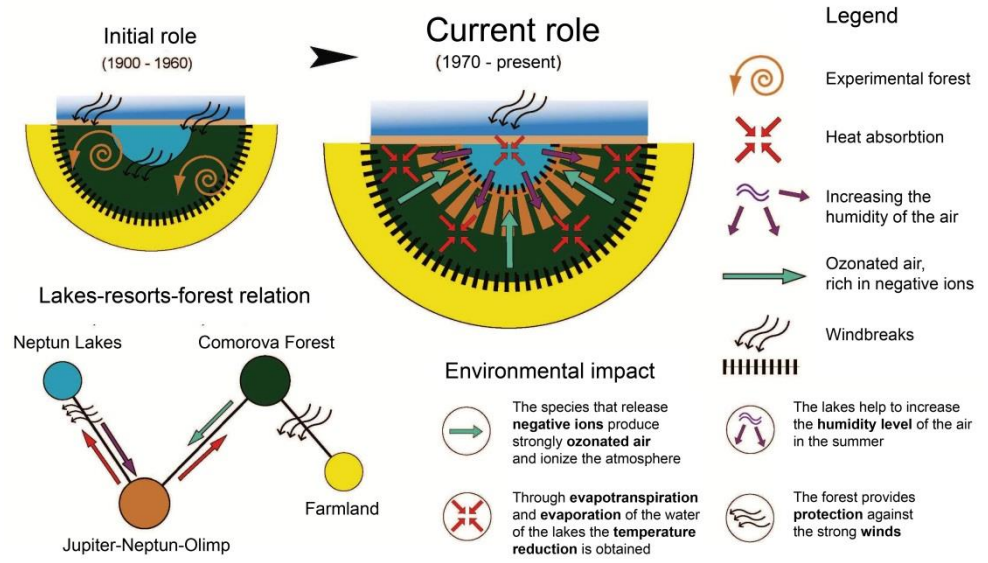


Figure 5. The initial and current role of Comorova Forest on microclimate improvement

Due to a significant share of species with high capacity to generate negative ions, such as *Pinus sp., Juniperus sp., Thuja sp., Betula sp., Populus sp., Robinia sp.* (Iliescu 2006), the forest plays an important role in ionizing the local atmosphere. The presence of the lichens on the trees in the resort confirms the lack of air pollution. The green area bordering the lakes also acts as a windbreak for the resort, against the air currents of the cold season. In addition to forests and lakes, there are numerous urban green areas which contribute to maintaining the comforting microclimate. These aspects combined with the marine aerosols enhance significantly the spa potential of the resort which creates special conditions for different treatments.

Olimp, Neptun and Jupiter resorts benefit from a common green space system (Figure 3), which continues along the Comorova forest. Due to the presence of the forest, which acts as a green belt, the resorts and especially Neptun, have a much more favourable microclimate compared to other coastal localities (Figure 5).

CONCLUSIONS

The three resorts are characterized by a very high percentage of green area in relation to the built space, the green areas being largely covered by tree vegetation. The environmental interactions between the forest (Figure 5), the urban green areas and Neptune lakes, determined by the configuration of the landscape, provide significant microclimatic benefits including the following processes:

- Retention and filtering of light and caloric radiation by the vegetation
- Increased relative humidity of the air during summer
- Ionization of the atmosphere
- Protection against marine and continental winds

Due to the location of the resort between two distinct ecosystems, the forest and the lakes, both the spontaneous and the planted vegetation comprise a relatively large variety of species, compared to other resorts on the Romanian coast. Also, the share of green areas in the urban area is one of the highest on the Romanian coast.

Currently, the two ecosystems (especially the Comorova forest) are threatened by real estate developments, pollution of water and soil, as well as by the ignorance of the authorities regarding the real protection of the fauna and flora of the two areas. In the absence of ecological conservation and reconstruction measures, the biodiversity and surface area of the ecosystems is likely to diminish continuously, endangering the extremely favourable microclimate of Jupiter, Neptun and Olimp.

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THE INFLUENCE OF INDOL-3- ACETIC ACID ON THE PHYSIOLOGY OF SOME PLANT SPECIES FROM THE *ORCHIDACEAE* FAMILY

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Key words*: auxin, photosynthesis, transpiration, chlorophyll*

ABSTRACT

Indole-3- acetic acid (IAA) is a growth hormone from the auxin group, which produces multiple actions on plants.

The research carried out on 3 species of terrestrial orchids, consisted in treating plants with solutions of different concentrations of IAA and measuring the physiological parameters at different variants, in order to establish the optimal concentration for growth and development.

In all the variants studied, the intensification of the photosynthesis process, the increase of the stomatal conductance values, as well as the intensification of the transpiration have been determined. As a result of this fact, the plants on which it has been intervened with IAA treatments also need a supplementation of the water supply.

INTRODUCTION

Indole-3-acetic acid (IAA) is a hormone of the auxin class and it regulates various aspects of plant growth and development (Spaepen S, Vanderleyden J.. 2011).

In 1880, Charles Darwin and his son Francis Darwin have reported that some plant growth responses are regulated by " a matter which transmits its effects from one part of the plant to another." In the 1930s, the term "auxin" was coined by biochemists. This term is derived from the Greek word "auxein," which means "to increase" or "to grow." (Darwin C, Darwin F, quoted by Shih-Feng Fu et all 2015)

Plants as well as microorganisms, including bacteria and fungi, produce indole-3-acetic acid (IAA).

Auxin is produced largely in shoot apical regions, historically identified as the shoot apical meristem.

However, application of auxin transport inhibitors blocks IAA accumulation in the shoot apex, suggesting that apical auxin is transported from other regions, probably young leaves and developing leaf primordia (Ljung *et al*., 2001; Avsian-Kretchmer *et al*., 2002).

IAA is transported basipetally in shoots (Lomax *et al*., 1995) and suppresses lateral shoot growth (Thimann and Skoog, 1934, quoted by Thimann KV. 1977). Both acropetal (Scott and Wilkins, 1968) and basipetal (Davies and Mitchell, 1972) transport occurs in roots. Opposing directions of auxin transport in roots is achieved by spatial separation, with acropetal transport in the central cylinder and basipetal transport in the epidermis (Tsurumi and Ohwaki, 1978).

Another assay for auxin activity was in tissue culture, where auxins promote rooting from undifferentiated callus. Along with the cytokinin phytohormone, which induces shoot formation, auxin allows regeneration of plants from callus (Krikorian, 1995).

Auxins profoundly influence root morphology, inhibiting root elongation, increasing lateral root production and inducing adventitious roots (Zimmerman and Hitchcock, 1942). The relevance of these bioassays to normal plant physiology is supported by the observation that mutants that overproduce auxin tend to have abundant lateral and adventitious roots, along with long hypocotyls and petioles, and epinastic leaves and cotyledons (Boerjan et al., 1995; King et al., 1995; Delarue et al., 1998; Zhao et al., 2001).

Many naturally occurring compounds that exert auxin-like effects have been revealed by these bioassays. IAA, an extensively studied endogenous auxin, is active in all bioassays described above and is often potent at nanomolar concentrations. A chlorinated form of IAA with high auxin activity, 4-Cl-IAA, is found in several plants (Slovin et al., 1999). In addition to the indolic auxins, phenylacetic acid (PAA) has been identified in plants and is an active auxin (Ludwig-Müller and Cohen, 2002).

Although many tissues can synthesize auxin (Ljung *et al*., 2001), auxin transport is complex and highly regulated, involving many identified proteins. Chemical and genetic studies have revealed that transport of auxin to distant sites is clearly required for normal development. IAA transport is necessary for proper lateral root development (Bhalerao *et al*., 2002), vascular development (Mattsson *et al*., 1999), phyllotaxis (Reinhardt *et al*., 2003), embryonic axis development (Friml *et al*., 2003) and tropisms (Friml *et al*., 2002).

The current paper presents the results of the research carried out in 2019 on plants belonging to three species of terrestrial orchids treated with different concentrations of indole-3- acetic acid.

The physiological processes concerned were photosynthesis, transpiration and stomatal conductance.

MATERIALS AND METHODS

The experiments have been performed in the laboratory of Plant Physiology from the University of Craiova and consisted in treating plants with solutions of different concentrations of IAA: 1 mg/ l, 10 mg/l, 20 mg/l, and comparing the results with the control variants, which were untreated.

The IAA solutions were applied in single dose, and the measurements were made 5 days after application. After one month, the treatment was repeated and new determinations were made.

The experiments focused on the intensity of leaf photosynthesis, leaf transpiration intensity, stomatal conductance, leaf water content and chlorophyll content.

Photosynthesis, transpiration and stomatal conductance were determined with the portable Lci apparatus.

The chlorophyll content was determined using the Minolta portable chlorophyll meter, the results being expressed in SPAD units.

The total water content was determined gravimetrically by drying the plant material at the oven at 105 ^{0}C.

The orchid species which have been used during the course of this research were:

Bletilla striata (Thumb.) Rchb. 1878

This species is found in Japan, Korea, China, Hong Kong in evergreen broad leaved forests, coniferous forests, grassy places and crevices at elevations of 100 to 3200 meters as a small to medium sized, cool to cold growing terrestrial with subterranean rounded and compressed pseudobulbs with an erect stem that bears 4 to 5, oblong-lanceolate, plicate, acuminate apically, flexible leaves and blooms on a lax, terminal, 2' (60 cm) long inflorescence arising with a new pseudobulb that has several (3 to 12), fragrant, somewhat nodding flowers that open in succession in the spring; requires a winter rest (http://www.orchidspecies.com/bletstriatal.htm)

Ludisia discolor (Ker-Gawl.) A. Rich. 1825

Found in China, Laos, Thailand, Cambodia, Vietnam, Malaysia, Sumatra, Borneo and the Philippines as a small sized, hot to warm growing 'jewel orchid', so called because of their dark green leaves criss-crossed with red lateral lines, that makes them quite appealing even when not in bloom. This species is a terrestrial or lithophytic plant occurring in evergreen, lowland forests in shady, humid habitats with rocky substrates along streams and rivers at elevations of 70 to 1100 meters, without psuedobulbs, the fleshy red stems twisted, erect or pendulous, 8 to 10" (20 to 25 cm) long and have stalked elliptic-lanceolate 2 to 3" (5 to 7.5 cm) leaves; the plant blooms in the spring on a terminal cylindrical fairly dense 4 to 12" (10 to 30 cm) long inflorescence that has small asymmetrical, fragrant flowers that last 2 to 3 weeks (http://www.orchidspecies.com/ludiscolor.htm).

Pleione formosana Hayata 1911

This is a small sized, cold growing terrestrial or lithophyte growing in moss on sunny rocks or on tree trunks in moist foggy areas found near the tree line in shaded locations in the mountains of Formosa at elevations of 1500 to 2500 meters with compressed, ovoid to ovoid-conical pseudobulbs carrying a single, apical, erect to arcuate, oblanceolate to elliptic, plicate, acuminate, deciduous leaf that is shortly petiolate and blooms in the late winter and early spring with one or two flowers per erect, 10" (to 22 cm) long, inflorescence which arises basally as a new growth appears.

The growth of the psuedobulbs begins in the spring as it blooms and they will grow vigorously all summer until the onset of the fall which will cause the growth to stop and the leaves will drop (http://www.orchidspecies.com/pleiformosana.htm).

The plants have been grown in vegetation vessels with a capacity of 1000 ml, in mesotrophic peat.

For all variants, the ambient temperature was of about 20 degrees Celsius and the light intensity had a mean value of 10,000 lux.

RESULTS AND DISCUSSIONS

The stomatal conductance

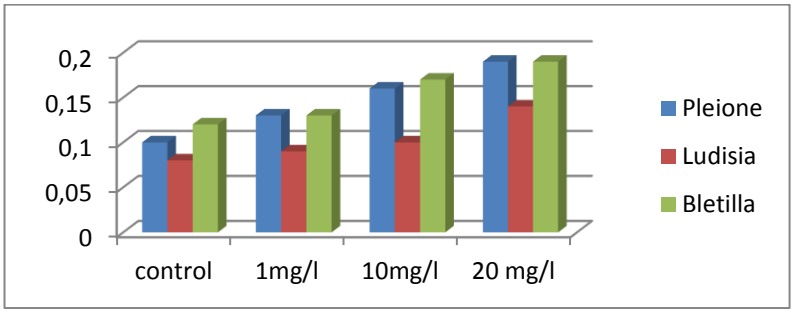
Stomatal conductance directly modifies plant water relations and photosynthesis. Many environmental factors that affect the stomatal conductance have been studied (Urban J et al, 2017)

Stomatal conductance, measured in mol m^{-2} s^{-1}, is the measure of the rate of passage of carbon dioxide entering, or water vapor exiting through the stomata of a leaf.

The obtained data show that IAA significantly influences the stomatal conductance, even at low concentrations of 1 mg / l; the largest opening of the stomata has been registered at the concentration of 20 mg / l (graphic 1).

The increase in the values of the stomatal conductance under the action of auxin has a stimulating effect on the photosynthesis process, but it also intensifies

the transpiration of the leaves, causing the loss of larger quantities of water. As a result of this fact, in the case of the plants which have been treated with these types of hormones, it was necessary to supplement the water supply in order to keep the plant in an equilibrate hydric balance.

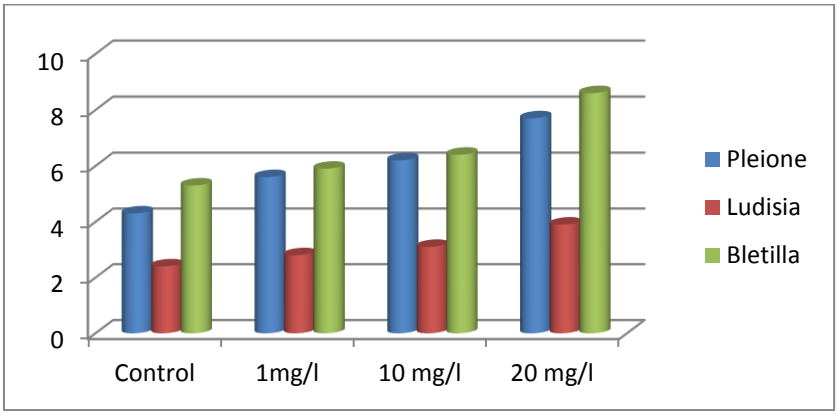


Graphic 1. The value of stomatal conductance at different concentration of IAA (mol / m ^{2} / s)

The intensity of transpiration

The process of transpiration records an increase which is directly proportional with the increase of the auxin concentration (graphic 2).

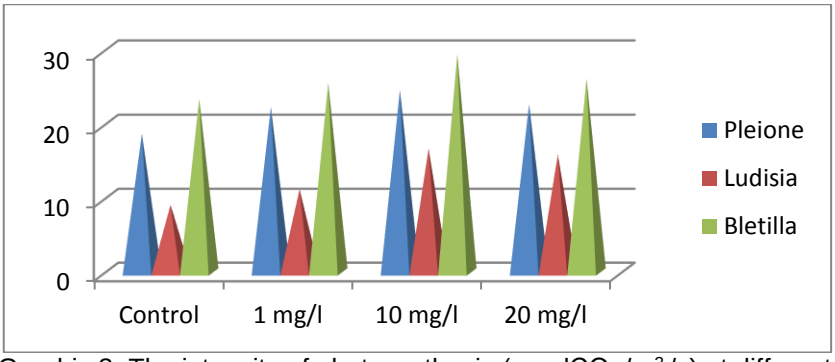
The smallest differences which have been registered when compared with the control variant are found in the species *Ludisia discolor*, which has also the lowest values of stomatal conductance.



Graphic 2. The intensity of leaf transpiration at different concentration of IAA (mmol H_2O / m ^{2} / s)

The intensity of photosynthesis

In the control variant, the highest values of photosynthesis intensity have been recorded at *Bletilla striata*. At auxin treated variants, the process is intensified, the maximum values being registered at 10 mg / l and not at the maximum concentration (graphic 3). This capping and slight reduction of photosynthesis may be due to the loss by transpiration of larger quantities of water.



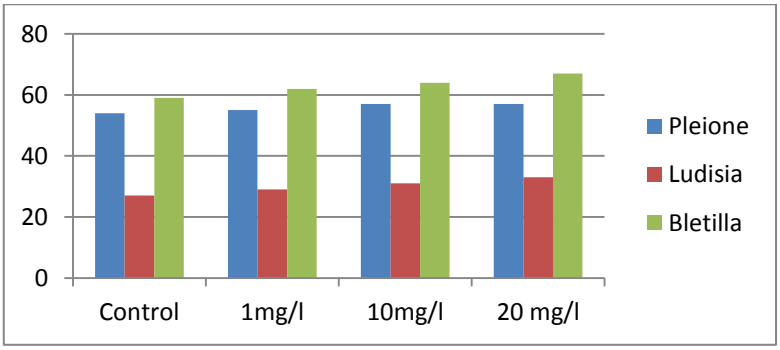
Graphic 3. The intensity of photosynthesis (μmolCO_2 /m^2 /s) at different concentration of IAA- 5 days after application

Because the photosynthesis process requires certain values of the water content of the assimilating tissues, it is considered that for a proportional increase of the photosynthesis with the increase of the auxin concentration, the water supply must be supplemented.

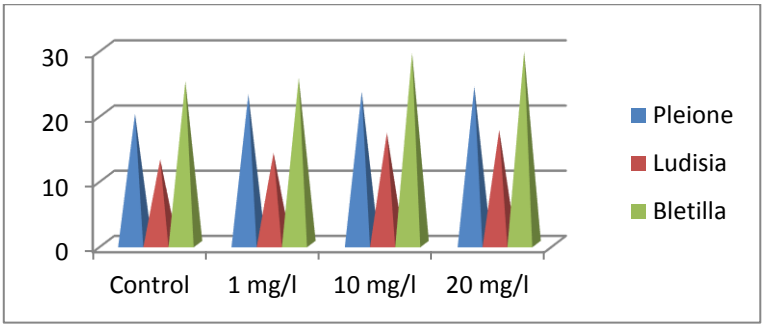
The content in chlorophyll pigments

At 5 days after applying the auxin solutions (regardless of the applied concentration), there were no differences in the content of chlorophyll pigments in any of the species studied.

In the determinations made after one month from the beginning of the experiments, the variants treated with IAA had a higher content of chlorophyll, the maximum being registered at the variants that received a concentration of 20 mg /l (graphic 4).



Graphic 4. The chlorophyll content of leaves (SPAD units) at different concentration of IAA



Graphic 3. The intensity of photosynthesis (μmolCO_2 /m^2 /s) at different concentration of IAA - one month after application

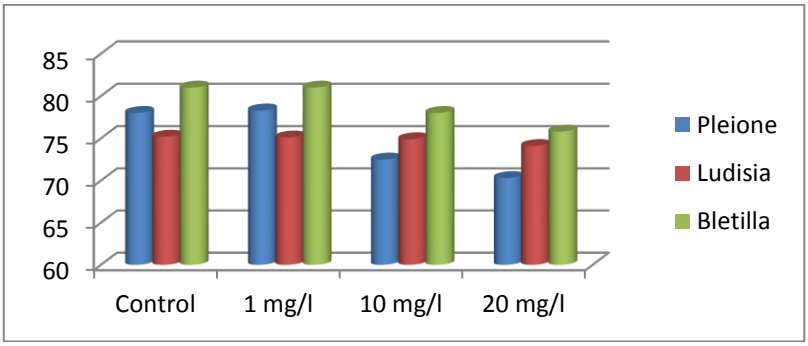
The data obtained show that auxin stimulates the process of synthesis of chlorophyll, but this process is slow and happens over time. The results are not immediately visible regarding this parameter.

The intensification of photosynthesis in the determinations made after one month (graphic 5) can thus be directly due to the influence of auxin and indirectly due to the higher content of assimilating pigments.

This conclusion has been formulated due to the fact that the values of the control variant were also higher than those initially recorded.

The water content

The water content of the plants does not change at low concentrations of auxin; at concentrations above 10 mg/l, the water content decreases, the highest differences from the control sample being recorded at *Bletilla striata* and the smallest ones at *Ludisia discolor* (graphic 6).



Graphic 6. The water content of leaves (%)

CONCLUSIONS

All the plants which have been studied have been reacting similarly under the action of indole3-acetic acid.

The stomatal conductance increases directly proportional with the increase of the concentration of the applied solutions.

The intensity of transpiration increases significantly at the concentration of 20 mg/l in *Pleione formosana* and *Bletilla striata* species. Smaller differences are found in the *Ludisia discolor* species.

Photosynthesis registered a significant increase, the highest values being recorded at *Bletilla striata*; the highest differences in comparison with the control sample have been found at the *Pleione formosana* species.

IAA has stimulated the synthesis of chlorophyll pigments in *Pleione formosana* and *Bletilla striata* species, but in the case of *Ludisia discolor*, it did not influence the pigment content when used in small to medium concentrations (at high values, the changes have been insignificant).

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ACONITUM SPECIES PRESENT IN "ALEXANDRU BELDIE" HERBARIUM

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Keywords: Aconitum genus, herbarium, species, botanists

ABSTRACT

Aconitum Genus is well represented in Al. Beldie Herbarium from „Marin Drăcea" National Institute for Research and Development in Forestry. The genus is represented by an important number of vouchers that contain representative plants as well as important information regarding their harvesting places or the specialists that have harvested or identified them. The species were collected from all over Romania.

The present paper organizes and presents Aconitum species present in the herbarium based on their harvesting place, year and the specialist that has gathered them. The analysis amounts to 42 species and 131 samples. Furthermore, the most important Aconitum species are also described from the point of view of their abundance within the herbarium.

INTRODUCTION

„Marin Drăcea" National Institute for Research and Development in Forestry from Bucharest hosts in good conditions an herbarium created in 1929 – "Alexandru Beldie" Herbarium. This collection is inscribed in Index Herbariorum, having the international BUCF code and contains approximately 40.000 vouchers (Dincă M. et al., 2017; Vechiu et al., 2018).

The herbarium was developed due to the work of collecting and establishing plants by important personalities from the systematics domain. The herbarium carries the name of Alexandru Beldie, one of the most important Romanian botanists that has dedicated his work to the flora from Bucegi Mountains (Beldie 1967, Beldie 1972).

Besides the Aconitum species taken into study for this paper, the herbarium also hosts: 41 *Polygonum* species (Vechiu et al., 2018), 15 *Veronica* species (Dincă et al., 2017), 69 *Potentilla* species (Crișan, V. et al, 2017), the 19 species of *Centaurea* genus (Dincă et al., 2017), 19 *Scorzonera* genus species (Dincă and Cântar I.C. 2017), 15 *Ornitogalum* species (Enescu R. and Dincă L. 2017), 80 *Trifolium* species (Cântar I. et al, 2018), and 16 *Abies* species (Enescu, C et al., 2018).

MATERIAL AND METHODS

The studied material was this paper was represented by the “Alexandru Beldie” herbarium collections that contain vouchers with *Aconitum* species. Within this herbarium, 131 *Aconitum* vouchers were identified, containing 42 *Aconitum* species.

The method used was systematization, each plant belonging to this genus being organized based on a number of criteria such as: herbarium drawer number, drawer voucher number, botanic collection to which it belongs, species name, harvesting date, harvesting place, the specialist that has collected and/or determined it, as well as the plant’s conservation degree. This last aspect was graded on a scale of 1 to 4, where 1 means a very good conservation state and 4 a poor conservation state.

Table 1

Aconitum Genus inventory from Al. Beldie Herbarium, INCDS Bucharest (excerpt)

Drawer number	Voucher number	Herbarium/ Botanic Collection/ Institution	Specie’s name	Harvesting date	Harvesting place	Collected/ Determined by:	Conservation degree (1..4)
11	7	Flora Romaniei	Aconitum Anthora L.	1932.08.01	Omu Peak Bucegi	Al.Beldie	2
11	56	Linnaea Plantae Gallice	Aconitum napellus L.	1825.08.16.	Mt. Hochneck Vosges	Cl. A. Gerard	1
11	12	Museum Botanicum Universitatis Cluj Flora Romaniae Exsiccata	Aconitum Anthora L.	1920.09.20	Blaj	J.Pop	1
11	66	Cluj University Herbarium	Aconitum moldavicum Hacq.	1927.06.08	Ardealului Plain	Al. Borza, G. Buj	1
11	67	Bucharest Polytechnic’s School Herbarium/ Botanic Laboratory	Aconitum moldavicum Hacq.	1936.06.07	distr. Prahova	M. Badea, P. Cretzoiu	1
11	68	Bucharest Polytechnic’s School Herbarium/ Botanic Laboratory	Aconitum moldavicum Hacq.	1907.06.17	Dâmbovicioara	Golescu	2
11	55	Museum Botanicum Universitatis, Cluj / Flora Romaniae exsiccata	Aconitum paniculatum Lam.	1936.07.01	Crișana, Stâna deVale, 1100 m	Vet. Borza	1
11	10	Bucharest Polytechnic’s School Herbarium/ Botanic Laboratory	Aconitum toxicum Rchb.	1942.08.01	Bucegi, Caraiman	Al. Beldie	1
11	12	Bucharest Polytechnic’s School Herbarium/ Botanic Laboratory	Aconitum toxicum Rchb.	1940.08.20	Valea Râul Mare, M. Retezat	C.C. Georgescu, T. Bunea	1
11	28	Bucharest Polytechnic’s School Herbarium/ Botanic Laboratory	Aconitum vulparia Rchb.	1935.07.01	Valea Tihu	C.C. Georgescu	1
11	24	Museum Botanicum Universitatis, Cluj / Flora Romaniae exsiccata	Aconitum vulparia Rchb. F. Galactonum	1946.05.30	Transilvania, distr. Cluj	E. Ghișa, V. Codorean	2

RESULTS AND DISCUSSIONS

Aconitum, also known as aconite, monkshood, wolfs bane, leopard's bane, mouse bane, women's bane, devil's helmet, queen of poisons, or blue rocket, is a genus of over 250 species of flowering plants belonging to the Ranunculaceae Family. These herbaceous perennial plants are chiefly native to the mountainous parts of the Northern Hemisphere, growing in the moisture-retentive but well-draining soils of mountain meadows. Most species are extremely poisonous and must be dealt with very carefully (https://en.wikipedia.org/wiki/Aconitum).

Fig.1 Aconitum moldavicum

Fig.2 Aconitum paniculatum

Fig.3 Aconitum toxicum

(Photo: "Alexandru Beldie" Herbarium from INCDS „Marin Drăcea" Bucharest)

Based on the systematization obtained, the number of collected plants were also represented in a graphic form as they have enriched the herbarium in certain periods of time. As such, the *Aconitum* samples were gathered on a period of approximately 160 years, starting with the middle of the XIX century and up to the end of the XX century.

As it can be seen in Figure number 4, the number of collected plants has recorded a growth in time up to the period 1900-1920 when a decrease was registered. However, this was followed by a peak as the majority of samples were collected during 1920-1940. The oldest plant of this genus belongs to an*Aconitum napellus* L.*,* species, gathered in 1825 by Cl. A. Gerard from Mt. Hochneck, Vosges.

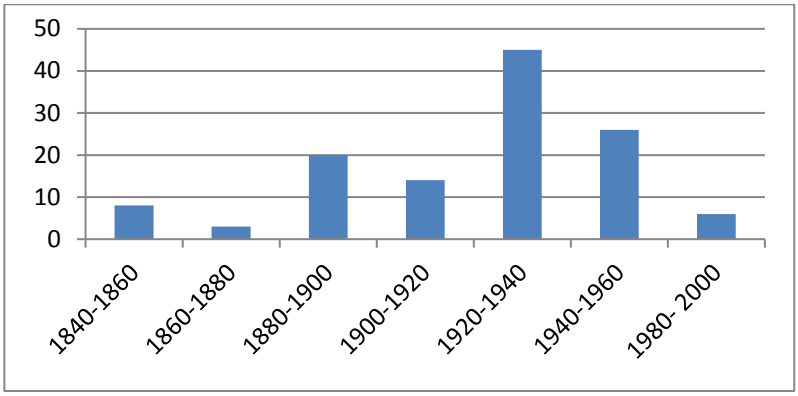

Fig. 4 Harvesting periods of *Aconitum* plants from INCDS Herbarium

The number of samples belonging to the 42 *Aconitum* species from the herbarium can be seen in Figure number 5. The majority of samples belong to *Aconitum tauricum* Wulfen. namely 16 exemplars. They are followed by *Aconitum anthora* L., with 14 samples.

Aconitum tauricum is a tall spindly erect to scandent forb which is perennial from rhizomes. Rhizomes are not globose. The leaves are divided, with faintly visible net-like leaf veins on their underside (stem leaves). The flowering period extends primarily from August to October. The inflorescence is paniculate and simple or branched with a few side risps. The perigon is blue or purple. The helmet is usually wider than high. The tepals are bare on the outside. The flower stems have upright gland hairs, are bare or possess glandular hairs only underneath the flower protruding. The linear bracteoles are bald or hairy and measure 3 to 7, rarely 2 mm. The nectar leaves may be bald or hairy. The plant reaches a stature height of about 0,8 m. The pollination is done by insects (Bombus spec. and others). The fruits are pod-like follicles, while ripe seeds are black. Aconitum tauricum is poisonous due the presence of alkaloids like aconitine.

Aconitum anthora, commonly known as anthora, yellow monkshood, or healing wolfs bane, is a yellow flowering Aconitum plant species from the Ranunculaceae family. Its native range is widespread, but focused mainly in European mountains, such as the Alps and the Carpathians, and the northern parts of Asia. Like all Aconitum species, it has great variability, due to isolation and hybridisation. Because of this polymorphism, A. anthora is included in the Aconitum vulparia group. The flowering period ranges from July to September. The name anthora or "against thora" stems from the historic reputation that the plant's tuberous root was a good antidote to poisons from 'thora' or Aconitum pardalianches, a plant that is extremely toxic to livestock and humans, with even small doses being potentially deadly. The root contains a large amount of volatile salt and essential oil, while the foliage and stems contain diterpenoid alkaloids. It has been used externally against rheumatism and deep pain, but it can irritate the skin. Internally, it has been used for weak pulse, vegetable poisons (shoot), feverish colds, pneumonia, croup, heart conditions, and cardiac arrest.

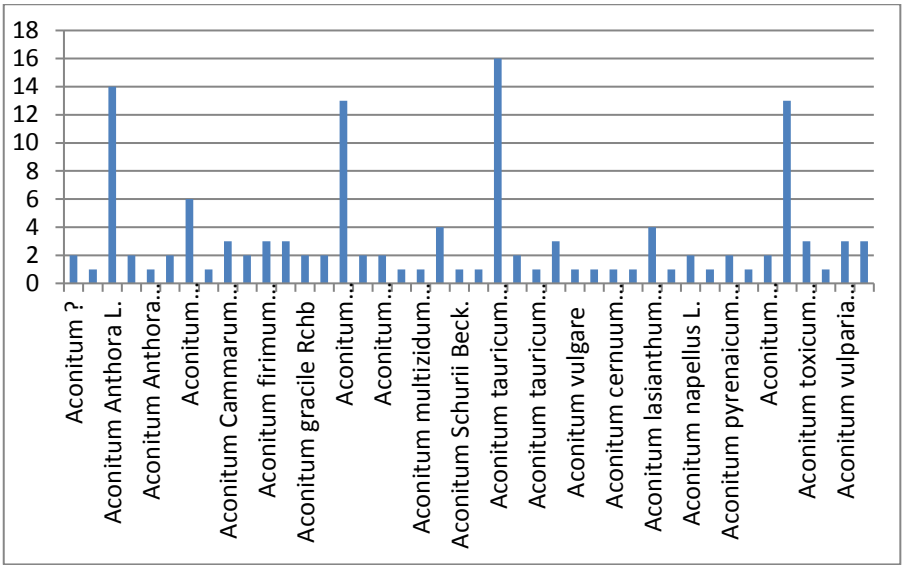

Fig. 5 Number of *Aconitum* species present in the herbarium

Through their work, both Romanian and foreign specialists have contributed to the development of *Aconitum* collections by collecting or determining them.

The Romanian specialists that have enriched „Alexandru Beldie" Herbarium with *Aconitum* species are: Al. Beldie, C.C. Georgescu, G. P. Grintescu, M. Badea, S P. Cretzoiu, S. Pașcovschi, A.Coman, and At. Haralamb.

Amongst the foreign ones, we mention: J. Neuwirk, Gayer Gyula, Karl Richter, D. Wolff, or V.Szerpligeli.

CONCLUSIONS

„Marin Drăcea" National Institute of Research and Development in Forestry hosts an herbarium that has the name of a famous Romanian botanist, "Alexandru Beldie" Herbarium. This herbarium in inscribed in Index Herbariorum and contains approximately 40.000 vouchers that are organized in 600 drawers.

Aconitum is an important and well represented genus in the herbarium, containing 42 species and 131 samples. The *Aconitum* species were collected over a long period of time, with the oldest sample dating back to 1825. The most flourishing period regarding the harvested number of *Aconitum* samples was the period between the wars (1920-1940).

Aconitum samples present in the herbarium were collected from all the relief form present in Romania as well as from the most important relief units of our country.

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STUDY REGARDING THE EVALUATION OF FAUNA FROM TIMIŞ COUNTY

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Keywords: game funds, Timiș, roe deer, pheasant, hare

ABSTRACT

The 86 game funds from Timiş County amount to a surface of 827.268 ha, characterised by a moderately-continental climate with slight Mediterranean influences. The main game species from the county are common deer, fallow deer, buck, boar, hare, pheasant, woodcock, badger, fox, marten, ferret and weasel, followed by fish species that live in the county's rivers and lakes (carp, salmon, trout, chub, tench). Amongst them, eight species (buck, hare, pheasant, large duck, great bustard, crucian carp and tench) were chosen and classified based on 19 criteria established by specialists. An analytical hierarchical process (AHP) was used in order to achieve this, as well as the Expert Choice Desktop Software.

INTRODUCTION

Hunting is a recreation mean, a method for regaining physical and mental forces for people who work. When they go back to work, they can offer better performances, are more productive and efficient.

Through its action of fighting against certain harmful agents (predatory animals and stray dogs), hunting is an efficient mean of ensuring a dynamic equilibrium for agricultural and forest ecosystems (Cotta, et al., 2001).

The present study intends to emphasize the most important game species present in Timiş County and to analyse them based on an analytical hierarchical process (AHP). The analyses were realized with the help of the Expert Choice Desktop software (Ciontu, et al., 2018).

In Romania, non-wood products are mainly represented by forest fruits, mushrooms, medicinal plants and game, amounting to approximately 350 species (Enescu, 2017).

MATERIAL AND METHODS

The study was realized in Timiş County, located in the country's West extremity, in the historical region of Banat. The municipality residence is in Timişoara, and base on its surface, this is the largest county from Romania. Most of the territory is situated in the plain area. The name originates from Timiş river that traverses the county from East to West. The total surface amounts to 8.697 km^2, namely 3,65% of the country's surface.

The relief is characterised by the predominance of plains that cover the West (low plains) and central (high plains) areas of the county. The plain penetrates the hill area as gulfs on Timişului (towards Lugoj) and Bega (towards Făget) rivers. Pogănişului premontane hills are located in the East part, while Lipova Plateau is located in the South. The highest heights belong to the North-West peaks of Ruscăi Clearing (800 —1.300 m), culminating with Padeş Peak (1.380 m).

The climate is moderately continental, with slight Mediterranean influences. The Carpathian Mountains located in the East part protect the county against cold continental winds, while the West opening allows the penetration of the maritime temperate air. The annual average temperature oscillates between -2°C and 21°C. The lowest temperature was recorded in Timişoara (-24,1°C during winter and 5,3°C during summer), while the highest temperature reached 20,5°C during winter and 39,5°C during summer. The annual precipitation average is situated between 500 and 600 mm, higher in the hill and mountain areas (https://pe-harta.ro/timis).

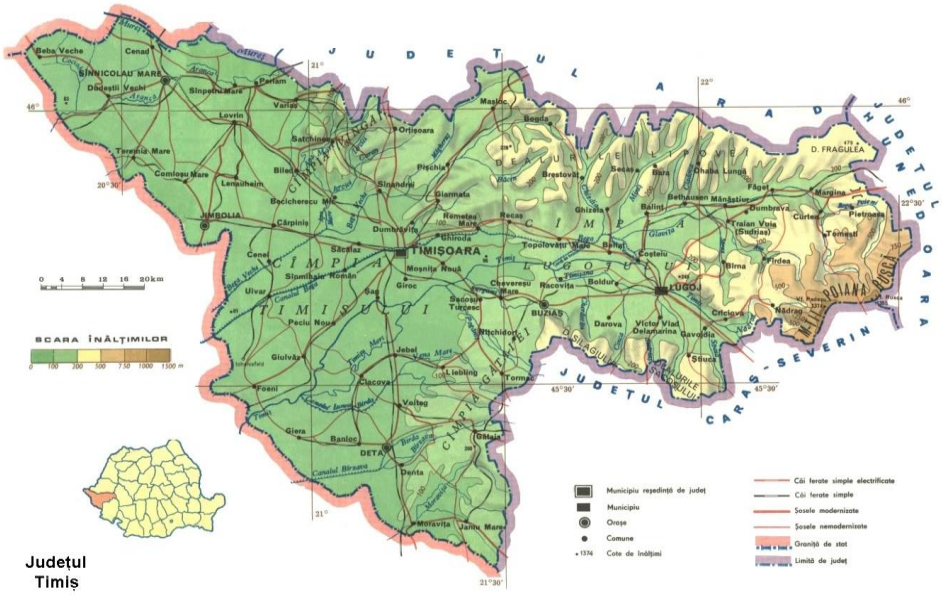

Fig. 1 Location of Hunedoara County (www.pe-harta.ro)

The total surface of the forest fund managed by Timiş Forest District through its six forest districts is of 77.515 ha, namely approximately 11% of the county's surface and 2,4% of the forest surface managed by RNP- Romsilva (http://timisoara.rosilva.ro).

Timiş County manages 86 game funds, amounting to a surface of 827.268 ha in which a variety of wild animals live. Among them we mention: boar (*Sus scofa* L.), deer (*Cervus elaphus* L), buck (*Capreolus capreolus* L.), pheasant (*Phasianus colchicus* L.), partridge (*Perdix perdix* L.), hare (*Lepus europaeus* Pallas), wolf (*Canis lupus* L), jackal (*Canis aureus* L.), fox (*Vulpes vulpes* L.), and marten (*Martes martes* L). The rivers and lakes are populated by otter (*Lutra lutra* L.), large duck (*Anas platyrhincos* L.) and small duck (*Anas crecca* L). From them, eight species (hare, pheasant, buck, mouflon, large duck, bustard, crucian carp and tench) were

taken into account and studied based on an analytical hierarchical process (AHP). The analyses were obtained with the Expert Choice Desktop software.

AHP is one of the most used global decisional support model for solving complex decision-making problems in many domains, including biology sciences (Aras et al., 2004, Wang et al., 2004, Park et al., 2013). The analytical hierarchical process uses pair comparisons for the selected criteria in order to evaluate the most important ones (Huang et al., 2011). As such, the complex problem (namely the purpose of this study) is structured hierarchically, with the objective on top of the hierarchy, while its base is composed of the criteria (and sub-criteria if they exist) and the alternatives (namely the eight animal species selected) (San Cristóbal, 2011).

RESULTS AND DISCUSSIONS

The concept of non-wood forest products (NWFPs) was introduced four decades ago in tropical forestry in order to take into account the entire production generated by the forest sector (Enescu, 2017).

The NWFP selected and taken into study were: buck (*Capreolus capreolus* L.), hare (*Lepus europaeus* Pallas), phaesent (*Phasianus colchicus* L.), large duck (*Anas platyrhincos* L.), mouflon (*Otis tarda* L.), crucian carp (*Carrassius Gibelio*), tench (*Tinca tinca*). The alternative AHP classification for the 19 criteria taken into account is rendered in table number 1:

AHP alternative ranking *Table 1*

	Criteria	Animal species							
		Hare	Pheasant	Roe-deer	Mouflon	Duck	Great bustard	Tench	Crucian-carp
		1	2	3	4	5	6	7	8
1	Harvesting period	8	7	3	2	6	1	4	5
2	Harvested quantity by one worker in 8 hours	4	7	3	2	6	1	5	8
3	Harvesting cost	5	6	7	8	4	3	2	1
4	Knowledge for harvesting	5	7	8	6	4	1	3	2
5	Tools needed for harvesting	7	6	8	5	4	3	1	2
6	Complexity of harvesting process	7	8	6	5	4	3	2	1
7	Development of the process of harvesting	6	7	8	2	5	1	3	4
8	Knowledge for recognition	6	7	8	5	4	3	1	2
9	Distribution range	8	7	5	3	6	1	2	4
10	Biotic threats	7	5	2	1	6	8	3	4
11	Abiotic threats	8	6	1	2	5	7	4	3
12	Perishability	7	8	1	2	5	4	3	6
13	Market potential	5	7	8	6	4	1	2	3
14	Market demand	6	7	8	5	4	1	2	3
15	Celebrity" of the product on the market	6	7	8	5	4	1	2	3
16	The price of raw product	6	5	7	8	4	3	1	2
17	The price of the derived product	7	5	8	6	4	1	3	2
18	Portfolio of derived products	6	5	8	7	4	1	2	3
19	Transport from the harvesting point to the storage centre	6	3	7	8	5	4	1	2

Based on the AHP results, the most important game and fish species from Timiş county were the buck and pheasant, while the least important ones are bustard and tench (Figure 2).

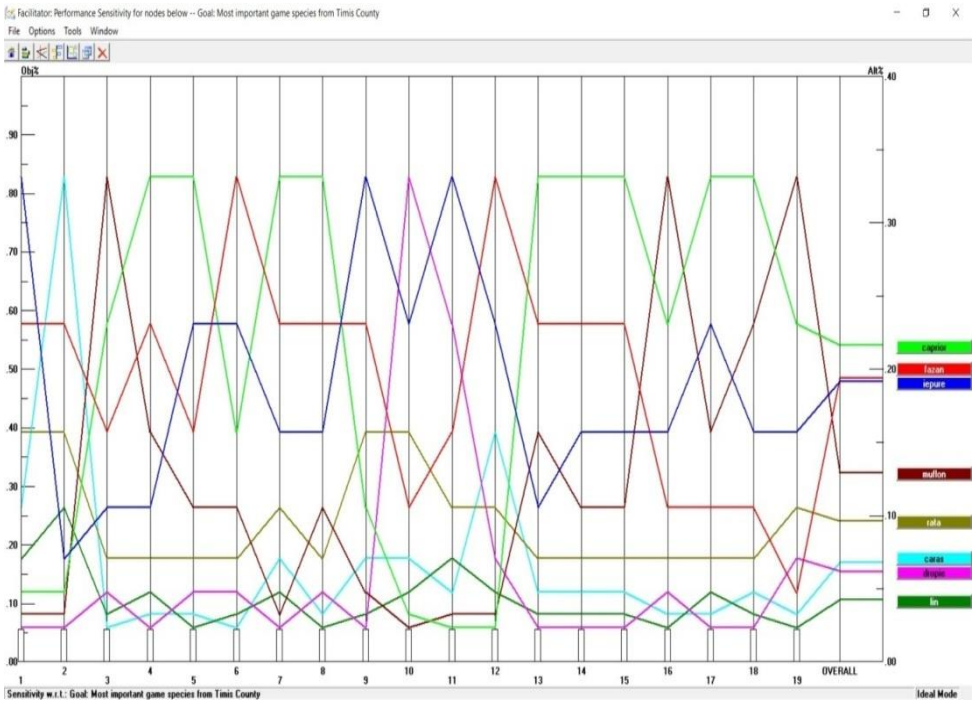

Fig. 2. Ranking of the selected NWFPs

In regard with the results, it can be seen the buck occupies the first place, a situation that occurred in other counties as well: first place in Călăraşi (Ciontu et al., 2018); second place in Bihor (Timiș-Gânsac et al., 2018) and Tulcea (Dincă et al., 2018); third place in Argeş County (Ciontu et al., 2018). This is followed by first places in classifying all non-wood forest products: first place in Prahova (Enescu et al., 2018), with a long harvesting period, a large portfolio of derived products, a large distribution range and an increased market request. Buck is one of the most tendered large game species from our country (28.705 exemplars in the country harvest quota for 2019/2020 and 1.642 exemplars in the harvest quota for Timiş County) (Order 673/13.05.2019, appendix 1-6). The second product as importance, the pheasant, presents an important interest for hunters from Timiş County, with 122.360 exemplars in the country harvest quota for 2019/2020 and 13.383 ex. the harvesting quota from Caraș-Severin County) (Order 673/13.05.2019, appendix 1-6).

Hare has occupied the first place in Dolj among the eight analysed non-wood forest products (Cântar et al., 2018), while in Timiş it occupies only the third place with 102.406 ex. in the country harvesting quota for 2019/2020 and 8.578 ex. the harvesting quota for Caraș-Severin County) (Order 673/13.05.2019, appendix 1-6**).**

The least important game and fish species from the studied ones are the bustard and tench. The bustard is almost extinct in our country, being present sporadically in the West part as it migrates from our Hungarian neighbours. The tench has a scarce presence in the lakes from Timiş County and does not arouse an interest from fishermen.

CONCLUSIONS

The diversity and potential for harvesting and commercializing game species from Timiş County is high due to the well representation of forest and agricultural areas (86 game funds that amount to a surface of 827.268 ha)**.** As such, game species have the space and environment to develop. Harvesting and commercializing these species represents an important income source for owners of game funds.

By analysing eight species with an analytical hierarchical process, the most important game species from this county are the buck and pheasant, while the least important ones are the and tench. If the buck and pheasant are hunted due to their long harvesting period, large distribution, varied portfolio of derived products and an increased market request, the bustards are almost extinct from our country or present sporadically in the West part as they migrate towards Hungary.

Based on the results of this study we can say that an important contribution on the evaluation, harvesting and marketing of game interest species from this county is brought through an evaluation of the potential of non-wood products.

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WATER MANAGEMENT FOR GROUNDNUT CROP: AN EVALUATION IN ÇUKUROVA REGION, TURKEY

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Keywords*:Groundnut Crop, Semi-arid Region, Sprinkler Irrigation, Water Management*

ABSTRACT

Hand-moved with no riser sprinkler irrigation systems are very popular in irrigation of groundnut in Mediterranean region of Turkey. In most, tractors has used during the process of irrigation as a power supply so irrigation energy cost resulting from petroleum consumption was very high among whole production inputs. Subsidize of diesel oil should be increased by government for sustainable groundnut production with pressurized irrigation systems especially use by petroleum as a power source. The electricity unit as power supply can be strongly suggested for economical irrigation energy source of sprinkler irrigation systems. Maintenance-repair works in water delivery systems should be done by water organizations before irrigation season for improvement conveyance efficiency.

INTRODUCTION

In most part of arid and semi-arid regions, rainfall is insufficient to meet whole crop water requirement so artificially water application namely irrigation is necessary activity for better agro-production. Economical crop yield is far from demand without irrigation especially in water poor environments (Yavuz et al. 2015 a,b). In those environments, groundwater has used plenty due to the insufficient surface water supplies and over water pumping from the groundwater reservoir has resulted negative effect on sustainable use of water supplies as well as raising energy consumptions of irrigation (Yavuz et al. 2016). Maximum yield is obtained from full irrigation so such irrigation program is recommended for farmlands situating water sufficient climates (Yavuz et al. 2018).

Correct agricultural water management is very important role to play in sustainable use of water resources in agriculture. The quality of water management in farm level is highly relevant to cooperation level between farmers, and water organizations. In water poor regions, one of the practical strategies is design of crop pattern in accordance of current water supplies. Beside those, well-managed modern irrigation technologies have great contributions on water productivity (Acar & Yilmaz 2018; Ekinci & Acar 2018).

Deficit irrigation by trickle irrigation system is also one of the good alternatives for water savings in irrigation. Up to 25% deficit irrigation, causing no significant yield reductions in some crops i.e sugar beet, maize, and potato via trickle irrigation technique may be recommended for water poor climates (Acar et al. 2014).

Selection of crop cultivars such as pumkin (*Cucurbita pepo* L.) having best suited to dry environment is one of the practical strategies for efficient use of water resources in water shortage environments (Seymen et al. 2019).

Although seeds of groundnut are one of main oil sources in worldwide, they have consumed mostly as appetizer and very little in sweets in Turkey. Due to better income, farmers have tended to increase of farmlands of groundnut especially Adana and Osmaniye provinces in Turkey.

The reasons of those increments in production are developments of new plant species best suited for the region, rich of experiences of farmers in that crop production and being very suitable rotation crop resulting extra income for farmers (Şahin 2014).

Soil properties are very important role to play in groundnut cultivation. Crop is best suited at soils (Sandy-Loamy) with good drainage conditions. Soil preparation is very important for better seed production.

In Çukurova region of Turkey, in case of groundnut as a main crop, sowing date is between 10 April and 20 May; as a second crop, sowing should be performed just after the wheat harvest. Sowing must be completed up to 25 June. Virginia groundnut cultivar, semi-lying or laying, is very suitable for Turkey. The row and plant spacing are 70 cm and 15-20 cm, respectively. In sowing, seed requirement is about 55 – 115 kg/ha. Sowing depths for sandy, S, and clay, C, soil are 6-9 cm and 5-6 cm, respectively. The experienced person is necessary especially seed sowing process by planting machine.

In Çukurova region of Turkey, groundnut has growth by irrigated conditions. Sprinkler systems are very common irrigation technique. One of the most important problems is irrigation energy cost under sprinkler-irrigated production. The cost is more in oil than electricity use as energy source during the irrigation by sprinkler system. Bah & Acar (2017) reported that almost 96% of farmers, in surveyed 50 farmers at Konya Çumra region of Turkey, stated energy cost of irrigation is high.

In this study, agricultural water management for sprinkler irrigated groundnut crop was assessed.

GROUNDNUT PRODUCTION WORDWIDE

Groundnut has growth more than 100 countries in worldwide. It is very beneficial cheap food source for human. The production is about 26.4 million tons at 37.1 million areas in world. The seed yield, as an average of world, is about 1.4 t/ha. The production and farmland of groundnut in developing countries are 97% and 94%, respectively. Most production has obtained from Asian and African countries for oil sources mostly. The leader countries in groundnut production are China, India and USA. Those countries have about 70% of seed production with 69% production area (Madhusudhana 2013).

As mentioned above, groundnut (*Arachis hypogaea*) has growth for appetizer or sweets in Turkey. Çukurova region has single about 86% groundnut seed production in Turkey. The distribution of seed production in Turkey are 47% in Adana, 39% in Osmaniye, 6.3% in Aydın, 4.3% in Antalya, 3.4% in İçel, 1.2% in Mugla and the rest is different parts of Turkey (Uçak et al. 2017).

IRRIGATION MANAGEMENT OF GROUNDNUT

The yield of groundnut varies from many factors including soil properties such as water intake, available water holding capacity, AWC, amount of applied

water with irrigation interval, fertilizer management, plants density and so on. Uniform water availability in root zone is very important role to play in satisfactory seed yield and quality. Water deficiency during vegetative stage can have negative impact on plant development, but water limitation in pod filling stages may result serious negative effect on pod development and plant growth. In India, irrigation efficiency has varied from 30% to 60% in surface irrigation systems. Sprinkler and trickle irrigation systems have getting popularity due to reliable water and labor savings as well as good increment in seed yield and quality. Drip irrigation is also preferable modern irrigation system recently. The reason behind that is facilitating almost optimal water status in root or pod zone with water saving around 30% or 60% by comparison to conventional irrigation techniques. Irrigation interval should be narrow at pod development and irrigation process must be ended when plant reaches to physiological maturity possibly 10-12 days before harvest. Irrigation has started at about 50% soil moisture depletion, SMD, in top 30 cm during the early growth stages and at 25% SMD during the pod development or seed formation stage. Crop water use, ET, ranges from 5 to 6 mm/day in most growth stages. Seasonal applied water is about 500-600 mm for economical seed yield (Nautiyal & Narendra 2004).

Soni et al. (2016) reported 500 mm and 700 mm irrigation water requirement of groundnut for short and moderate duration cultivar, respectively under India conditions. They stated that groundnut production is based on the rainfed system mostly. In recently, micro irrigation systems called trickle or micro sprinkler techniques are gaining great interests. The main limitation controlling wider production area of those systems is high initial installation cost. The systems can be beneficial in case of long-run uses. By comparison to conventional irrigation systems, micro-irrigation technologies have resulted water and energy productivity resulting high and qualified seed yield. They stated that increments in Water Use Efficiency, WUE, and pod yield are 20-90%, and 5-50%, respectively in micro-irrigated groundnut crop over surface irrigated plant.

In production season of May-September, irrigation is starting at Mid-June with total 3 or 4 irrigation events in one season at Çukurova region, Turkey. It is impossible to grow groundnut without irrigation in such ecology. Portable sprinkler irrigation systems have used mostly for irrigation of groundnut at region. Maximum benefit can be obtained by correct cultivar selection, well design and good operating of irrigation systems. Fortunately, farmers have strong experiences about sprinkler irrigation system management at field crops.

Groundnut does not like long period of water stress in root zone. In long-term water stress, seeds within capsules do not growth well so both seed yield and quality reduce under water stress conditions especially within top 30 cm soil depth.

First irrigation is very important in groundnut farming. Before first irrigation, sufficient flowers should be at crops. Drought symptoms, pale color over crops, should be observed before first irrigation event.

The most critical time of irrigation for groundnut crop has started gynophore development and has ended up seed maturity. In those stages, late irrigation has resulted significant seed yield reductions. Much water application is recommended in first irrigation. Depending on the atmospheric conditions, number of irrigation and irrigation interval are 3-4 and 15-17 day, respectively in Çukurova region.

IRRIGATION-YIELD RELATIONSHIPS IN GROUNDNUT

In process of the literature review in world, only following few studies have found about irrigation level affect on seed yield of groundnut crop.

Reddy et al. (1980) performed a field research about irrigation interval and irrigation regimes affect on seed yield of groundnut at Tripati Campus in India. They considered the crop root length of 60 cm and monitored soil moisture status by gravimetrically. Soil of research site had an average bulk density of 1.45 g/cm^3. Irrigation water depth for each irrigation event was based on amount of evaporated water of 2, 4, and 8 cm from the Class A Pan. Irrigation regimes were 50% of Pan evaporation, Ep: 50%, 75% of Pan evaporation, Ep: 75%, and 100% of Pan evaporation, Ep:100%. The crop cultivar was *Arachis hypogaea* (TMV2) having vegetation period of 105 day. The row and plant spacing were 30 cm and 10 cm, respectively. The irrigation system was furrow. Short irrigation interval resulted increase in grain development. In result, maximum seed yield of 3574 kg/ha was obtained from plot having irrigation frequency of 2 cm with an average applied water of about 548 mm. Wider irrigation frequency resulted lower seed yield (Table 1).

Table 1

Irrigation frequency and irrigation regimes affect on yield of groundnut kg/ha (Reddy et al. 1980).

Irrigation Frequency (cm)		**Applied Water (Ep%)**			**Average**
		50	**75**	**100**	
2	Applied Water (mm)	365	547	730	**547.5**
	Seed Yield (kg/ha)	3161	3551	**4011**	**3574**
4	Applied Water (mm)	360	540	720	540
	Seed Yield (kg/ha)	2950	3468	3677	3365
6	Applied Water (mm)	375	562	750	562.5
	Seed Yield (kg/ha)	2585	3022	3336	2981
8	Applied Water (mm)	380	570	760	570
	Seed Yield (kg/ha)	2398	2834	3182	2805
Average	Applied Water (mm)	370	555	740 (mm)	
	Seed Yield (kg/ha)	2773	3219	3551	

Idinoba et al. (2008) conducted field research at Nigeria during the periods 1998 - 1999. Annual rainfall at research site was about 1300 mm and such rainfall has observed at April-July and August-December. The groundnut seed cultivar was Fugar. In result, the highest evapotranspiration was found as 300 mm with 4 or 5 mm/day for 20-50 days after the sowing.

SOME PROBLEMS IN GORUNDNUT PRODUCTION

All sprinkler irrigation systems have operated by tractor so oil/petroleum is used as energy supply for pumping water through pipelines and spraying water over crops. Diesel oil is maximum production cost in whole inputs in Turkey. In region, farmers have stated that the financial support of Diesel oil by government is little. If that trend continues, groundnut production will not be sustainable in such region.

The other problem is that farmers have performed irrigation in accordance of their long-term experiences. Although, they have used the sprinkler irrigation technology well, still they need to have some technical information about system installation onto the farmlands, operation and irrigation water management issues.

CONCLUSION

Groundnut is one of the best-suited field crops in Çukurova region of Turkey. Irrigation is necessarily prerequisites for optimum growth of groundnut as well as maximum and qualified seed yield. Due to the sandy soil characteristics, in general farmers have preferred sprinkler irrigation system in irrigation of groundnut crop. In Çukurova region, sprinkler irrigation systems have operated by oil-use tractors so irrigation energy cost is very expensive. Farmers producing groundnut have very little oil/petroleum support. Therefore, they should be more subsidized by government for sustainable seed production. Performance of water delivery systems is very important in success of water organizations. Maintenance-repair works of those systems should be done with grate care before the irrigation season. Up to now, almost little field study has been performed about irrigation-seed yield relationships of groundnut crop. Therefore, future studies should focus on irrigation program of groundnut for different environmental conditions.

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PLANTS FROM DOLJ COUNTY PRESENT IN DIFFERENT HERBARIUMS

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Keywords*:herbarium, Dolj county, plant collection*

ABSTRACT

The present paper intends to present the plants collected from Dolj County and their harvesting collection as they can be found in the most important Romanian herbarium ("Alexandru Beldie" Herbarium from "Marin Drăcea" National Forestry Research and Development Institute) as well as in one of the most important European ones (WU Herbarium from the Botanic Institute of Wien University). The article presents the studied material, the number of vouchers from the above-mentioned herbariums with species gathered from Dolj as well as some characteristics of these collections. The most important species are mentioned and analysed for each herbarium, focusing on characteristics such as the collection's creation date and the harvesting periods. In the case of the local studied herbarium, the genera discovered were systematized, with an emphasis on the most representative ones. Furthermore, a map of the plant's harvesting from Dolj County was also created, based on the plants present in "Alexandru Beldie" Herbarium. The specialists that have contributed in representing Dolj County in the herbarium are also mentioned.

INTRODUCTION

Dolj County is characterised by the presence of some natural habitats specific to the steppe and silvo-steppe areas. The north part is hilly and fosters Tukkey oak and Hungarian oak forests (*Quercus Tukkey oakris*, *Quercus frainetto*), as well as forest types in which sessile oak (*Quercus petraea*) is present. The sessile oak's spreading area is situated on the entire North half of Getic Plateau. Other broad-leaved species are also present, specific to low altitude hills and fields. The county's central part (up to Pleniţa-Segarcea-Apele Vii line), is also represented by Tukkey oak and Hungarian oak forests, with larger surfaces in Craiova- Segarcea-Perişor triangle. These forests are either Tukkey oak-Hungarian oak stands, sometimes mixed with greyish oak (*Quercus pedunculiflora*) and pubescent oak (*Quercus pubescens*), an aspect that indicates a passage towards silvo-steppe or even pure Tukkey oak stands. Clearing areas are covered by associations of *Festuca sulcata*, *Festuca vallesiaca*, *Andropogon ischaemum*, and *Chriysopogon gryllus* etc. A silvo-steppe domain, the plain from the county's south part presents nowadays only some forest patches of bulky oak (in the North part and the highest plain area) or of brown oak (North of Bistreţ and near Boureni) (http://apmdj-old.anpm.ro).

Plant samples collected over time from Dolj County are stored today in different plant collections and herbarium from all around Europe. They are the evidence of their existence that were or even are rare or abundant.

The present paper analyses two important European herbarium and focuses on their collection of plants gathered from Dolj Count: WU Herbarium, Botany Institute, Wien University and "Alexandru Beldie" Herbarium, "Marin Drăcea" National Forestry Research and Development Institute. The last source is one of the most impressive plant collection from our country and not only, a reference herbarium with an inestimable scientific and historical value.

MATERIAL AND METHODS

The studied material was represented by the electronical database of WU Herbarium from Wien (https://herbarium.univie.ac.at), as well as plant collections from "Alexandru Beldie". Amongst them, the plant samples gathered from Dolj County were organized based on the species, the name of the specialist who has collected them, as well as the harvesting date and place.

As such, WU Herbarium contains 12 plant samples harvested from Dolj County, while for "Alexandru Beldie" Herbarium, their number reaches 96 samples. Based on their systematization, the data contained in herbarium vouchers have allowed the creation of a County map with the places from where most of the plants were collected. This has extended to the identification of the herbarium periods with a maximum development based on the data from the harvested plants.

RESULTS AND DISCUSSIONS

WU Herbarium, Botany Institute, Wien University – Plants harvested from Dolj County, Romania

The foundation of this collection of dried plant specimens' dates back to the year 1879 when Anton KERNER von MARILAUN (1831 - 1898), the Director of the Botanical Museum at that time, had begun to acquire herbarium material for the installation of an institute's new herbarium (WU). To accelerate the installation, KERNER had created the well-known exsiccata series - "Flora exsiccata Austro-Hungarica". The new herbarium grew rapidly and in 1889 it already contained 80.000 specimens. The herbarium reached soon a considerable size and importance, due to gifts and bequests as well as the activities of collecting expeditions. Today, the herbarium of the Institute of Botany is estimated to contain approximately 1,400.000 specimens covering all worldwide plant groups.

WU Herbarium's electronical catalogue (https://herbarium.univie.ac.at) has identified 12 plant samples gathered from Dolj County (Table 1). The harvesting date and location as well as the specialist that has gathered them were also extracted from the data base.

The plants collected from Dolj County and present in WU Herbarium are kept in their original maps and contain the plant's name, their harvesting place and date, the specialist who has collected them and many other important details.

The plants collected from Dolj County are present in WU Herbarium are relatively new, being gathered during 1951-2003. The majority of plants were harvested in the 1960's, followed by one sample for each following reference decades (with the exception of 1970-1979, when the herbarium was not enriched with no sample from Dolj).

Table 1

Plants gathered from Dolj County and present in Wu Herbarium, Botany Institute, Wien University - except

Taxon	Collected by	Date	Location
Agrostemma githago L.	Paun,M. & Olaru,M. Flora olteniae exsiccata 218.	*1960-06-18*	*Romania. Dolj*
Brachypodium sylvaticum (Huds.) P. Beauv.	*Pavel, C. 487*	*1965-06-25*	*Romania. Dolj*
Dianthus giganteiformis Borbás var. craiovensis Prodán	*Prodán,I. Flora Romaniae exsiccata 3446*	*1951-06-03*	*Romania. Dolj*
Doronicum hungaricum Rchb. f.	*Buia,A.*	*1963-05-02*	*Romania. Dolj*
Marsilea quadrifolia L.	Buia,A. Flora olteniae exsiccata 302	*1963-08-07*	*Romania. Dolj*
Papaver atlanticum (Ball) Coss.	*Anonymous collectors*	*1969-06-11*	*Romania. Dolj*
Poa pratensis L.	Šmarda,P. et al	*2003-05-18*	*Romania. Dolj*

The first plant that was introduced in WU Herbarium is a *Dianthus giganteiformis* Borbás var. *craiovensis* Prodán, collected on 03.06.1961 by Prodan.

"Alexandru Beldie" Herbarium, "Marin Drăcea" National Forestry Research and Development Institute – Plants harvested from Dolj County, Romania

„Marin Drăcea" National Forestry Research and Development Institute from Bucharest hosts a herbarium created in 1929 - "Alexandru Beldie" Herbarium. Inscribed in Index Herbariorum and having the international BUCF code, the herbarium contains approximately 40.000 vouchers (Vechiu et al., 2018; Dincă et al., 2017).

Amongst the species present in this herbarium we mention: 15 *Veronica* species (Dincă et al., 2017), 80 *Trifolium* species (Cântar I. et al., 2018), 19 *Scorzonera* species (Dincă et. Cântar I.C. 2017), 16 *Abies* species (Enescu, C et al., 2018), 69 *Potentilla* species (Crișan, V. et al., 2017), 19 *Androsace* species (Dincă, M. et al., 2017), 15 *Ornitogalum* species (Enescu R. and Dincă L. 2017) and the 41 *Polygonum* species (Vechiu et al., 2018).

Regarding the importance of Dolj County in developing "Alexandru Beldie" Herbarium, a total number of 96 vouchers that contain plants collected from this county were identified as belonging to 47 genera. The most representative genera of plants collected from this County and present in "Alexandru Beldie" Herbarium are: *Quercus* (15 samples from 4 species), *Ranunculus* (10 samples belonging to 9 species), *Trifolium* (7 samples from 7 species).

An except regarding the voucher systematization is rendered in Table number 2.

Table 2

Plants gathered from Dolj County and present in “Alexandru Beldie” Herbarium, “Marin Drăcea” National Forestry Research and Development Institute - except

Drawer number	Voucher number	Herbarium/ Botanic collection/ Institution (from the Herbarium's voucher label)	Species name	Harvesting date	Harvesting place	Collected/ Determ. by:	Conservation degree (1...4)
65	35	Hortus botanicus instituti agronomici T. Vadimirescu Craiova	*Centaurea arenaria* M.B.	1960.07.07	Craiova (in apropiere)	C. Maloş, M.Olaru	1
54	4	Flora Olteniae Exsiccata	*Rapistrum perenne* All.	1965.07.03	Bailesti	M. Paun et D. Cirtu	1
18	48	Hortus Botanicus Universitatis Craiovensis	*Alkanna tinctoria* L.	1967.01.01	Ciuperceni Dolj	M. Paun, Gh. Popescu	3
31	15	ICEF	*Anchusa procera* Bess	1935.06.12	Ciurumela Jud.Dolj	M. Petcut	2
66	18	N.Al. Iacobescu Herbarium	*Helichrysum arenarium* L.	1907.07.23	Piscul, Dolj	N. Al. Iacobescu	1

The systematization of plants based on their harvesting place has allowed the creation of a map for Dolj County with the representation of the harvesting places (Fig. 2). As it can be seen, most of the plants were collected from the county's central and south parts.

Figure 2. Harvesting map for the plants present in “Alexandru Beldie” Herbarium

Plants collected from Dolj County and that belong to “Alexandru Beldie” Herbarium are in a good conservation state and are kept in their original maps, containing relevant information such as: species name, harvesting date and place,

the collection to which they belong, the name of the specialist who has gathered them, altitude, slope etc. (Fig. 3).

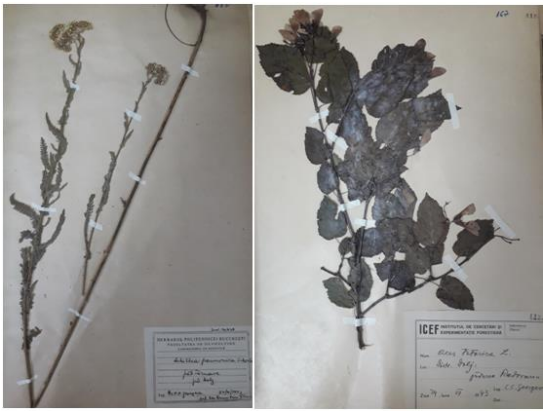

Figure 3. Vouchers with plats from Dolj County present in “Alexandru Beldie” Herbarium (*Achillea pannonica* – left, *Acer tataricum* - right)

The systematization of plants from “Alexandru Beldie” Herbarium based on their harvesting year has allowed for an analysis of the periods in which plants from Dolj County were gathered, as well as this county’s importance in the collection’s development. These periods can be seen and analysed in Figure number 4.

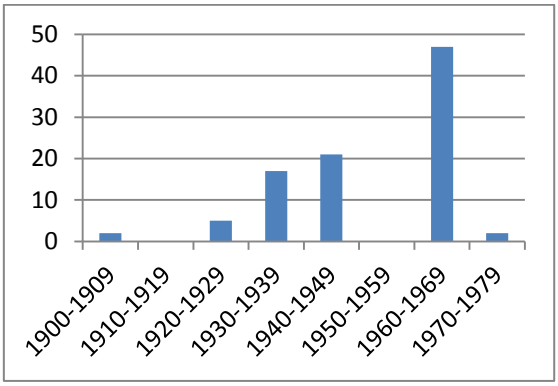

Figure 4. Harvesting periods for plants present in “Alexandru Beldie” Herbarium and originating from Dolj County

Plants gathered from Dolj County and present in “Alexandru Beldie” Herbarium were mainly collected by Romanian specialists such as: Petcuţ, Cretzoiu, Păun, Gh. Popescu, Iacobescu, Malos, Olaru, Vlădulescu, Paşcovschi, Cîrţu, Buia, Şerbănescu, Georgescu, Morariu, Nyarady, Rădulescu, Pavel, Grintescu, or Tătăranu.

CONCLUSIONS

Dolj County, represents a territory with a rich biodiversity and an important source of development and enrichment for the herbariums from the country and beyond. Within the WU herbarium of the Institute of Botany within the University of

Vienna there are 12 specimens of plants collected from Dolj County during 1951-2003, most of them being of the Alium genus (4 exemplary). Within this herbarium, there is also a exemplary of *Dianthus giganteiformis* Borbás var. *craiovensis* Prodán, collected on 03.06.1961 by Prodan, variety specific to this territory.

Numerous specimens of plants from Dolj County are also found in the "Alexandru Beldie" herbarium of the National Institute of Forestry Research and Development "Marin Drăcea". Out of a total of 96 plants, most, 49 in number, were collected during 1960-1969. About 20 specialists traveled through the forests, pastures and parks of Dolj County and studied them in order to collect the plants that expanded the collections of the "Alexandru Beldie" herbarium, most of which were harvested from the center and south of the county.

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ANTHROPOGENIC THREATS ON SOME BIRD SPECIES PROTECTED UNDER THE IUCN RED LIST IN THE PROTECTED AREA SLVOSTEPA OLTENIEI

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Keywords*: anthropogenic threats, birds, protected area*

ABSTRACT

During our research regarding the protected area Silvostepa Olteniei, we have identified four bird species protected under the IUCN red list: Alauda arvensis L., Ciconia ciconia L., Merops apiaster L. and Upupa epops L. One of our goal, within the management plan of the protected area Silvostepa Olteniei, has been to identify the major anthropogenic threats for these protected species. Following our studies we have identified several anthropogenic threats, among them: replacing pasture with arable land, intensive grazing, farming, use of biocidal, hormones and chemical, suspended power lines and telephone lines, storage of household waste, surface water pollution, landslides, forest cleaning, intensive agriculture.

INTRODUCTION

Human land-use intensification and changes such as urbanization (McKinney, 2006) and intensive agriculture (Ekroos, Heliölä, & Kuussaari, 2010) contribute to the homogenization process by diminishing rare and specialist species and promoting abundant and generalist species which are better able to cope in human-altered environments (Clavel, Julliard, & Devictor, 2011; McKinney & Lockwood, 1999). This process is usually asymmetrical: few abundant and generalist species replacing a larger number of rare and specialist species (McKinney & Lockwood, 1999).

In the case of birds, it has been shown that resident species are more vulnerable to anthropogenic changes than migratory species (Imbeau, Mönkkönen, & Desrochers, 2001), because resident birds are dependent on habitat resources all year round, whereas migratory birds only visit when the resources are most abundant (Mönkkönen & Welsh, 1994). Morphological traits of birds are well known to be associated with their diet, and movement and foraging behavior (Carrascal, Moreno, & Telleria, 1990; Jønsson, Lessard, & Ricklefs, 2015; Miles & Ricklefs, 1984). For instance, body size is associated with extinction risk, because larger species tend to have lower fecundity, and thereby higher sensitivity to habitat disturbances (Bennett & Owens, 1997). Using traits in our analyses, it is possible to study which characteristics are particularly sensitive to environmental change and thereby to reveal the mechanisms of biotic homogenization.

MATERIAL AND METHODS

As part of the management plan of the protected area Silvostepa Olteniei, during our research we have to identify the major anthropogenic threats for some bird species protected under the IUCN red list. In order to determine the major anthropogenic threats for these bird species we had to identify and locate the habitats of these species in the protected area Silvostepa Olteniei.

Following our studies we have identified a number of four species *Alauda arvensis L., Ciconia ciconia L., Merops apiaster L.* and *Upupa epops L.*.

Within the Protected Area, *Alauda arvensis* L. was identified in agricultural crops, and shrubs near the forests: Perişor, Entorsura, Târnava, Mărăcinele, Ciutura, Tencănăiul, Secii, Verbicioara and Pleniţa.

Regarding *Merops apiaster* L., species In the protected area, there have been identified nests in some areas with sharp banks: Ciutura, Sălcuţa, Cleanov, Verbiciaora, Valea Ţigăncii.

Within the Protected Area, *Upupa epops* L. has been identified in the following locations: Perişor forest, Întorsura forest, Târnava forest, Mărăcinele forest, Ciutura forest, Tencănăului forest, Şiubeiului forest, Secii forest, Verbicioara forest.

RESULTS AND DISCUSSIONS

Following our studies we have identified several anthropogenic threats, among them: replacing pasture with arable land, intensive grazing, farming, use of biocidal, hormones and chemical, suspended power lines and telephone lines, storage of household waste, surface water pollution, landslides, forest cleaning, intensive agriculture.

For each species protected under the IUCN red list we had identified the major anthropogenic threats.

For *Alauda arvensis* L. we have identified two major anthropogenic threats: A02.03 - replacing pasture with arable land and A04.01 –intensive grazing.

A02.03 - Replacing pasture with arable land. Although in this area the agricultural areas have a very good representation, in some localities: Radovan, Vela, Bucovicior, Tencănău, Vârvoru de Jos, these have expanded affecting the meadows of the area. This impact leads to the restriction of the habitats of the species, respectively the reduction of the effective population size.

A04.01 –intensive grazing. Through the abusive grazing a diminution of the surface of the natural habitats of the species takes place, phenomenon observed on the pastures near the localities Mărăcinele, Dobromira, Vârvoru de Jos.

For *Ciconia ciconia* L., we have identified four major anthropogenic threats: use of biocidal, hormones and chemical, suspended power lines and telephone lines, storage of household waste, surface water pollution.

A 07 use of biocidal, hormones and chemical. Applying pesticide products, hormones and various chemicals cause mutations, deaths of individuals with genetic, biological and environmental implications on short and long term.

D 02.02.02 Suspended power lines and telephone lines. The maintenance works of the electricity and telephone networks, sometimes, affect the destruction of the species nests having negative repercussions on the specie

E03.01. storage of household waste. Domestic waste storage is one of the most widespread pressures at the site level. In the absence of suitable facilities for the storage of waste, especially non-degradable ones (plastic, metal), they are stored (often scattered) on the edge of settlements, in parking lots on the roadside, and along the

asphalted and unpaved communal roads. The negative effects of waste consist not only of continuous pollution but also of a degradation of the species habitat.

H01surface water pollution. The affect of the water quality in the sense of changing the aquatic parameters and the evolution towards an inadequate state of the quality of the aquatic habitats for the respective species can be caused by different anthropic activities carried out in agriculture or forestry. These include the spillage of waste materials into the water, the infiltration of waste water into the groundwater that feeds the brooks, deworming treatments applied to the pets followed by their washing in the brook water. All this can lead to deaths of individuals with genetic, biological and ecological implications in the short and long term.

For *Merops apiaster* L., we have identified two major threats: use of biocidal, hormones and chemical and landslides

A 07 use of biocidal, hormones and chemical. Applying pesticide products, hormones and various chemicals cause mutations, deaths of individuals with genetic, biological and environmental implications on short and long term.

L05 Landslides. The collapse of the sharp banks especially near the localities of Verbicioara and Valea Tigancii leads to the destruction of species nests and implicitly to the reduction of the effective population size. In the protected area, nests have been identified in some areas with sharp banks: Ciutura, Sălcuţa, Cleanov, Verbiciaora, Valea Ţigăncii .

For *Upupa epops* L, we have identified three major anthropogenic threats: intensive agriculture, forest cleaning,

A 07 use of biocidal, hormones and chemical. Applying pesticide products, hormones and various chemicals cause mutations, deaths of individuals with genetic, biological and environmental implications on short and long term.

A02.01 - intensive agriculture. Agricultural lands attracted the construction of irrigation networks (most of which are currently abandoned), and during the communist period the removal of forest curtains. Although replanting these forests has begun in recent decades, the effects of these changes from river meadow and forest steppe ecosystems on agroecosystems are felt so far at the landscape level. In the absence of the forest vegetation and the regular periodic floods the summer droughts have become more frequent, and the winter winds accentuate this effect. On the agricultural land from the site, the agricultural practices specific to the intensive agriculture lead to the restriction of the habitats of the species, respectively the reduction of the effective population size.

B02.02 - cleaning the forest. Uncontrolled forest cleaning can lead to major changes in their flora and fauna. A controlled collection is recommended to maintain a balance in the forest ecosystem. This impact leads to the restriction of the habitats of the species, respectively the reduction of the effective population size.

CONCLUSIONS

During our research regarding the protected area Silvostepa Olteniei, we have identified four bird species protected under the IUCN red list: Alauda arvensis L., Ciconia ciconia L., Merops apiaster L. and Upupa epops L. One of our goal, within the management plan of the protected area Silvostepa Olteniei, has been to identify the major anthropogenic threats for these protected species.

Following our studies we have identified several anthropogenic threats, among them: replacing pasture with arable land, intensive grazing, farming, use of biocidal, hormones and chemical, suspended power lines and telephone lines,

storage of household waste, surface water pollution, landslides, forest cleaning, intensive agriculture.

All the impacts caused by the current pressures are valid also for the impacts caused by the future threats, because the way of managing the surfaces remains unchanged.

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THE QUALITY INDICATORS OF RAW MILK PRODUCED FROM A CATTLE FARM IN IASI COUNTY

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Keywords*: composition, milk quality, safety food*

ABSTRACT

Milk has a very important role for human diet, being indispensable for the growth and development of human body (Young W. Park and al., 2013). The aim of this paper was to analyse the quality of milk, obtained under a farm of bovine, in Iași County. For the purpose investigations, have been used samples of fresh milk, harvested directly from farm, in sterile containers and very well homogenised. The acidity of milk, indicated a mean value of 16.48°T (degrees Thörner), which proves a properly freshness of samples analysed. The fat content was in the range of 3,69%-4,78%. Therefore, if we relate to standard it is considered that the milk has a high fat content. The average content of casein was 2,89%. After perform the reductase test, the milk analysed was range in second quality class, with a content of 202520 NCS/mL, somatic cells, value located below maximum limit admissible in European norms. The physico-chemical analyzes have generated results which falls within the limits of specific standards, thus demonstrating, the quality of the analyzed samples. By the application of heat treatment (pasteurization/sterilization), would be significantly reduce the microbial load of milk and also, would be increase the consumer safety.

INTRODUCTION

In terms of food profile, consumers tilt the balance of preferences towards animal products. Milk is a fairly complex nutritional food, which is administered as main food from the first months of life of infants and whose contribution is indispensable for the growth and harmonious development of the body (Karoui R., 2017). In the food industry, are implemented specific standards which has a their main purpose the quality assurance and the risk prevention, by establishing and screening the critical control points. Entire population, worldwide, has the right to a healthy and nutritious diet, both in quantitative and qualitative terms. Consumers, at present, place a special emphasis on the quality of these two products, becoming more demanding both in terms of physical-chemical characteristics and hygienic-sanitary characteristics. At present, there are specific standards whose main purpose is to ensure the quality of food of animal origin, monitoring the possible risks

and preventing them through a system that analyzes the critical control points (Nollet M.L. and al., 2011).

Currently, the legislation at European level provides for the application, in any production unit and at any stage of the technological flow, of the system of identification and control of the risks attributed to the products used in human nutrition. In order to prove that the food is safe for consumption, the samples were qualitatively evaluated through sensory, physico-chemical, enzymatic but also microbiological analyzes.

It is considered that this food, due to its composition, represents a favorable substrate for the development of different species of microorganisms (Usturoi M.G., 2012). The milk samples were fresh, taken under appropriate conditions, in sterile and well-homogenized containers, within a zootechnical farm, making 25 determinations for each type of analysis.

MATERIAL AND METHODS

The milk samples were analyzed from a physico-chemical point of view, following: the degree of freshness by the Thörner method, the level of safety by the reductase sample using as resazurine and methylene blue substrate, the fat content by the Gerber method, the casein content and the number of somatic cells.

The Thörner method is the most used method for determining the acidity of milk, approved in Romania for a long time, which consists of titrating the samples with NaOH - 0.1 n, using phenolphthalein 1% as the main staining indicator (Bondoc I., Șindilar EV, 2002).

The level of milk health was assessed by the reductase method, an enzyme that is of microbial origin and has the ability to reduce certain colored substrates. They have been used as methylene blue staining substrates, whereby the enzyme reduces the amount of 5 mL of dye to substances called colorless leocoderivatives, respectively resazurine, a substance that produces reductase from samples, color changes, based on which it can classify the product in the specific quality class (class 1 / good-content blue, pastel; class 2 / satisfactory-mix purple-blue / purple-reddish; class 3 / poor-content of different shades of pink; class 4 / very poor- white colored mixture (Polushchuk P. K. end al., 2008).

The determination of the fat content (%) was performed by the Gerber method (acid-butyrometric variant), a centrifugation process that consists in separating the fat from the milk samples, based on the sulfuric acid that acts as a dissolving agent of the protein substances, in the presence of isoamyl alcohol (Zhiqian Liua end al., 2017).

The casein content of milk samples was determined by the Buruiană method, using acetic acid as the main reagent, resulting in precipitation of casein and its separation from milk, respectively titrated with NaOH-0.1n (Singh H. and al., 2014).

The number of somatic cells (NCS / mL) was determined with the help of Combiscop, a modern technique, used at European level, using special kits. For each parameter analyzed, a number of 25 determinations were performed.

RESULTS AND DISCUSSIONS

The analysis of the freshness of the milk collected from the farm was evaluated by the Thörner titrimetric method, based on the titration with NaOH 0.1 n. The values obtained after performing the titrimetric method for all 25 milk samples collected for analysis were within the standard limits. The coefficient of variation

within this analysis indicated a value of 3.09, which means that the homogeneity of the samples was very good. Considering the standard, which provides a value of free acidity between 15-19ºT (STAS 2418-61), it is considered that the obtained results are within this range. The minimum result value was 16ºT, while the maximum value was 17ºT, the difference between the two results being only 1ºT. In the case of milk acidity, an average value of 16.48ºT was obtained, located in the range 15-19, the difference between the maximum and the minimum allowed by the standard being not very large (fig.1).

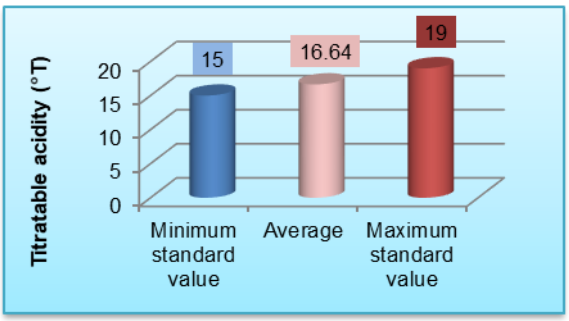

Figure 1. The titratable acidity of raw milk compared to minimum and maximum permissible values of the standard

Therefore, milk undergoing titrimetry analysis has an adequate freshness. The value of the acidity of cow's milk can serve to appreciate its technological characteristics. According to standard 6352-73, the milk must have a content of at least 3.2% fat. The 25 samples were worked under proper hygiene conditions and only sterile containers were used. In the case of the determinations made for milk samples, an average fat content of 4.06% was obtained. The analytical calculation interval was between the minimum of 3.69% and the maximum of 4.78%. The coefficient of variation reached the value of 6.65%, which shows a good homogeneity and a strictly representative average of the values. The difference between the minimum value of fat content, provided by the standard and respectively, the average value obtained is 0.86% (fig. 2).

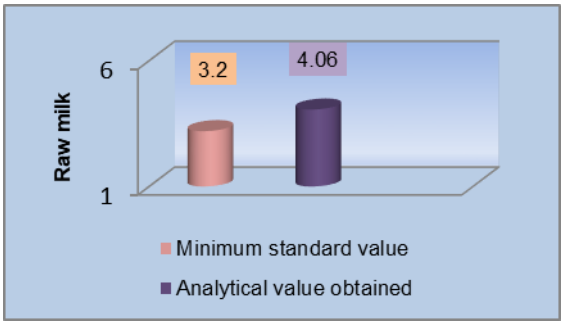

Figure 2. The fat content of raw milk, compared to the minimum value allowed by the standard

Therefore, the milk analyzed contains a significant amount of fat compared to the minimum stipulated by the specific normative acts, being considered a quality milk if we refer to the average content recorded. Therefore, the result obtained can be considered as an indicator of milk quality, the appreciation of the fat content being one of the main analyzes carried out in order to establish its quality but also for the purpose of detecting forgeries by smashing.

Casein is the main protein fraction in milk, viewed from a quantitative perspective and accounts for about 80% of total protein. It is highlighted in the milk samples in order to determine its special technological properties. The results obtained after performing the Buruiană method, by titrating the samples with NaOH and HCl were within the range of values according to the specific norms (Zsuzsanna Bösze, 2008). The average value of the casein content (2.89%) obtained after applying the statistical formulas in Excel is within the range of the values provided by the specialized literature (2.4-3.0%), which is sweet at a conclusion that denotes the fact. that the milk is technologically and physico-chemically qualitative (fig.3).

The results obtained for the twenty-five samples had values ranging from 2.27% to 3.36%, respectively the minimum and the maximum, the difference between the two data being only 1.09 percent. As a result of the statistical calculation, a coefficient of variation (C.V.) of 11.44% was obtained, which demonstrates a good homogeneity of the samples but also the accuracy of the working method.

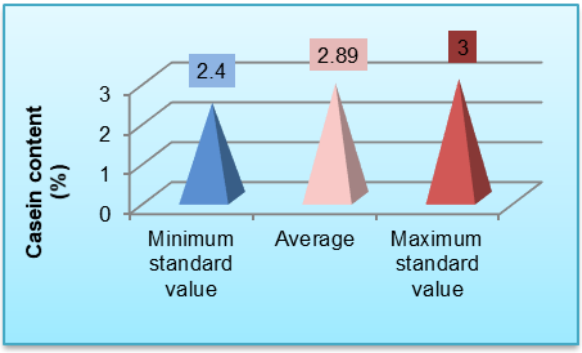

Figure 3. The average value of the casein content in milk, compared to the reference values

A total of 9 samples out of the 25 had a casein content above the comparison limit, which is an advantage especially in the dairy industry, this protein substance being considered the main constituent in the technological process of obtaining the derived products.

The concentration level of the germs characteristic of the intrinsic flora of the milk was estimated by means of the enzyme of microbial origin, on account of which it decolorizes in a certain period of time, a color substrate that was introduced in the test samples. The presence in milk of a significant number of microorganisms, leads to an increased level of reductase. Therefore, the sample substrate will become more discolored. The number of minutes elapsed from the time of incubation of the sample to the complete discoloration was measured by the reductase sample using

methylene blue and the resazurine method resulted in violet / pink shades. The time interval until the samples were discolored was between 240 and 300 minutes. The analysis of the coefficient of variation shows a good homogeneity of the 25 tested samples, having a value of 6.76%. Following the quantification of the microbial load of the milk by means of the methylene blue method, an average bleaching interval of 271.20 minutes (4.52h) resulted (fig. 4).

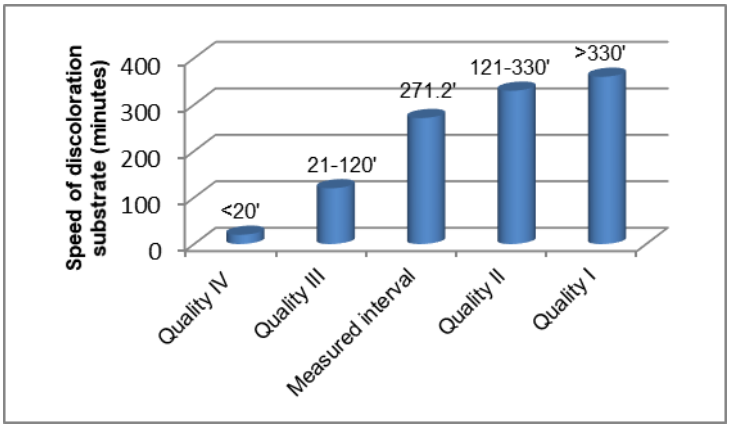

Figure 4. The hygienic quality of raw milk, appreciated by reductase test using methylene blue

In conclusion, the analyzed milk was classified in the second grade of quality, with an estimated content of up to 500,000 - 4,000,000 germs, according to the interpretation of the reductase test. An analysis of the classification by quality classes, as a result of the reductase sample with resazurine, is drawn up in figure 5.

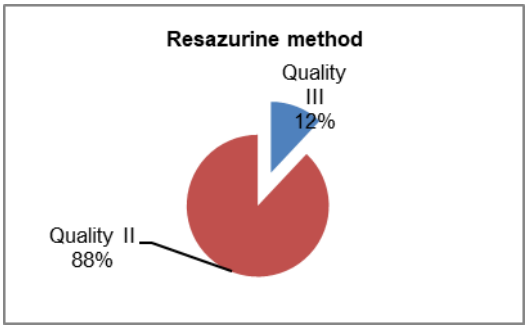

Figure 5. The distribution of raw milk samples by quality class (reductase test using resazurine)

The results of the research led to obtaining a percentage of 88% satisfactory quality samples colored in violet with shades of red and respectively a percentage of 12% samples classified in the third grade of quality.

The number of somatic cells in milk represents an indicator of the health of the animal's udder. According to the Regulation of the Parliament of the U.E. (no. 853/2004), raw milk should not exceed 400,000 somatic cells / mL. The maximum value identified by the lactoscope was 359000 NCS / mL and the minimum value reached a number of 91000 NCS / mL, which means that the milk is in compliance with European standards.

Picture 6 illustrates the comparison between the average value of the number of somatic cells and that provided by the European norms in force.

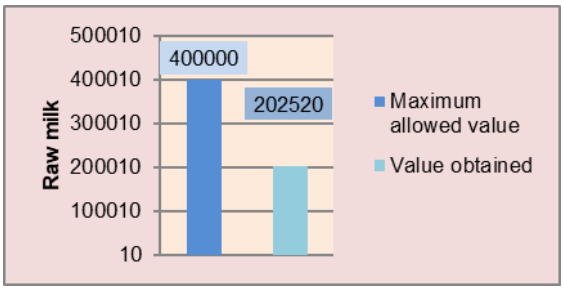

Figure 6. Comparative analysis between the number of somatic cells in the analyzed milk samples and the maximum allowed value

It is noted that the average NCS / mL of the verified milk (202 520 / mL) falls below the maximum limit specified by the U.E. regulation (below 400000 NCS / mL), which leads to the conclusion that the raw material is compliant and can be used further in the industry of obtaining finished milk products.

In conclusion, from the sensory, physico-chemical and microbiological point of view, the milk tested for the purpose of qualitative assessment has good properties, which can be used for consumption or industrialization.

CONCLUSIONS

The conclusion drawn from the research is that raw milk, freshly harvested, requires the application of heat treatments to ensure its maximum level of sanitation and, without doubt, the safety for consumption. Regarding the analyzed physico-chemical parameters, the samples fit perfectly within the specific limits. At the same time, it is recommended to periodically train the personnel on milk collection on the farm, in order to prevent the extrinsic microbial load as well as the continuous improvement of the feed rations in order to obtain milk at the level of the highest parameters of sensory and physico-chemical quality.

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FOREST SOILS FROM MEHEDINTI COUNTRY

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Keywords*: soil properties, forest soil description, Mehedinti County*

ABSTRACT

The aim of this paper is to realize a description of forest soils from Mehedinti County. The work material is represented by soil analysis data from forest managementplans made after 1988. These data are part of a huge national database collected by "Marin Dracea" National Institute for Research and Development in Forestry (INCDS). In this study, 520 soils profiles from Mehedinti County were analyzed together with a total of 1607 soil genetic horizons. The common types of soils from Mehedintii County are luvisol, eutric cambisols , dystric cambisols, preluvisols and fluvisols.

INTRODUCTION

Knowing that the biological, physical and chemical properties of forest soils represents for foresters one of the main way to assess the capacity of certain forest sites especially in terms of timber production (Schoenholtz et al., 2000).

Forest soils play an important role in hydrological, nutrient and carbon cycles (Bauhus et al., 2002). In the last decades, special attention was given to the role of the forest soils in mitigating climate change worldwide, being well known that the forest soils represent one of the most important carbon sinks (Lal, 2005; Zhou et al., 2006; Dincă et al., 2015). For example, in Europe, it was reported that the forest soils store 1.5 times more carbon than the trees (Baritz et al., 2010). The amount of the carbon stored in the soils varies depending on the type of the forests, more carbon being stored in the soils from the boreal forests in comparison with the soils from the tropical forests (Pan et al., 2011). The purpose of the present paper is to describe and present the characteristics of soil types identified in Mehedinti Forest County.

MATERIAL AND METHODS

Mehedinti County is situated in the South-West part of Romania, having all the types of relief units: fields, hills and mountains (figure1). Based on data from National Statistical Institute, the forest area from Mehedinti Forest District is 149.076 ha for de year 2015 (www.insse.ro). The surface of state forests administered by Romsilva National Forest Administration through its 8 Forest Districts (Baia de

Arama, Corcova, Drobeta Turnu Severin, Jiana, Simian,Tarnita, Topolnita, Vanju Mare) is of 119.324 ha (www. rosilva.ro).

Figure 1. Geographical localisation of Ialomița county within Romania source

The present paper has analyzed the soil samples gathered in the period 1988-2012 from 8 Forest Districts from Mehedinti County Forest Administration. A silvicultural management plan is realized for each forest district once every 10 years. During this plan, among other actions, soil samples from certain characteristic parcels are gathered and the soil type is determined based on its physical-chemical properties. These analyses are realized based on renowned national and international methodologies (Dincă et al., 2012). The present paper is based on the analyses realized for 520 soil profiles and 1607 pedo-genetical horizons.

RESULTS AND DISCUSSIONS

Forest soil types from Mehedinti Country

The most widespread soil types across the forest lands managed by Mehedinti Forestry Directorate were the luvisol (41%) followed by eutric cambisol (19%), dystric cambisol (16%), preluvisol (14%) and fluvisol (6%) (Figure 2). Other identified soil types across the county that accounted 4% of the total area were the entic podzol, arenosol, phaeozems, rendzina, vertisol, regosol.

At the country's level, dystric cambisol occupies the 1st place as spread in forest soils (2.292.35 ha, meaning 35%), luvisol the 2nd place (1.440.052 ha, meaning 22%), eutric cambisol occupies the 3d place (with a total area of 869.909 ha, meaning 13%), and preluvisol the 5th place (335.050 ha, meaning 5%), (Dincă et al., 2014).

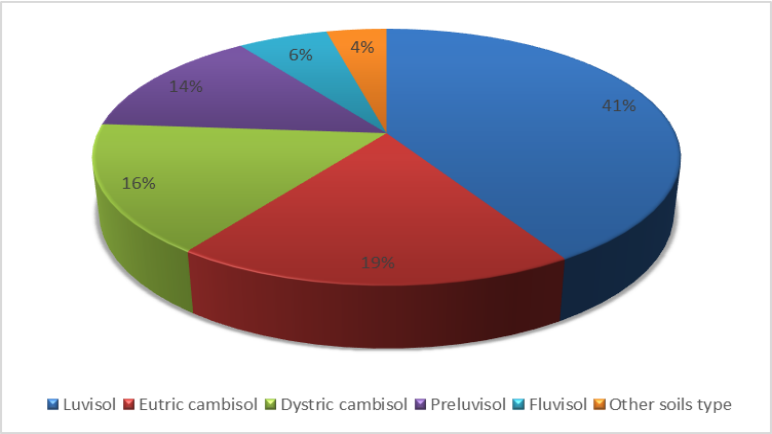

Figure 2. The percentaje of forest soils identified in Mehedinti County

The reaction of soil solution

The soil's reaction (pH) presents an extremely importance both for the soils characterization as well as for the agricultural practice.

The soil's solution reaction (pH) was calculated differentially on pedogenetic horizons for the most widespread types of soils (luvisol, eutric cambisol, dystric cambisol, preluvisol, fluvisol) (Figure 2). Dystric cambisol has an average pH of 4.33 in the Ao horizon and 4.62 in Bv, being a strongly acid soil, while eutric cambisol registers 5.48 in Ao and 5.69 in Bv, being a moderately acid soil. Preluvisol has an average pH in the Ao horizon of 4.88 (strongly acid) and 5.32 in Bt horizon, while luvisol registers 5.12 in Ao, 4.96 in El and 5.38 in Bt - moderately acid.

Dinca et al., 2019, founded for the West Romanian Plain similar values for the pH of eutric cambisols (4.99 in Ao horizont and 5.33 in Bv horizont) and for preluvisol (5.06 in Ao horizont and 5.64 in Bt horizont).

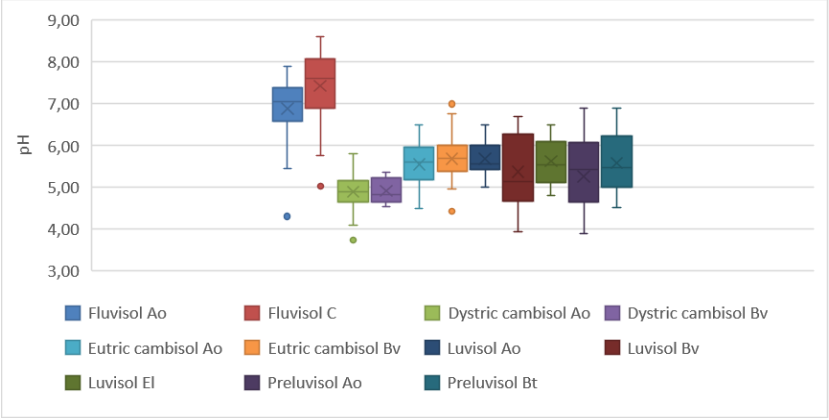

Figure 3. pH varation of genetic horizont for the most widespread forest soils from Mehedinti County

Total cationic exchange capacity

In regard with the total cationic exchange capacity, an average was calculated per profile and was rendered as table form for each type of soil (Table 1).

Dystric cambisol has a very large cationic exchange capacity, while all the other soils have a large exchange capacity. Dincă et al. (2017), have identified a cationic capacity of 20.83 for the forest preluvisol from Bihor County. For the Getic Piedmont, Enescu et al., 2019, identified a cationic capacity of 24.65 for the forest eutric cambisols. Crisan et al., 2017 found a big cationic capacity of forest soils from Braila County.

Table 1

Avarage content of total cationic excenge capacity, nitrogen, humus for forest soils from Mehedinti County

Luvisol	Eutric cambisol	Dystric cambisol	Preluvisol	Fluvisol
Total average cationic exchange capacity per type of soil (T-me 100 g^{-1} soil)				
17.73	20.01	22.67	19.02	11.94
Average humus content in A horizon (H-%)				
5.94	5.48	6.80	5.08	2.88
Average nitrogen content in A horizon (%)				
0,301	0,292	0,310	0,254	0,179

Humus

Due to the fact that the highest quantity of humus is accumulated in the first horizon of the soils, the average content of humus was calculated only for this horizon (Table 1, figure 4). Thus, the fluvisol were moderately humiferous, the eutric cambisols, dystric cambisols, preluvisol and luvisols intensely humiferous. Similar values were found by Enescu et al., 2018 in forests soils from Prahova County and by Crisan et al., 2017, for forest soils from Timis County.

Nitrogen

As in the case of the humus content, the nitrogen was also calculated only for the first horizon as both elements are accumulated through the decomposition of organic matter at the surface and in the first centimeters of the soil's profile. The lowest quantity of nitrogen was found for fluvisol, which is a well-supplied soil with nitrogen, while all the other soil types were very well supplied with nitrogen (Tabel 1, figure 4).

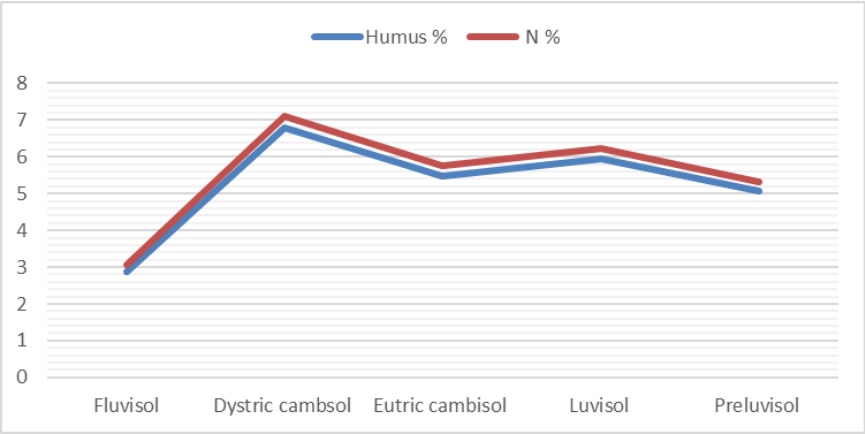

Figure 4. The varation of humus and nitrogen contents for the most widespread forest soils from Mehedinti County

CONCLUSIONS

The most common forest soils across Mehedinti County were the luvisol, eutric cambisols, dystric cambisols, preluvisol and fluvisol.

As regards the values recorded for soil pH for the main three forest soils types, the dystric cambisols are classified as acid soils, while the eutric cambisols, luvisols and preluvisol are moderately acid soils and fluvisol are moderat alkaline.

The soils vary from moderately humiferous (fluvisol) to intensely humiferous (eutric cambisols, dystric cambisols, preluvisol and luvisols), being favorable for the main tree stands across the county (beach, spruce, fir, oak).

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COLLECTION SPECIES FROM ATRIPLEX GENUS PRESENT N "ALEXANDRU BELDIE" HERBARIUM FROM "MARIN DRĂCEA" NATIONAL INSTITUTE FOR RESEACH AND DEVELOPMENT IN FORESTRY

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Keywords: *herbarium, plants, Atriplex, botanists.*

ABSTRACT

The present paper presents the morphological and ecological description of species belonging to the Atriplex Genus present in Alexandru Beldie Herbarium from Marin Drăcea National Institute for Research and Development in Forestry (INCDS), Bucharest. The research resulted in the creation of a database with information about the species, their gathering year, as well as the botanists who have identified and conserved them. The first part of the article shortly describes the herbarium and its specific, together with a presentation of the material and method used for elaborating this paper. The plants were gathered between 1851 and 1994, with a larger incidence during 1931-1950. The paper ends with a series of conclusions regarding the analysis of the Atriplex Genus species and specimens present in the herbarium.

INTRODUCTION

„Marin Drăcea" National Institute for Research and Development in Forestry from Bucharest hosts in good conditions an herbarium created in 1929 – "Alexandru Beldie" Herbarium. This collection contains approximately 40.000 plates and is inscribed in Index Herbariorum, with the international BUCF code (Vechiu et al., 2018; Dincă M. et al., 2018).

The Herbarium contains numerous plant species and genera, from which we mention: 15 *Veronica* species (Dincă et al., 2017), 29 *Allysum* species (Cântar I. et al, 2018), 41 *Polygonum* species (Vechiu et al., 2018), 80 *Trifolium* species (Cântar I. et al, 2018), 69 *Potentilla* species (Crișan, V. et al,, 2017), 19 *Scorzonera* species (Dincă and Cântar I.C. 2017), 15 *Ornitogalum* species (Enescu R. and Dincă L. 2017), and 16 *Abies* species (Enescu, C et al., 2018).

The *Atriplex* Genus comprises approximately 260 representatives confined mostly to arid and semiarid regions from Eurasia, America and Australia (Sukhorukov., et al.,2009).

The aim of this article is to present the state of this collection, to describe the species and the total number of *Atriplex* specimens (25 species), together with the date when they were collected, their location, the botanist who have collected each exemplar and their conservation.

MATERIALS AND METHODS

The work methods used are the ones characteristic to the research activity. As such, research and bibliographic documentation have played a very important role, especially from a morphologic and ecologic point of view. Together with these methods, analysis and synthesis were used as a main method for digitizing and systematizing the data from the herbarium's vouchers. Furthermore, creating the map, preparing the work, results and its conclusions have implied the analysis and synthesis of the initially systematized data.

The vouchers were grouped by species, harvest year, the place where they were harvested and by the specialist who harvested them. An excerpt of the *Atriplex* genus inventory is rendered in Table number 1.

Table 1.

The inventory of *Atriplex* genus from INCDS Bucharest's Al. Beldie Herbarium (excerpt)

Plate no.	Drawer no.	Herbarium/ Botanic collection/ Institution	Species	Harvest date	Harvest place	Collected/ Determined by:	Conservation degree (1..4)
54	19	Museum Botanicum Universitatis, Cluj / Flora Romaniae exsiccata	Atriplex hortensis L.	1944.08.05	Banatus, Timiș-Torontal	G. Bujorean	1
54	55	Bucharest Polytechnic's Herbarium, Silviculture Faculty/Botanic Laboratory	Atriplex patula L.	1944.08.19	Bucovăț village, Timiș County Torontal	S. Pașcovschi	1
54	56	ICEF, Institute of Forest Research and Experimentation	Atriplex patula L.	1937.09.12	Maxim forest, Maxim village, Buzău	C.C. Georgescu	1
54	72	Museum Botanicum Universitatis, Cluj / Flora Romaniae exsiccata	Atriplex rosea L.	1922.09.12	Moldova, Neamțu district	G. P. Grințescu	1
54	43	ICEF, Institute of Forest Research and Experimentation	Atriplex nitens Sch	1939.08.01	Constanta Carmeu forest	C.C. Georgescu	1
54	87	Museum Botanicum Universitatis, Cluj / Flora Romaniae exsiccata	Atriplex tatarica L. f incisa	1943.10.13	Banatus, Timiș	G. Bujorean	1
54	82	Bucharest Polytechnic's Herbarium, Silviculture Faculty/Botanic Laboratory	Atriplex tataricum L.	1935.09.23	Chișinău	C.C. Georgescu, I. Morariu	2

RESULTS AND DISCUSSIONS

The research material is composed of the 90 *Atriplex* genus species vouchers present in the maps of Al. Beldie Herbarium from INCDS „Marin Drăcea". *Atriplex* belongs to the Amaranthaceae family, the Caryophyllales order and has approximately 260 species.

The species of this genus present in the above-mentioned collection are the following: *Atriplex hortensis*, *A. oblongifolia* W. et K., *A. patula*, *A. patulum* L., *A. rosea*, *A tataricum* L., *A. hastata* L., *A. hastatum* L., *A. littoralis* L., *A. nitens*, and *A. tatarica* L.

The most widespread *Atriplex* species present in this herbarium are: *A. oblongifolia* W. et K. (11 vouchers), *A. patula* (10 vouchers), *A. hastata* L. (7 vouchers), *A. tatarica* L. (7 vouchers), *A. littoralis* L. (6 vouchers), *A. nitens* (6 vouchers), *A tataricum* L. (6 vouchers), *A. hortensis* (5 vouchers), *A. patulum* L. (5 vouchers), *A. rosea* (4 vouchers), and *A. hastatum* L. (4 vouchers).

Atriplex *hortensis* is a hard, annual plant, with an erect, branching stem. It varies in height from 60 cm to 180 cm, according to the variety and soil. The leaves are variously shaped, but somewhat oblong, comparatively thin, and slightly acidic to the taste. The flowers are small and obscure, greenish or reddish, corresponding to a degree with the plant's foliage colour. The seeds are small, black, and surrounded by a thin, pale-yellow membrane. They retain their viability for three years (figure 1).

Atriplex nitens is an annual plant with branched stems that are covered with hairs. The leaves are arrow-shaped, dark green on top and flour grey at the bottom. The small green flowers grow in groups that hang when the fruits are ripe. They usually appear on the plant between July and September. The plant can reach between 60 and 150 cm in height. The plant originates from southern Europe and Asia, but can survive also in more northern regions. It prefers wasteland and landfills (figura 2).

Atriplex patula is an annual plant that can grow up to 80 cm. It blooms from July to September, while the seeds ripen from August to October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by wind or insects. The plant is self-fertile. It is suitable for light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow on heavy clay soils. The suitable pH is represented by acid, neutral and basic (alkaline) soils but the plant can also grow on very alkaline and saline soils. However, it cannot grow in the shade and it prefers moist soils (figure 3).

Atriplex rosea is an annual herb with erect, hairless stems that can grow up to 1,5 meters. The leaves are green to red in colour, oval to triangular to lance-shaped, and with smooth to wavy edges. Each leaf has three prominent veins and is up to 6 centimetres long and 3 centimetres wide. The male and female flowers are born in clusters or spike like inflorescences. The plant originates from southern Eurasia and eastern North America (figure 4).

Figure1. Atriplex hortensis

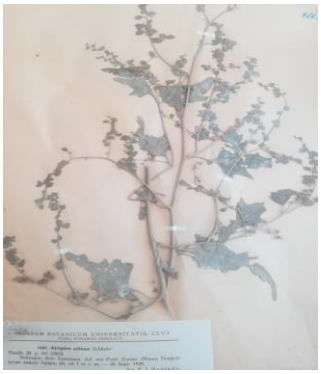

Figure 2. Atriplex nitens

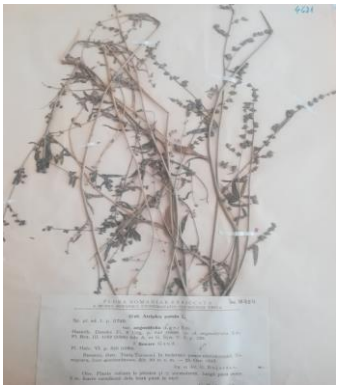

Figure 3. Atriplex patula

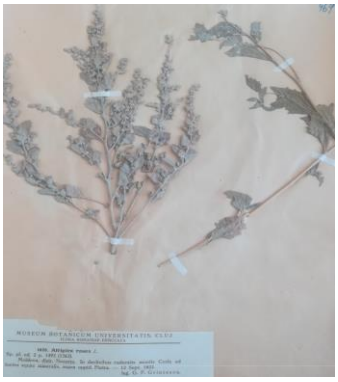

Figure 4. Atriplex rosea

The plant's harvest years. The plants were gathered in a time period ranging between 1851 and 1994. The oldest plant of this genre is *Atriplex littoralis L.*, collected in 1851. The periods in which the majority of plants were gathered was 1931-1950 (Figure 5).

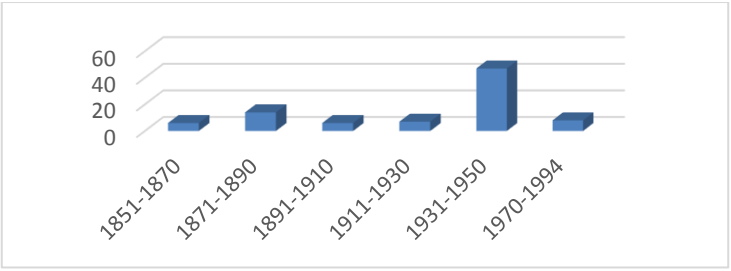

Figure 5. Harvesting periods for *Atriplex* plants from Al. Beldie Herbarium

CONCLUSIONS

"Alexandru Beldie" Herbarium contains more than 40,000 vouchers, from which 480 vouchers belong to the Atriplex genus.

Even if the first Atriplex samples were collected almost 143 years ago, the majority of them are in a good conservation state, meaning that the methods used for preserving the biological materials were adequate.

The plants from this herbarium were gathered between 1851 and 1994, reaching a maximum in the period 1931-1950. Furthermore, they were gathered by renowned Romanian and foreign botanists (C. Georgescu, E. I. Nyarady, S. Pascovschi, G. Bujoreanu). The plants were gathered from Romania (Bucharest, Cluj, Constanta, Timis, Neamt, Buzau), as well as from some European areas (France, Italy, England, Moldavia). The plants are in a good conservation state.

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RESTORATION OF RIPARIAN FORESTS IN MACEDONIA, N. GREECE

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Keywords*: riparian forest, restoration, Nestos river, Volvi lake, Protected areas management*

ABSTRACT

Riparian forests are among the most dynamic in functions and biodiversity ecosystems. Their existence is in danger by the intense human activities and pressures. There are quite a few riparian forests preserved today, while most of them have been downgraded and shrunk considerably. The restoration and rehabilitation of existing degraded riparian forests and their restoration to areas that existed and displaced due to other human activities is everyone's responsibility. Purpose of this paper is to present selected examples of riparian forests rehabilitation in rivers and lakes of Macedonia, N. Greece, such as the riverside forest in the Nestos Delta and Lake Volvi. The rehabilitation results were impressive in cases where there was protection of re-afforested surfaces from human presence and pressures.
In Volvi lake (New Madytos), the monitoring of the success of afforestation showed that Populus and Platanus trees had a survival rate of 80.2 and 85.2 %, respectively. In Nestos Delta, about 85-90 % of all planted trees survived and have reached in very good values at a maximum height and diameter 10 years after plantation.

INTRODUCTION

The riparian forests are the main category of wetland ecosystems, which until the last century had suffered from intense degradation and shrink because of human activities and pressures. The riparian forest occur along the banks of rivers, small streams and lakes. They form linkages and material flows between terrestrial and aquatic ecosystems (Efthimiou 2000, Keeton et al 2007).

Lack of management of wetland ecosystems during the last decades led to degradation, shrinking and often disappearance of riparian forests, in global level. In North Greece, Macedonia and Thracian, there are important riparian forest at the Rivers Nestos, Strymon, Evros, Ardas, Axios, Aliakmon and at the lakes Volvi, Doiran, Agras (Efthimiou 2000, Spanos et al 2004, Grigoriadis et al 2016).

Most of the riparian forests, while are located in protected areas and within the administrative boundaries of Management Bodies of Protected Areas, are often ecologically downgraded and shrunk in size due to intense anthropogenic pressures. The preservation of the existing riparian forests and, above all, the restoration and rehabilitation of the degraded ones must be the main management concern of the forestry service and the scientific bodies scientifically related to them. Restoration of wetlands through reforestation is a common practice worldwide. In cases of extraordinary ambitious programs, thousands or even millions of hectares, mostly of former agricultural use, have been restored (King et al 1999, King et al 2006).

Selection of appropriate plant species being very important to ensure a self-sustained vegetation cover (Zhao et al 2015).

There are too many examples of restoration, rehabilitation and restoration of riparian forests in wetland ecosystems at international level. Similar examples of rehabilitation and restoration of riparian areas also exist in Greece, mainly in rivers and lakes of Macedonia such as the Nestos River and the lake of Volvi.

The purpose of this paper is to study the main problems and to present selected examples of riparian forests restoration in rivers and lakes of Macedonia.

Figure 1. Map of Greece with Restoring riparian forest areas:
sotseN * Delta and ♦ Volvi lake

MATERIAL AND METHODS

This paper presents selected examples of the restoration of riparian forest ecosystems in two regions of Macedonia. At the sample plots of these areas, was measured the viability, diameter at breast height (Dbh) and total height of the tree species planted and also their distribution per storey (classified according to the IUFRO classification). The statistical analysis was made using SPSS ver 21. In the last decades with the establishment and operation of protected area Management Bodies has increased the interest in the protection, conservation and recovery of riparian forests, particularly those belonging to one Management Body. There with the Forest Service developed and implemented several studies restoring riparian forests (Figure 1) as in Volvi lake (Efthimiou et al 2014) and the Nestos delta (Efthimiou and Jerrentrup 2013).

RESULTS AND DISCUSSIONS

a. Restoration the Riparian Forest of Nestos Delta.

The riparian forest of Nestos river is considered one the largest and natural in Southeastern Europe. Because of its outstanding biodiversity the Nestos Delta is a Ramsar Site, a Site of Ecological European Network “Natura 2000” (GR1150001 & GR1150010) and since 1996 a National Park with international ecological interesting. In 2002 an EU-LIFE supported program (LIFE02 NAT/GR/8489) started restoring about 65 ha of riparian forest in former poplar plantations and agricultural areas under exclusively ecological criteria as new initial plots for a broader regeneration (Figures 2 & 3). According to soil type and the distance from the river bank ware planted in 2003 and 2004, the appropriate riparian tree and bushes (Efthimiou and Jerrentrup 2013).

Figures 2 & 3. left: 3 years after plantation and right: 5 years after plantation (Photo: G. Efthimiou).

The riparian forest plots have developed, 10 years after plantation. The scientific results were astonishing (Table 1) and showing the still existing outstanding natural dynamic and potential of the ecosystem of Nestos Delta. About 85-90 % of all planted trees survived and have reached a maximum height and diameter of respectively: *Populus alba* (21 m & 35 cm), *Salix alba* (25 m & 55 cm!), *Fraxinus angustifolia* (5 m & 24,5 cm), *Alnus glutinosa* (24 m & 40.5 cm) and *Quercus robur ssp. pedunculiflora* (17 m & 20 cm) (Efthimiou and Jerrentrup 2013).

Table 1. Data of Diameter (D) and Height (H) per riparian tree species 10 years after plantation in Nestos Delta (Efthimiou and Jerrentrup 2013).

Species	**N**	**D max**	**H max**
Populus alba	61	35	21
Salix alba	80	55	25
Alnus glutinosa	113	40.5	24
Ulmus minor	11	5.5	8.2
Quercus robur ssp pedunculiflora	68	20	17
Fraxinus angustifolia	86	24.5	5

b. Restoration the Riparian Forest of Volvi lake.

The area of study is the riparian forest reforestation in the riparian area of Nea Madytos, Volvi lake depicted in Figure 1, which is protected by national, European and international Conventions Specifically (Efthimiou et al 2004). The area of study belongs to the areas of Ramsar Convention on Wetlands, the Convention of Barcelona, the Convention of Bern and the Network of Natura 2000, as special protected area (S.P.A.) with code number GR1220009. The reforestations in N. Madytos were made by a study commissioned by the N. Madytos municipality (1993) to private foresters and was carried out under the supervision of the Stavros Forest Office in 1994.

Figures 4 & 5. Planted sites in Volvi lake, left: *Platanus orientalis* plots and right: *Populus alba* plots (Photo: C. Kaskaneta).

From the analysis of measurements, in reforested riparian areas of Nea Madytos of the Volvi lake (Figures 4 & 5), were found the following results. Regarding the height of trees, *Populus* outweighs *Platanus*. The highest *Populus* tree measured had height 40.5 m, the lowest one 20 m, while the highest *Platanus* measured 35 m and the lowest one 13 m. Concerning the diameter (D), no differences were observed between the two types. The highest rate d measured was 51 cm and involved both species, while the lowest rate was 14 cm and was measured on Populus tree. They are mainly one-storey pure plots (Table 2), where about the 95% of trees are located at overstorey and just 5% at middle-storey (Efthimiou et al 2014).

Table 2. Tree distribution per storey of plots *Populus alba* and *Platanus orientalis* (Efthimiou et al 2014).

Species	**N/ha**	**Overstorey (%)**	**Middlstorey (%)**	**Understorey (%)**
Populus alba	494	467 (95%)	27 (5%)	- (-)
Platanus orientalis	520	490 (94%)	30 (6%)	- (-)

CONCLUSIONS

The results in Nestos Delta show the enormous dynamics and potential for restoration of this riparian area and should encourage others to restore former riparian forest areas.

Particularly impressive is the Natural Regeneration. Especially *Salix alba* shows strong tendencies for natural regeneration inside the planted plots, following linear depressions that are regularly flooded; here the density of seed grown trees is up to 40 ex. per m2 reaching 1.6 – 2.05 m of height.

At higher areas inside the plots natural regeneration took place by *Ulmus minor* and *Fraxinus angustifolia* reaching 2.80 - 3.50 m height and *Fraxinus angustifolia* from 3.55 m to 5.00 m, with maximum diameter of 2.55 cm and 3,09 cm respectively (Efthimiou and Jerrentrup 2013).

The results in Volvi lake are interested. The monitoring of the success of afforestation in New Madytos showed that *Populus* and *Platanus* trees had a survival rate of 80.2 and 85.2 %, respectively (Efthimiou 2017). In contrast the species Salix and *Ulmus*, survival success was limited to about 1/3 and 1/4 of the initial number respectively. The *Populus* and *Platanus* species are fast growing trees (Efthimiou 2017). The measurements have shown that almost 20 years after reforestation with these species at the riparian areas of lake Volvi. The data of structure show that the G are almost double for the *Populus* clumps from the *Platanus* plots (Efthimiou et al 2014).

As a general conclusion, from the experience up to date in cases of restoration of riparian forest vegetation, in riparian protected areas of Northern Greece in the region of Macedonia, it can be said that it was very good and with impressive success. This experience should be applied to other riparian areas in order to restore the riparian forest vegetation in size and quality. Controlled access in necessary measure for the protection and restoration of riparian forest ecosystems. This will protect plantings from human activities, such as destruction, logging, fire, grazing, and the impressive restoration of riparian forests will be quickly achieved.

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RESEARCH ON THE VIEWS OF RESIDENTS FOR TITHOREA'S AESTHETIC FOREST (GR2450005), CENTRAL GREECE

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Keywords*: Aesthetic Forest, views, management, protected area*

ABSTRACT

Aesthetic forests belong to the protected areas. Tithorea's Aesthetic Forest is one of 19 in the country. It is located in central Greece and belongs to NATURA 2000 as a Special Area of Conservation (SAC) - Code GR2450005, which is unknown to 73.3% of respondents. This paper presents the views of the local residents the Tithorea's Aesthetic Forest. The main problems recorded were garbage (96.7%) and destruction of existing infrastructure (86.7%). Upgrading the forest with new plantings, building ecotourism, environmental education and promotion the aesthetic forest are the main suggestions of the locals for the area. 93.3% believe that the local government should protect and promote the forest while 86.7% consider the aesthetic forest as a reference point for the wider area.

INTRODUCTION

Several studies emphasize the importance of using local people's views as starting for the design and implementation of appropriate management plans for sustainable development (Keftoyanni et al 2010).

Aesthetic forests are one of the categories of protected areas. The Greek protected areas catalog includes nineteen (19) Aesthetic Forests (Efthimiou 2008). One of them is the Aesthetic Forest (A.F.) of Tithorea located in Central Greece. It has a total surface area of 200 Ha and was declared in 1979, 40 years ago.

It is located above the homonymous village of Tithorea and extends at an altitude of 500 to 1200 meters (Figure 1). It is a forest with rich biodiversity. The dominant forest vegetation consists of *Pinus, Abies, Quercus* and the fauna of the area is rich. It is part of the European Ecological Network Natura 2000 as Special Area of Conservation (SAC) - "N.A. Parnassos-Ethnikos Drymos Parnassou-Dasos Tithoreas" with Code GRD4520005. (www.ypeka.gr).

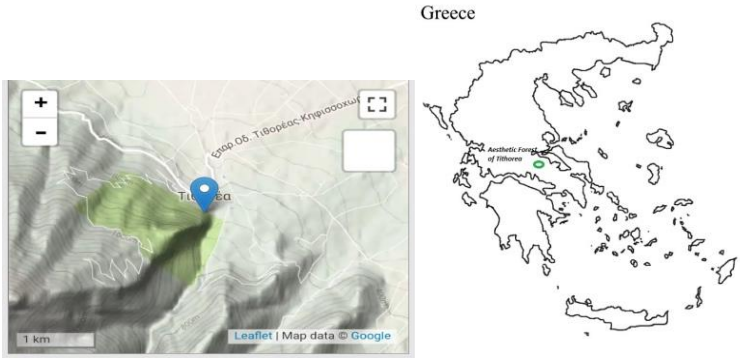

Figure 1. Map of Tithorea's Aesthetic Forest (Google Map data).

The purpose of this paper is to record the views of the local people regarding the Tithorea's Aesthetic Forest.

MATERIAL AND METHODS

For the needs of the work described in this paper, 70 questionnaires were filled in, at the Tithorea village, namely within the aesthetic forest. The objective of the distributed questionnaire was to record the visitors profile, their interests and their opinion about the area condition and status. The statistical analysis of the questionnaires was carried out with the SPSS 14.0 statistical package.

RESULTS AND DISCUSSIONS

The questionnaire analysis has shown that 81.7% of the visitors were male and 18.3% female. The half of the visitors is middle-aged, 36.7% of them are between 31-45 years old, and 16.7% are between 46-60 years old, while the younger visitors between 19-30 years old are 30.0 %. The visitors with age more than 60 years old are only 8.3 %.

The vast majority of the visitors come from the same periphery of Central Greece. 46.7% of respondents work in the private sector. 73.3% were unaware that the forest belongs to a protected area, even though the area is adjacent to Parnassos National Park, while only 6.7% of the sample is a member of any environmental organization.

Interesting are the answers to the question of prioritizing the main problems of the Tithorea's Aesthetic Forest. 91.7% of the respondents ranked garbage (old furniture, cars and rubbish) in the top three problems (40% of them consider it to be primary). In the same ranking (ie in the first three) ranked: 86.7% of the damage to forest infrastructure (benches, lighting, signs, etc.) and 96.7% of the cleanliness (garbage, graffiti). Issues related to marking, animal manure, and visitor safety are at least a non-existent problem for respondents. In the first three problems were classified: vegetation density and accessibility were considered by 8.3%, poor lighting by 20%, stray animals by 6.7%.

In exploring residents' views of the factors they consider necessary for the development of leisure and the improvement of aesthetic forest infrastructure, the first priority is the cleanliness of the site (judged useful by 96.7%) and follows: cleaning and grooming of the forest 91.7%, the planting of young trees 90%, the attraction of new species of fauna 81.7%. As for ecotourism infrastructures, residents

find it useful to create: hiking and cycling trails 60%, sports infrastructure 50%, bird watchers 50%, training and information space 48.3% while events are only interested in 41.7%.

About 26.7% of respondents visit the area once a month while 63.3% rarely visit it. The reason for the visit is: 68.3% for recreation and walking and only 10% for sports, and there is a 28.3% for firewood.

At the same time, we asked respondents to evaluate or rate a number of aesthetic forest infrastructures. Many consider it very necessary for the area: 20% sports infrastructure, 18.4% signage, 15% information center creation, 8.4% site surveillance and security, 31.7% room lighting, 22% easy access and parking 22%, information placement plant and animal signboards 31.6%, environmental and cultural events 18.4%, while the establishment of a catering shop is considered essential for only 15%, and promotion and advertising is only 13.4%.

In terms of recording residents' views on proposals for aesthetic forest, the majority (95%) agree that Aesthetic Forests are an important category of peri-urban green belt for the city and that the cities with Aesthetic Forest are more favored. Also 98.3% believe in the preservation and upgrading of the forest with plantations. 60% believe that residents have a role in protecting and enhancing the aesthetic forest and 69.9% believe that the situation would be better if there was cooperation between residents. However, 93.3% consider that protection should be the responsibility of the local government while 86.7% consider the Aesthetic Forest as a reference point for the area.

CONCLUSIONS

From the profile of the residents involved in the survey, it appears that they are middle-aged people, mainly with basic education. Most (63.3%) rarely visit the Aesthetic Forest. This is reasonable because the inhabitants of the village of Tithorea have direct visual contact with the forest, so it is an element of their daily life. According to a study in the Steni's Aesthetic Forest, the people who visit it more often are the residents of nearby big cities (Chalkida, Athens) who are looking for an excursion in nature at the earliest opportunity (Efthimiou and Karageorgos 2010).

A major problem recorded by respondents for Aesthetic Forests (A.F.) is cleanliness (96.7%) and infrastructure vandalism (86.7%). The same problems are prevalent in similar surveys for the Aesthetic Forest Tempi (Efthimiou et al. 2014) and in A.F. of Steni (Efthimiou and Karageorgos, 2010).

The creation of ecotouristic infrastructure, the proper and methodical promotion and the organization of events in the area of the aesthetic forest will be the motive for more and more frequent visits by the inhabitants of the area. The information is deemed necessary and this is due to the fact that the vast majority of the respondents do not know about the ecological importance of A.F. Tithoreas, it belongs to NATURA 2000 although they live on the borders of Parnassos National Park. Similar ignorance of residents was reported by Efthimiou et al (2012) in a similar survey on the Metamorfosi's Marsh. Tan Geok-Chin Ivy et al (1998) claim that through knowledge and awareness, positive values and attitudes are developed. Knowledge is considered as precondition for appropriate action (Engleson and Yockers, 1994). The results of this research, can be used for further development of environmental programs regarding to environmental sensitization to all residents.

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RESEARCH ON THE EVALUATION OF METABOLIC LIPIDIC PARAMETERS FOR THE "ROMANIAN SPOTTED" CATTLE BREED IN DIFFERENT PHYSIOLOGICAL STATES

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Keywords: *biochemical parameters, cattle, lipids, metabolism*

ABSTRACT

This paper presents the evaluation of 5 lipidic parameters (cholesterol, triglycerides, HDL, LDL and total lipids) at cattle found in different physiological categories belonging to the "Romanian Spotted" breed. *The research was conducted on three groups of animals: 12 lactating cows, 12 in advanced gestation and 12 non-lactating cattle. Significant fluctuations were observed at the results of lactating cows, triglycerides and HDL presenting low values compared to other physiological categories. The values obtained at lipoproteins with low density (LDL) were significantly lower in the dry cow group. The cholesterol and total lipids values showed uniformity for the three batches. As a result of the researches carried out there is a possible variation of the lipid indicators, depending on the physiological state of the studied animal.*

INTRODUCTION

Lipids are an essential source of energy for the animal body [6] the concentration of biochemical parameters is important in cases of early diagnosis of certain diseases *(Giuseppe P. et al, 2012).*

Fats are the basic components of ingested food, from a nutritional point of view, they are considered to be indispensable substances for life, which ensure the functionality of the body *(Boișteanu P.C. and Iolanda M., 2002).* These are found in the cells of all tissues, facilitating the physiological, biological and chemical processes, representing the most concentrated energy reserve of all organisms (*Gross JJ. et al, 2013).* Knowing the concentration of energy metabolism indicators is very important in cases of early diagnosis of certain conditions *(Gross J. et al, 2011).* Lipid metabolism changes its activity depending on certain factors the age, sex or health status of the animal.

The lipids used for the functioning of the body come from two sources, from ingested food or they can be synthesized by the liver *(Sepulveda-Varas P. et al, 2014).* When the energy needs of the body are increased, the necessary energy is provided with the help of free fatty acids. Fats are used immediately for energy or stored in adipose tissue *(Ruginosu E. et al, 2011).*

MATERIAL AND METHODS

In this paper have tracked the plasma lipids levels in a cattle study group in different physiological states. This study was conducted on a group of 36 cattle, of which: 12 lactating cattle (the second lactation month); 12 dry cattle (pregnant); 12 non-lactating cattle (culled). Five investigations were conducted on each animal: cholesterol, triglycerides,high density lipoprotein (HDL), low density lipoprotein (LDL) and total lipids.

The age of the cattle was 4-5 years old for cattle from the lactating and pregnant group and 7-8 years old for the non-lactating cattle. Daily milk production at the time of the study was 21 kg of milk for each animal.

Blood samples were collected from the jugular vein through venipuncture. Vacutainers with no additives were used and the harvested blood samples were centrifuged at 3000 rpm for 10 minutes in the JP Selecta Cencom II Centrifuge. The determination of plasmatic parameters was performed using the Cormay Accent 200 automated analyzer. The analyzer was connected to a computer and a printer, the results being available shortly after the harvesting.

The statistical calculations were performed with the IBM SPSS V.22 program.

RESULTS AND DISCUSSIONS

Cholesterol is synthesized from acetylCoA in liver cells *(Onasanya GO. et al, 2015)*. Both cholesterol derived from food ingested by animals and from endogenous origin, reach the level of the liver via blood in the form of lipoprotein particles *(Kessler EC. et al, 2014).*

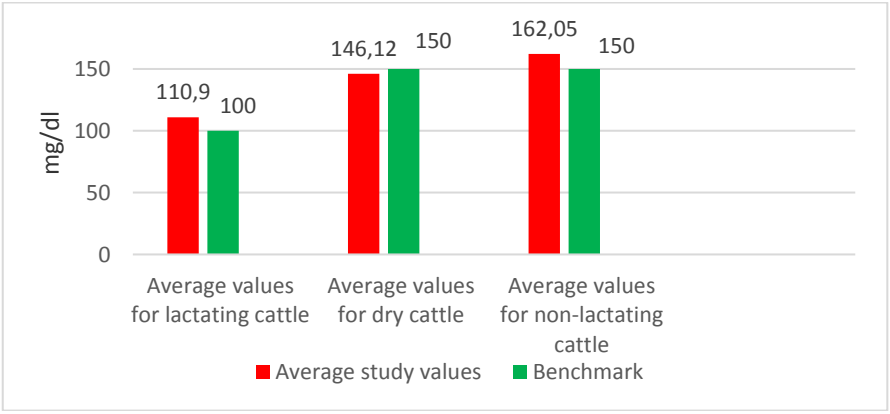

Figure 1. The average values of the cholesterol levels obtained for the three studied groups, compared to those in literature

In lactating cows we obtained an average cholesterol of 110.90 mg/dl, although this value is higher than in the literature (100 mg/dl) *(Santos JE. et al, 2010*), the twelve cows studied had cholesterol level in normal parameters. In the case of dry

cows, the cholesterol values we have obtained fall within the characteristic limits of this physiological state, but the average is higher than in the case of lactating cows. In the group of reformed cows, one individual presented with hypercholesterolemia, assuming that this condition was reached due to the fact that this category is subjected to a fattening process.

Triglycerides account for over 95% of adipose tissue fat *(Jożwik A. et al, 2012).* These are also called neutral fats, being glycerol esters. Liver and adipose tissue are the main triglyceride producing plants *(Kang SW et al, 2010).*

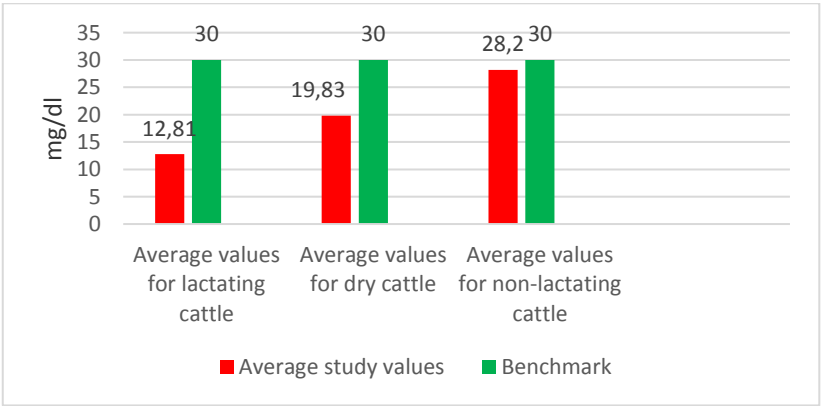

Figure 2. The average values of the triglycerides levels obtained for the three studied groups, compared to those in literature

The level of triglycerides in cattle is within the limits of 15-45 mg/dl, with an average of 30 mg/dl *(Guretzky NA. et al,2006).* The value of triglycerides can be modified by several factors: nutrition, microclimate, age, physiological status etc. *(Kim IH. and Suh, 2003).*

The values we have obtained in the case of lactating cows are lower than the values obtained from pregnant and reformed cows, because additional energy consumption is required for milk production.

In the case of pregnant and reformed cows, the values obtained fall within the normal limits reported in the specialized literature, but the average on the studied population is lower than that of the specialized literature *(*González LA**.** *et al, 2008)*.

High density lipoprotein. According to the literature, one HDL particle contains about 75-90 proteins that are controlled by two, three apolipoproteins *(Giuseppe P., 2012)*. The HDL reservoir represents the hepatic and intestinal part, these lipoproteins being continuously released to aid the transport of fat molecules that block in the artery walls *(Coroian C.O., 2017).*

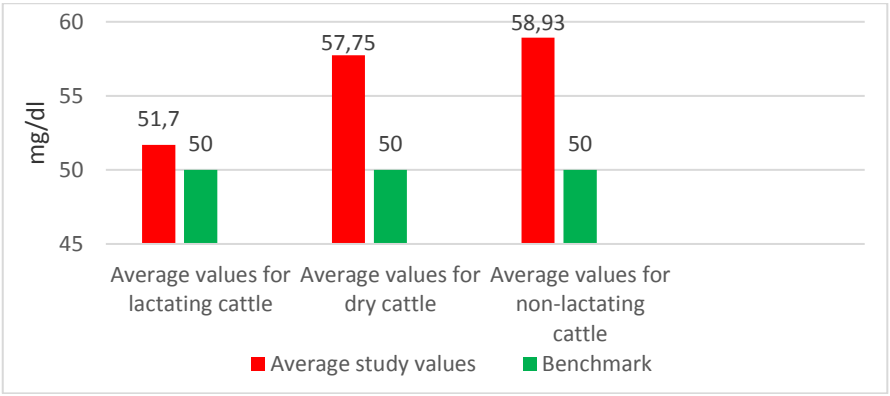

Figure 3. The average values of the HDL levels obtained for the three studied groups, compared to those in literature

In the case of dairy cows, we observed a uniformity of the values obtained, in fact the average of this lot (51.7 mg/dl) is the closest to the average reference values *(*Bjerre-Harpøth *V. et al, 2012).* The dry and reformed cows we studied had high density lipoprotein values, higher than the values recorded in lactating cows. Reformed cows have the highest standard deviation from the average, but still fall within normal limits.

Low density lipoproteins (LDL) are formed from intermediate density lipoproteins after the process of hydrolysis of triglycerides, cholesterol being the predominant lipid in the composition of these lipoproteins *(Botezatu A. et al, 2014).*

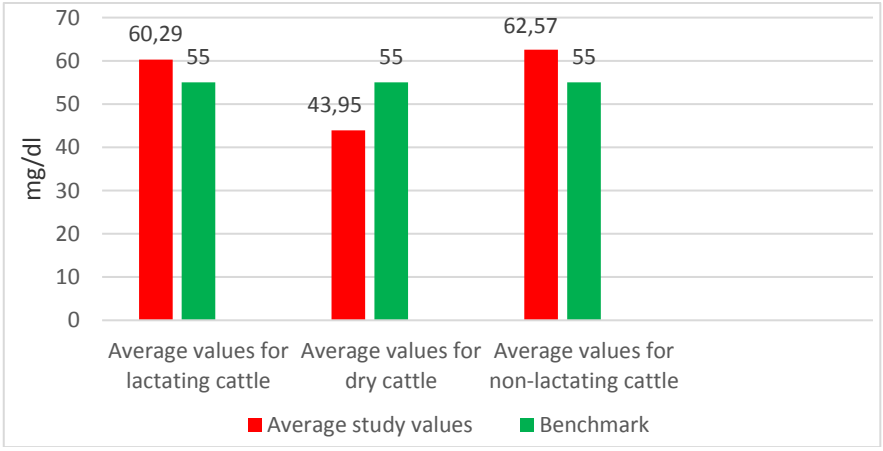

Figure 4. The average values of the LDL levels obtained for the three studied groups, compared to those in literature

Because low density lipoproteins are considered to be "bad cholesterol" *(Sow A. et al, 2014),* the values of this parameter should be as low as possible, so in the literature the variation limits are between 0-110 mg/dl, with an average of 55 mg/dl , regardless of the physiological state of the animal *(Lazăr R. and Boișteanu P.C., 2012).*

Following the study I observed that in the case of this indicator, the values obtained are noticeably lower in the case of dry cows, compared to the other two categories of cows studied. Although in the case of lactating and reformed cows this parameter registered higher values, however all the obtained results fall within normal limits.

The total lipids found in the plasma are the optimal form that favors the transport of fat from the place of acquisition or synthesis to the target organs *(Omeje JN. and Anene, 2012).* From an energy point of view, lipids play a very important role because it helps the animal body to store energy in a very concentrated way *(Radkowska I. and Herbut E al, 2014).*

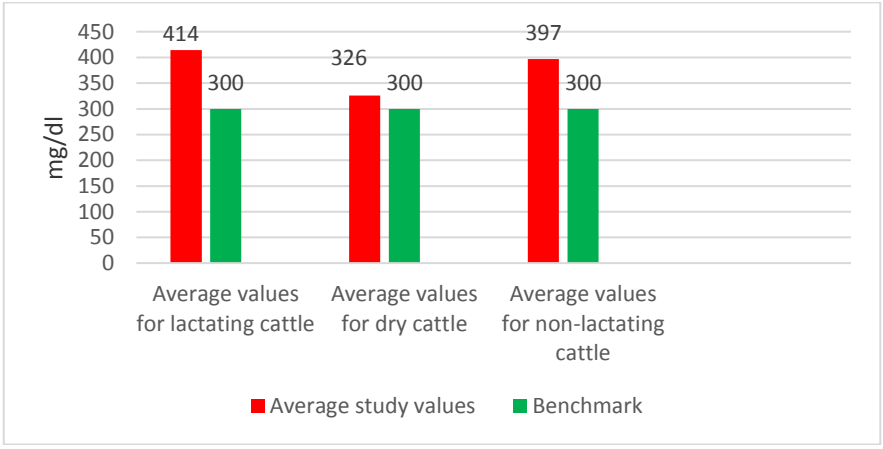

Figure 5. The average values of the total lipids levels obtained for the three studied groups, compared to those in literature

In the case of total lipids, the average reference values vary greatly, with limits between 150-450 mg/dl with an average of 300 mg/dl *(Cavestany D. et al, 2005).* As can be seen in Figure 5, the average values obtained are higher than the average values in the literature. These results show us that the animals were properly maintained, being in full health. Only in the case of reformed cows, we have obtained to an individual values above the maximum limit given by some researchers, but this is not a cause for concern of the farmer because after fattening the cattle of this category are destined for slaughter.

CONCLUSIONS

Parameters of lipid metabolism are those that provide incipient information on subsequent metabolic disorders.The dairy cow's body passes regularly through tumultuous changes that must be sustained through rational exploitation. As a result of the researches carried out there is a possible variation of the lipid indicators, depending on the physiological state of the studied animal.

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PERFORMANCE ANALYSIS OF AYRANCI WATER USER ASSOCIATION IN KARAMAN, TURKEY

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Keywords*: Agricultural Water Management, Financial performance, Irrigation Systems, Water Delivery Performance, Water Organizations.*

ABSTRACT

This study was performed to examine performance of Ayrancı Water User Association, AWUA, during periods 2015-2017. As water delivery performances; Annual Water Delivery per Unit Command Area, AWDUCA, Annual Water Delivery per Unit Irrigated Area, AWDUIA, Irrigation Ratio, IR, and as finacial performances; Money Collection Ratio, MCR, and Number of Staff Employed at Unit Area, NSEUA were evaluated. In results, AWDUCA, were found as about 8511 m^3/ha, 1665 m^3/ha and 9261 m^3/ha for 2015, 2016 and 2017, respectively. AWDUIA, was found maximum as about 5266 m^3/ha in 2017 and minimum as about 3154 m^3/ha at 2016. IR were found as about 180%, 53% and 176% for 2015, 2016, and 2017, respectively. MCR, were found as about 22%, 36% and 58% for 2015, 2016 and 2017, respectively.

INTRODUCTION

The study region, Karaman province of Turkey, is located at transitional zone between Middle Anatolia and Mediterranean climates. In Karaman, field crops such as cereals, sugar beet, sunflower and maize are common. Apple tree is top rank as production area and as production. Vegetables such as tomato, cucumber and watermelon are also growth in study province. As a result, climate of such region is suited for most of the field crops, fruit plants and vegetables. In general, sprinkler irrigation system is common for irrigation of field crops such as sugar beet, dry bean, and squash and so on in region. Trickle irrigation system is widely used for irrigation of maize crops.

Both sprinkler and drip irrigation system has designated and installed onto the farmlands by recommendations of staff of pipe producer factory and in accordance of farmers experiences.

One of the most important advantages of both sprinkler and drip irrigation systems is better irrigation efficiency as well as labor saving during the irrigation period (Charzaoulakis & Bertaki 2015).

In making irrigation program, some information relevant to crop type, soil and atmospheric conditions, characteristics of cultivation area are needed. Well management of irrigation systems is very important for increase irrigation efficiency.

Innovative irrigation systems, sprinkler and trickle, have resulted about 50-60% water saving under correct management (Kodal & Ahi 2018).

As it is known that most of the fresh water resources have been used in irrigation and even more than world average at semi-arid Konya Closed Basin of Turkey. Irrigation has the highest cost within the total agricultural production inputs in water shortage regions such as in our research region. Especially in water scarce environments, water management leading to irrigation water savings is necessarily prerequisites for sustainable use of current water resources.

In accordance of some studies (Acar & Yilmaz 2018; Ekinci & Acar 2018) efficiency of water uses in agriculture is highly relevant to quality of agricultural water management and level of cooperation between water organizations and water users.

Water management can be defined as 'development, distribution and use of water resources with great care resulting maximum benefits from unit water use'.

Efficient management of crop pattern is vital important role to play in better water productivity so it should be in accordance of current water supplies in region. Preference of drought-tolerant crop is one of the most important ways for sustainable water management especially in water scant regions (Seymen et al. 2019).

Süheri & Topak (2005) stressed that performance of water organization is highly affected from level of technical experiences of staff employed at water organizations.

In water scant climates such as Konya Closed Basin of Turkey, it is almost impossible for crop production without irrigation due to none uniform rainfall in time and place (Yavuz et al. 2015 a,b).

There are two irrigation program namely full and deficit. In full irrigation, whole crop water requirement is met by every irrigation event so there is no water stress for crops during the whole vegetation period. In deficit irrigation, certain amount of water, not resulting significant yield reduction, of crops is not accessed in crops.

Trickle irrigation system is very suitable for deficit irrigation applications. In accordance of field researches at our region, up to 25% deficit irrigation by trickle irrigation system had no resulted significant yield reduction in some crops such as sugar beet, maize and potato so it is practical solution for sustainable use of water supplies in water poor environments (Acar et al. 2014).

In obvious that maximum crop yield is obtained from full irrigation conditions and that irrigation schedule can be recommended at agricultural lands with no water shortage (Yavuz et al. 2018). In brief, if the farmer's goal is to get maximum yield full irrigation; to put more area into production deficit irrigation is recommended.

So far almost none study was performed about the performance assessment of AWUA at Karaman, Turkey. The aim of current research, therefore, was to analyze efficiency of AWUA, and to give practical solutions for better water productivity in irrigation.

MATERIAL AND METHODS

This study was conducted at Ayrancı province of Karaman, and data were obtained from records of AWUA, General Directorate of State Hyraulic Works, DSI, and from farmers by face-to-face survey technique.

Performance of AWUA was determined by using some well known indicators (Table 1).

RESULTS AND DISCUSSIONS

The number of farmers registered and unregistered to AWUA was about 232 and 909, respectively with total 1141 in accordance of 2017 records.

Annual Water Delivery per Unit Command Area

In research, Annual Water Delivery per Unit Command Area, AWDUCA, for 2015, 2016 and 2017 were found as about 8511 m^3/ha, 1665 m^3/ha and 9261 m^3/ha, respectively (Table 2).

Sönmezyıldız & Çakmak (2013) reported about 4311 m^3/ha for Beyazaltın Water User Organization. AWDUCA for Goksun, Andırın, Keysun and Kayacık were stated as 7648 m^3/ha, 8751 m^3/ha and 6730 m^3/ha. Cihan & Acar (2017) reported AWDUCA as about 10360-13240 m^3/ha for Çumra Ova Water User Association, ÇOWUA, depending on examined years. In this study, it was found as about 9261 m^3/ha for 2017. Our finding was found more than the result of Sönmezyıldız & Çakmak (2013) and is lower than Cihan & Acar (2017).

Table 1.

Criterias used at performance evaluation of AWUA

(Burton et al. 2000; Hazneci 2015).

Performance	Performance indicators
Water Delivery	Annual Water Delivery per Unit Command Area (m^3/ha) = Amount of Water Access in Irrigation Area (m^3) / Command Area (ha)
	Annual Water Delivery per Unit Irrigated Area (m^3/ha) = Amount of Water Access in Irrigation Area (m^3) / Irrigated Area (ha)
	Irrigation Ratio was calculated by dividing irrigation area (ha) to command area (ha).
Financial	Money Collection Ratio (%) = Total Amount of Money Collected from Water Users / Total Amount of Money Required from Water Users x 100
	Staff Number per Unit Area (Staff/ha) = Staff Number Epmloyed at Water Organization / Irrigation Area (ha)

Annual Water Delivery per Unit Irrigated Area

In table 2, AWDUIA was found the highest as about 5266 m^3/ha in 2017 and the lowest as about 3154 m^3/ha at 2016. By comparison to 2015, there was an increament about %12 in 2017. In genaral, water delivery for unit irrigated land is low by comparison to other water organizations in Turkey. The reason could be increase of irrigated lands without control in region. Cihan & Acar (2017) found AWDUIA as

about 5958-7848 m^3/ha for ÇOWUA dending on the years. Our study result is lower than with finding of Cihan & Acar (2017).

Irrigation Ratio

Irrigation ratios, IR, for 2015, 2016, and 2017 were found as about 180%, 53% and 176%, (average of 136%), respectively (Table 2). IR was classified as GOOD in accordance of standard developed by Vermillion (2000). It is obvious that water organization allocates water more than the command area. Çakmak (2001) stated that value as between 35% and 104% for Konya province, and Yazgan & Değirmenci (2002) as 57% - 81%, and Cihan & Acar (2017) as 132%-192% for ÇOWUA in Konya. Our finding was greater than results of Çakmak (2001) and Yazgan & Degirmenci (2002); almost agreeement with Cihan & Acar (2017).

Table 2.

Performnace indicators of AWUA

Year	2015	2016	2017
Water Delivery Performance			
1. Annual Water Delivery per Unit Command Area (m^3/ha)	8510.87	1665.22	9260.87
2. Annual Water Delivery per Unit Irrigated Area (m^3/ha)	4720.85	3153.56	5266.41
3. Irrigation Ratio **(%)**	180.28	52.80	175.85
Financial Performance Indicators			
1. Money Collection Ratio (%)	21.68	35.51	58.45
2. Number of Staff Employed at Unit Area (staff/ha)	0.0098	0.0098	0.0063

Money Collection Ratio

Money collection ratios, MCR, for 2015, 2016 and 2017 were found as about 22%, 36% and 58%, respectively (Table 2). MCR was POOR for 2015 and 2016; ACCEPTABLE for 2017 In accordance of Vermillion (2000). The value has increased gradually year by year. In reality, such organization has received the water charges of previous year as well. If amount of money collected from previous year is added to money collection of current year, it will be more satisfactory. Cihan & Acar (2017) reported the MCR as 75% for an average of six year at ÇOWUA.

Number of Staff at Unit Area

Number of Staff Employed Unit Area, NSEUA, were 0.0098, 0.0098 and 0.0063 staff/ha for 2015, 2016 and 2017, respectively. Cihan & Acar (2017) reported 0.0012 staff/ha for ÇOWUA at Konya province of Turkey. They added that although this value seems low, services quality of such association for farmers is satisfactory, since the experiences and quality of staff were good so there is no fragmentation in water distribution services of AWUA. The present study finding is greater than that result of Cihan & Acar (2017).

CONCLUSIONS

In general, main problem in water user associations, WUA's, is lack of cooperation between water organizations and water users. Farmers are final user of irrigation water so they should be involved more in water management. In addition, they should be informed about efficient water use strategies i.e. correct crop pattern preference, modern irrigation systems installation onto the fields and their management. The region is semi-arid environment so water shortage is common limitation at agro-production. Water resources must be used efficiently since agriculture is the maximum water use activity in such climates. Deficit irrigation by drip irrigation system for some crops such as sugar beet and maize is very beneficial solution for water productivity. The quality of staff employed at water allocation is very important role to play in performance of water organizations so those staff should be well experienced about agricultural water management. For getting better services from water organization, farmers should pay water charges on time. In region, water charges also have billed by farmers in accordance of water receiving duration. Therefore, farmers have received water from the irrigation delivery system by great care so over water use in irrigation has controlled. This water saving system is strongly recommended for other water organizations as well. Water saving irrigation technologies, trickle or sprinkler irrigation systems, are widely used in our study region. Those technologies should be increased for better water productivity especially in water shortage regions.

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RESEARCH ON SOME PHYSIOLOCICAL ASPECTS OF ORGANICALLY GROWN WHEAT

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Keywords:*photosynthesis, fertilization, pigments*

ABSTRACT

The critical analysis of the use and management of the agricultural land of the country, of the agricultural systems used, is of particular importance for substantiating the measures to be taken at national level, by the community or by each landowner (Toncea I., 2002).

During the entire analysed period, there was an increase in the chlorophyll content of the wheat leaves, due to the influence of the foliar fertilizers.

The chlorophyll content registered in the flowering phase at the Miranda variety was 552.65 mg / kg, and during the physiological maturity phase of 235,273 mg / kg.

INTRODUCTION

Well-being, balance and sustainability - these are three major goals that must mark the development strategies of the entire human society (Munteanu N. et al. 2008).

The production of the crops is influenced by the environmental conditions, soil and the technology used. Within the technology, the use of fertilizers and especially those with nitrogen, which largely condition both the protein and carbohydrate metabolisms, plays an important role.

This influence of carbohydrate metabolism is basically manifested in the intensification of photosynthesis as a result of the enlargement of the leaf surface.

At the same time, there cannot be disregarded the role of fertilizers also on the metabolism of carbohydrates resulting in starch accumulation as an important energy reserve of plants (Nedelciuc C.et al. 2003).

MATERIAL AND METHODS

The data entered in this thesis was obtained from the observations, measurements and determinations of wheat culture within the didactic field of the Faculty of Natural and Agricultural Sciences of "Ovidius" University of Constanta, located next to Siutghiol Lake.

The terrain of the experimental field is specific to the analysed area, in general meaning flat surfaces affected by moderate erosion processes.

Regarding the climatic regime, the terrain of the experimental field is located in agro-climatic zone I, subzone 1 and is characterized by thermal and hydric big contrasts between winter and summer and between south and north.

The wheat crop as an ecological system was established on an area of 60 sqm, which is divided into 4 plots of 15 sqm each. On each plot was used a certain type of fertilizer, as it follows: Cropmax, Bionat plus and Nettle Macerate. In order to determine the superiority or inferiority of these experimental variants, the control variant (the unfertilized plot) must also be present in the experiment.

The ability of plants to synthesize their food depends to a large extent on the amount of assimilating pigments. The photoactive pigments of the reaction centres convert light energy into biochemical energy and are represented by chlorophyll. Therefore, the amount of chlorophyll is an indication of the health of the plant.

The analysed biological material was represented by the Miranda variety, and the sampling was performed identical for all four experimental variants.

There were analysed the chlorophyll and carotenoid pigments from wheat leaves harvested from both the base and the top of the plants throughout the entire vegetation period.

The leaf material was collected separately, to determine the pigment concentration, as a measure of the health of the plants. For examination, 0.1 g of each sample was used, by dipping it in 10 ml acetone. After filtration, the extract was analysed by spectrophotometry, at specific wavelengths (470, 647 and 663 nm).

Chlorophyll A, chlorophyll B and carotenoid (total xanthophyll + carotene) concentrations were calculated using the trichromatic equations of Lichtenthaler and Buschmann (2001).

Green plants with the help of chlorophyll capture the solar energy which they transform into chemical energy, storing it in complex substances that they synthesize (Chirilei H. et al. 1970).

RESULTS AND DISCUSSIONS

Plant growth is a complex process, consisting of quantitative, irreversible changes, finalized by increasing the number of cells, their size and their mass growth, as well as by the accumulation of dry matter (Burzo I. et al., 2004).

To further highlight the differences that occur in wheat culture and for each of the fertilization variants, the concentration of chlorophyll A, chlorophyll B and carotenoid pigments (xanthophyll and carotene) was determined according to the specific equations.

Regarding the way in which foliar fertilizers have been used for wheat, the results show that chlorophyll undergoes a continuous process of biosynthesis and biodegradation.

The estimation of the chlorophyll content of wheat leaves harvested in different vegetation phases and of the four analysed variants is presented in Figure 1.

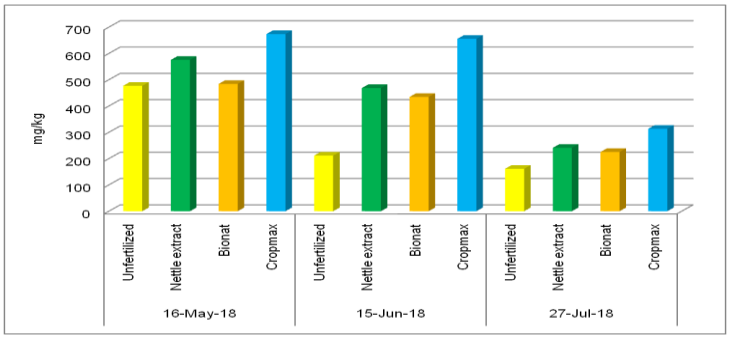

Figure 1. Evolution of chlorophyll A content during the vegetation period for the Miranda variety

If we compare the average values obtained for wheat on all analysed variants, it is found that the chlorophyll content was higher in the middle phase (477,03 -673,770 mg / kg), while at the physiological maturity it is the lowest (161,247- 313,430 mg / kg).

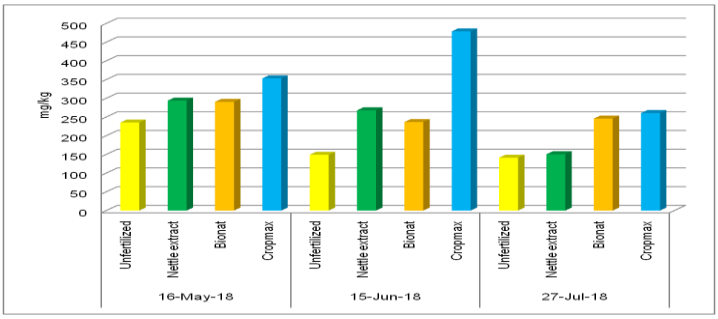

Figure 2. Evolution of chlorophyll B content during the vegetation period for the Miranda variety

Regarding the amount of Chlorophyll B the Miranda variety recorded values between 235,286 și 353,373 mg / kg on 16.05.2018 and a content between 141,23 și 260,686 mg / kg on 27.07.2018.

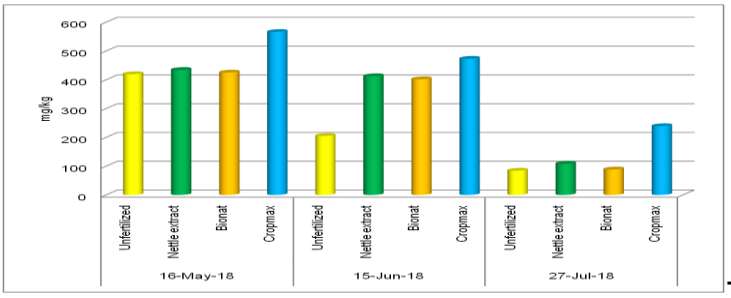

Figure 3. Evolution of carotenoids content during the vegetation period for the Miranda variety

Comparing the four variants studied between them according to the vegetation phase, the Miranda variety accumulates the highest content of carotenoids during the phase of wheat ears growth.

The research carried out on the wheat culture aimed to determine the production on the four experimental variants.

Table 1

Results regarding the production, the Miranda variety

Variants studied	Production (Kg/ha)
Unfertilized variant	2890
Variant fertilized with nettle macerate	3346
Variant fertilized with Bionat plus	3190
Variant fertilized with Cropmax	4100

From the analyzed data, it appears that in the fertilized variant with Cropmax the production increase over the unfertilized variant was 1210 kg / ha.

CONCLUSIONS

After the centralization of the results regarding the A and B chlorophyll content it is found that the values obtained in the fertilized variant with Cropmax are higher than those registered in the unfertilized version.

The concentration of carotenoids accumulated in wheat leaves has varied, though it had a downward trend during the growth and development of plants.

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CONTROLLING POTATO SILVER SCURF DISEASE ON CV. CHRISTIAN WITH DIFFERENT FUNGICIDES

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Keywords*: applied doses, re-emergence disease, potato, silver scurf, yield*

ABSTRACT

In recent years silver scurf produced by Helminthosporium solani became a problem for fresh and processing potatoes. The disease is widespread and very common in all countries. The fungus attacks only the tubers. Tubers may be infected in field and/or in storehouse, but the disease progresses only during storage. Control is difficult because epidemiology of the disease is not clear and there are not resistant cultivars. Field experiments were carried out between 2016-2017 at the NIRDPSB Brasov, Romania, using fungicides with different mode of action in order to find the products that ensure maximum efficiency of control. Applying treatments the average percentage of yield with attack was significantly reduced from 76.1% in untreated control to 51.6 to 56.9% in treated variants. Products applied at planting had a significant reduction in the incidence of the disease compared with control. Less effective were the products applied during growing season. Treatment must be accompanied by appropriate cultural practices, rotation of 4-5 years and avoiding mechanical injuries, also to develop a humidity control in storage, because lower relative humidity and temperature limits disease progression.

INTRODUCTION

Silver scurf is caused by *Helminthosporium solani* Dur. & Mont. and it is present in all potato growing countries, in our country being detected in early '70. The disease is one that often affects the appearance and skin color of potato tubers, resulting in reduced consumer acceptance (Secor and Gudmestad, 1999, Cunha and Rizzo, 2004).

The fungus can infect potato tubers during the growing season and in the storage. Infection makes the tuber skin more permeable to water, resulting in moisture loss and loss of mass, the tuber consequently becoming shriveled and wrinkled.

The infected seed tubers ensure the transmission form one year to another of most important quantity of inoculums, the soil having a more limited role than in other diseases (Plamadeala, 1987). If much of area is affected, tubers become dehydrated, losing 8-13% of weight. Although strong attack of silver scurf increases weight loss, delayed growth and development of plants is only temporary and became insignificant after 7 weeks after planting (Read and Hide, 1984).

To the ill tubers is depreciating the commercial aspect, less the culinary quality. Heavily infected tubers can not be used for planting, because did not sprout

normally and decreases their yield capacity the tubers number being reduced and by small size.

Silver scurf may have a transient effect on potato growth and tuber yield (Denner et al., 1997).

According to Fraizer et al. (1998) which quoting Rodriquez et al. (1996) silver scurf sporulates on potatoes in the storage and spreds to the healthy tubers. Fungus penetrate by lenticels and periderm. Minimum conditions for achieving infections are 3°C and 90% RH.

Reports have shown that the fungus has saprophytic capabilities (Merida and Loria, 1994) and may survive between storage seasons inside potato storages, on potato waste and other organic substances. This can present an increased risk of infecting new potatoes brought into storage. Potato storages that have had a problem with silver scurf need to be periodically cleaned and sanitized.

MATERIAL AND METHODS

At NIRDPSB Brasov between 2016-2017 was held an experience in which fungicides with different mode of action were tested in order to find products that ensure maximum efficiency of control.

The experiences were carried out using randomized complete block design with 4 replicates with 29 plants each row. It was used Christian variety, a Romanian variety with red skin. The choice was not random, at the varieties with red skin the pigment is destroyed and the disease is better observed.

Evaluation of silver scurf attack on potato tubers was done by analysis all the tubers harvested from each repetition/variant.

Analysis of the number of tubers and the weight of the final yield were performed in three size fractions, as follows: >55 mm; 30-55 mm and <30mm.

The disease incidence was determined by establishing the proportion of infected tubers using a scale with three different degrees of severity:

- Low <3% from the infected tuber surface
- Moderately 3-25%
- High >25%

The disease incidence is calculated using formula I=(Nlx2+Nmx5+Nhx7)/N, where Nl, Nm and Nh represent the number of infected tubers at low, medium and high level and N represent the total number of tested tubers.

The paper presents the characteristics of silver scurf attack on total yield using statistical calculations performed with SPSS software.

RESULTS AND DISCUSSIONS

In 2016 the number of tubers with different degrees of attack was between 41.7 (Dithane M-45) and 34.3 (Prestige 290 FS) at the treated variant and about 52.3 at the untreated one (control variant), but without statistical significant differences (table 1).

Table 1

The percentage of tubers with silver scurf attack (2016)

Product	Tub. no.	% tub. without attack	% tub. with attack	% attack under 3%	% attack 3-25%	% attack over 25
Dithane M45	623	58.3	41.7	16.5	14.3	10.9
Prestige Extra 370 FS	618	58.8	41.2	16.2	13.1	11.9
Ortiva 250 SC	659	56.9	43.1	18.5	13.7	11.0
Prestige 290 FS	645	65.7	34.3	13.3	11.0	10.0
Untreated (control)	812	47.7	52.3	20.0	17.5	14.8
Total	671	57.5	42.5	16.9	13.9	11.7
Standard deviation	18.8	11.8	12.8	6.1	3.9	3.3

The percentage of yield with silver scurf attack was 48.9 at the untreated variant (control) and with unsignificant decrease to the different treatments (35.9% Prestige 290 FS - 45.7% Dithane M-45).

Significant differences were recorded at the tubers with medium degree of attack to which the spots comprised 3-25% of the tubers. Following treatment with Prestige 290 FS - 0.8 l/t and Ortiva 25 SC - 0.5 l/ha rate of yield with silver scab was reduced at 11.3, respectively 12.7% compared to 17.1% for untreated (control) (table 2).

Table 2

Yield (2016)

No.	Product	% yield without attack	% yield with attack	% yield with attack under 3%	% yield with attack 3-25%	% yield with attack over 25%	Total yield
1	Dithane M45	54.3	45.7	17.6	15.2	12.9	28.9
2	Prestige Extra 370 FS	58.0	42.0	13.1	13.3	12.5	29.2
3	Ortiva 250 SC	56.6	43.4	17.8	12.7	12.8	28.4
4	Prestige 290 FS	64.1	35.9	13.6	11.3	11.1	29.4
5	Untreated (control)	51.1	48.9	17.6	17.1	14.2	32.7
Total		56.8	43.2	16.5	13.9	12.7	29.7
Standard deviation		10.3	11.3	5.9	3.2	3.5	7.2

In addition to disease incidence in table 3 shows the efficiency of control as a result of various treatments and disease severity.

It is found that the control efficiency was highest at V3, 34.4% and was achieved through planted tubers treated with Prestige 290 FS in a dose of 0.8 l/t (table 3).

Table 3

The effect of treatments on the incidence and severity of *Helminthosporium solani* attack (2016)

No.	Product	Disease incidence % *	Control efficiency % **	Disease severity (index 1-7)***
1	Dithane M45 (0,5 kg / t tubers)	41,2	20,3	4,3
2	Prestige Extra 370 FS (0,4 l / t tubers)	41,2	21,2	4,4
3	Prestige 290 FS (0,8 l / t tubers)	34,3	34,4	4,4
4	Ortiva 250 SC (0,5 l/ha)	43,1	17,4	4,2
5	Untreated (control)	52,3	-	5,4

* (No tub. with spots$_{< 3\ \%}$ + No tub. with spots$_{3 - 25\%}$ + No tub. with spots$_{>25\ \%}$)*100 / analyzed no.tub.

** (Incidence Ss V untreated - Incidence Ss V treated) * 100 / Incidence Ss V untreated

*** (No tub. with spots$_{< 3\ \%}$ * 2 + No tub. with spots$_{3 - 25\%}$ *5 + No tub. with spots$_{>25\ \%}$ *7) / (No tub. with spots$_{< 3\ \%}$ + No tub. with spots$_{3 - 25\%}$ + No tub. with spots$_{>25\ \%}$)

In 2017 the number of tubers with different degrees of attack was between 56.3 (Ortiva 25 SC) and 48.5 (Prestige 290 FS) at the treated variant and about 62.4 at the untreated one (control variant), but without statistical significant differences (table 4).

Table 4

The percentage of tubers with silver scurf attack (2017)

No.	Product	Tub. no.	% tub. without attack	% tub. with attack	% attack under 3%	% attack 3-25%	% attack over 25%
1	Dithane M45	633	44.5	55.5	31.8	20.2	3.6
2	Prestige Extra 370 FS	894	45.1	54.9	26.9	26.5	1.5
3	Ortiva 250 SC	721	43.7	56.3	32.8	16.1	7.3
4	Prestige 290 FS	762	51.5	48.5	26.9	17.7	3.9
5	Untreated (control)	652	37.6	62.4	26.5	21.9	14.0
Total		632	44.5	55.5	29.0	20.5	6.1
Standard deviation		11.8	12.1	10.9	6.8	7.9	5.2

Through the treatments applied yield average percentage with attack has been reduced significantly from 76.1% to the untreated (control) to 51.6% to Prestige Extra 370 FS.

Most reduced was the percentage of yield with severe attack (over 25%) to variants Dithane M45 (3,2%) and Prestige Extra 370 FS (2,0%) (table 5).

Table 5

Yield (2017)

No.	Product	% yield without attack	% yield with attack	% yield with attack under 3%	% yield with attack 3-25%	% yield with attack over 25%	Total yield
1	Dithane M45	45.4	54.6	38.0	13.4	3.2	39.5
2	Prestige Extra 370 FS	48.4	51.6	29.4	20.3	2.0	28.7
3	Ortiva 25 Sc	39.1	60.9	31.8	18.1	11.0	36.1
4	Prestige 290 FS	43.1	56.9	31.5	19.6	5.8	41.9
5	Untreated (control)	23.9	76.1	31.8	26.6	17.7	35.9
Total		40.0	60.0	32.5	19.6	7.9	36.4
Standard deviation		11.6	12.6	13.7	4.1	5.8	3.5

Table 6

The effect of treatments on the incidence and severity of *Helminthosporium solani* attack (2017)

No.	Product	Disease incidence % *	Control efficiency % **	Disease severity (index 1-7)***
1	Dithane M45 (0,5 kg / t tubers)	55,5	11,1	3,4
2	Prestige Extra 370 FS(0,4 l / t tubers)	54,9	12,0	3,5
3	Prestige 290 FS (0,8 l / t tubers)	48,5	22,3	3,5
4	Ortiva 25 SC (0,5 l / ha)	56,3	9,77	3,5
5	Untreated (control)	62,4	-	4,2

* (No tub. with spots$_{< 3\ \%}$ + No tub. with spots$_{3 - 25\%}$ + No tub. with spots$_{>25\ \%}$)*100 / analyzed no.tub.

** (Incidence Ss V untreated - Incidence Ss Vtreated) * 100 / Incidence Ss V untreated

*** (No tub. with spots$_{< 3\ \%}$ * 2 + No tub. with spots$_{3 - 25\%}$ *5 + No tub. with spots$_{>25\ \%}$ *7) / (No tub. with spots$_{< 3\ \%}$ + No tub. with spots$_{3 - 25\%}$ + No tub. with spots$_{>25\ \%}$)

In 2017, with favorable weather conditions for potato crop, which ensured the achievement of high yields, were also favorable conditions for the manifestation of silver scurf attack. The disease incidence reached 62.4% to the untreated (control). Efficiency was lower to the majority of the treatments. As in the previous year, Prestige 290 FS ensured the highest efficacy (22.3%).

It is noted that products Dithane M45 and Prestige Extra 370 FS had a similar efficacy. Disease severity was medium on a scale of 1-7. Least of all in controlling silver scurf was Ortiva 25 SC (table 6).

CONCLUSIONS

The experiments confirm that the severity of disease on potato tubers is influenced by the applied fungicides on seed tubers. Disease incidence differed between years.

As in the case of other diseses an integrated management is needed. This requires an adequate rotation accompanied by planting seed treated with products with high efficiency on the disease. Also the storehouses must be supervised closely knowing that during storage relative humidity and lower temperature limits the disease evolution.

Can consider that the most effective method of controlling the disease is the use of combined tubers treatments pre- and post storage.

ACKNOWLEDGMENT

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ASPECTS OF *Xanthium italicum* Morretti WEED FRUITS VARIABILITY

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Keywords*: Xanthium italicum, di-achenes, morphological characters, variability*

ABSTRACT

*The species had a female fruit system made up of characteristic di-achene pieces. Such a fruit had an average length of 25 mm, a thickness of 7 mm, with a special cover coating. The fruit has grown, grainy, vigorous, runny-hairy, 4 mm long. Two vigorous horns were formed at the top of the fruit, graceful, thick to the base, straight and slightly curved, with a length of 6 mm. The weight of an average fruit was 0.4 g. Among the different characters studied, simple correlations were established. Among these, the closest were the weight of the fruit with the dimensions: length (0.604***) and thickness (0.423***). Significantly correlations were between the length and width/ breadth of the fruit (0.275**) and the horns length and the fruit thickness (0.258**). Significant correlations were obtained between the weight of the fruit and the length of thistle (0.241*) and with the length of the horns (0.209*), also and the length of horns with fruit length (0.229*).*

INTRODUCTION

The weed species present today in agricultural fields (Rui & Fang Nao, 2010) demonstrate increasing ecological adaptability (Takakura & Fujii, 2010). The main cause is also the reduction of the spectrum of effective active chemical ingrediens (herbicides) (Figure 1). Among the new control measures, studies of morphological variability are also recommended (Conti et al., 2005). The higher of the exprerssion, the plant is better suited. From the practical point of view, for a more effective control, new, complex of integrated management (IM) type investigations are required. Morphology studies are part of this IM. A weed known tu have a growing spread in agricultural fields is also *Xanthium italicum* Morretti. (pro syn *X. echinatum* Auct., *X. macrocarpum* (Auct.) ssp. *italicum* (Morr.) Nym., *X. orientale* ssp. *italicum* (Morr.) De Love., cocklebur, italian cocklebur, XANIT in Bayer code). *Xanthium*: greek "ξανθός xanthós" means yellow coloring: "colorato di giallo" (it.). X. Italicum is native to the US, and it is adventive in E and SE Europe, with a very high capacity for invasion of agricultural land (Albert et al., 2000; Dihoru, 2004; Richardson et al., 2000; Sharma et al., 2005; Vitousek et al., 1996). In recent decades, it has spread to large Asian regions (Rui & Fang Hao, 2010). Species prefer warm climate, deep soil with high humidity (Ehrenfeld, 2003). Fruit maturation takes place from late summer to autumn. Germination takes place in spring, staggered, from a depth of 4-9 cm. Tha plant contains a group of chemicals from *xanthanolide* group with possible allelopathic biological activity (Thorpe et al., 2009; Tsankova & Trendafilova, 1994).

Blooming takes from July to September. Compared to climatic elements, the plant has a high degree of resistance. Being a variable species, *X. italicum* in the diploid form contains 36 chromosomes. The plant is unisex monoic. The male flowers are at the tip of inflorescence, being glandular (Figure 2). The form of this is lake a disk and 6-8 mm in diameter. The female flowers have an elongated coat, by two grouped together in fruit and at maturity it make the di-achene type. The coat forms smaller thistles and at the top two vigorous horns. Due to the configuration of the fruit, it has a great capacity to cling to variuos supports, including animal fur- an important means of spreading. The fruit is trapped of the axes of big fruit complex by a short pedicle (Figure 3). The fruit is 23-26 mm long and 6-8 mm thick. The color of the mature fruit is brownish in color. The thistles that are formed over the entire surface of the fruit, are 5-7 mm long, and the usual horns of double lengths. Coat, thistles ans horns are also covered with other very short hairs, necessary for weed spreading.

Figure 1. *X. italicum* from sunflower crop

Figure 2. Flower type of *X. italicum*

Figure 3. *X. italicum*, raceme with fruits

Figure 4. *X. italicum*- fruit content

By conducting measurements under different vegetation condititions, some new elements might be introduced in the description of this weed species. In the present study, from each mature plant, length of fruit & thickness, length of thistles, length of horns, and weight of each fruit was analyzed. From a practical point of view, the construction of the fruit has a particular influence on germination. This occurs firstly through the lower plant of the fruit and occurs through a different permeability of the skin to oxygen: 0.6% at the lower than 1.2% at the upper one, at a similar temperature of 21^0C (Weaver & Lechowicz, 2982) (Figure 4).

MATERIAL AND METHODS

Determinations were made in the second decade of September on *Xanthium italicum* plants over the last two years. The weed plants have been chosen from sunflower crop. Surfaces were located in the resort area. From 100 particular plants of X. Italicum, on single mature fruit was harvested and then brought to the laboratory. The 100 fruits were measured: length, thickness/ diametre in the central portion, length of thistles, length of the horns, and absolute weight/ every fruit. These characters were expressed using the histogram (frequency polygon, FP,%) method. In this method, either the absolute values of such or the class intervals were used. The study revealed several aspects, namely: i) the modal values, the ones with the highest frequencies, ii) the limits of the variability ranges of the studied characters and iii) the specificity of each character of the weed ecotype in the analyzed area. Between all 5 characters analyzed, correlations and regressions were established. These correlations could express some tendencies within the studied eco-type. The Excel program was used to express the values. Another method was the statistical calculation of all the values obtained. Variance analysis (Anova test) was used, namely on variation strings. Statistical parameters were calculated using he formulas: $\bar{u} = \Sigma x/n$, where $\bar{u}$ = average of the determinations, and x = the determined values, s^2 (variance) = $1/(n-1).[\Sigma x^2-(\Sigma x)^2/n]$, s (standard error) = $\sqrt{s^2}$, s% (variation coefficient) = $s/\bar{u}.100$.

RESULTS AND DISCUSSIONS

Variability of *X. italicum* fruit characters. The plant forms in the raceme many fruits, usually between 30 and 2000, with a specific configuration of *Asteraceae* family. A first character of the fruit is the length (Figure 5). The variability of this character ranged from 20 to 29 mm. The modal value was expressed by two peaks, namely 23-24 mm (17-18%) and 26-27 mm (both 16%), followed by the lengths of 25 mm (14%). The thickness of the fruit had the variability of the dimensions between 5.5 and 10.0 mm. Of these, those with 6.5-7.0 mm (27%) dominated, followed by 6.0-6.5 mm (24%) and 7.0-7.5 mm (19%) thickness (Figure 6).

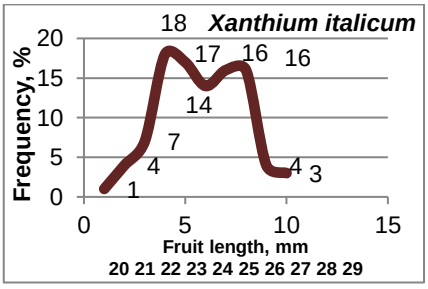

Figure 5. Frequencies of fruit length

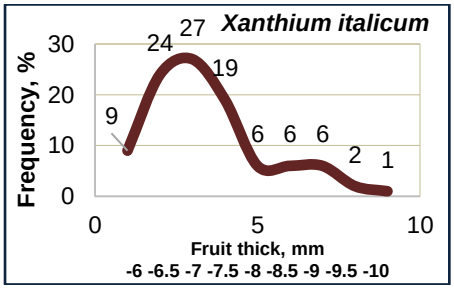

Figure 6. Frequencies of fruit thickness

The length of thistles was between 2.5 and 7.0 mm. Of these, the dominant ones were 3.5-4.0 mm in size, with a maximum frequency of 29%. Then followed thistles with 4.0-4.5 mm (24%). Lower twins, namely 2.5-3.0 mm constituted 6% of the total, and those with lengths over 5.5 mm, 18% of the total. Thistles of 7.0 mm length made up 2% of the total (Figure 7). Fruit horns ranged between 4.0 and 7.5 mm. The pieces were dominated by 5.5-6.0 mm (26%) (Figure 8). These were

followed by 6.0-6.5 mm (23%). The horns of *X. italicum* under 4.5 mm constituted 3% of the total, and the 7.5 mm ones, only 1%.

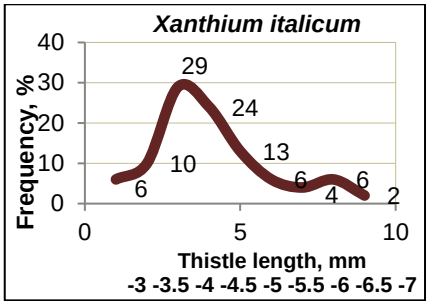

Figure 7. Frequencies of thistle lengths

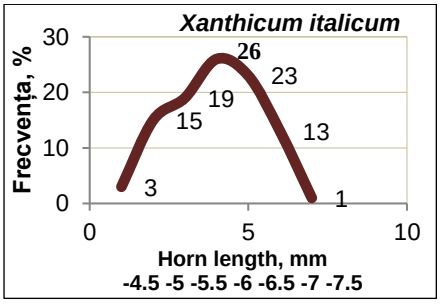

Figure 8. Frequencies of horn length

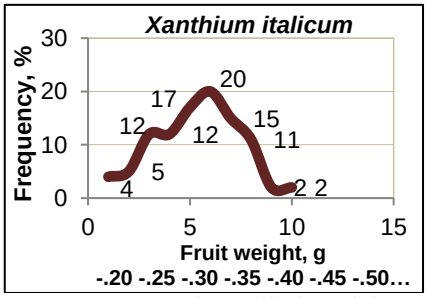

Figure 9. Frequencies of fruit weight

Figure 10. Mature fruit of *X.italicum*

The weight of a fruit of *X. italicum* ranged from 0.15 to 0.60 grams (g). Fruits weighing between 0.40 and 0.45 g (20%) dominated (Figure 9). Near these the ones with 0.30-0.35 g (17%) and 0.45-0.50 g (15%) were found. Fruit with an absolute weight of less than 0.15-0.20 g consisted of 4% of the total, and the ones with 0.60-0.65 g, only 2% of the whole set.

Correlations of the length of the fruit with other characters. all four causal links, such as correlations, showed positive trends (Figures 11-14). One of the closest correlations of the legth of the fruit was that of the fruit weight (r = 0.604***). This demonstrates that to ensure a higher degree of sunflower technology in this area (as in case in the resort), weeds provide longer and heavier fruit.

The length of the fruit was significantly correlated with the length of horns (r = 0.229*), and between the length of the fruit and the length of the thistles/ bristles, the connection was positive, but insignificant (r = 0.134). Finally, the length of the fruit was distinctively correlated with the thickness (r = 0.275**), which shows that in longer fruit formulas, they will also have larger thickness.

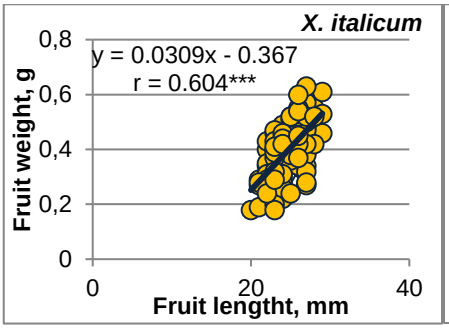

Figure 11.Correlation: fruit length x weight

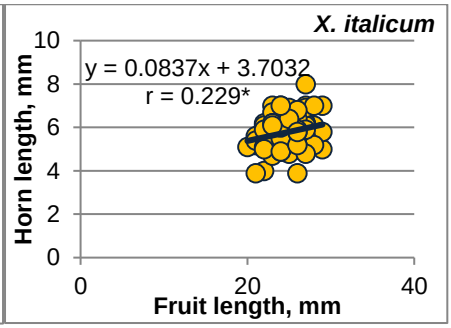

Figure 12.Correlation: fruit length x horn length

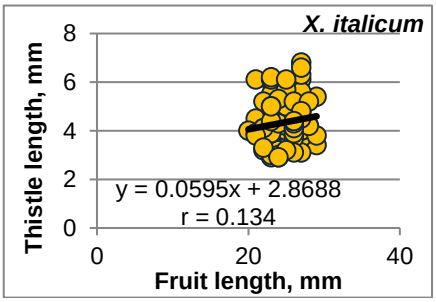

Figure 13.Correlation: fruit length x thistle length

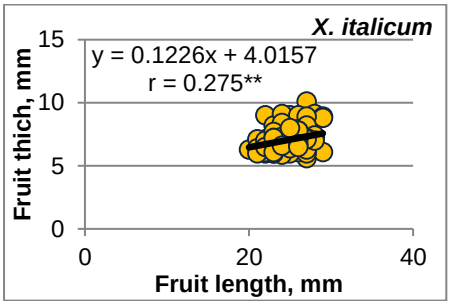

Figure 14.Correlation: fruit length x fruit thickness

Correlations of the thickness of the fruit with other characters. In the three links obtained, positive situations were also found, but with some differences (Figures 15-18). And in the case of thickness of the fruit the correlation with its absolute weight was very significant (r = 0.423***). Instead, the thickness of the diachene with the length of the horns was significantly ensured (r = 0.258**), and with the length of the thistles at the insignificant level (r = 0.075).

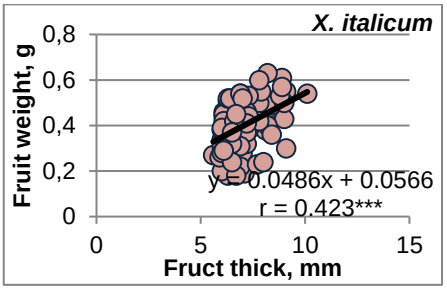

Figure 15. Correlation: thickness x weight fruit

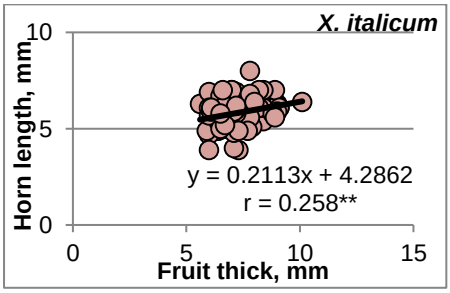

Figure 16. Correlation: fruit thickness x horn length

Correlations of the length of thistles with other characters. In the case of the correlation between the length of the thistles and the fruit weight, the connection was

significant (r = 0.241*) (Figure 19). Instead, between the length of the thistles and the length of the horns, the connection was rather weak (r = 0.187) (Figure 20).

Correlation of the length of the horns with the weight of the fruit. The relationship was significant (r = 0.209*) (Figures 21 and 22). For a weed species whose characters have been wholly positive, it actually demonstrates its ability to adapt as much as possible to crops and especially to sunflowers. We present in a synthetic table (Table 1) the correlations obtained between all characters of the *X. italicum* fruit.

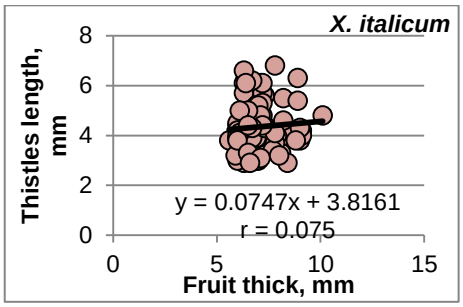

Figure 17. Correlation: fruit thick x thistles length

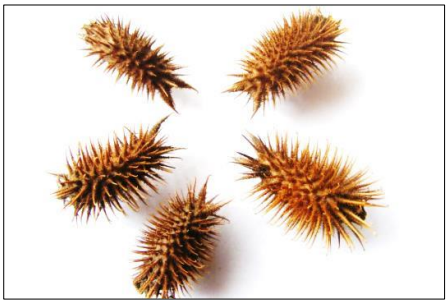

Figure 18. Fruit characters of *X. italicum*

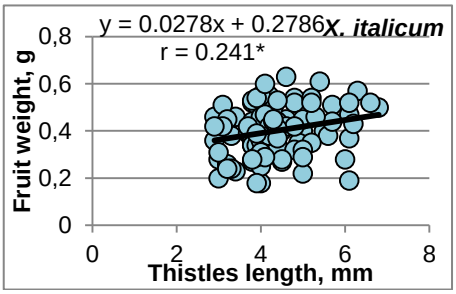

Figure 19. Correlation: thistles length x fruit weight

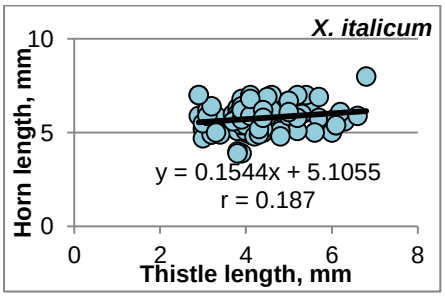

Figure 20. Correlation: thistle length x horn length

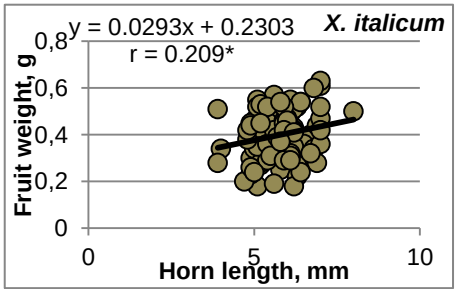

Figure 21. Correlation: horn length x fruit weight

Figure 22. *X. Italicum* fruit sections

Table 1

Correlations between fruit characters of *X. italicum* weed

Character	Fruit weight, g	Horn length, mm	Thistles length, mm	Fruit thickness, mm	Fruit length, mm
Fruit length, mm	0.604***	0.229*	0.134	0.275**	1
Fruit thick, mm	0.423***	0.258**	0.075	1	
Thistles length, mm	0.241*	0.187	1		
Horn length, mm	0.209*	1			
Fruit weight, g	1				
DL 5 % = 0.19 DL 1 % = 0.25 DL 0.1 % = 0.32					

Statistical analysis of the variability of *X. italicum* fruit. Calculated for each analyzed character: average (ū), variance (s^2), standard error (s) and coefficient of variation (CV;%). The statistical estimation made evident the characteristic values of *X. italicum* eotype in the sunflower crop. The values obtained were characteristic. Thus, the fruit length was on average 24.8 mm with variability below 10%. The thickness was 7.05 mm with 12.7 variability. Thistle had lengths of 4.3 mm with a high coefficient of variability (20.4%). The horns averaged 5.8 mm with 12.8 % variation, and the weight of the fruit was 0.40 g with the highest variability (26.1%) (Table 2).

Table 2

Statistical indices of *X. italicum* fruits variability

Indices	Fruit, mm		Thistles length, mm	Horn length, mm	Di-achene weight, g
	Length	Thickness			
Media, ā	**24.77**	**7.052**	**4.343**	**5.776**	**0.3995**
Variance, s^2	4.037	0.803	0.785	0.546	0.01091
Standard error, s	2.009	0.896	0.886	0.739	0.10443
Var. coeff., %	**8.11**	**12.71**	**20.40**	**12.79**	**26.14**

CONCLUSIONS

A widespread species causing significant damage is *X. italicum* Morretti. The type existing in these southern areas is very well adapted to the special biology of sunflower crops. In order to control it through its own management it is good to know as many morphological characters as possible. In fact, it has been found that a species that expresses wider variability could help to find the most appropriate control methods. Morphologically variability, especially reproductive, being less well known, could express the eco-type existing under these conditions (Fig. 1-22).

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SPECIFIC MANAGEMENT MEASURES FOR THE FOREST HABITAT 91D0* - BOG WOODLAND

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Keywords*: 91D0*, Natura 2000, management*

ABSTRACT

The 91D0 habitat is located in the alpine and continental bioregions within Romania. This habitat can be found in 21 Sites of Community Importance (SCI). The management measures prescribe the possibility of implementation of care forestry operations of the young stands, these operations having as main aim to promote the seedlings of the tree species which are edifying for the forest ecosystem, together with the development of the individual resistance of the trees against the action of some abiotic ecological factors. All these types of forestry operations must be carried out taking into account the high fragility of the organic soils characteristic for the peat bogs. The resin collection will be forbidden together with the afforestation of the typical bog ecosystems – active bogs (naturally missing forest vegetation). Special attention will be given to the management of the neighbouring stands. Only highly intensive forestry operations (the most specialised ones) must be carried out, or the ones which asure natural regeneration in the margins of the forest canopy, therefore a specific structure will be created, which will asure the Priority habitat's protection against the action of the wind, taking also into account the maintaining of the hidrological equilibrium of the peat bog.*

INTRODUCTION

According to Annex 1 of the Habitats Directive, the priority habitats are the ones which: are threatened to dissapear from their natural range, they have a limited range of natural regression or limited natural occurence, they show remarkable examples of typical characteristics of one or more of the nine biogeographical regions of EU [Stăncioiu P. T. et al. 2008]. Their conservation became an important responsability of the European Community. The member states have a common mission to adopt measures for the promotion of conservation of the priority natural habitats, together with the priority species of Community importance.

The 91D0* habitat is a priority habitat, therefore the management measures must be selected carefully, in order that after their application the habitat's area, respectively its structure and functions, will not be affected, targeting the maintaining or achievement through time the favourable conservation status of the habitat. The status of conservation of a natural habitat is considered to be "favourable" when: its natural range and the surfaces it covers are stable or increasing; its structure and specific functions, needed for its maintaning for long time, exist and will continue, probably, to exist in the near future; the status of conservation of the characteristic species is adequate [Stăncioiu P. T. et al. 2008].

MATERIAL AND METHODS

In order to achieve equivalence between the forest habitats of community interest and the Romanian habitats and the forest types used by the Romanian typology, they were used a series of scientific books and materials such as: "Interpretation Manual of European Union Habitats", "Interpretation Manual of the Natura 2000 Habitats from Romania" – coordinators: D. Gafta and O. Mountford, "The Habitats of Romania" – Doniţă et al., "Forest Ecosystem Types from Romania" – coordinators: N. Doniţă, C. Chiriţă, V. Stănescu, "The Forest Types from Romania" – S. Paşcovchi and V. Leandru and "The Reference List of the Habitat Types".

Regarding the ellaboration of the management measures for the forest habitat 9180*, they were used for documentation protected areas' management plans, studies from existing projects, the existing forestry techincal norms and regulations (*Technical norms for forestry operations within young stands, Technical norms for forestry cutting systems*), forest management plans and the legislative framework currently in force.

RESULTS AND DISCUSSIONS

The habitat 91D0* - Bog Woodland is located in Romania in the alpine and continental biogeographic zones (the list of SCIs is presented in the table 1.).

Table 1

The national list of SCIs where the 91D0* forest habitat is present [Ordinul nr. 1964/2007]

	Nr. crt.	Număr / nume SCI
Habitat 91D0*	1	ROSCI0002 Apuseni
	2	ROSCI 0037 Ciomad Balvanyos
	3	ROSCI 0051 Cuşma
	4	ROSCI 0086 Găina Lucina
	5	ROSCI 0090 Harghita Mădăraş
	6	ROSCI 0101 Larion
	7	ROSCI 0111Mestecănişul de la Reci
	8	ROSCI 0113 Mlaştina după Luncă
	9	ROSCI 0116 Molhaşurile Căpăţânei
	10	ROSCI 0188 Parâng
	11	ROSCI 0233 Someşul Rece
	12	ROSCI 0241 Tinovul Ana Lina - Honcsok
	13	ROSCI 0242 Tinovul Apa Roşie
	14	ROSCI 0243 Tinovul de la Dealul Albinelor
	15	ROSCI 0244 Tinovul de la Fântâna Brazilor
	16	ROSCI 0245 Tinovul de la Romăneşti
	17	ROSCI 0246 Tinovul Luci
	18	ROSCI 0247 Tinovul Mare Poiana Stampei
	19	ROSCI 0248 Tinovul Mohoş – Lacul Sf. Ana
	20	ROSCI 0249 Tinovul Şaru Dornei
	21	ROSCI 0256 Turbăria Ruginosu Zagon

The following forest types correspond to the 9410 habitat:

- 1172 - Spruce sparse forest with *Sphagnum* and *Vaccinium myrtillus*

- 1173 - Spruce forest with *Sphagnum* and *Vaccinium myrtillus*
- 1174 - Spruce forest on soils with water excess
- 3141 - Pine forest on bogs [Paşcovschi, Leandru 1958].

Management measures

Within this habitat type the care operations of the young stands will be carried out taking into account the following aspects:

- the caring of the natural regeneration and the care of the seedlings layer – only if it is necessary, in the first years of development for the seedlings of the edifying species;
- the release cuttings – will be executed only if there are parts of the stands where the development of the edifying species is hold back by allochthonous or invasive species;
- the cleaning operations – only in exceptional cases, when there are large portions of the stands with high density, aiming the development of individual trees' strength against wind and snow, the cuttings should have low intensities;
- the thinning operations – they are recommended only in exceptional cases, when there are large portions of the stands with high density, aiming the development of individual trees' strength against wind and snow, the cuttings should have low intensities [Biriş, Merce O 2012, ******* 2000 – 2, ******* 2000 – 3].

Taking into account that this habitat is characterised by organic soils with high fragility, the caring operations of the young stands will be carried out only in dry periods, using technologies and machinery which will produce the minimum dammage to the soil. Because it is a rare and priority habitat, it is recommended that only sanitary cuttings will be carried out (at least in bogs and moist sparse forests). These cuttings will be carried out only if they are imperatively needed (e.g. if there is a large quantity of dry, dead biomass and there is danger of fire, etc.). Regeneration cuttings will not be carried out. The afforestation of the typical bog ecosystems – active bogs (the ones without forest vegetation) will be forbidden. When the forest management plan states such operations, it will be proposed the cancellation of this provision and it will be solicited a derogation from the central public authority responsible for forestry [Biriş, Merce O 2012, ******* 2000 – 2, ******* 2000 – 3].

Other interventions

For the maintaining of the ecological equilibrium of the bog it is recommended that all the forests from the basin which provides water to the bog to be included in one forest management plan (i.e. by inclusion into an unique forest management plan, or by correlating the provisions of the existing forest management plans), stopping this way the concentration of the harvesting cuttings. İn the case when the priority habitat is neighbouring with other forest stands, it is necessary that they will be applied within these stands only highly intensive forestry operations or the ones which asure natural regeneration in the margins of the forest canopy, operations that will create a forest structure that will assure the potection of the priority habitat against the wind [Biriş, Merce O 2012, ******* 2000 – 2, ******* 2000 – 3].

The existing roads will be preserved insofar as they do not seriously affect the hydrological regime of the habitat. They are forbidden any typ of activities which could lead to the modification of the hydrological equilibrium of the water supplying basin of the bog. It is also forbidden to collect resin and peat. These two activities are higly dammaging to the ecosystem and could have negative effects for very long

periods of time [Biriş, Merce O 2012, *** 2000 – 2, *** 2000 – 3].

For tourism, in the areas where it is permitted, they will ne used as much as possible suspended trails, located in areas carefully selected in order to not deteriorate biodiversity and especially the rare herbaceous species; generally, the access of the public must be limited outside the specially designed trails and the access of the off-road vehicles will be forbidden [Biriş, Merce O 2012, *** 2000 – 2, *** 2000 – 3].

CONCLUSIONS

The site conditions, somehow limitative, generate a specific composition relatively poor for the bogs. The location of the priority habitat 91D0*, sometimes inside nature reserves, doesn't mean total non-intervention on its area because they can evolve, through succesions, towards unwanted natural forest types. Therefore, the measures which conduct the ecosystem (the forest) towards an optimal structure are needed. The technical norms in force, applied adequately, include sufficient measures to promote the sustainable management of these habitats that could assure the maintaining of the favourable conservation status. The management measures must be adapted to the priority function of the forest (production or protection), and, in the case of the Natura 2000 sites, these measures are adapted to the need of the habitat. In the elaboration of the measures of restrictions to be imposed, these are due only to the special requirements of conservation of the habitat, but they should be taken into account the tensions that these restrictions could generate between the stakeholders, especially the economic losses that these could generate to forest owners.

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MAIN PRESSURES AND THREATS ON FOREST HABITATS IN THE UPPER AND MIDDLE BASIN OF BISTRA MĂRULUI VALLEY

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Keywords*: ROSCI0126, Natura 2000, threats, pressures*

ABSTRACT

*The main pressures and threats identified in the study area refer, in order of frequency and intensity, to various forestry activities (forestry works, forestry operations not complying with technical norms, planting of non-native species of trees, etc.) forest motor sports (enduro trails through the forest), dam construction on the main or secondary valleys / water abstractions, rock / gravel exploitations, high voltage lines and grazing. The most affected is habitat 91V0 - Dacian beech forests (Symphyto-Fagion), the level of incidence of pressures / threats being medium, especially due to past or present forest harvesting or due to forestry operations that do not comply with technical norms. On the other hand there is the 91E0 * habitat - Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) which is not directly affected by pressures or threats, the incidence of which is only potential (on some adjacent areas of the habitat being executed forestry operations).*

INTRODUCTION

The growth of the human population, coupled with a growing economic development, generates a number of negative effects on natural ecosystems. To overcome this problem, many legislative provisions have appeared in most countries to protect the environment. An important step was taken in 1992 with the "Rio de Janeiro Conference on Environment and Development". At this conference the Convention on Biological Diversity was signed, a convention ratified to date by more than 170 states, including Romania, which ratified it by law 59/2004 [Stăncioiu et al. 2008].

Forest habitats should be seen as dynamic systems whose evolution is influenced by different events that can cause changes in structure and composition over time. Due to disturbances, the period of installation of a similar forest ecosystem varies depending on the extent of disturbance, but also on the ability of the ecosystem to return to the original structure after disturbance [Merce 2012].

The pressures and threats to forests across the European Union vary from one region to another, and these pressures / threats can be generated by a single factor or a multitude of factors among which can be listed: habitat fragmentation, forest fires, storms, drought, air or water pollution, invasive alien species, etc. [*** European Commission. 2018]. Even in the case of an effective site management, all pressures and threats can not be fully prevented, but human actions with a negative impact can be limited in order to maintain or gain a favorable conservation status of habitats within Natura 2000 sites [Stanciu Erika, Florescu Florentina 2009].

IUCN considers a pressure to be an action / phenomenon that has had a negative effect in the last (usually) 5 years, while the threat is an action / phenomenon that will continue or may occur in the future and with potential negative effect in the coming years [www.iucn.org].

MATERIAL AND METHODS

The research is located in an area that encompasses the intravilan and extravilan territory of Zăvoi Communne in Caraş-Severin County, on which the site of community interest ROSCI0126 Ţarcu Mountains is found, in the upper and middle basin of Bistra Mărului Valley. This area is overlapped mostly over the forest stands from Production Units IV Măgura, V Peceneaga, VI Bistra Mărului, VII Şucu - Olteana and VIII - Scorila - Bratonea belonging to Oţelul Roşu Forest District (figure 1).

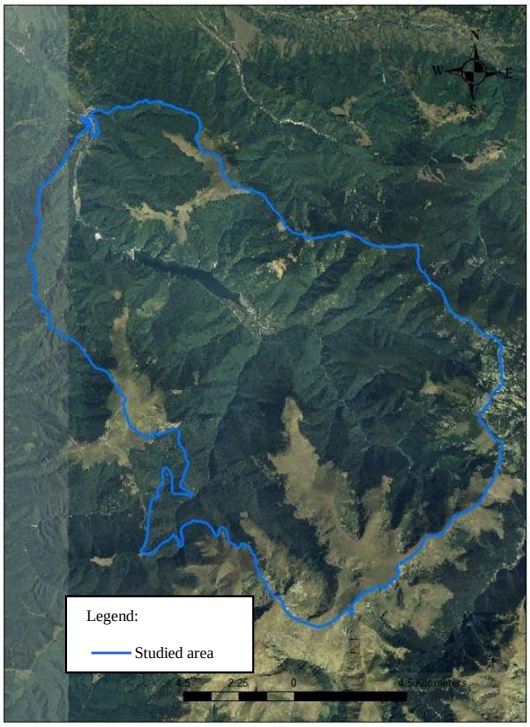

Figure 1 – Research location

The research material consists of forest stands found within the studied area. Pressures and threats, as well as their codes, have been assimilated to those outlined in the "Pressures and Threats Nomenclature" in the "Guide to Managing Natural Areas Management Plans".

For each stress factor / limiting situation encountered the following aspects were observed: the incidence level, the affected habitat area and the intensity of the negative influence (Table 1).

Table 1

The scale of incidence level, the affected habitat area and the intensity of the negative influence [Stăncioiu et al. 2008]

No.	Name of the characteristic of threat evaluation	Scale of classification
1	Incidence level	Potential
		Small
		Average
		High
2	Affected habitat area	Small
		Average
		High
3	Intensity of the negative influence	Small
		Average
		High

The mapping of the pressures / threats was based on the forest management planning maps of the five Production Units mentioned above, using the ArcGIS 10 software.

RESULTS AND DISCUSSIONS

The main pressures and threats identified in the studies area are (Figure 2): grazing in areas adjacent to forest habitats (code A04), practicing motor sports in the forest (enduro trails) (code B08.08), forestry works (collecting wood along watercourses, debris along watercourses or forest harvesting areas) (code B08), various forestry activities (theforestry opperations not complying with the technical norms, the plantation of some non-native tree species, the planting of a variety of sycamore with red leaf used especially as ornamental species in parks / squares, duglas fir, black locust, pine, collecting of fir tree branches) (code B09), stone / gravel exploitation (code C01.01), high voltage lines (D02.01.01), dam construction in the main or secondary valleys / water abstractions (code J02.12), fir seed affected by deer (code K04.05), landslides with surface boulders or stones (code L05); [*** Ministerul Mediului 2017].

Inappropriate management of habitats within the site

This category mainly included the following deficiencies identified on the ground: inappropriate application of forestry provisions and of forestry management plans, inappropriate tree marking selection regarding the forestry objectives of the young stands' care operations and respectively the main harvesting operations, failure to apply in time the young stands' care operations,use of allochthonous species, or local species planted outside the natural range. These activities have a negative effect on the composition and structure of forest habitats, leading to an inadequate conservation status over time.

Wood extractions carried out inappropriately

This category mainly included the following deficiencies identified in the site: inappropriate location of the harvest roads, collecting wood along the permanent water courses, harvesting debris abandoned in the forest and along the water

courses, maintaining in the forest, between April and October, of resinous wood with bark (which causes danger of bark beetle attacks), damage to the seedlings, damage to the standing trees and inappropriate layout of harvesting primary platforms.

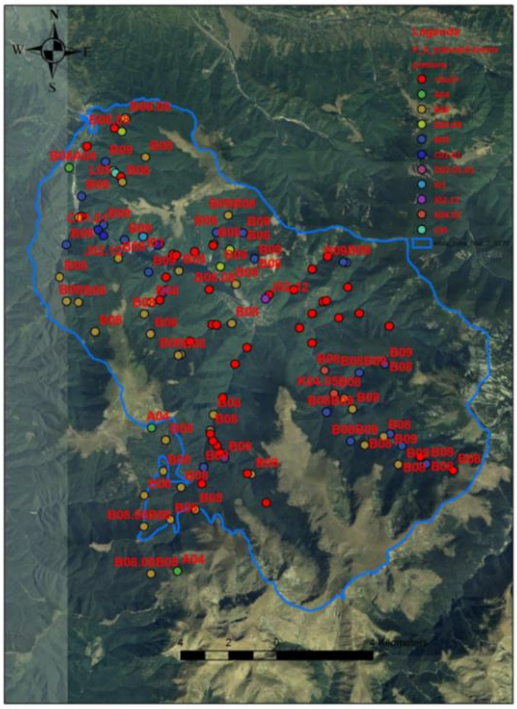

Figure 2 – Map of types of pressures and threats

Afforestation with species other than those specific for the habitat or use of non-local provenances

Even if the forestry management plan aims to promote the natural regeneration and the preservation of the natural forest type, there are situations in which other species (foreign or native trees planted outside the areal) are introduced in the composition of some stands, other than those characteristically natural in the area.

Constructions and other works

The execution of new objectives, meaning the modernization of existing works (for example, forest roads, water pipes, torrents' correction dams, high voltage lines) may cause significant changes in the development of the characteristical natural processes or even the degradation of habitats of Community interest.

Exploitation of abiotic and biotic resources (other than wood)

This category mainly included the following deficiencies identified in the site: fir-tree branches harvesting or illegal harvesting of Christmas trees and the extraction of building materials, whether we refer to (former) quarries were exploitation was made on a large scale or we refer to punctiform ornamental stone extracts made by locals.

Grazing and passage of domestic animals through the habitats

Even if these practices are forbidden, grazing and passage of animals occur in the studied area and have a negative impact on forest habitats. These activities affect the composition of the herbaceous layer, the seedlings, the soil and the natural regeneration, and lead to soil compaction and acceleration of the erosion phenomena.

Pollution

Permanent or seasonal human settlements (accommodation places for workers, sheepfolds, etc.) generate various household waste and a large part of them are stored improperly, affecting water and soil. Storage of household waste should be strictly monitored and sanctioned. Another threat is the leakage of fuels and lubricants used by forestry machinery.

Uncontrolled tourism

Practicing motor sports (enduro) in the area of forest habitats, along with other types of tourist activities, requires strict regulation. These activities affect the composition of the herbaceous layer, the seedlings and the natural regeneration process, leading to compaction of the soil and acceleration of erosion phenomena.

At the studied area level, all these types of pressures / threats, with the exception of the forestry works, have a low incidence rate, the surface area affected and the intensity of negative influence being small. In the case of pressures / threats from forest exploitation, the level of incidence, the affected area and the intensity of negative influence are average.

Regarding the pressures / threats at the level of Natura 2000 forest habitats encountered in the studied area, the situation is as follows:

-In the case of the habitat *9180* * [Doniţă et al. 2005, Gafta D,. Mountford O. 2008] they have been found (disseminated, rare) specimens of allochthonous tree species. Their level of incidence is low, the affected area being small, as well as the threat intensity.

- *The habitat 91E0** [Doniţă et al. 2005, Gafta D,. Mountford O. 2008] are not directly affected by pressures or threats, their incidence being only potential in certain areas of the habitat (where forest harvesting operations are executed).

- *The level of incidence of pressures / threats within the habitat 91V0* [Doniţă et al. 2005, Gafta D,. Mountford O. 2008] is average, especially due to past or present forest harvesting or due to forestry practices not complying with technical standards. Relative to the entire area of the habitat, the affected area is small, and the intensity of this type of pressure / threat (even if in some cases punctual, both surface and intensity are high). Also, within this habitat, they have been identified enduro trails that cross the stands, coming out from the forest into the alpine meadow. The level of incidence of this type of threat is low, the intensity and the affected area being small. If we refer to to grazing, we can say that the incidence rate is a potential one.

- In the case of habitat *9410* [Doniţă et al. 2005, Gafta D,. Mountford O. 2008] the level of incidence of past or present forest exploitations is reduced and the affected area is small, also the intensity of this type of pressure / threat. A potential incidence is represented by grazing.

CONCLUSIONS

At European Union level, the main threats to forest habitats in the continental region include deforestation, invasive alien species, air pollution, anthropogenic reduction of habitats connectivity, change in species composition (succession), grazing damage and the construction of roads and highways, but also the removal of forest vegetation and the excessive removal of diseased or dead trees. Other types of threats can also be mentioned, such as: inadequate application of conservation measures, natural eutrophication, diseases, low drought, habitat modification and man-made changes in hydrological conditions (mainly for alluvial and riverane) [*** European Commission 2018].

The main anthropogenic impacts (pressures and threats) identified in the studied area refer, in order of frequency and intensity, to various forestry activities (forestry operations, forestry practices not complying with technical norms, planting of non-native tree species, etc.), practicing motor sports in the forest (enduro trails through the forest), dams construction on main or secondary valleys / water abstractions, rock / gravel exploitations, high voltage lines and grazing. The most affected is the habitat *91V0,* while habitat *91E0** are not directly affected pressures or threats, their incidence being just potential.

It has been concluded that in order to reduce the anthropogenic impact on forest habitats of Community interest, the management measures (care operations of the young forest stands and harvesting operations of the mature stands) provided by the technical regulations in force promote the sustainable management of these habitats as a result of their application, with favorable conservation status. It is useful for management measures to take into account the provisions of the Forest Code and to be related to the priority function of the forest (production or protection).

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THE BOTANICAL GARDEN "DIMITRIE BRANDZA" ROSARIUM IN BUCHAREST HONORS STEFAN WAGNER'S CAREER BY ESTABLISHING A SECTOR WITH VARIETIES CREATED BY THE GREAT ROSES LOVER

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Keywords*: breeders, roses, Bucharest, Romania*

ABSTRACT:

In the present work we try to pay homage to the great rose variety creator Stefan Wagner who left us in 2017. Of the over 40 varieties he created alone or in collaboration with other famous breeders like G. Roman or R. Palocsay, we will present some of them which are in a new collection in the Botanical Garden "Dimitrie Brandza" Rosarium in Bucharest starting from 2018.

INTRODUCTION

A little history of Wagner's career:

The beginnings were with Rudolf Palocsay who was the director of the Horticulture Research Station in Cluj; many of the varieties created by R. Palocsay have disappeared and most of them can be found in the nursery catalogs from 1938-1944.

Stefan Wagner continued the improvement activity at the Horticulture Research Station in Cluj since 1962. He created over 40 varieties, some in collaboration with Gabriela Roman and Rudolf Palocsay, of which we can list:

'Auriu de Cluj' Fl. 1991, 'Bordura de Nea' Fl. 1995, 'Carmen' with G. Roman, groundcover 1999, 'Doamna In Mov' TH 2005, 'Foc de Tabara' Fl. 1970, 'Golden Elegance' TH 1995, 'Golden Fiesta' with G. Roman, park roses 2000, 'Incandescent' TH 1991, 'Judit' Fl. 1996, 'Mirela' Fl. 1999, 'Nobilia' with G. Roman, park roses 1998, 'Nostalgica' park roses 1998, 'Orange Ace' TH 1999, 'Red Candy' cover 1995, 'Romstar' TH 1991, 'Rosabunda' Fl. 1979, 'Rosadora' Fl. 1995, 'Rosagold' Fl. 1995, ' Rosalinda 'Fl. 1994', 'Rusticana' groundcover 1995, 'Simfonia' TH 1978, 'Simina' Fl. 1996, 'Splendid' with G. Roman, Fl. 1997, 'Vigorosa' park roses 1994, 'Zburlici' groundcover 1995. (Wagner, 2002)

Stefan Wagner continued to breed new varieties that enriched the floral heritage of our country.

Starting with 1997, the improvement activity was taken over by Gabriela Roman, who aimed to create varieties of floribunda and groundcover with abundant flowering and good resistance to frost and diseases (Wagner, 2002). Stefan

Wagner's last creation was 'Wagner's Favorite' in 2012 which is a sport of ‘Alinka’ (Rosarium, 2018)

After founding the “Roses Friends” Association in 1990 he started to gather people who were interested in growing roses and in 1991 the association became member of the World Federation of Rose Societies. (Rosarium, 2018)

In 2007 a great collaboration with S. Wagner started leading to the important changes of the Botanical Garden Rosarium, by enriching the collection with more than 200 varieties. Today the collection holds around 5000 roses.

MATERIALS AND METHODS

In 2017, after S. Wagner passed away, we came up with the idea that the Rosarium in the botanical garden should have a sector dedicated to the great breeder. In 2018, 31 varieties were purchased from Rosafruct in Aiud with the planting of those being done in October. The varieties have evolved well in 2019 and next we will continue by presenting some of them:

Fig1. Photo: M. Negulici

‘Aroma’
Type: Floribunda
Parentage: ‘Rusticana’ x ‘Lavender Dream’
Bred by G.Roman, Stefan Wagner, E. Hârșan, M. Giurgiu, 2012

Fig2. Photo: M. Negulici
'Bordura de Nea'
Type: Floribunda
Parentage: 'Bonica 82' x 'Incandescent'
Bred by Stefan Wagner, 1995

Fig3. Photo: M. Negulici

'Carmen'
Type: Groundcover
Parentage: 'Candy Rose'
Bred by Stefan Wagner, Gabriela Roman, 1999

Fig4. Photo: M. Negulici

‘Cluj 2010’
Type: Floribunda
Parentage: Sport ‘Foc de Tabara’
Bred by Stefan Wagner and Angela Bokor, 2010

Fig5. Photo: M. Negulici

‘Doamna in Mov’
Type: Thea hybrid
Parentage: ‘Lavendula’ x ‘Mainzer Fastnacht’
Bred by Stefan Wagner and Gabriela Roman, 1999

Fig6. Photo: M. Negulici

'Foc de Tabără'
Type: Floribunda
Parentage: 'Paprika' x 'Coup de Foudre'
Creator: Stefan Wagner, 1970

Fig7. Photo: M. Negulici

'Golden Elegance'
Type: Thea hybrid
Parentage: Sport 'Ambassador'
Bred by Stefan Wagner, 1995

Fig8. Photo: M. Negulici

‘Golden Fiesta’
Type: Park
Parentage: ‘Candy Rose’ x ‘Allgold’
Bred by Stefan Wagner and Gabriela Roman, 2000

Fig9. Photo: M. Negulici

‘Judit’
Type: Floribunda
Parentage: ‘Rosabunda’ x ‘Circus’
Bred by Stefan Wagner, 1996

Fig10. Photo: M. Negulici

‘Mirela’
Type:Floribunda
Parentage: ‘Castanet’ x ‘Carillon’
Bred by Stefan Wagner and Gabriela Roman, 1999

Fig11. Photo: M. Negulici

‘Orange Ace’
Type: Thea hybrid
Parentage: ‘Rosabunda’ x ‘Galia’
Bred by S. Wagner and Gabriela Roman, 1999

Fig12. Photo: M. Negulici

‘Petrina’
Type: Floribunda
Parentage: ‘Bonica 82’ x ‘Lavender Dream’
Bred by Stefan Wagner and Gabriela Roman, 2004

Fig13. Photo: M. Negulici

‘Rosagold’
Type: Floribunda
Parentage: ‘Vigorosa’ x ‘Allgold’
Bred by Stefan Wagner, 1995

Fig14. Photo: M. Negulici

‘Simfonia’
Type: Thea hybrid
Parentage: ‘Mount Shasta’ x ‘Pascali’
Bred by Stefan Wagner, 1978

Fig15. Photo: M. Negulici

‘Simina’
Type: Floribunda
Parentage: ‘Vigorosa’ x ‘Allgold’
Bred by Stefan Wagner, 1996

Fig16. Photo: M. Negulici

‘Splendid’
Type: Floribunda
Parentage: ‘Centennaire de Lourdes’ x ‘Clare Grammerstorf’
Bred by Stefan Wagner and Gabriela Roman, 1997

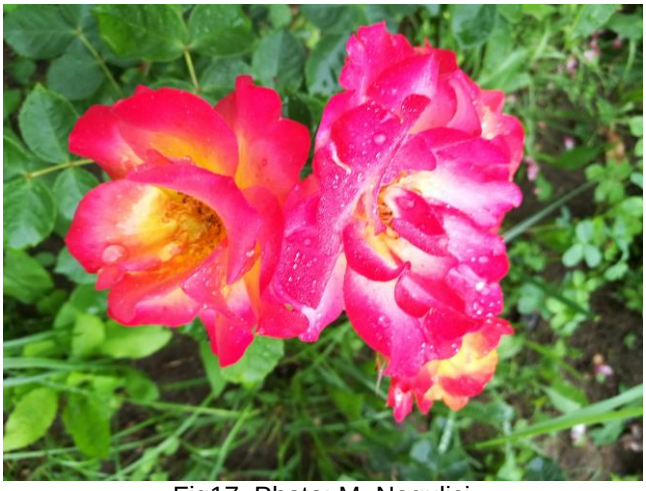

Fig17. Photo: M. Negulici

‘Veronica’
Type: Floribunda
Parentage: ‘Golden Holstein’ x ‘Montana’
Bred by S. Wagner and Gabriela Roman, 2011

Fig18. Photo: M. Negulici

‘Wagner’s Favorite’
Type: Thea hybrid
Parentage: Sport ‘Alinka’
Bred by Stefan Wagner, 2012

Fig19. Photo: M. Negulici
‘Zburlici’
Type: Groundcover
Parentage: ‘Bonica 82’ x ‘La Sevillana’
Bred by Stefan Wagner, 1995

CONCLUSIONS

Stefan Wagner was a huge fan of roses and shared with all those who are passionate about roses all the things there are to know, like how to take care of these wonderful plants.

In 2007 a great collaboration with S. Wagner started leading to the important changes of the Rosarium, by enriching the collection with more than 200 varieties. In the future we will try to gather all the varieties created by S. Wagner

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PHYSIOLOGICAL AND PATHOLOGICAL ASPECTS OF THE COLON

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Keywords*: colon, digestion, biopsy, endoscopically.*

ABSTRACT

The colon is the segment of the digestive tract with an important role in the digestion of intestinal chemistry and the formation of fecal matter.

The function of the colon is to extract water and salt from feces before they are eliminated in the external environment of the body. Unlike the small intestine, the colon does not play an important role in absorption. It has four regions: ascending colon, transverse colon, descending colon and sigmoid colon.

Many problems and disorders can affect the colon's ability to function properly. These may include intestinal gas, diarrhea or constipation. More severe disorders include colorectal cancer, ulcerative colitis, irritable bowel syndrome, diverticulitis and colon polyps.

Most treatment options tend to depend very much on the disorder in question, its severity and the general condition of the person affected. These may include a well-balanced diet and taking certain medications. In more severe cases (such as cancer), surgical removal of the large intestine may be necessary.

INTRODUCTION

Colon cancer is a major public health problem, ranking 4th in the world in terms of frequency. (http://www.gastromed.ro/Cancerul-de-colon.html)

The increase in the incidence of colon cancer can also be explained by a rapid evolution and improvement of the diagnostic means, by increasing the accessibility to the diagnostic centers and / or through a better health education of the population. The introduction and spread of colonoscopy as a diagnostic and screening method, the widespread use of Computed Tomography and Nuclear Magnetic Resonance in the diagnosis and staging of colon cancer have led to the identification of an increasing number of patients requiring specialist treatment. Modern imaging methods such as diagnostic laparoscopy or virtual colonoscopy can ensure much earlier detection of colon cancer cases to allow for adequate treatment (Trifan et al. 2006).

In Romania, colorectal cancer increases in the incidence: 21 new cases / year / 1000 inhabitants in men and 11.4 new cases / year / 1000 in women, prevalence of 54.6% / 1000, and mortality of 11.6% / 1000. The incidence of colorectal cancer is considered average (18.55% / 1000 inhabitants), noting, in the last 10 years, a marked increase of this, from 10.1% / 1000 in 1989 to 18.55% / 1000 in 1999 (Hamidreza Sadeghi Gandomani et al. 2017).

Mortality due to colorectal cancer in Romania followed a constant increase, from 14/1000 for men and 18.3 / 1000 for women, in the years 60-90, to 22.2 / 1000 in 1995-20034. The information obtained from the NIS (National Institute of Statistics) showed an increase in the number of new cases of colorectal cancer (CCR) from 2971 to 5185, which means an increase of 74.5%; In terms of incidence, this means an increase from 13.5 / 100,000 to 23.57 (Bică 2011).

The digestive tract provides the body with a continuous supply of electrolytes, nutrients and water. In order to achieve this goal it is necessary to move food along the gastrointestinal tract; secretion of digestive juices and food digestion; absorption of products resulting from digestion, water, and various electrolytes; vascularization of the organs entering the gastrointestinal tract, through which the transport of absorbed substances will be ensured; and control of these functions at the local, hormonal and nervous levels (Pascarenco et al. 2015).

Each of the component parts is adapted to its specific functions: some parts provide digestion and absorption, as is the case with the small intestine; others are intended only for food transit, such as the esophagus (Sur et al. 2018).

The colon performs the following main functions: absorption of water and electrolytes from the chemical to form solid faeces and storage of faeces until they can be eliminated. The distal half plays a role of storage, and the proximal half plays a role in absorption (Ogobuiro 2019).

Colon movements are very slow because intense colon motility is not required to perform these functions. These movements, even if they are slow, retain the similar characteristics of the small intestine, thus they are divided into: mixing movements and propulsive movements (Guyton & Hall 2007).

MATERIAL AND METHODS

The study group consisted of 7 cases (patients from Târgu Cărbunești Emergency Hospital and from CMI Dr. Chiricioiu Alina), patients who were collected from colon tissue, either by colonoscopy with biopsy or from the surgical resection piece. Both the preparations and the images were made at C.M.I. Dr. Chiricioiu Alina.

Tissue preparation

The histopathological material was collected following the direct biopsy obtained endoscopically, as well as following the curative tint surgery. The examination also included adjacent mesenteric lymph nodes, a necessary step for formulating the stage diagnosis of the tumor lesion.

Biological material (colorectal resection pieces) was introduced immediately after resection in 10% neutral formalin fixative solution, then processed in classical histological technique for inclusion in paraffin, a technique that allowed us to perform serial sections of 3-5μ thickness. We used the stain considered standard for a correct and complete anatomopathological diagnosis of colorectal cancer, namely staining with hematoxylin-eosin (HE) (Sorenson 2008).

The images were purchased with a Nikon Eclipse E20 microscope with 10X and 20X lens and a 10 megapixel camera.

From all the blocks selected, included in paraffin, sections of 4 μm thick were cut using a microtome equipped with a special system of section transfer.

Hematoxylin-eosin staining: Deparaffining; Mayer hematoxylin - 2-5 minutes; Wash; Rapid differentiation into alcohol-hydrochloric acid; Wash; Eosin - 10-15 seconds; Dehydration - three baths of ethyl alcohol (70°, 96°, absolute); Clarification - 3-5 toluene baths.

Mounting

Reagents - Hematoxylin Mayer: hematoxylin 1.5 g + potassium alum 75g + sodium iodate 0,3g + 1 liter distilled water. Eosin: yellow eosin 6g + blue eosin 6g + orange G 0,4g + ethyl alcohol 70° 700 ml + lithium carbonate solution 80 ml + glacial acetic acid 3 ml. Alcohol-hydrochloric acid: 99 ml 70° ethyl alcohol + 1 ml 1N hydrochloric acid.

Results: nuclei-blue, cytoplasm-red (Mogoantă 2003).

Melanosis coli is a benign lesion that affects the lining of the large intestine (Figure 1, 2). There is a relationship between the presence of melanosis and the use of anthracinone laxative. Melanosis coli is also observed in colon cancer patients, but there are doubts whether these two conditions are related (Biernacka-Wawrzonek et al. 2016).

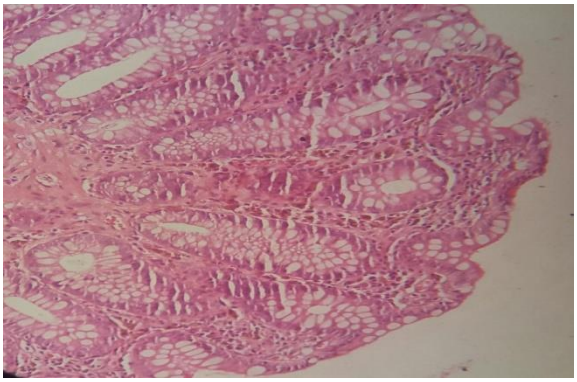

Figure 1. Mucosa harvested by colonoscopy from the descending colon.

Image from a 38 years patient, urban area, consuming laxatives of about 18 months, where melanic-like pigment (lipofuscin) is observed in the macrophages of the colic mucosa. × 10

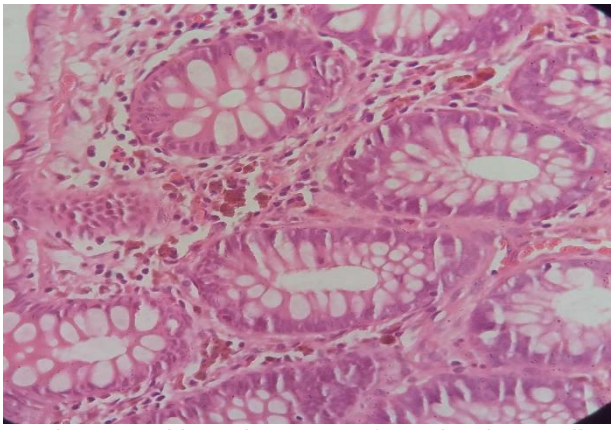

Figure 2. Mucosa harvested by colonoscopy from the descending colon. Image from a 38 years patient, urban area. x 20

Melanosis coli is a harmless condition in which the lining of the colon and rectum, which is usually pink, turns black and brown. Experts believe that the lining of the colon darkens - resulting in melanoma coli - when the cells in the colon are destroyed and excess lipofuscin pigment is produced. The discoloration may vary from person to person. It can be mild or severe, and affects a small or large portion of the colon. (https://www.medicinenet.com/melanosis_coli/article.htm)

A polyp is a projection of the tissue from the inner lining of the colon into the lumen of the colon (Figure 3). Different types of polyps look different under the microscope. Polyps are benign (non-cancerous) growths, but cancers may start in some types of polyps. These polyps can be considered precancerous, which is why it is important to eliminate them. (https://www.cancer.org/treatment/understanding-your-diagnosis/tests/understanding-your-pathology-report/colon-pathology/colon-polyps-sessile-or-traditional-serrated-adenomas.html)

Figure 3. Mucosa harvested by colonoscopy from the descending colon. Macroscopic polyp appearance

The mucinous adenocarcinoma of the colon and rectum is a histological subtype of colorectal adenocarcinoma (Figure 4). It constitutes about 10% of all colorectal adenocarcinomas. (https://www.dovemed.com/diseases-conditions/mucinous-adenocarcinoma-colon-and-rectum/)

Figure 4. Tumor harvested from the descending colon near the sigmoid colon. A prominent formation with the external surface is observed in the lumen.

The areas with microchistic aspect are identified in section

The tumor is diagnosed under a microscope, when the cancer cells are examined by a pathologist. The subtype is noted based on the predominant histological pattern.

The cause of mucosal adenocarcinoma of the colon and rectum is generally unknown. It is believed to be associated with genetic defects and certain dietary and lifestyle factors. The lack of exercise and high calorie diet is linked to this type of cancer. (http://atlasgeneticsoncology.org/Tumors/colonID5006.html)

Signs and symptoms may include abdominal pain, rectal bleeding, fatigue and weight loss known. (https://www.cancercenter.com/cancer-types/colorectal-cancer/types)

CONCLUSIONS

The incidence of melanosis coli increases with age, similar to that of colon cancer. Melanosis was not present within the tumors, in almost half of the cases it was not present in the proximal area, and the degree of pigmentation increased in the distal area.

The cause-and-effect relationship between melanosis coli and colon cancer remains uncertain. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5663380/)

Most tumors in the colon are mucinous adenocarcinomas and have poor prognosis. In children, tumors grow rapidly, mostly presenting the advanced stage, and the five-year overall survival is reported between 7 and 12%.

Typically, in the pediatric age group, patients have an early onset, a short duration (usually within a few months) and are in an advanced stage of the disease when they seek medical advice. According to a US study, about 86% were presented in advanced stages. (https://www.esmo.org/Oncology-News/Mucinous-Colorectal-Cancer)

To date, surgery has remained the mainstay of treatment. Chemotherapy and radiotherapy are used as adjuvant modes for controlling local and remote metastases and recurrences. Sometimes neoadjuvant chemotherapy can also be used to decrease the size of the tumor and facilitate resection. Segmented resection of the intestine with end-to-end anastomosis is the preferred option in the early stage of the tumor after clear margins are obtained. When the tumor is non-resectable with local metastases beyond the lymph nodes, incisional biopsy with neoadjuvant chemotherapy is recommended (Zhou Zheng et al. 2013).

In cases of obstruction and undetectable tumor, permanent colostomy is preferred. In cases where the tumor is resectable, but with doubtful margins, as in our case, segmental excision with temporary stomata is recommended, followed by chemotherapy. (https://www.nhs.uk/conditions/colostomy/)

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RESEARCH ON THE PATHOLOGICAL ASPECTS OF THE TONGUE

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Keywords: *tumor, tongue, patients, lingual wounds.*

ABSTRACT

Muscular and mobile organ, the tongue has mechanical, phonatory and sensory functions, intervening in chewing and swallowing, articulated speech as well as in the gustatory sense.

Due to the multiple roles it plays, the language and in particular, the lingual mucosa is exposed to mechanical stress, but also to the action of chemical factors (contained in food) and microbes reached in the mouth. Neurological lesions, medicines, local lesions and inflammations, surgery in the field of ENT, poor oral hygiene, metabolic disorders (diabetes), avitaminosis, etc. lead to changes in the lingual mucosa and to taste disorders.

The local and general mechanisms of protection of the organism have the capacity of antimicrobial defense and the restoration of the affected tissues. If the disruptive factors exceed certain limits, pathological changes appear in the form of different diseases, the premalignant tumors representing serious disorders that can affect the tongue.

INTRODUCTION

The pathology of the tongue is quite complicated, the diseases that can be located at this level are multiple. The cause of oro-facial cancer and cancer in general is not fully elucidated being attributed in particular to a genetic imbalance that allows uncontrolled cell proliferation.The oncogenesis process consists of activating oncogenes of different factors and inhibiting the suppressor mechanisms leading to chaotic cell division and the appearance of malignant cells (Pătroi 2010).

Stages of tumor development:

- Slight dysplasia, of the first degree
- Moderate displasia, of the second degree
- Severe dysplasia, of the third degree

The first two types of dysplasias (disorders in cell multiplication, growth and differentiation) are reversible, and those of grade III are irreversible, following the malignant process evolving into carcinoma in situ (cancer of degree 0) (Țovaru 2015).

Oral cancer may start in lesions recognized as potentially malignant entities or in other lesions. Thus they can be:

- Unrelated lesions in the form of white and red spots, erosions and ulcers
- Highlighted lesions, such as vegetative lesions, proliferative lesions and nodules

At the level of the tongue, cancer can frequently manifest as:

- A painless erosive ulceration located on the edges of the tongue that can be confused with a traumatic injury. Over time, the lesion develops both inside and at the surface and acquires a firm consistency, the edges becoming highlighted.
- In the form of a nodule, of firm consistency that can ulcerate

Due to localization in areas difficult to access for inspection (glosso-epiglottic envelope, paralingual duct) and presentation as minor and asymptomatic lesions, tongue cancer is detected in late stages of the disease (Pătroi 2010; Rusu 2017; Țovaru 2015).

In order to detect oral cancer, careful clinical examination is required especially of the areas listed as being of high carcinogenic risk. "Epithelial malignancies (carcinomas) make up about 95% of cancers with this localization", many of the cases manifesting in the tongue (50%) (Burlibașa 2005; Simionescu 2002).

Two groups of diseases with an increased risk of malignant transformation are known:

- Lesions with malignancy potential that present an increased degenerative risk, having a reversible character and only sometimes evolving towards the malignant stage. This category includes lesions: oral leukolplasia, flat lichen, chronic hyperplastic candidiasis, etc.
- Premalignant lesions with irreversible morphologically altered tissue, evolving towards malignancy. Injuries with a certain premalignant evolution are:

- Erythroplasia (Bowen's disease)
- Floral oral papillomatosis (proliferative verbose leukoplasty) (Pătroi 2010; Rusu 2017; Țovaru 2015).

The cancer of the tongue has different locations:

- In the mobile part of the tongue (73.33%) on the anterior dorso-lingual or ventro-lingual part (especially on the edges of the tongue and in less cases at the tip of the tongue)
- Dorsal-posterior location or at the base of the tongue (26.66%). This cancer is usually detected in late stages because it is difficult to examine.

When the tumor is located in the back of the tongue, the saliva and food are swallowed with weight, the phonation is altered, difficult to understand and even painful. At the onset of the disease the condition of the patients is quite good, but in a rather rapid time it worsens, the pains cause insomnia, impedes the feeding, the patient weakens very much (Burlibașa 2005).

MATERIAL AND METHODS

The study was conducted at the County Emergency Clinical Hospital, Craiova within the Oro-Maxilo-Facial Surgery Clinic, with the help of specialist doctor Camen Adrian.

We retrospectively examined the data of 48 patients who presented with tumors and wounds of the tongue.

All patients studied belong to the Oltenia region and from each patient we received information about the detailed case history, oral status, nature and types of dependencies of each individual.

The data on the age and sex of patients diagnosed with lingual disorders were analyzed.

RESULTS AND DISCUSSIONS

The results obtained from the research conducted at the Oro-Maxilo-Facial Surgery Clinic, Craiova are: In 2017 there were 19 cases of lingual disorders,in 2018 there were 15 cases of lingual disorders, in 2019, 14 patients with lingual disorders were presented.

Of the patients who presented exclusively with lingual disorders in 2019 until June, 10 cases were diagnosed with tumors (malignant and benign), and 4 cases reported different wounds.

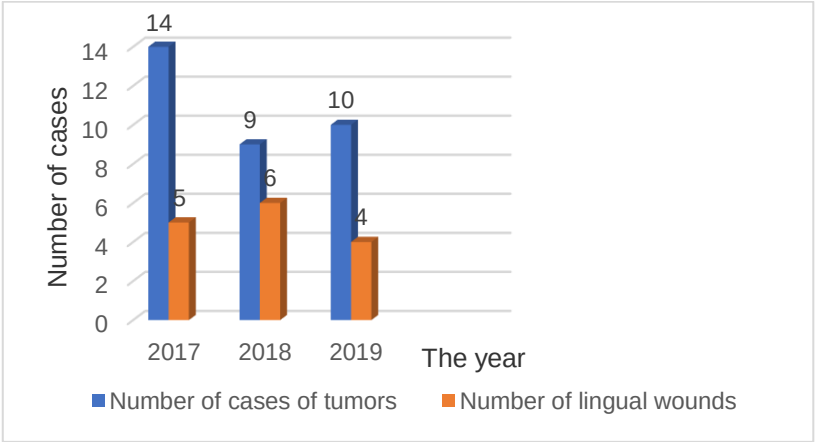
In 2018, 9 patients were diagnosed with tumors, and another 6 patients were registered with lingual wounds.

At the level of 2017, there were 13 tumor cases, one case of lingual hemorrhage due to a tumor and 5 cases lingual wounds (Table 1, Graphic 1).

Table 1

Distribution by year of cases of tumors and lingual wounds

The year	Number cases of tumors	Number cases of lingual wounds
2017	14 (29,16%)	5 (10,41%)
2018	9 (18,78%)	6 (12,50%)
2019	10 (20,83%)	4 (8,33%)



Graphic 1. Distribution by year of cases of tumors and lingual wounds

In terms of age, most patients were between 51 and 60 years old.

Thus, in 2017, 8 cases with the age ranging from 51 to 60 years, 4 cases with the age between 41-50 years and 2 cases with the age between 20-30 years were registered with lingual tumorous diseases.

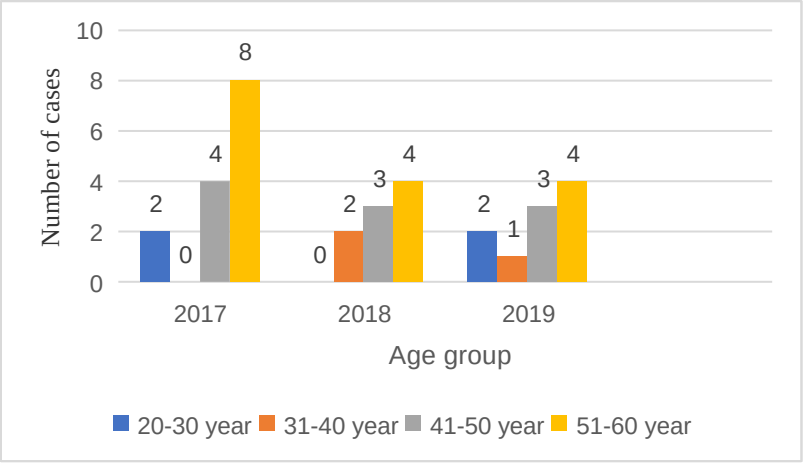
For the year 2018, patients with tumor disorders were aged between 51-60 years in 4 cases; 41-50 years in 3 cases; 31-40 years in number of 2 cases.

In 2019, there were 4 patients aged 51-60 years; 3 patients aged 41-50 years; 2 patients aged 31-40 years and one patient aged 20-30 years (Table 2, Graphic 2).

Table 2

Distribution of tumor cases according to age group

The year	The number of tumor cases according to age group			
	20-30 year	31-40 year	41-50 year	51-60 year
2017	2 (4,16%)	-	4(8,33%)	8(16,66%)
2018	-	2(4,16%)	3(6,25%)	4(8,33%)
2019	2(4,16%)	1(2,08%)	3(6,25%)	4(8,33%)



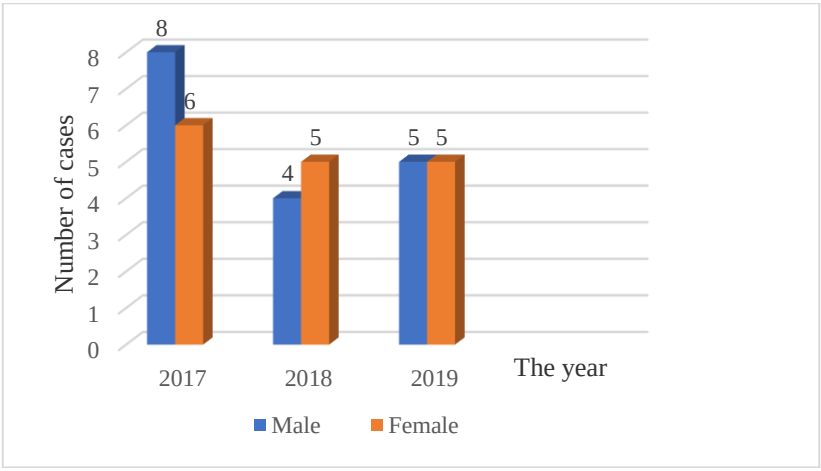
Graphic 2. Distribution of tumor cases according to age group

Regarding the male-female ratio (sex ratio 1: 1.06) of the tumor cases, the number of men affected was almost equal to that of the women affected (Table 3, Graphic 3).

Table 3

Distribution of tumor cases by sex

The year	Number of tumor cases	Number of female patients	Number of male patients
2017	14 (29,16%)	6 (12,50%)	8 (16,66%)
2018	9 (18,83%)	5 (10,41%)	4 (8,33%)
2019	10 (20,83%)	5 (10,41%)	5 (10, 41%)
Total	33 (68,75%)	16 (33,33%)	17 (35,41%)



Graphic 3. Distribution of tumor cases by sex

Most patients presented to the hospital within 6 months to one year after the onset of symptoms, which led to the rather early discovery of the tumor disorders.

In the study, only a few patients presented to the doctor after a longer period from the development of the oral injury.

In 2017, a patient presented at a rather advanced stage of the tumor and with a strong bleeding due to the tumor lesions.

In the recorded tumor cases, both tumors of a benign nature and cases of malignant tumors were discovered.

Tumors with a lingual location are one of the most aggressive and also with the most tendencies towards malignancy.

According to the data provided by Dr. Afrem, in the countries of Eastern Europe (Bulgaria, Romania, Hungary, Slovakia and Slovenia) there is an increase in the mortality rate due to these tumors.

Among the most common cancers worldwide (the 11th most common form of cancer according to the International Agency for Cancer Analysis - IARC), with an annual incidence rate estimated for 2008 in 400,000 new cases (of which 223 000 deaths), tumors of the oral cavity are some of the cancer cases whose number has increased significantly in recent years.

(http://www.umfcv.ro/files/s/t/Studiul%20morfologic%20al%20procesului%20de%20tranzitie%20epitelio-mezenchimala%20in%20carcinoamele%20scoamoase%20linguale.pdf)

CONCLUSIONS

Following the analysis of the data recorded from the articles and studies from different countries as well as from the data obtained from his own research, it was concluded that the incidence of cancerous tumors is quite high and in a continuous increase.

This increase is also associated with the increase in the number of smokers, alcohol users and dental problems associated with poor nutrition.

In addition to traditional risk factors (alcohol and smoking), tumors are also responsible for human papillomavirus (HPV) infection, which plays an important role in the etiology of cancer.

Analyzing the statistical data it was noticed that the most affected percentage of the population is represented by the male persons between the ages of 50 and 60 years.

However, tumors were also detected in younger people, who did not have associated risk factors such as tobacco and alcohol. International studies show that the incidence of cancer in younger people is constantly increasing due to orogenital practices and drug use.

The survival rate increases if the cancer is diagnosed on time, but in most cases, the tumor is diagnosed late. Dental doctors have a very important role in diagnosing oral cancers. Oral cancer prophylaxis can be achieved by health education of the population and preventive oncological controls (Burlibașa 2005).

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THE FOLLOW-UP DURING PREGNANCY

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Keywords*: pregnancy, follow-up, screening, prenatal tests*

ABSTRACT

The aim of this study was to evaluate how often pregnant women present to the obstetrician for ultrasound examination of the embryo or fetus and for performing the specific tests required during pregnancy. The distribution of pregnant patients by age group showed that the majority, respectively 39.09% belonged to the age groups 25-29 years, followed by the age group 30-34 years with a percentage of 25.57%. The youngest pregnant woman was 16 years old and the oldest was 44 years old. Regarding the time of examination 21.05% of pregnant woman were present in the first trimester, 72.93% in the second trimester and 6.01 % in the third trimester. 59,39% of patients came in the second trimester of pregnancy for the assessment of the fetal morphology.

INTRODUCTION

The development of the human embryo and fetus should be evaluated by specific tests in each trimester of pregnancy. The first trimester of pregnancy lasts up to 13-14 weeks of amenorrhea and during this period the presence of the gestational sac in the uterine cavity must be confirmed by the ultrasound examination (Porche & Abuhamad, 2019).

Between 11 weeks and 13 weeks and 6 days, the double test can be performed, consisting of the dosing of certain hormones in the maternal blood correlated with the evaluation of structural details of the fetus such as the presence of the nasal bone and the measurement of the nuchal translucency (Lewis, 2019).

In the second trimester of pregnancy the triple test and the fetal morphology can be performed. The triple test consists in determining the values of certain hormones in the maternal blood that correlate with the gestational age evaluated by fetal biometry measurements.

Fetal morphology is performed between 20-22 weeks of amenorrhea and has the role of evaluating all fetal structures reaching maturity at this time (Norton et al., 2017).

In the third trimester of pregnancy the status of "well being" is monitored through biometric measurements and the evaluation of blood flow through the umbilical artery and the middle cerebral artery (Porche & Abuhamad, 2019).

MATERIAL AND METHODS

The studied material was represented by a group of 133 pregnant women, aged between 16 and 44 years. The study was carried out in the obstetrics and

gynecology office of the PANMED Craiova Clinic, from January 2019 to June 2019. A retrospective anamnestic study was conducted that followed the next issues:

- the proportion of pregnant women out of the total number of patients who showed up for medical examination;
- age of patients;
- the gestational age at the time of presentation and placement in the trimester of pregnancy;
- the test for which the patients showed up, respectively: ultrasound confirmation of intrauterine pregnancy, double test, triple test, fetal morphology or third trimester screening;
- number of births from personal history as well as birth mode: natural birth or caesarean section;
- number of spontaneous or on-demand abortions;
- existence of ectopic pregnancies;
- administration of vitamins and folic acid up to the present;
- progestin administration;
- administration of other medicines;
- the regular or irregular character of the menstrual cycle;
- detection of pathological aspects or structural abnormalities during pregnancy.

RESULTS AND DISCUSSIONS

Of the 201 patients who came to the obstetrics practice, 133 were pregnant women, representing a percentage of 66.16%. This shows that pregnant women are much more concerned about their health and implicitly that of the unborn child.

Women who are not pregnant come much less frequently for routine medical check-ups, and they usually request specialized consultation in case of certain pathological issues.

The distribution of pregnant patients by age group showed that the majority, respectively 39.09% belonged to age groups 25-29 years, followed by the age group 30-34 years with a percentage of 25.57%. 9.02% of the patients belonged to the age group 15-19 years, 18.79% to the age group 20-24 years, 6.01% to the group 35-39 years and only 1.5% were over 40 (Table 1).

The youngest pregnant woman was 16 years old and was at her second pregnancy, and the oldest was 44 years old, being pregnant for the first time (primigaesta).

Table 1

The repartition of the cases according to the age

Group of age	16-19	20-24	25-29	30-34	35-39	>40	Total
No. of cases	12	25	52	34	8	2	133
Percentage	9,02%	18,79%	39,09%	25,56%	6,01%	1,50%	100%

Regarding the time of presentation for the ultrasound examination, 28 patients, respectively, a percentage of 21.05% were present in the first trimester of pregnancy, 97 patients (72.93%) in the second trimester and 8 patients (6.01 %) in

the third trimester. 5 patients were presented to confirm the diagnosis of pregnancy, respectively 3 patients at 6 weeks of amenorrhea, one patient at 9 weeks of amenorrhea and one patient at 10 weeks of amenorrhea.

For the double test, 23 patients showed up, and for the triple test 18 patients. The majority of patients (79), respectively 59,39% came in the second trimester of pregnancy for the assessment of fetal morphology. Only 8 of the examined patients came in the third trimester, one of them coming at 26-28 weeks for the assessment of fetal morphology (Table 2).

Table 2

The repartition of the cases according to the examination

The examination	No. of cases	Percentage
The confirmation of the pregnancy	5	3,75%
Double Test	23	17,29%
Triple Test	18	13,53%
Fetal Morphology	79	59,39%
The third trimester	8	6,01%
Total	133	100%

The period between 11 weeks of amenorrhea and 13 + 6 weeks is important for the double test that assesses the statistical risk for Down syndrome (Lewis, 2019).

The sonography performed at this time can observe important elements of morphology such as the nasal bone and can measure the nuchal translucency, both of which are markers for Down syndrome. At this time the crown-rump length of the embryo or fetus can be measured and the beats of the fetal heart monitored (Figure 1, 2, 3). Also, the cerebral, abdominal and limb structures can be observed.

Figure 1. The presence of the gestational sac in the uterine cavity

Figure 2. The measurement of the crown-rump length of the embryo

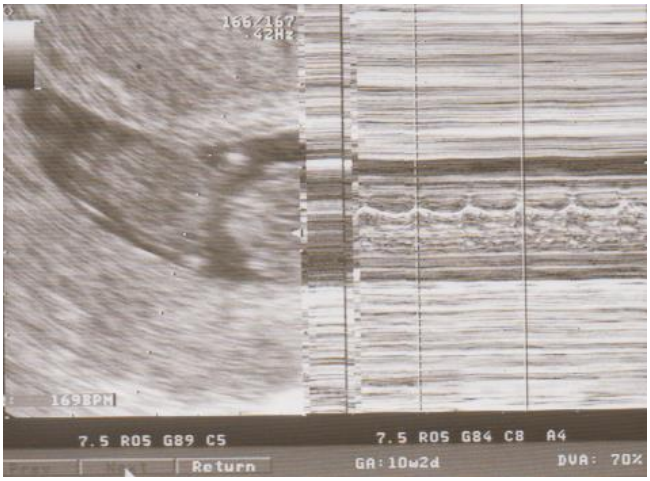

Figure 3. The heart rate – 169 beats per minute

Following this examination, two cases with structural abnormalities were detected, respectively one case with abdominal wall defects and one with limb anomalies.

The fact that the majority of patients came in the second trimester for the assessment of fetal morphology shows that they are aware of the importance of this examination in which the development of all fetal organs is observed (Porche & Abuhamad, 2019).

Of the 79 patients who came for evaluation of fetal morphology, 14 patients (17,72%) stated that they did not perform the double test or the triple test, 14 patients (17,72%) performed only the double test, 6 patients (7,59%) only the triple test and 8 patients (10,12%) performed both tests. The rest of the patients cannot specify what analyses they have performed so far, some of them being monitored in other countries.

Some patients stated that they did not show up for the necessary tests because they "felt good". A pregnant woman feels good even if the fetus has no legs, hands or brain.

Of the 18 patients who came for evaluation of the triple test, only 2 patients had performed the double test, 5 patients were sure they did not, and the rest could not specify.

49 patients from the examined group, respectively 36.84%, were primigesta (at the first pregnancy). 51 patients (38,34%) had an previous birth, in 24 cases this occurred through cesarean section. 6 patients (4,51%) had 2 previous births, of which one patient with two cesarean sections and one patient with a natural birth and a cesarean section. 2 patients (1,5%) had 3 births in their personal history, one case with 3 cesarean operations and 1 case with two natural births and one cesarean intervention.

Regarding the evaluation of the number of abortions, 62 patients (46.61%) stated that they had no abortions in the past, and 23 patients had an abortion, in 20 cases upon request and in 3 cases the abortion appeared spontaneously. 12 patients had 2 abortions in the past and 5 patients had 3 abortions in the past.

In 4 cases the patients had had more than 4 abortions on request, respectively 2 patients with 7 abortions, one patient with 5 abortions and one with 4 abortions. 9 patients underwent spontaneous abortions, of these 2 patients presenting 3 and 5 abortions respectively, and the rest of the cases only one abortion.

Regarding the administration of folic acid in pregnancy, this vitamin was prescribed only for 7 patients out of 133, representing a percentage of 5.26%. This vitamin is extremely important because it prevents neural tube defects. It is recommended to administer it 3 months before the onset of pregnancy and in the first trimester of pregnancy (Quist-Nelson, 2019).

The administration of vitamins was recommended for 57 patients (representing a percentage of 42.85%). Vitamins administration is especially recommended for pregnant women who do not feed properly, who have nausea and vomiting in the first trimester (disgravidia) and is justified by increased renal excretion by increasing glomerular filtration rate during pregnancy (ACOG, 2004).

Progestin administration was recommended for 21 patients, either prophylactically or for the diagnosis of threat of abortion. 5 patients received iron preparations for the treatment of iron deficiency anaemia. One patient received thyroid hormone treatment (Euthirox) for the diagnosis of hypothyroidism, and one patient was treated for epilepsy. For 6 patients, treatment with Aspenter (acetylsalicylic acid) for platelet anti-aggregating effect was prescribed, knowing that the blood coagulation process is amplified in pregnancy.

Regarding the regular or not character of menstrual cycles, 71 patients stated that they had a regular menstrual cycle and can specify the date of last menstruation, 7 patients had irregularities of the cycle, and the rest cannot specify.

CONCLUSIONS

The study showed that the majority of pregnant women present for ultrasound examination, especially in the second trimester of pregnancy for the assessment of fetal morphology.

In a few cases, patients came for pregnancy confirmation in the first two months of pregnancy or in the first trimester for performing the double test. This

period is very important for the development of the embryo and fetus and many structural abnormalities can be observed and diagnosed by ultrasound examination. As a result, additional tests, especially genetic ones, can be performed to confirm the presumptive diagnosis.

If the diagnosed abnormalities are incompatible with the survival of the fetus or severely affect the pregnancy, it can be stopped as early as the first trimester.

Very few pregnant women take folic acid in the first trimester for the simple reason that their family physician or obstetrician does not recommend it.

An important role in the education of pregnant women should be the responsibility of family physicians, who unfortunately do not always recommend the necessary tests.

For the diagnosis of fetal anomalies and a normal course of pregnancy, pregnant women should be monitored from the first month of pregnancy until the time of birth. Unfortunately, the pregnant woman or her family members are often more interested in the gender of the fetus than in its health.

Currently, there are non-invasive prenatal tests that can evaluate the risk of many chromosomal abnormalities, but their cost is high and therefore very few pregnant women can afford them.

An important role is played by government institutions and the health insurance system, which should promote new strategies so that pregnant women have access to all blood, ultrasound and genetic tests.

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THE MATERNAL BODY CHANGES IN THE FIRST TRIMESTER OF PREGNANCY

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ABSTRACT

The aim of this study was to evaluate the neurovegetative disorders during the first trimester of pregnancy. 59,01% presented only morning sickness, 35,24% of them had nausea and 1-2 vomiting a day, and a small percentage of 5,74% had severe vomiting, which required hospitalization and specific treatment. The constipation was present in 68,03% pregnant women, 51 of them (61,44%) presenting this symptom prior to the installation of the pregnancy. Regarding the olfaction changes, of the total of 122 pregnant women, 68 (55,74%) stated that they no longer stand the odour of perfume, aftershave, detergent, room spray, coffee, tobacco or food odour. 81,15% of patient registered weight gain in the first trimester of pregnancy. The largest weight loss recorded in the first trimester was 8 kg.

INTRODUCTION

During the gestational period, morphological, physiological and metabolic changes occur in all organs and systems. These changes are determined by variations in endocrine hormones secreted by the maternal glands and by the placenta in order to create optimal conditions for the development of the embryo and fetus (Munteanu, 2000).

These changes also play a role in the adaptation of the maternal organism that is functionally overloaded, as a new physiological situation called pregnancy homeostasis appears. All functions of the maternal body organs return to normal after termination of pregnancy.

MATERIAL AND METHODS

The studied material was represented by a group of 122 pregnant women between the ages of 16 and 44 who appeared in the obstetrics practice in the first trimester of pregnancy. The study was conducted between June 2018 - May 2019 at the PANMED Clinic. An anamnestic study was conducted which covered the following aspects:

1. Presence of neurovegetative disorders such as:

- gastrointestinal disorders: nausea, vomiting, constipation;
- olfaction changes;
- perverted appetite with preferences for certain foods or, on the contrary, their refusal;
- nervous disorders: insomnia, sleepiness, irritability.

2. Variations in body weight from the beginning of pregnancy to the end of the first trimester (13-14 weeks of amenorrhea).

3. Changes to the skin such as: prurigo, hyperpigmentation, stretch marks.

4. Urinary disorders: polyuria, pollakiuria.

RESULTS AND DISCUSSIONS

Evaluation of digestive disorders, such as nausea and vomiting, revealed the following situations (Table 1):

- pregnant women who presented only morning sickness, without vomiting.
- pregnant women who presented vomiting only 1-2 times a day, especially during the morning and after the meal;
- pregnant women with frequent and severe vomiting, up to 5-6 in a day, some of them requiring hospitalization.

Table 1

Distribution of cases according to the severity of symptoms

Symptoms	Nausea	Morning nausea + 1-2 vomiting	Severe vomiting
No. of cases	72	43	7
Percentage	59,01%	35,24%	5,74%

The majority of pregnant women, 59,01% presented only morning sickness, 35,24 of them had normal changes, respectively nausea and 1-2 vomiting a day, and a small percentage of 5,74% had severe vomiting, which required hospitalization and specific treatment: removal from the family environment, fluid and glucose infusions, vitamins B and vitamin C.

Most digestive disorders started at 5-6 weeks of amenorrhea and persisted until the end of the first trimester. In cases where patients experienced gastrointestinal pathology before pregnancy, such as gastritis, peptic ulcer, biliary disorders (biliary dyskinesia), the symptoms persisted in the second and third trimesters of pregnancy as well.

Nausea and vomiting are presumptive pregnancy symptoms and they usually occur in the morning, but sometimes they can persist all day, making the pregnant woman's alimentation impossible (Munteanu, 2000).

About 80% of pregnant women report nausea, which is also the most common reason for hospitalization in the first trimester of pregnancy (ACOG, 2004).

The causes of nausea and vomiting are not fully known, but they are considered to be correlated with increased values of chorionic gonadotrophin (hCG), increased estradiol, low prolactin, and well-developed placenta (Lagiou et al., 2003, Huxley, 2000).

Vitamin administration decreases the frequency of digestive symptoms, especially vitamin B6 administration. Phyto therapy preparations such as ginger can also be administered (Vutyavanich et al., 2001).

The constipation was present in 83 pregnant women, 51 of them (61,44%) presenting this symptom prior to the installation of the pregnancy (Table 2).

Table 2

Distribution of cases according to the presence of constipation

Symptoms	Constipation	
	Yes	No
No. of cases	83	39
Percentage	68,03%	31,97%

Constipation is the consequence of decreased gastrointestinal tract motility and increased water absorption (Munteanu, 2000).

A prospective study showed that 50% of pregnant women have this symptom at some point during pregnancy, with a rate of 24% in the first trimester. It occurs more frequently in women who have had constipation before pregnancy and who take iron preparations. It has been found that the frequency of constipation in non-pregnant women is about 7% (Bradley et al., 2007).

In the second trimester of pregnancy the constipation is accused by about 70% of the pregnant women. It is recommended to increase the water intake, the consumption of certain foods such as plums, bran or wheat fibre in the amount of 23 grams or corn biscuits 10 mg / day. If diet modification is not enough, laxatives containing senna can be administered (Rungsiprakarn et al., 2015).

Regarding the olfaction changes, of the total of 122 pregnant women, 68 (55,74%) stated that they no longer stand the odour of perfume, aftershave, detergent, room spray, coffee, tobacco or food odour.

Some pregnant women have indicated that they have an increased appetite for fruit or, on the contrary, they cannot consume meat or dairy products, foods that, before the pregnancy, have been consumed frequently, without aversion.

One pregnant woman said she prefers to eat raw meat. The consumption of raw meat is not recommended because there is the risk of infestation with the parasite Toxoplasma Gondii which is only destroyed by the thermal preparation of food at temperatures above 60^0C (Schoen et al., 2019).

The assessment of weight gain at the end of the first trimester of pregnancy (13-14 weeks of gestation) revealed the following situations (Table 3):

- weight loss versus pre-pregnancy weight;
- weight gain.

Table 3

Distribution of cases according to the variation of the weight

The variation of the weight	Weight loss	Weight gain
No. of cases	23	99
Percentage	18,85%	81,15%

The majority of pregnant women 81,15% registered weight gain in the first trimester of pregnancy and only 18,85% lost weight due to first trimester symptoms such as nausea, vomiting and lack of appetite. The largest weight loss recorded in the first trimester was 8 kg.

A weight gain of 10-12 kg is considered optimal during pregnancy. Most of it is caused by enlargement of the uterus and fetus, development of the mammary glands, increased blood volume and extracellular fluids.

Regarding the appearance of the skin, itching with or without skin lesions is common in pregnancy, with over 20% of pregnant women presenting this symptom.

It most commonly affects the abdominal skin, usually in the 3rd trimester of pregnancy and seems to be due to skin distention. Itching may be localized vulvar, anal or on the scalp and usually disappears after the birth. The therapy includes avoiding anxiety, heat, fatigue, and irritating clothing (Correale et al., 2019).

Hyperpigmentation is found in over 90% of pregnant women. It appears from the first trimester of pregnancy and accentuates until birth. It usually disappears after birth, but can sometimes persist for months and years. Its intensity is medium, but more pronounced in people with dark skin.

It can be localized or generalized. It usually affects areas that are normally darker in colour: breast areola and nipple, armpits, perianogenital area, inner face of thighs.

The pigmentation around the mammary areola determines the so-called secondary areola, and the white line (the dull midline on the anterior abdominal wall) becomes the "black line". Recent scars also pigment.

The pigmentary naevi darken or extend especially in the first trimester. A large number of oestrogen and progesterone receptors have been observed on their cells, suggesting that their changes are also hormone-induced. It is recommended to avoid the sun, artificial tanning, perfumed cosmetics, topical photoprotectors and trauma (Munteanu, 2000).

The presence of old stretch marks remaining from previous pregnancies was evaluated. The most pronounced were observed in 16-year-old pregnant women whose abdomen suddenly widened with the development of pregnancy, in contrast to women aged 30-40 years who have previously suffered variations in body weight and in which the elastic fibres have spread slowly over time.

Stretch marks (striae gravidarum) appear in 50% of pregnant women by the end of pregnancy. They have a family component, they are more common in white women and rare in black or asian women. They appear in the form of purple lines, depressed, arranged on the abdomen, thighs, breasts, sometimes on the arms, lobes, buttocks. The striae appear to be higher in obese mothers. After birth they become less obvious through discoloration, but the skin defect persists (Correale et al., 2019).

The causes are tegument distension and adrenocortical activity, both acting on the extracellular matrix, on collagen and elastic fibres.

There are no products that would prevent their appearance, nor is there any treatment once they have appeared, but hyaluronic acid, collagen and elastin creams are recommended (Brennan et al., 2012, Soltanipour et al., 2014).

Regarding urinary disorders, many pregnant women showed signs of cystitis at the beginning of pregnancy. From the anatomical point of view there is a development of pelvic nerve plexuses (Munteanu, 2000).

The urinary tract (calyx, pelvis, ureter) presents a dilation, especially on the right, generating the so-called "pregnancy hydronephrosis". The dilatation of the ureters is present from the first trimester of pregnancy and in 90% of the term pregnancies. The dilatation of the urinary tract settles at 10-12 weeks, being maximal at 20-35 weeks, then diminishes and disappears at 4-6 weeks post-partum.

The incidence of urinary tract infections in pregnant women is high (from asymptomatic bacteriuria to complicated pyelonephritis), especially in those with high glycosuria and amino aciduria (McCurdy, 2019).

The rate of glomerular filtration (RFG) starts to increase from the second month of pregnancy, being 50% higher than in the non-pregnant woman, but gradually returns to normal after birth. This has significant effects on the clearance of vitamins and medicines (Munteanu, 2000).

The nervous system is influenced by pregnancy by increasing the lability of its vegetative component. The cause is the exhaustion and insufficient adaptation of the mother's body to the stress determined by the gestation state, so that a hypotony of the sympathetic nervous system occurs.

The period of onset of pregnancy is characterized by the predominance of subcortical activity and increased tone of the parasympathetic nervous system. They also play an important role in the excitability of the external environment, which can cause disturbance of cortical activity (Becker et al., 2019).

The majority of pregnant women experienced sleepiness in the first trimester and to a lesser extent insomnia or irritability.

CONCLUSIONS

The majority of the pregnant women have gastrointestinal disorders due to the hormonal changes. The symptoms are more severe in women with the nervous system lability.

Constipation could be prevent by nutritional education and choosing an appropriate diet.

At the level of the epidermis, due to the stimulation of melanogenesis, there is the appearance of hyperpigmentation, which is more pronounced in certain areas of election and is more intense in brunettes. From the first trimester of pregnancy, there is a tendency to pigmentation of the areolas, navel, vulva and perianal teguments.

As a consequence of the loosening and rupture of the elastic fibres in the dermis and amidst the growth of corticosteroid hormones that produce changes in collagen and the fundamental substance of the connective tissue, stretch marks or striations may occur.

Pregnancy weight gain is one of the most useful parameters for monitoring pregnancy progression, a weight gain of 10 - 12 kg throughout the gestational period being considered optimal.

A sane lifestyle, an optimum caloric intake are necessary to assure the physical and mental health of the pregnant women and, consequently, the normal development of the embryo and fetus.

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SHORT REVIEW REGARDING MICROBIAL BIODEGRADATION IN THE CULTURAL HERITAGE CERAMIC OBJECTS AND MATERIALS

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Keywords: *ceramic cultural heritage, microorganism, biodegradation, fungi, algae*

ABSTRACT

Art objects have a particular interest in the culture of each country, so that, as much as possible, researchers try to develop methods to combat the degrading factors (biological, mechanical or chemical). The purpose of this review paper is to present the most common methods of identifying and combating biodegradation factors such as bacteria, fungi or algae, which attack cultural heritage ceramic objects and materials.

INTRODUCTION

Over time, cultural heritage objects have become even more important by the historical event with which they were associated, especially because they created a bridge between our generation and the legacy of our ancestors, which was preserved and transmitted by previous generations. However, at the same time, their preservation process is a difficult one, especially since the risk of biological degradation and deterioration increases, because heritage objects are generally stored for a long time in closed rooms or special boxes that favor the growth of microorganisms. Also, mechanical degradation and deterioration should not be overlooked as it may be the result of accidents or the passage of time. Thus, it can be said that both organic and inorganic art objects are affected by microbiological colonization such as bacteria, fungi, algae, viruses, etc. The appearance of colonies of microorganisms is mainly due to environmental conditions, favorable to them but unfavorable to art objects, such as too large variations of some physical parameters such as temperature, pressure, pH or humidity. Consequently, it is necessary to monitor these parameters as much as possible in order to keep the heritage materials and objects in the best condition.

Among the cultural heritage objects and materials are organic materials such as textiles, paintings, costumes, parchment, paper, manuscripts, tanned leather, but also inorganic materials such as ceramics, stones, rocks, sculptures, wood, minerals, some pigments, metals (i.e. bronze, iron), plastics, oils, waxes, etc.

Therefore, the aim of this review is to focus only on ceramic objects and materials, because ceramic is a very common material in archaeological objects.

Ceramics are an inorganic material with a crystalline or amorphous structure, obtained by heat treatment (subsequent firing and cooling). Among the types of ceramics most commonly found in museums and art institutions are: pottery, stoneware, earthenware, porcelain, terracotta, etc. But, the porosity and roughness of ceramic materials influence biodegradation and bioreceptivity, due to the fact that are more willing to absorb contaminants.

In order to maximize the effects of the processes of prevention, control, analysis and conservation of the ceramic cultural heritage objects and materials, different techniques have been used, that have developed this field of research by obtaining favorable results, among which nuclear techniques (Pereira et al. 2013, Ager et al. – in press), radiographic techniques (Negahdarzadeh et al. 2019), bactericidal nano-material based techniques (Veltri et al. 2017), etc.

MATERIALS AND METHODS

The present work is a study of the specialized literature, a review, constructed by studying numerous scientific specialized materials (review articles, research articles, encyclopedia, book chapters, short communication, international databases, etc.) that presented various means and methods for identifying and combating microbial biodegradation of ceramic objects and materials present in international cultural heritage. For the best preservation of historical ceramic objects, a complete knowledge of the possible damages that they may have suffered over time is required.

Although exposing ceramic materials to degrading environmental factors (chemical, physical or biological) does not help keep them in optimum conditions, however in this paper we shall address the topic of biological deterioration because microbial degradation of cell walls is considered to be the main cause of ceramic deterioration in the time of long term exposure to environmental factors unfavorable to this material.

Microbial biodegradation of ceramic objects and materials is due to microorganisms, which become more active in the presence of humidity. This biodegradation consists in changing the visual appearance of the materials (spots, discoloration), lixiviation, development of the inability of thermal and hydric isolation or solar reflectance (in the case of ceramic tiles), efflorescence, disintegration of the ceramic matrix, glaze exfoliation, increase of capillary porosity of the ceramic body or chemical alteration (Coutinho et al. 2016). Several methods for identifying microorganisms and biodeterioration factors have been presented in the literature (Coutinho et al. 2015, Ranalli et al. 2019, Romani et al. 2019).

Methods for combating the biodegradation of ceramic objects include nuclear methods (based on the biocidal effect of irradiation) and environmentally friendly biocides (bio fungicide). In the process of decontamination of cultural heritage artefacts is applied a dose of 10 kGy, but the radiosensitivity of most present fungi and bacteria range between 0.1–1.0 kGy (Ponta et al. 2017). For example, gamma irradiation has been shown to be an effective technique in the decontamination treatment and control of the activity of microorganisms present in ceramic materials, with a significant microbial decreasing effect for irradiation doses higher than 2 kGy (Cabo Verde et al. 2017).

A cleaning method of ceramic objects uses a tensioactive concentrated preservative based on quaternary ammonium salts (5% preservative solution in distilled water), which has an effect on microorganisms and biological patina, without the need to rinse with water after treatment (Bekic et al. 2014).

Another method of removing the impurities and contaminants from ceramic surfaces is plasma cleaning (low-pressure oxygen, ozone prepared by plasma-chemical methods or argon-oxygen mixture used as working gas in plasma cleaning method) and successful was the application of discharge generated directly in water solution (Tino et al. 2019).

Conditions for the prevention and preservation of ceramic objects. A first preventive measure in infestation with biological agents or diminishing their proliferation consists in keeping the storage space of ceramic objects clean (dust elimination as an acid agent), a humidity between 40% - 60% and a visible light level around 300 lux. The shelves should be removed from the walls and covered with an insulating cloth, the use of sealed glass cases and excess of light is not recommended. More, the ceramic objects must be kept under conditions that minimize the danger of growth of microbial colonies, by controlling the environment (conditions of cold and dry environments and proper ventilation) that will minimize their growth. Remedial conservation aims to stop the processes of biodegradation or even of strengthening of the artifact structure as in the desalination of ceramics, but even the restoration has an important role in the ceramic materials and objects conservation.

RESULTS AND DISCUSSIONS

A study conducted by Silva et al. (Silva et al. 2014) by using X-ray techniques such as X-ray diffraction (XRD), X-ray fluorescence spectrometry (XRF) and energy dispersive X-ray spectrometry microanalysis (EDX) coupled with a Scanning electron microscopy (SEM) in order to highlight the presence of microorganisms (algae) on the glaze of decorative blue-and-white ceramic tiles.

The presence of microorganisms as the genus *Bacillus*, *Microbacteriaceae* family and genus *Streptomyces* (*Actinomycetale* order) has been identified on archaeological ceramics, but *Streptomyces* sp. led to their biodeterioration, and the validated treatment to combat them was the biocide Biotin R 2% diluted in ethanol (Colonna-Preti & Eeckhout 2013). As biocid was used TiO_2 too (Barberio et al. 2015). On the aged ceramic roofing tiles was identified the presence of algae cyanobacteria and lichens (*Verrucaria nigrescens* and *Endocarpon pusillum*), but the fungus species (*Aspergillus niger* and *Cladosporium* sp.) favored the aging process (Radeka et al. 2007). In the study conducted by Guiamet (Guiamet et al. 2019) were identified fungi such as *Cladosporium* spp. Link, *Curvularia* spp. Boedijn, *Apergillus niger* van Tieghem and *Penicillium* spp. Link and bacteria *Bacillus* sp. and *Pseudomonas aeruginosa* on Aguada and Rustic ceramics. More, the fungus *Devriesia Imbrexigena* was indetified in majolica glazed tiles (Coutinho et al. 2019), and *C. pseudodiphtheriticum*, *C. aquatium*, *Listeria monocytogenes*, yeasts, *Clostridium* sp., were found in pottery jar, pottery bowls and glazed pottery (Elserogy et al. 2016). The presence of microorganisms (Grabek-Lejko et al. 2017) has also been confirmed on the red and white-yellow bodies of the glazed ceramic or unglazed sides, the residues hyphae are those that enter the deposit layer or grow on the surface (Baricza et al. 2016). Microorganisms as *Acremonium* and *Aspergillus versicolor* can be observed on ceramic materials and these are favorised by by indoor/outdoor air pollution (indoor/outdoor moulds) (Ahmed et al. 2017).

Following the application of nuclear techniques such as gamma irradiation, the opacity of the glaze and the darkening of the pigment-free areas were observed as an irreversible effect (Cabo Verde et al. 2017). Also, it was observed that the irradiation of ceramic materials induced their artificial aging (Ponta et al. 2017).

CONCLUSIONS

Considering that the objects resulted from the archaeological discoveries carry with them a load of spores taken from the respective soil, it can be stated that fungi have a considerable role in the biodeterioration and biodegradation of the cultural heritage ceramic objects and materials. Therefore, biodegradation of ceramic materials and objects affects both the cultural and economic spheres by significantly diminishing their properties, their durability and their functionality.

ACKNOWLEDGEMENT

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MORPHOLOGICAL AND BIOCHEMICAL CHARACTERISTICS OF *Prunus avium*'s EXTRAFLORAL NECTARY GLANDS

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Keywords*: sweet cherry tree, extrafloral nectaries, morphology, anthocyanins.*

ABSTRACT

Plants must cope with a wide variety of herbivores, which can consume significant amounts of biomass and reduce the rate of plant reproduction. As a result, the plants have developed a variety of evolutionary structures and strategies to ensure their protection against herbivores. Nectariferous glands produce carbohydrate exudates and can be located on any vegetative or reproductive structure of the plant. Extrafloral nectar is generally secreted on vegetative parts of plants (extrafloral nectaries) and attracts members of the third trophic level as a method of indirect protection against herbivores. The purpose of this study was to determine the morphology, position and anthocyanin content of extrafloral nectaries, in six sweet cherry (Prunus avium) varieties, namely: Giant Red, Kordia, Ferrovia, Regina, Lapins and Skeena

INTRODUCTION

Plant diversity could increase natural enemy populations due to the fact that some plants can provide alternative food to natural enemies. Such an alternative food is represented by extrafloral nectar, and plants producing extrafloral nectar are known to suffer less from herbivory attack. In fact, in return to the food provided by the extrafloral nectaries, the natural enemies protect plants against herbivory, therefore considering extrafloral nectaries an indirect plant defense (Escalante-Pérez et al., 2012, Rezende et al., 2014, Gish et al.,2016). Recent studies have demonstrated that extrafloral nectaries may play an important role in herbivore suppression in agricultural systems (Llandres et al., 2019). Extrafloral nectaries secrete nectar that attracts ants and other small arthropods; ants and a few other visitors then protect the plant by disturbing, attacking, removing or killing insect herbivores and seed predators (Marazzi et al., 2013, Nogueira et al., 2015).

Prunus avium (sweet cherry, *Rosaceae*) is a temperate tree species, native to Europe and Asia. Extrafloral nectaries on sweet cherry trees are most active early in the season, when leaves have numerous glands at the tip of each tooth along the leaf margin, in addition one to five large, brightly coloured extrafloral nectaries on the

leaf base and petiole. Later in the season only glands on the leaf base and petiole are visible (Pulice and Packer, 2008).

The purpose of this paper was to determine morphology and position of extrafloral nectaries on petiole and limb for 6 varieties of sweet cherry. The results obtained are presented below.

MATERIAL AND METHODS

The varieties analysed in this study are: Giant Red, Kordia, Ferrovia, Regina, Lapins and Skeena. For each variety, 10 leaves were collected on 27th April 2019 from the ISTRITA experimental fields in Buzau county.

Microscopic images were acquired using the Leica S8 APO stereomicroscope, which is connected to the LAS Core software that controls the Leica DFC295 camera installed on the microscope.

Anthocyanin quantification was performed using the AOAC Official 2005.02 method (pH differential method). Two buffers were used, one with pH 1.0 (KCl, 0.025M) and one with pH 4.5 (sodiummacetate, 0.4M). Briefly, dilutions of the samples were made using the two buffers, and the extract solutions were diluted until the value of the absorbance read at 530 nm had values between 0.2 and 1.4. The absorbance was read both at 530 and 700 nm. Anthocyanin concentration was calculated according to the formula:

$$\text{Anthocyanin (cyanidin-3-glucoside equivalents, mg/L)} = (A \times MW \times DF \times 10^3)/(\varepsilon \times 1)$$

where $A=(A_{530nm} - A_{700nm})pH\ 1.0 - (A_{530nm} - A_{700nm})pH\ 4.5$; MW (molecular weight) = 449.2 g/mol for cyanidin-3-glucoside; DF = dilution factor; 1 = pathlength in cm; ε = molar extinction coefficient, in L x mol^{-1} x cm^{-1} (34 300 for 1% HCl/Methanol), for cyd-3-glu; and 10^3 = factor for conversion from g to mg.

RESULTS AND DISCUSSIONS

For each studied variety, a series of images was made to determine the morphology and position of extrafloral nectaries on petiole and limb (Figures 1 to 6).

Figure 1. Extrafloral nectaries for Giant Red variety

Figure 2. Extrafloral nectaries for Kordia variety

Figure 3. Extrafloral nectaries for Ferrovia variety

Figure 4. Extrafloral nectaries for Regina variety

Figure 5. Extrafloral nectaries for Lapins variety

Figure 6. Extrafloral nectaries for Skeena variety

After the images were acquired, it was observed that the glands are found mostly on the petiole, their number being 1 or 2, for the studied samples. The position on the petiole of the extrafloral nectaries differs from one variety to another.

Following microscopic analysis of different sweet cherry varieties, some major differences in position, number and size of extrafloral nectaries were observed. Therefore, the Ferrovia, Kordia, Regina and Lapins varieties consistently had a total number of 2 glands, which are positioned on the petiole. A variable number of glands was obtained for the Giant Red and Skeena varieties, which were the only ones having the position of glands both on petiole and limb. Figure 7 show the distance to the limb and the total number of extrafloral nectaries for all studied cherry varieties.

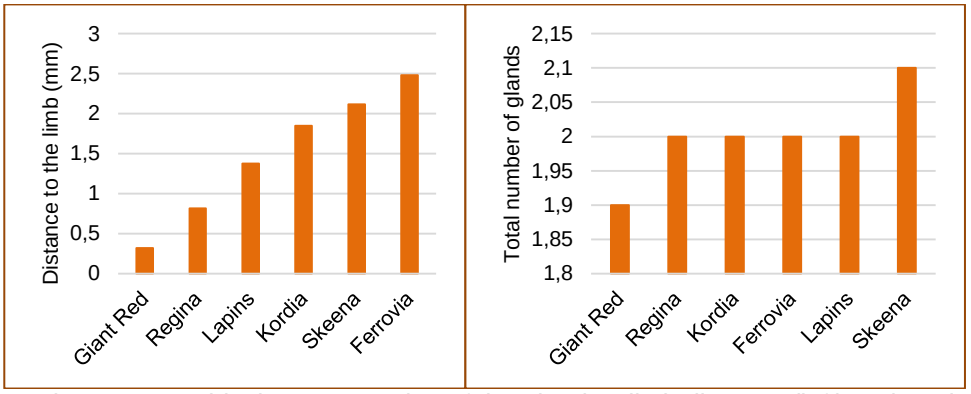

Figure 7. Graphical representation of the gland-to-limb distance (left) and total number of glands (right) for the analyzed sweet cherry varieties

Anthocyanins stand out as constitutive defenses that act over herbivorous and are modulated by plants. The most accepted hypothesis for anthocyanins as legitimate antiherbivory defenses refers to the color observed in plants that possess this pigment, inhibiting herbivores that do not recognize the red color (Cardoso-Gustavson et al., 2013).

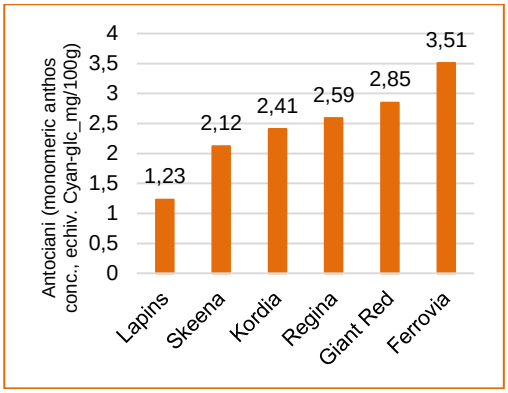

Figure 8. Graphical representation of the anthocyanins content of the extrafloral nectaries for the analyzed varieties

The anthocyanin content varied depending on the variety. However, the anthocyanin content varied between 1.23 and 3.51 mg/100gFW cyanidin-3-glucoside equivalents, the lowest amount being obtained for Lapins variety, while the highest amount was obtained for Ferrovia variety.

CONCLUSIONS

No more than 2 extrafloral nectaries were found on the leaves of the studied sweet cherry varieties. Ferrovia, Kordia, Regina and Lapins varieties consistently had a total number of 2 glands positioned on the petiole, while a variable number of glands were present on leaves belonging to Giant Red and Skeena varieties. All tested extrafloral nectaries presented anthocyanins, which according to the scientific literature stand out as constitutive defenses against herbivorous attack.

Overall, no literature data was found on the correlations between sweet cherry tree variety and extrafloral nectaries morphology and further research should be conducted on this topic.

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* AOAC Official Method 2005.02, Total Monomeric Anthocyanin Pigment Content of Fruit Juices, Beverages, Natural Colorants, and Wines - pH Differential Method, 2006.

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CAROTENOIDS, FLAVONOIDS AND TOTAL PHENOLIC COMPOUNDS CONCENTRATION IN FRUITS OF MILKFLOWER COTONEASTER (*COTONEASTER LACTEUS* W.W.Sm.)

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Keywords*: Cotoneaster lacteus, carotenoids, flavonoids, phenolic compounds*

ABSTRACT

Cotoneaster lacteus is a decorative bush, grown in various gardens and parks, throughout temperate areas, including Romania. The purpose of this research was to study its fruits, for assessing the total carotenoid, flavonoid and phenolic content.
Average carotenoid concentration found was 43.61 mg/kg DW (29.58 mg/kg in dried fruits). Flavonoids accounted for 23,775 mg/kg (8,846 mg/kg in dry fruits). 38,241 mg/kg GAE of total phenolic compounds were found in frozen pomes and 9,366 mg/kg in dry ones.
Polyphenol concentrations are comparable or higher than those found in other Cotoneaster species or other related Rosaceae (including rowans), thus pointing to a high alimentary and medicinal potential. However, thermal processing leads to an up to 75.5% loss of bioactive compounds.

INTRODUCTION

Cotoneaster is a large genus of Rosaceae (Amygdaloideae subfamily, Maleae tribe), with 70-300 species distributed worldwide. Most species are shrubs, some growing as small trees and most have their origins in China and surrounding areas, but are nowadays common ornamentals in many parts of the world including Romania.

Cotoneaster lacteus W.W.Sm. (milkflower cotoneaster/Parney's cotoneaster/red clusterberry) is a low to medium-sized, erect shrub, up to 2 m tall. Leaves are oval, dark-green and with pale undersides. White flowers are grouped in large, dense clusters. Fruits are pale reddish pomes (Fig. 1).

A native of Yunnan (China), the shrub is currently grown as an ornamental species throughout the world, due to its evergreen foliage and attractive berries. It is a tolerant species, however it prefers areas with proper sunlight and moist (but well-drained) soils. In some areas, it can become invasive (DiTomaso et al. 2016).

Most cotoneasters have mildly toxic fruits, with certain amounts of cyanogenic glycosides. Human digestion converts them to cyanide, but their concentration is low enough to avoid health issues in adults, unless consumed in extremely large amounts (which would lead to brain, liver, heart, or kidney illness). Although no scientific data is available, *C. lacteus* seems to have a larger amount of toxins than related species, since few birds consume its pomes (DiTomaso et al. 2016, Swati et al. 1995).

Figure 1. Milkflower cotoneaster (*Cotoneaster lacteus* W.W.Sm.)

Some cotoneaster berries are used in traditional cuisine, in some parts of the world, for jellies or as colorant. Others, like *C. microphyllus* and *C. multiflorus*, are used in folk medicine against skin irritation, infections, vascular diseases, biliar disfunction, irregular menstruation, bronchitis and gastritis (Liu et al. 2018, Swati et al. 1995).

The aim of this research was to determine the concentrations of some key classes of phytochemicals in fresh and dry fruit tissue of *C. lacteus*.

Carotenoids (including carotenes, lutein, lycopene, zeaxanthin etc.) are pigments commonly found in plants (leaves, flowers, fruits). For the human organism, they are important as precursors of melanin and retinol, thus essential for skin and eye health. They also have antioxidant and antiproliferative properties (Eldahshan & Singab 2013).

Phenolic and polyphenolic compounds (flavonoids, phenolic acids, tannins etc.) form a wide class of phtyochemicals, with the main function of protecting plants against microbial and fungal infections and insects (Kivrak & Kivrak 2014). They also work as antioxidants, radical scavengers, reducing agents or lipid oxidation inhibitors (Zymonė et al. 2018). Flavonoids (low-mass polyphenolic substances) have anti-inflammatory, antiproliferative, antiviral, antibacterial, and antifungal properties (Kivrak & Kivrak 2014).

MATERIAL AND METHODS

Pomes were collected from several individuals in public gardens (Constanța, Romania, October-November, 2018). Fruit pyrenes (kernels) were eliminated manually. The fruit pulp was ground, in an electrical grinder. Fruit tissue was frozen (-20°C) before examination. Part of the tissue was oven-dried at 80°C, for 72 hours, for determining biochemical content of dry fruit powder. The percentage of dry biomass was also determined gravimetrically.

For determining total carotenoid concentration, 0.1 g ground fruit pulp was extracted in 10 mL acetone (80%; triplicate samples for all determinations). After filtering, the spectrophotometric absorbance was read (S106 WPA spectrophotometer) against a blank (80% acetone) at 470, 647 and 663 nm (Miazek 2011). With resulting values, total carotenoid concentration was calculated using specific trichromatic equations (Lichtenthaler & Buschmann 2001).

For flavonoid concentration, 1 g ground fruit pulp was extracted in 5 mL methanol, then filtered. 0.5 mL methanolic extract was diluted in 4:8 water:methanol mixture, and the spectrophotometric absorbance was read at 340 nm wavelength (Szabo et al. 2012).

For total phenolic compounds concentration, a spectrophotometric version of the Folin-Ciocâlteu method was employed. 0.1 g fruit tissue was extracted in 10 mL methanol. 1 mL of filtered extract was added to 5 mL 10% Folin-Ciocâlteu reagent and 4 mL 7.5% sodium bicarbonate solution and left 30 minutes. Spectrophotometric absorbance was read at 765 nm wavelength, against a blank. A calibration curve was prepared, using known gallic acid concentrations (Siddiqui et al. 2017, Stanković 2011).

RESULTS AND DISCUSSIONS

Carotenoid concentrations in fresh frozen and heat-dried *C. lacteus* fruits are shown in Fig. 2. Flavonoid levels are shown in Fig. 3, while Fig. 5 shows the average concentrations of total phenolic compounds.

The dry weight percentage in studied fruits was 8%, making the average carotenoid concentration per dry weight 43.61 mg/kg (23.81-75.03 mg/kg DW in individual samples). Heat-drying led to a 32.16% average loss, up to 29.58 mg/kg DW (28.22-30.31 mg/kg; Fig. 2).

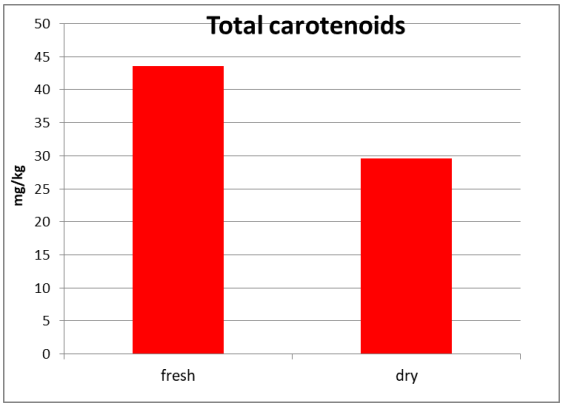

Figure 2. Total carotenoid concentration in *Cotoneaster lacteus* fruit pulp (average values; mg/kg).

Data concerning carotenoids in *Cotoneaster* pomes are scarce in literature. However, comparisons can be drawn with a related genus, *Pyracantha. P. angustifolia* fruits contain over 65 mg/kg carotenoids (Zechmeister & Schroeder 1942), while the well-known medicinal plant *P. crenulata*, only 22 mg/kg in (Pal et al. 2013).

Sorbus (rowanberries and service-trees), is another related member of the Maleae tribe, with similar pomes. A research on a wide range of domestic rowan cultivars found total carotenoid contents between 39-2,659 mg/kg (Zymonė et al. 2018).

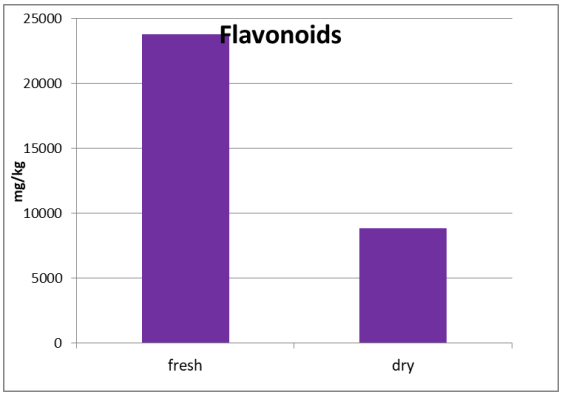

Figure 3. Total flavonoid concentration in *Cotoneaster lacteus* fruit pulp (average values; mg/kg).

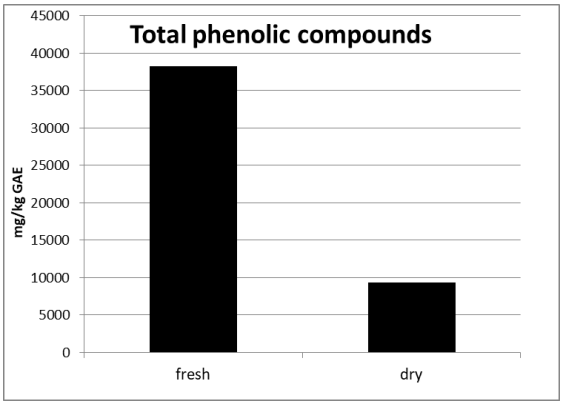

Figure 3. Total concentration of phenolic and polyphenolic compounds in *Cotoneaster lacteus* fruit pulp (average values; mg/kg GAE).

The average concentration of flavonoid compounds was 23,774.77 mg/kg DW (20,568-29,525 mg/kg) in fresh fruits, while only 8,846.43 mg/kg (4,777-18,577 mg/kg) in dry pulp powder (62.79% loss; Fig. 3). For comparison, lower values were found in fruits of *Cotoneaster horizontalis* (6,800 mg/kg; Mohamed et al. 2012) and higher ones were found in fruits of *C. multiflorus* (53,700 mg/kg; Liu et al. 2018).

Fruit tissues of various *Sorbus* species and cultivars contain 435-37,000 mg/kg, variations being due to species/variety, fruit ripening stage, or unknown local factors (Majić et al. 2015, Zymonė et al. 2018).

Total phenolic and polyphenolic compounds (flavonoids included) amounted for 38,240.52 mg/kg GAE (DW; 33,672-41,052 mg/kg). Dry fruit powder contained an average of 9,366.43 mg/kg GAE of total phenolics (8,514-10,454 mg/kg; Fig. 4), meaning a 75.51% loss.

These concentrations are higher than those found in fruits of *C. horizontalis* (14,000 mg/kg GAE; Mohamed et al. 2012) and similar to those in *C. multiflorus* fruits (38,600 mg/kg GAE; Liu et al. 2018).

Among other related species, *Pyracantha crenulata* pomes contain 7,430 mg/kg total phenolics (Pal et al. 2013). *Sorbus domestica* fruits have over 10,000

mg/kg phenolics (Majić et al. 2015), while *S. torminalis* (service tree) has 19,150 mg/kg (Hasbal et al. 2015). Fruits of domestic *Sorbus* sp. cultivars contain a highly-variable amount of 362-8,142 mg/kg GAE (Zymonė et al. 2018), while 2,218-9,843 mg/kg GAE were found in some wild forms (Raudonis et al. 2014).

CONCLUSIONS

While having low amounts of carotenoids (43.61 mg/kg DW, on average), fruits of *Cotoneaster lacteus* had high amounts of flavonoids (23,774.77 mg/kg DW) and total phenolic compounds (38,240.52 mg/kg GAE DW), when compared to those of other cotoneasters and related species, including the medicinal species *Pyracantha crenulata*, or edible pomes of various rowanberry and service tree varieties.

Such values show a potential for various applications of these fruits, needing further investigation.

However, *C. lacteus* fruit tissues proved sensitive to heat-drying, which led to 32.17-75.51% losses in these categories of bioactive compounds (especially phenolics). This means that alternative processing methods are required.

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THE REACTION OF SOME ROSE VARIETIES CULTIVATED IN THE "ALEXANDRU BUIA" BOTANICAL GARDEN, CRAIOVA TO THE ATTACK OF THE MAIN SPECIFIC PHYTOPARASITES

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Keywords*: rose, variety, reaction, powdery mildew, black spot disease*

ABSTRACT

The research conducted on the reaction of fifteen rose varieties cultivated in the rosarium of the "Alexandru Buia" Botanical Garden, in Craiova to the attack of the pathogens Sphaerotheca pannosa (Wallr.) Lev. var. rosae Woron and Diplocarpon rosae Wolf showed that they display great variability. Thus, four varieties were susceptible to the powdery mildew attack, while five varieties showed moderate resistance and six varieties were resistant; in four of these cases, the attack was missing. In the case of the black spot attack, three varieties reacted as moderately resistant, while twelve varieties were resistant; in four of the cases, the disease was not reported.

INTRODUCTION

The rose represents one of the most appreciated and beloved flowers, more than 20,000 varieties being presently cultivated around the world.

In order to preserve the ornamental aspect, one of the conditions is to detect, as early as possible, the attack of the specific pests; this is done by careful and regular observations in the culture, in order to take appropriate phytoprotection measures.

The results obtained during certain studies on the complex of pathogens affecting the rose, the reaction of some varieties to the attack of the key phytoparasites, and the role of prevention and control measures in limiting the attack were presented by a number of Romanian and foreign specialists.

Following morphological and genetic analyses (ITS and PCR), Romberg et al. (2014) reported for the first time that the powdery mildew attack on a species of rose in the U.S.A. is caused by the pathogens *Leveillula taurica* and *Podosphaera pannosa*.

The presence of *Podosphaera pannosa* fungus attack was also reported by Baradaran et al. (2012), but on the *Rossa damascena* species, in the province of Kerman - Iran.

Berrardis et al. (2007) present data concerning the behavior of six varieties of roses on the attack of the main pathogens and pests, under the conditions of the Iași ecosystem; the authors highlight the moderate resistance of the roses, especially to the attack of animal pests.

In order to keep the powdery mildew under control, Singh et al. (2012) recommend Bavistin, Benlate (0.1%) or Karathane (0.05%) treatments; the authors underline the positive contribution of the *Cicinnobulus cesatti* fungus in preventing the disease.

Mehairjan (2012) presents the spreading area of the black spot of roses at global level, certain differential diagnosis symptoms, as well as the most appropriate measures and means for keeping the disease under control.

Studying the behavior of some varieties during the black spot attack, Costache and Roman (2001) mention that the White Christmas, Royal Ascot, Blue Moon, Crimson Glory, Allgold and Fairy varieties exhibit resistance and recommend foliar treatments with different fungicides in order to protect the susceptible and very susceptible varieties.

MATERIAL AND METHODS

The analyzed biological material consisted of fifteen rose varieties, cultivated within the collection of the "Alexandru Buia" Botanical Garden, in Craiova.

During the vegetation period, the plants were subjected to observations regarding the attack of the main pathogens (*Sphaerotheca pannosa var. Rosae, Diplocarpon rosae* and *Phragmidium mucronatum*), under natural infection conditions.

In order to assess the response of the rose varieties to the attack of the phytoparasites under study, notes were made regarding the frequency (F%) and the intensity (I%); these were used to calculate the degree of attack (DA%), by using computation formulas established in the phytopathology researches.

Depending on the value corresponding to the degree of attack, the varieties fell into the following resistance classes:

- resistant (R) - DA % = 0 -1%;
- moderately resistant (MR) - DA % = 1-5%;
- susceptible (S) - DA % = 5-10%;
- very susceptible (VS) - DA % > 10%.

RESULTS AND DISCUSSIONS

Following the observations conducted on the fifteen rose varieties, between April and October 2018, there was identified the attack of the micromycetes *Sphaerotheca pannosa (Wallr.) Lev was identified. cousin. Woron rosae* and *Diplocarpon rosae Wolf*.

The presence of the attack of *Sphaerotheca pannosa var. rosae* fungus, responsible for the rose powdery mildew, was observed on the leaves, flower stalks and bud calyx during spring and evolved until autumn, following successive series of secondary infections.

Typical powdery mildew symptoms appeared on the attacked organs and, as the disease evolved, some leaves yellowed, deformed and dried; the flower buds wrapped in mycelium felt did not open or, if the blooming process did occur, the flowers were small, deformed, and stained.

As presented by the data in Table 1, the reaction of the varieties to the powdery mildew attack was different, the value of the attack degree ranging from 0% to 8.3% and being mainly influenced by the incidence of the attack.

In the climatic conditions of the year 2018, four of the fifteen analyzed varieties behaved as susceptible, five varieties as moderately resistant and six varieties as resistant, at four of them the attack practically missing (Petrina, Letitia Casta, Blue for you, and Judith).

Table 1.

The response of some rose varieties to the attack of the pathogen *Sphaerotheca pannosa (Wallr.) Lev. cousin. rosae Woron*

No.	Variety	F %	I %	DA %	Resistance class
1.	Cluj 2010	59.9	8.6	5.2	S
2.	De Kora	82.5	10.1	8.3	S
3.	Burgundy Ice	50.6	2.6	1.3	MR
4.	Golden Elegance	80.4	7.9	6.3	S
5.	Velvet Fragrance	81.6	9.2	7.5	S
6.	Petrina	0	0	0	R
7.	Cindy	62.3	5.6	3.4	MR
8.	Asya	39.1	3.4	1.3	MR
9.	Letitia Casta	0	0	0	R
10.	Terracotta	48.2	4.2	2.0	MR
11.	Ambasador	16.6	1.3	0.3	R
12.	Mondiale	28.7	2.1	0.6	R
13.	Blue for you	0	0	0	R
14.	Melina	48.4	3.6	1.7	MR
15.	Judith	0	0	0	R

The attack of the *Diplocarpon rosae* fungus, which produces the black spot of the rose, started in May and has been present throughout the summer and autumn.

The disease is easily recognizable, as circular black spots appear especially on the upper part of the folioles. An important characteristic of an early stage of the disease is that near the spots there can be noticed the mycelial filaments of the pathogen, which develop radially around the infection point. During strong attacks, following the confluence of the spots, which form in large number, the folioles dry up and fall, which leads to the weakening of the plant in full vegetation season and to a poor flowering.

The data presented in Table 2, regarding the response of the fifteen varieties of roses to the black spot attack, illustrates that it was present on eleven varieties, while the four varieties without attack were Cindy, Asya, Letitia Casta, and Blue for you.

In the eleven varieties in which the disease manifested, the incidence of the attack had values comprised between 10.3% and 35.9% and the virulence ranged between 1.7% and 5.5%, which led to the computation of an attack degree (DA%) with values comprised between 0.2% and 2%. As a result, three of the total number of analyzed varieties behaved as moderately resistant (Cluj 2010, De Kora, and Ambasador), while twelve behaved as resistant.

It is noteworthy that the fifteen analyzed varieties did not show symptoms of rust, which is considered another key disease for rose crops.

Table 2.

The response of some rose varieties to the attack of the pathogen *Diplocarpon rosae Wolf*.

No.	Variety	F %	I %	DA %	Resistance class
.	Cluj 2010	30.1	4.5	1.6	MR
.	De Kora	28.7	3.9	1.1	MR
.	Burgundy Ice	14.5	2.1	0.3	MR
.	Golden Elegance	15.8	2.5	0.4	R
.	Velvet Fragrance	16.5	2.6	0.4	R
.	Petrina	12.1	2.8	0.3	R
.	Cindy	0	0	0	R
.	Asya	0	0	0	R
.	Letitia Casta	0	0	0	R
0.	Terracotta	13.1	1.7	0.2	R
1.	Ambasador	35.9	5.5	2.0	MR
2.	Mondiale	10.3	2.7	0.2	R
3.	Blue for you	0	0	0	R
4.	Melina	15.7	1.9	0.3	R
5.	Judith	11.3	2.0	0.2	R

CONCLUSIONS

Within the rosary of the "Alexandru Buia" Botanical Garden, in Craiova, under the climatic conditions of the year 2018, there occurred the attack of the pathogens *Sphaerotheca pannosa (Wallr.) Lev. var. rosae Woron* and *Diplocarpon rosae Wolf*, which are responsible for the rose powdery mildew and for the black spot of the rose.

Of the fifteen varieties of roses that were analyzed, eleven showed symptoms characteristic of the powdery mildew attack, four of them behaving as susceptible, five as moderately resistant, and two as resistant; the varieties without attack were Petrina, Letitia Casta, Blue for you, and Judith.

Most of the analyzed rose varieties showed resistance to the attack of the pathogen *Diplocarpon rosae*, with the exception of the De Kora, Cluj 2010, and Ambasador varieties, which behaved as moderately resistant; in this case, the varieties without attack were Cindy, Asya, Letitia Casta, and Blue for you.

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PATHOGENIC MYCOFLORA OF CERTAIN FLOWERING PLANTS IN THE GREEN AREA OF CRAIOVA MUNICIPALITY

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Keywords: *host plant, mycoflora, virulence of attack, key disease*

ABSTRACT

The research on the pathogenic mycoflora of a range of flowering plants in the green area of Craiova Municipality revealed that the attack of twenty-seven specific phytoparasites was present on nineteen species of host plants.

The most commonly identified diseases are in the category of leaf spot problems, being produced by fungi of the genera Septoria, Cercospora, Phyllosticta, Heterosporium, Coniothyrrinium, and Alternaria, followed by those in the category of powdery mildew, caused by species of the genera Sphaerotheca, Erysiphe, and rust produced by five species of the genus Puccinia.

INTRODUCTION

The esthetic value of flowering plants is largely influenced in a negative manner by the attack of harmful organisms.

In order to eliminate this issue, the development actions intended for the culture of flowering plants must be complemented with measures of detection, prevention and control of the vegetal parasites and of the animal pests.

Numerous Romanian and foreign researchers, among which we mention Rodi Mitrea (2005, 2006), Rodi Mitrea et al. (2007, 2009), I. Mitrea et al. (2008, 2009), Pîrvu (2007), Costache and Roman (2001), Moorman (2016), Jullien Elisabeth and Jerome (2014), Lynne (2016), Bhat et al. (2017), have showed interest and are still approaching this field.

The purpose of the research within the present paper was to highlight the structure and dynamics of the mycoflora at certain flowering plants in the green area of Craiova Municipality, under the climatic conditions of the year 2018.

MATERIAL AND METHODS

The research was conducted in Craiova, concerned the assortment of flowering plants cultivated in different green spaces and aimed at establishing the spectrum of pathogenic fungi, the appearance and evolution of their attack in the climatic conditions of the year 2018.

In order to establish the spectrum of pathogens, the attack was monitored by repeated visual checks during the vegetation period, on the different organs of the host plants.

Depending on the value corresponding to the attack intensity (I%), which represents the degree of disease of a plant or organ, there have been established the dynamics and structure of the mycoflora responsible for the diseases reported in the field.

The intensity of the attack was evaluated according to the range of values comprised between 0 and 6 and it was calculated based on the following formula:

$$I\% = (\Sigma(i \times f)) / n$$

where: i = the score given based on the percent coverage with the symptoms of the disease

f = the number of cases with the same score

n = the total number of diseased plants

In order to analyze the mycoflora for each host plant, the interval corresponding to the attack intensity of each pathogen was scored as follows:

\+ = attack intensity comprised between 1 and 25%

++ = attack intensity comprised between 26 and 50%

+++ = attack intensity comprised between 51 and 75%

++++ = attack intensity comprised between 76 and 100%

* = key pathogen

The structure of the pathogenic mycoflora was presented in the alphabetical order of the host plants.

RESULTS AND DISCUSSIONS

Given the fact that the occurrence and evolution of pathogens is directly influenced by the climatic conditions, in Table 1 we present the monthly average temperature and precipitation values recorded in 2018, during the vegetation period, as compared to the average values for the last ten years.

Table 1.

Climatic conditions recorded in Craiova, during 2018

Specification	Month							
	III	IV	V	VI	VII	VIII	IX	X
Temperature (^{0}C)	3.9	16.6	19.2	21.6	22.3	24.1	19.2	14.0
Ten years average value	5.6	11.8	16.2	20.4	22.6	22.1	17.5	13.2
Precipitation (mm)	95.0	11.1	60.2	182.3	177.3	19.2	19.0	10.15
Ten years average value	33.7	46.0	66.9	67.9	61.5	48.9	42.4	22.5

The data presented above shows the fact that the year 2018 was abundant in precipitation, with higher temperatures during the summer months as compared to the average value for the last ten years; during different stages, these conditions influenced the initiation and evolution of the diseases presented in Table 2.

Table 2.

The pathogenic mycoflora of some flowering plants grown in the green area of Craiova Municipality

No.	Host plant	Disease – causative pathogen	I% + → ++++	Reporting period	Observations
1	*Althea rosea L.*	Rust - *Puccinia malvacearum Mont*	+++	May-October	*
2	*Antirrhinum majus L.*	Rust - *Puccinia antirrhini Dict. et Holw.*	++	June	*
3	*Bellis perenis L.*	Leaf spot, drying of the foliage - *Septoria bellidis Desm. Et Rob.*	+	July	
4	*Calendula officinalis*	Powdery mildew- *Sphaerotheca fusca (Fr.) Blumer*	+++	May - August	*
		Cercosporiosis- *Cercospora calendulae sacc.*	+	June - July	
5	*Chrysanhemum sp.*	Powdery mildew - *Erysiphe cichoracearum DC.*	++	September - November	*
		Septoria leaf spot - *Septoria chrisanthemella Sacc.*	++++	May-October	*
		White rust - *Puccinia horiana P. Herr*	+	September - October	
6	*Dahlia variabilis (Willd.) Desf.*	Powdery mildew - *Sphaerotheca fuliginea (Schlecht) Salm.*	+	August – September	
7	*Dianthus barbatus L.*	Rust- *Puccinia arenariae (Schum.) Wint.*	+	June - July	
8	*Gladiolus communis L.*	Brown spot (Septoria disease) *Septoria gladioli Pass.*	++	May - June	*
9	*Hydrangea hortensis Sm.*	Powdery mildew - *Oidium hortensiae jst.*	+	September - November	

No.	Host plant	Disease – causative pathogen	I% + ⟶ ++++	Reporting period	Observations
		Gray leaf spot (cercosporiosis) *Cercospora hydrangeae Ell. et Ev.*	+	September - November	
10	*Impatiens walleriana*	Powdery mildew - *Sphaerotheca balsaminae Wallr*.	+++	July – October	*
		Brown leaf spot – *Phyllosticta balsaminae Vogl*.	+	August - October	
11	*Iris germanica L.*	Rust – *Puccinia iridis Rabenh.*	+	May – September	
		Leaf spot - *Heterosporium prunetti Nikolas Aggery*	+++	June - August	*
12	*Yucca filamentosa auct.*	Leaf spot - *Conyothyrium concentricum (Desm.) Sacc.*	++++	March - November	*
13	*Latyrus odoratus L.*	Powdery mildew – *Erysiphe martii lev.*	+++	July - September	*
14	*Lilium regale Wills.*	Black spot – *Heterosporium alii El et. mont*.	+	May - July	
15	*Nicotiana alata Link et Otto.*	Blight – *Peronospora tabacina Adam*	+	October	
16	*Paeonia officinalis L.*	Brown leaf spot – – Cladosporium paeonie Pass.	++++	April - September	*
17	*Salvia sp.*	Powdery mildew – *Erysiphe salviae (Jacz.) Blum.*	+	May – June	
		Brown leaf spot – (Septoria disease) – *Septoria salviae Pass.*	+	June - August	
18	*Viola tricolor L.*	Powdery mildew – *Erysiphe orontii*	+	May - June	

No.	Host plant	Disease – causative pathogen	I% + ⟶ ++++	Reporting period	Observations
		cast. Emend U. Braun			
19	*Zinnia elegans Jacz.*	Leaf spot – *Alternaria zinniae pape*	+++	June-October	*
		Gray mold – *Botrytis cinerea pers.*	+	August - October	

The data presented in Table 2 illustrates that the characteristic attack of twenty-seven pathogenic fungi responsible for diseases in the categories of blight (one species), powdery mildew (eight species), leaf spot (twelve species), rot (one species) and rust (five species) was reported on the nineteen host plants.

Analyzing the structure of the mycoflora in each host species, it was found that twelve of them undertook the attack of one specific pathogen, while on six species (*Calendula officinalis, Hydrangea hortensis, Impatiens walleriana, Iris germanica, Salvia sp.,* and *Zinnia elegans*) the attack was reported for two specific pathogens, and in *Chrysanthemum sp.*, there was reported the attack of three pathogens.

The attack of each reported pathogen occurred during a certain period with a different virulence, some of them being classified as key pathogens.

Out of the total number of pathogens, twelve species behaved as key parasites and the remaining fifteen as secondary pathogens.

Because of the high intensity of the attack, the key pathogens adversely influenced the development of plants, having repercussions especially in terms of flower quality.

Although the attack of the secondary pathogens occurred with lower intensity values, i.e. under 25%, it should not be neglected, as they can turn into main pathogens in the framework of the annual increase of the biological reserve and of the climate changes readily seen during the last years.

CONCLUSIONS

1. Under the climatic conditions of the year 2018, the attack of twenty-seven phytoparasites within the micromycetes category was identified on nineteen species of flowering plants from the green area of Craiova Municipality.
2. The reported phytoparasites have a strict specialization, the richest genera in species being *Puccinia, Septoria, Sphaerotheca*, and *Erysiphe*.
3. Regarding the distribution of phytoparasites within the host plants, *Chrysanthemum sp.* is host to three phytoparasites, *Calendula officinalis, Hydrangea hortensis, Impatiens walleriana, Iris germanica, Salvia sp.,* and *Zinnia elegans* to two parasites, while the remaining twelve host plants showed the attack of a single specific parasite.
4. Out of the twenty-seven micromycetes whose attack was reported, twelve species are key pathogens for specific host plants, while fifteen species are secondary pathogens.

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EFFECT OF SOME NOVEL FERTILIZERS WITH PROTEIN HYDROLYSATES OF VEGETABLE ORIGIN ON WHEAT AND SUNFLOWER

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Keywords*: fertilizers, foliar application, biostimulators, protein hydrolysate.*

ABSTRACT

An approach to the concept of organic fertilizer in the biostimulators class is difficult because the description of the concept is far from being elucidated: legislation, research and experimentation are, with regard to this category of products used in agriculture, in a permanent stage of development and harmonization.

This paper introduces a range of biofertilizers containing protein hydrolysates of vegetable origin. These natural organic substances are embeded on an anorganic matrix which contains macro and micronutrients. Fertilizers with 1, 2, 3 and 4% protein content were implemented by foliar spraying at a concentration of 1% in doses of 2.5 L / ha.

Experimental data displayed that these complex fertilizers formulae are well assimilated by plants, having a positive effect on crops yield.

INTRODUCTION

In recent years, the use of natural biostimulants is proposed as a novelty solution to the challenges of sustainable agriculture by *assuring* optimal nutrient uptake, crop yield, quality, and tolerance to abiotic stress. Organic substances and biostimulators used in agriculture are represented by a wide range of nontoxic, environmentally friendly compounds, most coming from natural sources, with the purpose of improving and stimulating different metabolic processes and photosynthesis in plants. (Canellas et al. 2015, Rouphael & Colla 2018)

World-wide studies on the obtaining and use of fertilizers with organic substances (protein hydrolysates, algae extracts, humic substances) have shown that there is a positive relationship between their application, the yields achieved and the quality of agricultural production, due to the increase of fertilizer efficiency. (Oprică-Dumitriţa et al. 2016, Sîrbu et al. 2009)

The algae extracts, although very different depending on their origin, exhibited bio stimulating effects, especially due to their carbohydrates, organic acids, cytokines, auxins and vitamins. Algal extracts are often enriched with such substances as urea, humic acids, ammonium phosphate, potassium sulphate and additional doses of growth hormones. The composition of these products may influence not only the growth and development processes in plants, but also indirect

factors such as soil fertility. (Brown & Saa 2015, Carrasco-Gil et al. 2018, Gorka et al. 2018, Li et al. 2014, Onder et al. 2015)

The major aim of the research activities carried out was to obtain a new range of fertilizers that contain natural organic substances with a variable mixture of compounds with bio stimulating effect (proteins, protein fractions, amino acids, and phytohormones), secondary nutrients, microelements and to physically, chemically, and agrochemically characterize them in order to acquire major agrochemical effects such as nutritive elements supply for plants growth, prevent and correct nutrition deficiencies and increase bearing to technologic and climatic stress factors.

MATERIAL AND METHODS

The experiment aimed to achieve some bio fertilizers with major agrochemical effects on nutrient needs supply in the plants vegetal growing tips and on nutrition deficiencies correction by introducing trace elements (Fe, Cu, Zn, Mn, Mo, B, S) in a matrix with bio stimulating role, with variable protein fractions, amino acids and phytohormones composition. A vegetal soya hydrolysate (a peptides and free amino acids mixture) used as natural organic substance was considered in addition of the three bio fertilizers formulae. The use of some products and substances accepted by the Council Regulation (CE) 834/200 and the Commission Regulation 889/2008 were borne in mind for the bio fertilizers variants elaboration.

The experimental fertilizers were tested during the growing season on plots by foliar application using three treatments for wheat (Boheme) and sunflower (PE64LE25) with the concentration of 1%. Testing was compared with controls basic fertilized with $N_{45}P_{45}K_{45}$.

Agrochemical experiments were carried out on experimental lots, on a soil with the following physico-chemical properties: total nitrogen (Nt) - 0.26%, mobile phosphorus (PAL) - 68 mg/kg, mobile potassium (KAL) - 172 mg/kg, humus - 2.46%, pH = 7.28, mobile microelements (in ammonium acetate solution and EDTA at pH = 7) zinc (Zn) - 10 mg/kg soil, copper (Cu) 1.7 mg/kg, iron (Fe) 40 mg/kg, manganese (Mn) - 6.6 mg/kg, microelements total zinc (Zn) - 105 mg/kg, copper (Cu) -111 mg/kg, iron (Fe)) - 2.5% and manganese (Mn) - 972 mg/kg.

For agrochemical testing, 5 foliar fertilizers were obtained and applied. A control fertilizer with NPK matrix containing meso and microelements (coded F111) and 4 fertilizers for which concentrations of 1, 2, 3 and 4% protein substances from vegetable hydrolysate resulted in the enzymatic hydrolysis process of soybean were added to the basic matrix (coded F111H1, F111H2, F111H3 and F111H4).

The effects of the treatments were studied by analysis of variance (Fischer method) and Fisher's Least Significant Difference (LSD) test. All data are relative values, which were compared to the control (treated only with water) considered equal 100%.

RESULTS AND DISSCUTIONS

Five samples of fertilizers out of which four containing organic substances were experimentally obtained and characterized physico-chemically to determine their agrochemical efficiency and effectiveness. The experimental fertilizers contain in their composition hydrolyzed vegetable proteins and elements Fe, Cu, Zn, Mn, Mo, B, Mg and S in an NPK matrix.

The experimental fertilizers achieved contained between 79.6 - 101.8 g / dm^3 the macronutrients nitrogen, phosphorus and potassium, g / dm^3 the elements

Fe, Cu, Zn, Mn, Mo, B, Mg, S and between 1 - 4 g / dm^3 protein substances from vegetable hydrolysate.

The experimental fertilizers were tested during the growing season on plots by foliar application using three treatments for wheat (Boheme variety) and sunflower (PE64LE25 variety) with the concentration of 1%. Testing was performed in comparison with controls with a basic fertilization of $N_{45}P_{45}K_{45}$.

The evolution of the production and the increases according to the fertilizer applied to the wheat crop (Boema variety) are displayed in figures 1 and 2. The highest increases of the production were obtained by the foliar application of the fertilizer F111H4 (13.6%) but without significant differences compared to variants with 1, 2 and 3% protein substances from vegetable hydrolysate. There were significant differences for F111 and F111H1 variants and distinctly significant for variants with 2, 3 and 4% protein substances compared to the unfertilized foliar control.

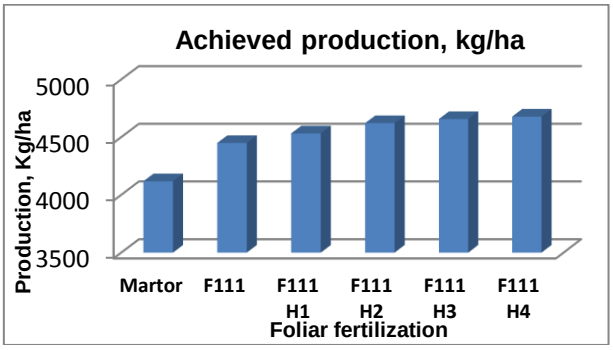

Figure 1. The production achieved for wheat crop (kg/ha) depending on the applied foliar fertilization.

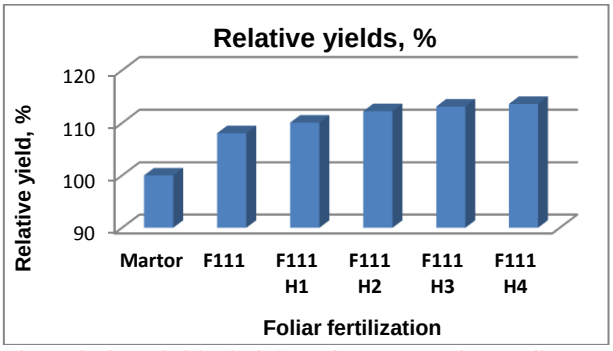

Figure 2. The relative yields (%) for wheat crop depending on the foliar fertilization applied.

Figure 3 shows the production growth due to the presence of the protein substances in the fertilizers matrix.

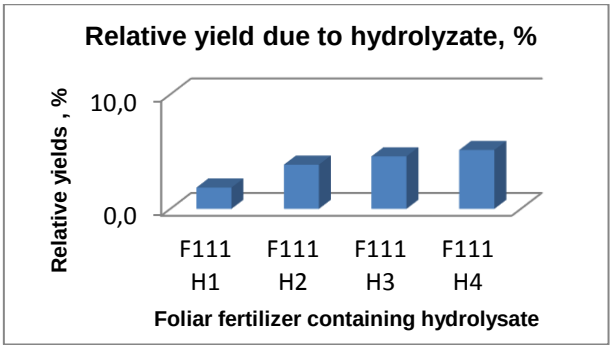

Figure 3. The relative yields (%) for wheat crop depending on the protein substances from fertilizers.

The evolution of the production and the production increases depending on the fertilizers applied to the sunflower crop (PR92B63 variety) are shown in figures 4 and 5.

The greatest increases in yields were obtained by the foliar application of the F111H4 fertilizer (14.4%) but without significant differences compared with the with the variants that contain 1, 2 and 3% protein substances.

Compared to the unfertilized control, there were significant differences for variant F111 (matrix without organic substances), distinctly significant for variants F111H1, F111H2 and F111H3 and very significant for the variant with 4% protein substances, F111H4.

Compared to the F111 variant, in the case of fertilizers with 2, 3 and 4% protein substances, there were obtained productions with significant differences.

The production increase due only to the presence of the protein substances in the fertilizer matrix is presented in figure 6.

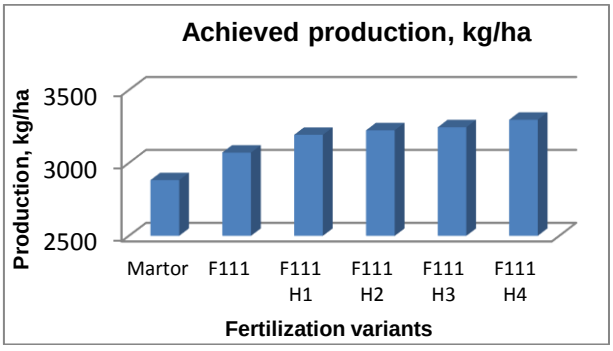

Figure 4. The production achieved for sunflower crop (kg/ha) depending on the applied foliar fertilization.

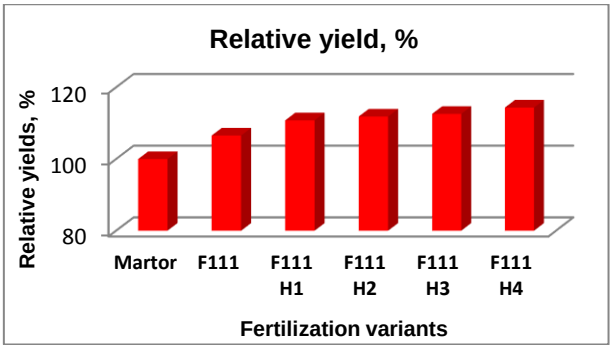

Figure 5. The relative yields (%) for sunflower crop depending on the foliar fertilization applied.

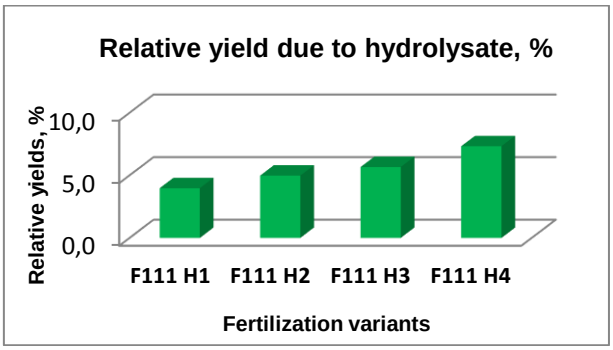

Figure 6. The relative yields (%) for sunflower crop depending on the protein substances from fertilizers.

The data are in accordance with the results obtained by other authors who have applied foliar fertilizers with amino acids and peptide. (Luziatelli et al. 2019)

Table 1 presents the contribution of the protein substances from the vegetable hydrolysate in the total production increase compared to the foliar unfertilized control, related to fertilizers and crops.

Table 1. Contributions of protein hydrolysate on diferent crops.

Fertilization variants	Contribution of protein hydrolysate (%)	
	wheat	sunflower
F111 H1	23,1	36,8
F111 H2	38,3	41,9
F111 H3	37,6	44,9
F111 H4	39,3	50,9

ACKNOWLEGMENTS

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CONCLUSIONS

1. Three new bio fertilizers with foliar application containing complex natural organic substances matrix, bio stimulating effect, chelate compounds forming properties, variable proteins, amino acids and trace elements (Fe, Cu, Zn, Mn, Mo, B, Mg, S) fractions were obtained and physically, chemically, and agro-chemically characterized.

2. Compared to the unfertilized control, the yields obtained by foliar application of the four fertilizers were in the ranges of 8.1 - 13.6%, for wheat crop and 10.8 - 14.4%, for sunflower crop.

3. The highest yields were obtained in the case of F111H4 fertilizer for the crops (wheat and sunflower) tested on.

4. The contribution due to the protein substances from the vegetable hydrolysate in the total production increase was in the ranges 23-39% for wheat crop and 36-50% for sunflower crop.

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THE HARMFUL ENTOMOFAUNA FROM GREEN HOUSE OF THE BOTANICAL GARDEN ,,A. BUIA,, CRAIOVA

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Keywords*: harmful entomofauna, green house, botanical garden*

ABSTRACT

From our observation regarding the harmful entomofauna from the Botanical Garden "Al. Buia", Craiova, there has been identified a number of: 6 harmful species, sistematicaly framed in 4 orders, belonging to 3 Clases : ARACHNIDA, INSECTA and NEMATOIDEA.

INTRODUCTION

A. Buia Botanical Garden Craiova is located in the southwestern of Craiova, between 44^0 19' N latitude and 23^0 47' E longitude, on an area of about 17 hectares. (D. Radutoiu, 2001)

The garden was designed and works with the following sectors: plant systematics, floral provinces of the globe, floristic provinces of Romania, greenhouses, ornamental nursery, Rosarium, cultivated plants . The greenhouses of the Botanical Garden in Craiova, with a total area of 750 m.p. harbor a collection of about 900 exotic species of great scientific and decorative value (Gh. Popescu et all, 2002).

MATERIAL AND METHODS

Observations were conducted during 2018 in the greenhouses of the Botanical Garden of Craiova A. Buia.

To determine the structure of the harmful entomofauna were made collection of material using various means and methods: directly by hand from plants or soil, frame metric, soil surveys and soil surface collected, visual inspection, collection with sticky traps for flying insects, analyzing samples with binocular magnifier glass directly in the field or laboratory.

The collection of the insects has been made using different methods according to the morphological characteristic features, in particular the way they move. Thus the entomological material was divided into groups insects that move by flying (Lepidoptera, Diptera, Odonates, Hymenoptera) and the group of insects that move by walking (Beetles, Heteroptera, Orthoptera and larvae from different species) (O. Tuca et al. 2013).

After collecting of biological material was made the material collected was analyzed and determined with the binocular magnifier glass using the Identification Manual (Chinery M. 1998, Godeanu S.P. 2002,).

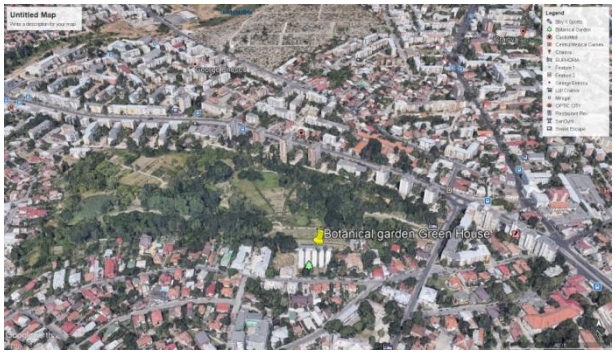

Fig 1. Botanical Garden - geographical location (Google earth)

In order to determine the frequency of pests, we have collected individuals from 30 leaves from plants with symptoms of attack, and with the help of the magnifying glass we have counted the specimens establishing the density number of specimens/leaf (the attacked organ).

The frequency of the attack was determined using the formula: F% = n/N x 100 - n = number of attacked palnts**,** N = total number of studied plants (Săvescu A., Rafailă C., 1978, Roşca I., 2000)

RESULTS AND DISCUSSIONS

The most dangerous species identified during our research in the ornamental plants crops from the Craiova Botanical Garden Greenhouse sistematically clasified in the following orders: *Homoptera, Thysanoptera*, *Acari şi Tylenchida* (table 1).

Table 1

The structure of the harmful entomofauna identified in the Craiova Botanical Garden greenhouse

Nr. crt	Harmful species	Host plant	Frequency F%
1	*Trialeurodes vaporariorum* West.	Oleandru, Euphorbia, Colocasia, Hybiscus, Zanthadeschia, Ficus, Citrus.	45%
2	*Pseudococcus adonium* L	Ficus, Oleandru, Citrus, Wasingtonia, Hibiscus	15%
3	*Lecanium hesperidum* L	Ficus, Oleandru, Citrus, Wasingtonia, Hibiscus	8%
4	*Heliothrips haemorrhoidalis*	Ficus, Oleandru, Citrus, Wasingtonia, Colocasia, Zantedeschia, Coleus, Hibiscus, Euphorbia	8%
5	*Tetranycus urticae* L	Ficus, Oleandru, Citrus, Wasingtonia, Colocasia, Zantedeschia, Coleus, Hibiscus, Euphorbia	17%
6	*Meloidogyne incognita*	Colocasia, Zantedeschia	30%

Fig.2. Plants attacked by *Trialeurodes vaporariorum*

Regarding the time of the pest occurrence in the greenhouse, the data are presented in the following table:

Table 2.

The time of the pests occurance

Nr. crt	Species	The time of the pest occurrence in the greenhouse
1	*Meloidigyne incognita*	Permanent in soil/ Colocasia, Zantedeschia, Euforbia, Freesia
2	*Tetranychus urticae*	April-October / Dianthus Cyclamen, Euphorbia, Zantedeschia
3	*Heliothrips haemorrhoidalis*	April-October /Begonia, Cyclamen, Euphorbia, Ficus
4	*Trialeurodes vaporarium*	April-October / Ficus, Oleandru, Citrus, Wasingtonia, Colocasia, Zantedeschia, Coleus, Hibiscus, Euphorbia
5	*Lecanium hesperidum*	Permanent/Ficus, Citrus, Oleandru
6	*Pseudococcus adonidum*	Permanent/Ficus, Oleandru, Citrus, Wasingtonia, Hibiscus

Fig.3. Attacked plants by *Pseudococcus adonidum*

Fig. 4. Attacked plants by *Heliothrips haemorrhoidalis* and *Tetranychus urticae*

Fig. 5. *Colocasia* root and leaves attacked by *Meloidigyne incognita*

CONCLUSIONS

From the analysis of the recorded data it is found that in the greenhouses of the Botanical Garden, there is a harmful entomofauna that negatively influences the growth and development of the plants. The pests found are very dangerous because they have a great propagation capacity, they propagate easily and can cover large areas in short time, therefore it is necessary the repeated control for their timely detection in order to establish the most appropriate measures to prevent and combat them.

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VERIFICATION OF THE SPECIFICITY AND SELECTIVITY OF THE IMMUNOFLUORESCENCE TEST IN DETECTING OF *CLAVIBACTER MICHIGANENSIS* SUBSP. *MICHIGANENSIS* (Smith 1910) Davis et al. 1984

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Keywords*: bacterium, Clavibacter michiganensis subsp. michiganensis, tomato, indirect immunofluorescence, specificity, selectivity*

ABSTRACT

Clavibacter michiganensis subsp. michiganensis, the agent of bacterial wilting of tomatoes is a gram postive bacteria, extremely dangerous, which produces significant damages, in most of the tomatoes producing regions. One of the screening tests used in detecting this bacteria is indirect immunofluorescence.This test may be applied both to vegetal extracts as to bacterial suspensions.

INTRODUCTION

The immunofluorescence test is a test which allows the diagnosis of different bacterial diseases and may be direct or indirect. It allows antigens detecting, using immune serums, which contain specific antibodies, together with a fluorescent colouring agent, called fluorochrome (ex. fluorescein isothiocyanate). The antibodies, which are treated this way, are observed with the epifluorescence microscope in ultraviolet light.

In order to detect/identify *Clavibacter michiganensis* subsp. *michiganensis*, the indirect immunofluorescence is used. The test may be applied both to the plant material of the hosts and the bacterial suspensions, of different concentrations.

For a method to be used in a laboratory, it is necessary to validated/verified that method. It will validated/verified if the method is adequate for the purpose for which it will be used. This way, the laboratory establishes the performances characteristics and the limits of the involved method, it identifies the factors which may influence the method and the influence degree of these factors. (https://www.scribd.com/doc/33116977/Curs-Instruire-Validare-Metode-Analitice).

According to SR EN ISO/IEC 17025/2018, validation means the process by which it is confirmed that the specified requests are adequate for a intended use. A laboratory must validate non-standardized methods, methods developed by laboratory and standardized methods used outside the intended scope or otherwise modified.

The validation/verification of an analysis method is achieved according to the EPPO protocol “PM 7/98 (3) Specific reguirements for laboratories preparing accreditation for a plant pest diagnostic activity”. For this to be achieved, certain

performance parameters of the method will be followed, such as: specificity, selectivity, sensitivity, repeatability, reproductibility and robustness.

In this study, only two of the six parameters will be verified, such as:

- **specificity** - it allows to determine, on one side, the specificity of antibodies in comparison with different strains of the target organism (ex. genetically different, coming from different geographical areas or from different host plants) and on the other side, it allows to determine the specificity of the antibodies in comparison with non-target bacteria, especially in comparison with the ones which can attack the host plant of the target organism. It is recommended to use pure cultures, for a concentration of 10^6 cells/ml;
- **selectivity** - it is determined by matrix changes (ex. different hosts from the same family, different cultivars) and it traces if this affects the method performance (https://onlinelibrary.wiley.com/doi/epdf/10.1111/epp.12508).

The purpose of this study is to verify the specificity and the selectivity of the indirect immunofluorescence method, in the detection of *Clavibacter michiganensis* subsp. *michiganensis*, in Romanian laboratory, based on the study conducted by Olivier et al., in 2010 and the protocol EPPO "PM 7/98 (3) Specific requirements for laboratories preparing accreditation for a plant pest diagnostic activity".

MATERIAL AND METHODS

The indirect immunofluorescence method used in detection/identification of *Clavibacter michiganensis* subsp. *michiganensis* is achieved according to the EPPO protocol "PM 7/97 (1) Indirect immunofluorescence test for plant pathogenic bacteria".

In order to achieve this experiment, there were used the following biological materials:

- three reference strains which attack tomatoes: *Clavibacter michiganensis* subsp. *michiganensis* (NCPPB 2979 - Hungary origin), *Xanthomonas campestris* pv. *vesicatoria* (NCPPB 3315 - Hungary origin) and *Pseudomonas syringae* pv. *syringae* (NCPPB 2778 - France origin) purchased from Food and Environment Research Agency Sand Hutton, York, Great Britain;
- two reference strains which attack tomatoes: *Clavibacter michiganensis* subsp. *michiganensis* (PD 223 - Hungary origin) and *Ralstonia solanacearum* (PD 2762 - Netherlands origin) purchased in 2007, from Protection Service, Wageningen, the Netherlands;
- one reference strain which attack tomatoes, *Pseudomonas syringae* pv. *tomato* (LMF/BA/15/1 - Romania origin) detected and identified in 2015, within the National Phytosanitary Authority (National Phytosanitary Laboratory), Romania;
- one reference strain which accidentaly attack tomatoes, *Clavibacter michiganensis* subsp. *sepedonicus* (PD 406 - Finland origin) purchased in 2007, from Plant Protection Service, Wageningen, the Netherlands;
- one reference strain which doesn't attack tomatoes, but belonging to the same studied genus, *Clavibacter michiganensis* subsp. *insidiosus* (PD 239 - USA origin) purchased in 2007, from Plant Protection Service, Wageningen, the Netherlands;
- four reference strains which don't attack tomatoes and which are of different genus from the target organism involved in this study: *Xanthomonas campestris* pv. *phaseoli* (NCPPB 1811 - Romania origin), *Xanthomonas campestris* pv. *pruni* (NCPPB 3156 - Italy origin) and *Pantoea stewartii* (NCPPB 3253 - Italy origin) purchased from Food and Environment Research Agency Sand Hutton,

York, Great Britain and *Erwinia amylovora* (PD 4072 - UK) purchased in 2007, from Plant Protection Service, Wageningen, the Netherlands;

- six strains of *Clavibacter michiganensis* subsp. *michiganensis*, isolated from *Lycopersicon lycopersicum* plants, coming from Romania, from 3 areas: Argeș (19-3857 / cv. *Colibri*, 19-3858 / cv. *Paris*, 19-3861 / cv. *Colibri*), Dolj (19-4088 / cv. *Prekos*) and Suceava (19-4326 / cv. *Colibri*, 19-4327 / cv. *Kyveli*); detected and identified within the National Phytosanitary Authority (National Phytosanitary Laboratory), Romania, by 3 methods: isolation on culture medium, indirect immunofluorescence and PCR multiplex;
- four vegetal extracts coming from plants of: *Lycopersicon lycopersicum, Solanum dulcamara*, *Solanum melongena* and *Solanum tuberosum*, previously tested and found free of *Clavibacter michiganensis* subsp. *michiganensis*, within the National Phytosanitary Authority (National Phytosanitary Laboratory), Romania.

The reagents used in this study to carry out the indirect immunofluorescence test have been obtained from Loewe® Biochemica GmbH, Germany. Two types of antibodies are required for this test, such as: polyclonal antibodies ex goat (cat. no. 07363) and rabbit-anti-goat IgG (H+L) FITC (cat. no. 07200). The working dilution of these antibodies was the recommended dilution by the manufacturer, 1/2000 for the first antibody and, respectively 1/200 for the second antibody.

The above mentioned bacterial strains were cryoconservated (-80^{0}C) with the PROTECT™ system. At the time of use, one or two beads, with bacterial cells of each analyzed strain, were passed on the surface of a culture medium (YPGA - Yeast extract Peptone Glucose Agar which contains: 5g Yeast extract, Bacto peptone 5g, D-glucose 10g, Bacto agar 15g). Petri dishes, innoculated this way, were placed in the incubator, at the growing temperatures adequate to the target strains until the growth of bacterial colonies. After obtaining typical colonies, for each analyzed strain. 1 ml of bacterial suspension (light turbidity) was made in sterile water.

In order to determine the specificity of the indirect immunofluorescence method, bacterial suspensions were used such as, and for determining the selectivity of this method, there was collected 1 ml from each analysed vegetal extract and there was artificially contaminated with 0,1ml bacterial suspension of *Clavibacter michiganensis* subsp. *michiganensis.*

Each analysed suspension was pipetted on a slide with 8 windows and analized to indirect immunofluorescence, according to the EPPO protocol ”PM 7/97 (1) Indirect immunofluorescence test for plant pathogenic bacteria”.

At the end, the slides were mounted in glycerol buffer and observed with the epifluorescence microscope, under immersion oil, with the 100x objective, obtaining a 1000x magnification. It was followed the absence or the presence of the cells with living fluorescence and with typical rod-shaped morphology.

RESULTS AND DISCUSSIONS

The results obtained after examined test slides on an epifluorescence microscope are presented in tables 1 and 2.

Table 1

Clavibacter michiganensis* subsp. *michiganensis
Determination the specificity of the indirect immunofluorescence test

Experimental infection with:	The windows of the slide								Results (%)
	1	2	3	4	5	6	7	8	
***Cmm* PD 223**	+	+	+	+	+	+	+	+	100% pozitiv
***Cmm* NCPPB 2979**	+	+	+	+	+	+	+	+	100% pozitiv
***Cmm* 19-3857**	+	+	+	+	+	+	+	+	100% pozitiv
***Cmm* 19-3858**	+	+	+	+	+	+	+	+	100% pozitiv
***Cmm* 19-3861**	+	+	+	+	+	+	+	+	100% pozitiv
***Cmm* 19-4088**	+	+	+	+	+	+	+	+	100% pozitiv
***Cmm* 19-4326**	+	+	+	+	+	+	+	+	100% pozitiv
***Cmm* 19-4327**	+	+	+	+	+	+	+	+	100% pozitiv
***Xcv* NCPPB 3315**	-	-	-	-	-	-	-	-	100% negativ
***Pss* NCPPB 2778**	-	-	-	-	-	-	-	-	100% negativ
***Pstom* LMF/BA/15/1**	-	-	-	-	-	-	-	-	100% negativ
***Rs* PD 2762**	-	-	-	-	-	-	-	-	100% negativ
***Cmi* PD 239**	F +	F +	F +	F +	F+	F +	F +	F +	100% false pozitiv
***Cms* PD 406**	F +	F +	F +	F +	F +	F +	F +	F +	100% false pozitiv
***Ea* PD 4072**	-	-	-	-	-	-	-	-	100% negativ
***Xcph* NCPPB 1811**	-	-	-	-	-	-	-	-	100% negativ
***Xcpr* NCPPB 3156**	-	-	-	-	-	-	-	-	100% negativ
***Pst* NCPPB 3253**	-	-	-	-	-	-	-	-	100% negativ
Negativ control (sterile water)	-	-	-	-	-	-	-	-	100% negativ

"– " negative; "+" positive; "F+" false positive; *Cmm* (*Clavibacter michiganensis subsp. michiganensis*); *Cms* (*Clavibacter michiganensis* subsp. *sepedonicus*); *Cmi* (*Clavibacter michiganensis* subsp*. insidiosus*); *Xcv* (*Xanthomonas campestris* pv. *vesicatoria*); *Pss* (*Pseudomonas syringae* pv. *syringae*); *Pstom* (*Pseudomonas syringae* pv. t*omato*); *Rs* (*Ralstonia solanacearum*); *Ea* (*Erwinia amylovora*); *Xcph* (*Xanthomonas campestris* pv. p*haseoli*); *Xcpr* (*Xanthomonas campestris* pv. *pruni*); *Pst* (*Pantoea stewartii*).

Using a polyclonal serum, there were obtained the following reactions when testing some bacterial strains, related or not with the studied strain:

- positive reaction to testing all strains of *Clavibacter michiganensis* subsp. *michiganensis*, no matter the origin place; there were obtained bacterial cells with typical morphology of *Clavibacter michiganensis* subsp. *michiganensis* and with living fluorescence (fig. 1);
- false positive reaction to testing two bacterial strain from *Clavibacter* genus: *Clavibacter michiganensis* subsp. *insidiosus* which doesn't attack tomatoes and *Clavibacter michiganensis* subsp. *sepedonicus* which attack tomatoes accidentally (fig. 2);
- negative reactions when testing other bacterial strains from different genus than *Clavibacter*, but which attack tomatoes (*Xanthomonas campestris* pv. *vesicatoria*, *Pseudomonas syringae* pv. *syringae*, *Pseudomonas syringae* pv*. tomato* and *Ralstonia solanacearum*);
- negative reactions when testing other bacterial strains from different genus than *Clavibacter*, but which don't attack tomatoes (*Erwinia amylovora*, *Pantoea*

stewartii, *Xanthomonas campestris* pv. *phaseoli* and *Xanthomonas campestris* pv. *pruni*).

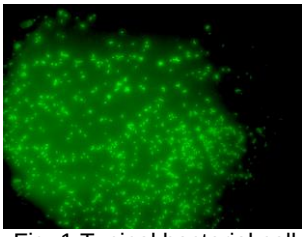

Fig. 1 Typical bacterial cell of *Cmm*

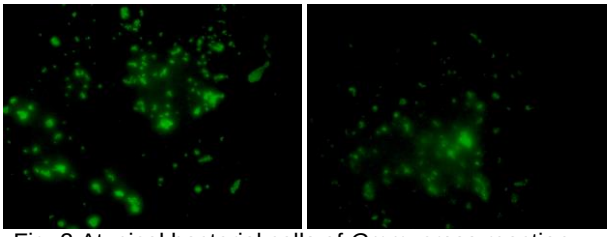

Fig. 2 Atypical bacterial cells of *Cmm*, cross reaction

Table 2

Clavibacter michiganensis* subsp. *michiganensis
Determination selectivity of the indirect immunofluorescence test

Biological material	The windows of the slide								Results (%)
	1	2	3	4	5	6	7	8	
Extract of *Solanum melongena* contaminated with *Cmm* PD223	+	+	+	+	+	+	+	+	**100% pozitiv**
Extract of *Solanum melongena* contaminated with *Cmm* NCPPB 2979	+	+	+	+	+	+	+	+	**100% pozitiv**
Extract of *Solanum tuberosum* contaminated with *Cmm* PD223	+	+	+	+	+	+	+	+	**100% pozitiv**
Extract of *Solanum tuberosum* contaminated with *Cmm* NCPPB 2979	+	+	+	+	+	+	+	+	**100% pozitiv**
Extract of *Solanum dulcamara* contaminated with *Cmm* PD223	+	+	+	+	+	+	+	+	**100% pozitiv**
Extract of *Solanum dulcamara* contaminated with *Cmm* NCPPB 2979	+	+	+	+	+	+	+	+	**100% pozitiv**
Pozitiv control (extract of *Lycopersicon lycopersicum* contaminated with *Cmm* PD 223)	+	+	+	+	+	+	+	+	**100% pozitiv**
Pozitiv control (extract of *Lycopersicon lycopersicum* contaminated with *Cmm* NCPPB 2979)	+	+	+	+	+	+	+	+	**100% pozitiv**
Negativ control (extract of *Lycopersicon lycopersicum*)	-	-	-	-	-	-	-	-	**100% negativ**

"– " negative; "+" positive; *Cmm* (*Clavibacter michiganensis* subsp. *michiganensis*).

All tested vegetable extracts were positive in 100%, regardless of the matrix used. The indirect immunofluorescence test is positive, if the extracts are contaminated by a strain of the target organism (*Clavibacter michiganensis* subsp. *michiganensis*).

CONCLUSIONS

The used antibodies are specific to the *Clavibacter* genus, as they have no reaction with bacteria in other genus (*Xanthomonas, Pantoea, Erwina* și *Psudomonas*). However, these antibodies are not specific to the *michangensis* subspecies because they have also reacted to other subspecies (subsp. *insidiosus* and subsp. *sepedonicus*) of the same genus. The indirect immunofluorescence method is therefore not a method which is specific to 100 % if polyclonal antibodies are used. As the EPPO protocol "PM 7/42 (3) *Clavibacter michiganensis* subsp. *michiganensis*" recommends, for the detection of this bacteria further tests are necessary, only the indirect immunofluorescence not being sufficient.

As all bacterial strains of *Clavibacter michiganensis* subsp. *michiganensis* have been detected, it can be concluded that the detection of this organism by indirect immunofluorescence is not influenced by the geographical area where the bacterial strain comes from. The used serum has 100 % specificity in the detection of the target organism, regardless of its origin.

As far as the selectivity of the immunofluorescence method is concerned, this is not a selective method, since *Clavibacter michiganensis subsp. michiganensis* has been detected, irrespective of the matrix analyzed. The lack of selectivity does not affect the performance of this method, since bacterium has been detected in all extracts.

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PRELIMINARY RESULTS REGARDING THE USE OF NON-INVASIVE METHODS TO IDENTIFY POTATO GENOTYPES WITH TOLERANCE TO THERMO-HYDRIC STRESS

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Keywords*: potato, genotype, non-invasive methods, SPAD, NDVI*

ABSTRACT

The present study was conducted to identify and select potato genotypes with high demand to abiotic stress. Field experiments were carried out in the year 2018 at the National Institute of Research and Development for Potato and Sugar Beet Brasov, Romania. SPAD values, as indicators of chlorophyll content from leaves are of particular importance in comparing the vegetation status of the plants. NDVI provides a estimation of the health of vegetation and represent a tool to monitor the changes during the growing season and remains the most well known and used index to detect green plants canopia using multispectral data. Close correlations were found, statistical provided between SPAD, NDVI and plant measurements carried out in the context of the two dynamics and to the final production. The average level of production of tested genotypes was of 47.8 t/ha. It has been influenced by the climatic and soil specific conditions.

INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the most cultivated vegetable crops and it is highly consumed in Romania. Potato produces the highest yield of energy and proteins per hectare a day (1.4 kg protein ha-1 day-1), overcoming wheat (1.3 kg protein ha-1 day-1) and rice (1.0 kg protein ha-1 day-1). Furthermore, it is a source of vitamins, mainly B and C complexes, and of mineral salts. Although it is included among high energetic value foods, it presents a low caloric value (Silveira Collares et al. 2004). Extreme climatic changes put their fingerprint and can even determine the growing plant health status. They favor the dynamics, abundance, frequency, intensity and aggressiveness of pathogens attacks. May cause changes in plants biology, the emergence of new pests, reactions of plants attacked, increasing the vulnerability of crops in front of pests and diseases (Prodan, 2011). SPAD 502 Plus (Chlorophyll Meter) is a portable device with the widest possible use for the measurement of fast, accurate and non-invasive concentration of chlorophyll from the leaves. Quantify subtile changes or trends in the plant health long before they can be visible for the human eye. This is a portable device which is based on the measured values via the transmittance of two wavelengths of electromagnetic spectrum (650 nm in red and 940 nm in infra-red) at the level of the potato leaflets (Gianquinto, 2004). The sources of variation are related to the environment (soil type, climatic conditions, foliage diseases, intensity of light), variety (very early

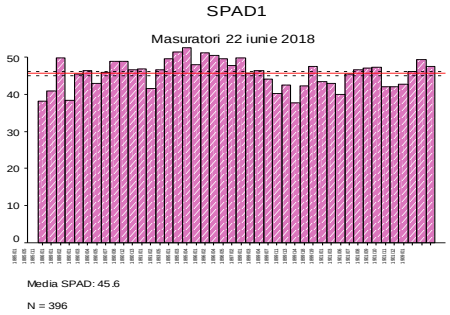
varieties show higher variations of chlorophyll than late ones, even if were planted on the same date), culture management (irrigation, residues from the previous crop) (Goffart et al., 2008; Hermeziu et al., 2017). Calculating the report of visible light and near infrared reflected by a sensor is obtained a number from minus one (-1) to plus 1 (+ 1). The result of this calculation is called Normalized Difference Vegetation Index (NDVI). If the value of NDVI is zero, it means that there are no green vegetation and a value close to + 1 (0,8-0,9) indicates the highest density possible of green leaves. NDVI provides a estimation of the health of vegetation and represent a tool to monitor the changes during the growing season and remains the most well known and used index to detect green plants canopia using multispectral data. Literature indicated that the spectral reflectance of green vegetation in the red band (0.6 –0.7 lm) is most sensitive to leaf chlorophyll and pigment contents while the near infrared (NIR) band (0.7–0.9 lm) is most sensitive to biomass (Kurschner et al ., 1984; Blakeman, 1990). Moreover, the quantity of chlorophyll content of green plants directly correlates to the healthiness of the plants. The potato's highly diversified genetics allow the identification and selection of the genotypes that are high performing in different type of environments (Zia et al., 2017).

MATERIAL AND METHODS

A number of 44 potato breeding clones growing in the field of NIRDPSB Brasov were characterized. Cultivation and maintenance were in line with current good agricultural practice. Normalized Difference Vegetation Index (NDVI) determinations: 3 plants on each plot with 3 measurements using a raport defined as the proportion of the difference infrared - red bands and their amount, respectively, NDVI = NIR-RED/NIR+RED, where NIR = near infrared and RED = red. SPAD 502 Plus (Chlorophyll Meter) determinations: 3 plants on each plot with 3 readings. For interpretation of chlorophyll results is used the formula of nitrogen index (Shapiro et al., 2006): N index = readings average/control average*100%, resulting that nitrogen needs to be applied when the N index < 95%. Were calculated the average values regarding the plants high, foliage, roots and tubers weight, number of steams and tubers/plant. SPAD and NDVI values have been used directly in the statistical analysis of genotypes. Yield assessment: two central rows in each plot were harvested mentioned the number and the weight of tubers and total yield/ha. The recorded data have been transferred in the spreadsheet of SPSS program.

RESULTS AND DISCUSSIONS

SPAD values, as indicators of nitrogen content of plants, are of particular importance in comparing the status of plants vegetation in different years. Closely resembling between genotypes are closely related to the differences in phenological dates and the accumulation of production. At the measurements from mid-June, the genotypes presented close SPAD values, registering an average of 45.6 units, higher concentration of chlorophyll and the threshold of 50 units have submitted genotypes 1893/5, 1895/5, 1895/3, 1895/4, 1891/2 and 1885/5 (fig. 1). At the measurements of July 2, due to climatic conditions, the SPAD values recorded at all genotypes were situated below the limit of 50 units, the average value been of 31.4 units, while still higher values to the genotypes 1895/3, 1895/4, 1897/2 and 1899/1 (fig. 2). The reason for which NDVI is linked to the vegetation is that healthy plants reflect very well in the spectrum of the near infrared light, which is part of the electromagnetic spectrum.



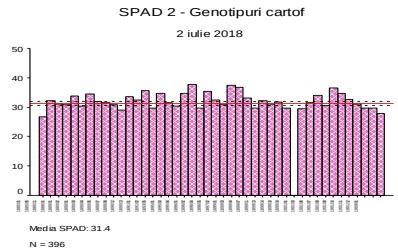
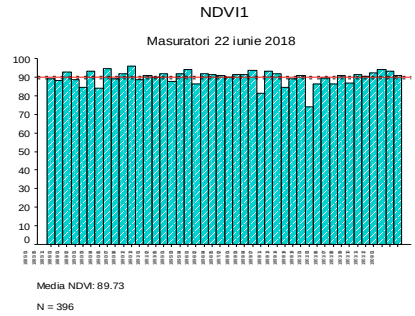


Fig. 1. SPAD measurements – 22.06.18 Fig. 2. SPAD measurements – 2.07.18



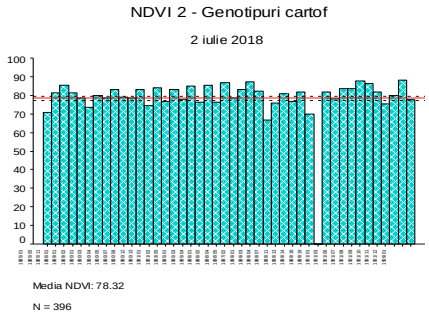


Fig. 3. NDVI measurements – 22.06.18 Fig. 4. NDVI measurements – 02.07.18

At the measurements of June 22, 2018, the NDVI average of genotypes was 0.89, higher values been registred at the genotypes 1901/11, 1901/12, 1895/3, 1895/4 and 1890/7 (fig. 3). The average NDVI at the second measurement, on July 2 was 0,78, being influenced by the climatic conditions, the presence of less sunny days, with lower intensity of light radiation. Higher values were recorded at the genotypes 1901/12, 1885/11, 1901/7, 1901/6 and 1893/5 (fig. 4). Close correlations were found, statistical provided between SPAD, NDVI and plant measurements carried out in the context of the two dynamics and to the final production. The correlation coefficients were significantly higher for both variables in terms of the plants high and foliage development (.754** and .812**) (Table 1). The correlations between SPAD and NDVI measurements calculated from the reflectance and the number of leaves per plant reflect very well the state of foliage. Significant coefficients were recorded for all the components of plant, observing the evolutionary process of the crop. Positive correlations for the whole of the foliage, including the height of plants, roots and stolons, weight of tubers. All the coefficients were significant (Table 2). Thus, it is appreciated the existence of a positive correlation for the foliage, for roots and stolons, respectively for the weight of tubers. The correlation coefficients between SPAD, tuber weight and estimated production were distinctly significant, and SPAD coefficients - tuber weight were significant. The level of production of tested genotypes was of 47.8 t/ha. It has been influenced by the climatic and soil specific conditions. Regarding the final production of all the genotypes it was observed genotype 1896/1, which has the highest yield (double than the average), followed by the genotypes 1896/4, 1893/5, 1895/1, 1890/3, 1890/4, 1890/8, 1901/6, 1901/7 (Table 3). All the factors which contribute to the

vegetative grows of plants or prevent these processes, can make changes and through this may influence the rate of yield accumulation. Close relations existing between the final production and the foliar surface developed over the vegetation period influences the final character of a genotype.

CONCLUSIONS

During the period of vegetation has been meeting favorable termo-hydric conditions to the accumulation of early tubers yield. Also late blight attack, which usually causes accentuated defoliation was controlled and thus the relations between the SPAD, NDVI and yields average values were positive. Little differentiation between the genotypes were closely related to the differences in phenological dates and the degree of production accumulation.

ACKNOWLEDGMENT

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Table 1

Corellation of SPAD and NDVI average values with plants average values measurements (June 22, 2018)

		SPAD 1	NDVI 1	No. steams/ plant	Plants high (cm)	Median leaf length (cm)	Foliage (g/plant)	Roots+stolons (g/plant)	Tubers no. (g/plant)	Tubers weight (g/plant)
SPAD 1	Pearson Correlation	1.000	.251	-.076	.115	-.082	.112	-078	-.093	.237
	Sig. (2-tailed)		.108	.632	.467	.607	.481	.625	.558	0131
NDVI 1	Pearson Correlation	.251	1.000	-.001	-.010	.023	.021	-.060	-.065	.042
	Sig. (2-tailed)	.108		.997	.950	.885	.897	.707	.682	.791
No. steams/plant	Pearson Correlation	-.076	-.001	1.000	-.919**	.942**	-658**	.919**	.916**	-.683**
	Sig. (2-tailed)	.632	.997		.000	.000	.000	.000	.000	.000
Plants high (cm)	Pearson Correlation	.115	-.010	-.919**	1.000	-.925**	.843**	.915**	-.894**	.754**
	Sig. (2-tailed)	.467	.950	.000		.000	.000	.000	.000	.000
Median leaf length (cm)	Pearson Correlation	-.082	.023	.942**	-.925**	1.000	-.645**	.962**	.941**	-.687**
	Sig. (2-tailed)	.607	.885	.000	.000		.000	.000	.000	.000
Foliage (g/plant)	Pearson Correlation	.112	.021	-.658**	.843**	-.645**	1.000	-.632**	-.620**	.812**
	Sig. (2-tailed)	.481	.897	.000	.000	.000		.000	.000	.000
Roots+stolons (g/plant)	Pearson Correlation	-.078	-.060	.919**	-.915**	.962**	-.632**	1.000	.964**	-.668**
	Sig. (2-tailed)	.625	.707	.000	.000	.000	.000		.000	.000
Tubers no (g/plant)	Pearson Correlation	-.093	-.065	.916	-.894**	.941**	-.620**	.964**	1.000	-.639**
	Sig. (2-tailed)	.558	.682	.000	.000	.000	.000	.000		.000
Tubers weight (g/plant)	Pearson Correlation	.237	.042	-.683**	.754**	-.687**	.812**	-.668**	-.639**	1.000
	Sig. (2-tailed)	.131	.791	.000	.000	.000	.000	.000	.000	

**. Correlation is significant at the 0.01 level (2-tailed)

a. Listwise N=42

Table 2

Corellation of SPAD and NDVI average values with plants average values measurements (July 2nd, 2018)

		SPAD 1	NDVI 1	No steams/ plant	Plants high (cm)	Median leaf length (cm)	Foliage (g/plant)	Roots+ stolons (g/plant)	Tubers no (g/plant)	Tubers weight (g/plant)
SPAD 1	Pearson Correlation	1.000	.221	-.035	.218	.223	.020	-.075	-.055	.158
	Sig. (2-tailed)		.189	.837	.194	.185	.909	.661	.746	.352
NDVI 1	Pearson Correlation	.221	1.000	.007	-.010	-.022	.026	.040	-.034	.040
	Sig. (2-tailed)	.189		.0967	.953	.898	.878	.814	.840	.814
No steams/plant	Pearson Correlation	-.035	.007	1.000	.588**	.469**	.436**	.652**	.464**	.470**
	Sig. (2-tailed)	.837	.0967		.000	.003	.007	.000	.004	.003
Plants high (cm)	Pearson Correlation	.218	-.010	.588**	1.000	.883**	.748**	.693**	.345*	.706**
	Sig. (2-tailed)	.194	.953	.000		.000	.000	.000	.036	.000
Median leaf length (cm)	Pearson Correlation	.223	-.022	.469**	.883**	1.000	.744**	.623	.218	.668**
	Sig. (2-tailed)	.185	.898	.003	.000		.000	.000	.195	.000
Foliage (g/plant)	Pearson Correlation	.020	.026	.436**	.748**	.744**	1.000	.848**	.345*	.690**
	Sig. (2-tailed)	.909	.878	.007	.000	.000		.000	.036	.000
Roots+ stolons (g/plant)	Pearson Correlation	-.075	.040	.652**	.693**	.623	.848**	1.000	.410*	.602**
	Sig. (2-tailed)	.661	.814	.000	.000	.000	.000		.012	.000
Tubers no (g/plant)	Pearson Correlation	-.055	-.034	.464**	.345*	.218	.345*	.410*	1.000	.587**
	Sig. (2-tailed)	.746	.840	.004	.036	.195	.036	.012		.000
Tubers weight (g/plant)	Pearson Correlation	.158	.040	.470**	.706**	.668**	.690**	.410*	.587**	1.000
	Sig. (2-tailed)	.352	.814	.003	.000	.000	.000	.012	.000	

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

a. Listwise N=37

Table 3

Corellation of SPAD and NDVI average values with yield (September 4th, 2018)

		SPAD 1	NDVI 1	Tubers no (g/plant)	Tubers weight (g/plant)	Tubers average weight (g)	Yield (t/ha)
SPAD 1	Pearson Correlation Sig. (2-tailed)	1.000	.259 .090	.159 .302	.479** .001	.364* .015	.479** .001
NDVI 1	Pearson Correlation Sig. (2-tailed)	.259 .090	1.000	-.010 .951	.184 .232	.217 .157	.184 .232
Tubers no/plant	Pearson Correlation Sig. (2-tailed)	.159 .302	-.010 .951	1.000	.499* .001	-.285 .061	.499* .001
Tubers weight (g/plant)	Pearson Correlation Sig. (2-tailed)	.479** .001	.184 .232	.499* .001	1.000	.595** .000	1.000** .000
Tubers average weight (g)	Pearson Correlation Sig. (2-tailed)	.364* .015	.217 .157	-.285 .061	.595** .000	1.000	.595** .000
Yield (t/ha)	Pearson Correlation Sig. (2-tailed)	.479** .001	.184 .232	.499* .001	1.000** .000	.595** .000	1.000

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

a. Listwise N=44

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NATURA 2000 FOREST TYPES HABITATS IN THE UPPER AND MIDDLE BASIN OF BISTRA MĂRULUI VALLEY

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Keywords*: ROSCI0126, Natura 2000, 91V0, 9110, 9140*

ABSTRACT

Habitat types of community interest encountered were the following: 91V0 - Dacian Beech forests (Symphyto-Fagion), 9130 - Asperulo-Fagetum beech forest, 9110 - Luzulo-Fagetum beech forests, 9410 - Acidophilous Picea forests of the montane to alpine areas (Vaccinio-Piceetea), 91E0 - Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae), and 9180* - Tilio-Acerion forests on steep slopes, groves and ravines. The most significant area is occupied by habitat 91V0 (39,6%), 9410 (21,5%) 9110 (12,2%). Less represented are the following habitats 91E0 * (0,2%), 9180 * (1%) and 9130 (0,3%).The conservation status of these habitats is favorable.*

INTRODUCTION

Within our continent, the forest area has grown steadily since 1990, both due to afforestation through various programmes and to the natural succession of vegetation that has begun to invade the lands that were once used for agricultural or grazing purposes. With few exceptions, forests represent the main type of vegetation in Europe, which develops under natural conditions. In addition to economic functions, forests have a positive role in terms of quality of life, and to a large extent, keep elements of cultural and spiritual heritage in many European countries. At continental level, approximately 375000 km^2 of forest are included in the Natura 2000 network [**** Comisia Europeană. 2018].

The aim of the Natura 2000 network is to improve and restore the favorable conservation status of species and habitats in Natura 2000 sites [7]. Reporting of the conservation status of habitats to the European Commission takes place every six years. The report published in 2015 shows that the conservation status of forest habitats is generally not good, even if there are some improvements in comparison with previous assessments [**** Comisia Europeană. 2018].

In Romania, forest management is done through forestry management plans based on a number of forestry technical norms, compliance with these provisions resulting in a sustainable management of forest ecosystems. The existence of forest habitats in a good conservation state even in forests within the economic circuit, indicates that the sustainable management of the resources of these forests does not contradict the Natura 2000 objectives [Stăncioiu P. T. et al. 2008].

MATERIAL AND METHODS

The researches are located in an area that encompasses the intravilan and extravilan territory of Zăvoi Communne in Caraş-Severin County, on where the site of community interest ROSCI0126 Ţarcu Mountains is found, in the upper and middle basin of Bistra Mărului Valley. This area overlaps mostly on the forest stands of the Production Units IV Măgura, V Peceneaga, VI Obârşia Bistrei Mărului, VII Şucu - Olteana and VIII Scorila - Bratonea belonging to Oţelul Roşu Forest District (figure 1).

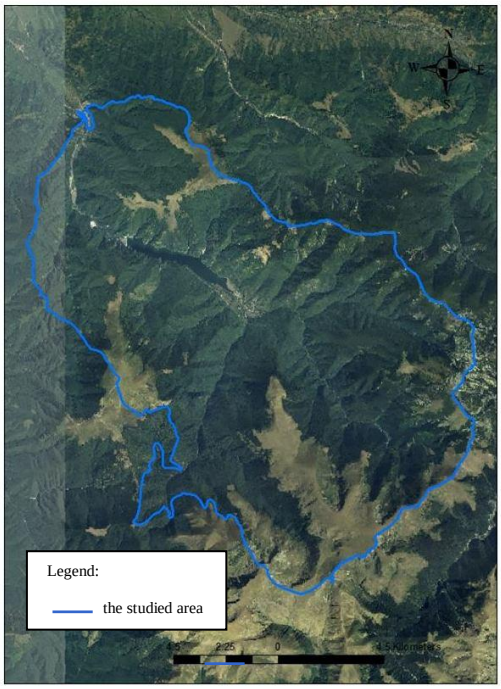

Figure 1 – Research location

The research material consists of forest stands found within the studied area. In order to determine the types of Natura 2000 forest habitats, an equivalence has been made between the forest habitats of Community interest with the Romanian habitats and the forest types used in the Romanian typology. In this respect, the equivalence of the work "Establishment of management measures for forest habitats of community interest included in the Natura 2000 sites" - authors Iovu Biriş and Oliver Merce was used. This equivalence is based on a series of scientific papers: "Interpretation Manual of European Habitats", "Handbook for the Interpretation of Natura 2000 Habitats in Romania" - coordinators: Gafta D. and Mountford O., "Habitats of Romania "- authors: Doniță et al., "Types of forest ecosystems in Romania" - coordinators: Doniță N., Chiriţă C., Stănescu V., "Types of forest in Romania" - authors Paşcovchi S. and Leandru V. and "The list of habitats and species of Community interest for which sites of Community importance have been declared" [http://www-old.anpm.ro/files2/Anexa4%20-%20SCI%20-%20Lista%20tipurilor%20de%20habitate%20%C5%9Fi%20a%20s.pdf].

Subsequent to this equivalence, the correspondence forest type - Natura 2000 forest habitat was checked in the field. During this check, a complex data sheet was completed, in which the characteristics of the forest stand, shrub layer, seedlings layer and herbaceous flora were recorded (based on these determinations being the book "Flowers in Romania's forests" - authors: Candrea-Bozga, Indreica, Lazar, 2013). The implementation of the Natura 2000 forest habitats distribution maps was done through the ArcGIS 10 software.

RESULTS AND DISCUSSIONS

Within the Production Units IV Măgura, V Peceneaga, VI Obârşia Bistrei Mărului, VII Şucu - Olteana and VIII Scorila - Bratonea, over which the study area is largely overlapping, following the equivalence of the forest types with the types of Natura 2000 forest habitats, the following types of habitats of Community interest were encountered: *91V0 - Dacian beech forests (Symphyto-Fagion), 9130 - Asperulo-Fagetum beech forest, 9110 - Luzulo-Fagetum beech forests and 9410 - Acidophilous Picea forests of the montane to alpine areas (Vaccinio-Piceetea).*

Following the correspondence check of the forest type - Natura 2000 forest habitat on site, two types of forest habitats of community interest were identified*: 9180 * - Tilio-Acerion forests on steep slopes, groves and ravines and 91E0 * - Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae).* Parts of the forests within the studied area did not present attributes specific to the Natura 2000 forest habitats.

The most significant area is occupied by habitat *91V0 - Dacian beech forests (Symphyto-Fagion)*. Along with this habitat, there have been identified two other types of habitats in which the beech composition is the dominant species (Table 2). These are the *habitats 9110 - Luzulo-Fagetum beech forests (Luzulo-Fagetum beech forests)* with a relatively large spread *and 9130 - Asperulo-Fagetum beech forest (Asperulo-Fagetum beech forest)* with a fairly low surface area. The high frequency of beech is also due to the fact that the area studied overlaps the ecological species optimum, it being either pure or mixed with hornbeam, fir, spruce, etc. Thus, beech is encountered starting with the hilly area, its upper limit being in some cases even the upper limit (altitudinally) of the forest.

Habitat *9410 - Acidophilic spruce forests (Picea) from the mountain to the alpine areas (Vaccinio-Piceetea)* is the average in size. It is mostly encountered nearby the alpine area, with spruce especially concentrated at higher altitudes (Table 1).

*91E0 * - Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* has a reduced percentage. Alder stands are encountered along the watercourses, forming relatively narrow corridors with variable lengths (Table 1).

Habitat *9180 * - Tilio-Acerion forests on steep slopes, grooves and ravines* are also found on very small areas, with a more punctiform presence (Table 1).

Table 1 synthetically displays the area occupied by the forest habitats of community interest in the study area.

Table 1

Surface distribution of Natura 2000 forest habitats

Habitat type Natura 2000	Area (ha)
9180*	227,75
91E0*	40,36
91V0	9245,68
9110	2854,54
9130	73,94
9410	5011,37
Other surfaces (enclaves, intravilan, quarry, lake, meadows)	5880, 73
Total	23334,36

Habitat *9180** is spread on steep slopes in the basins: Valea Rea, Sturului Valley, Peceneaga Valley, the upper basin of Bistrei Marului, Şuculeţ, etc. (figure 3). The 91E0 * habitat is located on the Bistra Mărului River from the entrance to the study area upstream to the quarry and upstream of the trout farm, Bolvaşniţa Mare Valley, Sălătruc Valley, the shore of the reservoir near the Forests between the Făneşti Valley, Valea Mare, on the Olteana Valley upstream of Poiana Mărului, at the confluence between the Şucu River and the Olteana River, on Valea Vâlsanului (Figure 2). The *91V0* habitat occupies important areas in the basins: Bolvaşniţa Mare, Sălătruc, around the accumulation lake, Valea Mare, Olteana, Scorila, Bratonea, etc. (figure 4). The *9110* habitat is spread in the upper basin of the Great Valley, Roşia Valley, Valea Sturului, Valea Peceneaga, in the upper basin of Bistra Mărului Valley, in the upper basins of the Scorila, the Surupata Mică and the Surupata Mare, Bratonea (figure 5).

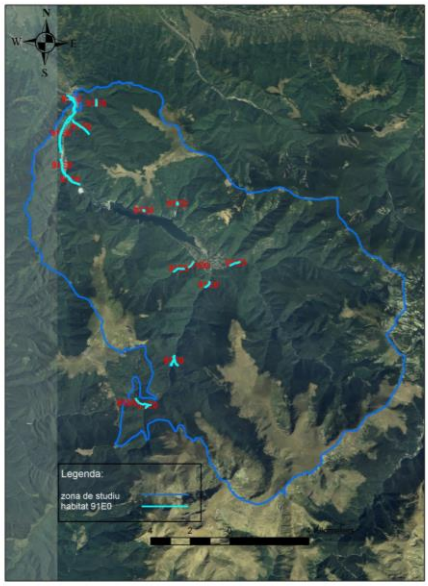

Figure 2 – Distribution of habitat 91E0* within the studied area

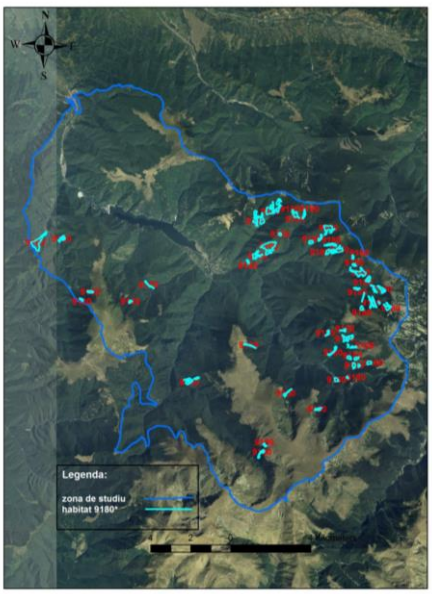

Figure 3 – Distribution of habitat 9180 * within the studied area

The *9130* habitat occupies confined areas near the village of Măru on the Pârâul Surdului (figure 6). The *9410* habitat is well distributed in the upper parts of the basins: Valea Roşia, Valea Rea, Sturu, Peceneaga, Bistra Mărului, Şucu, etc. (figure 7).

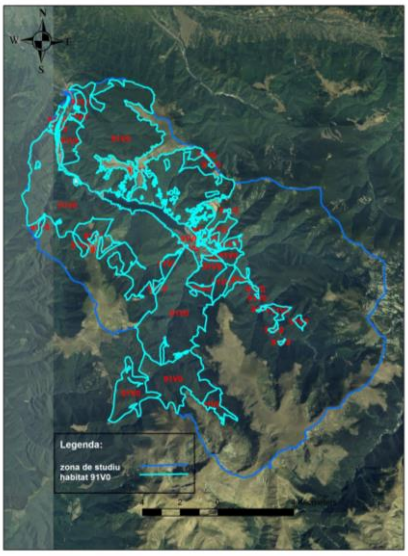

Figure 4 – Distribution of habitat 91V0 within the studied area

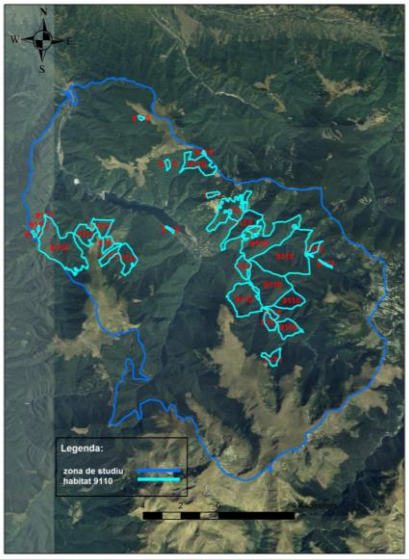

Figure 5 – Distribution of habitat 9110 within the studied area

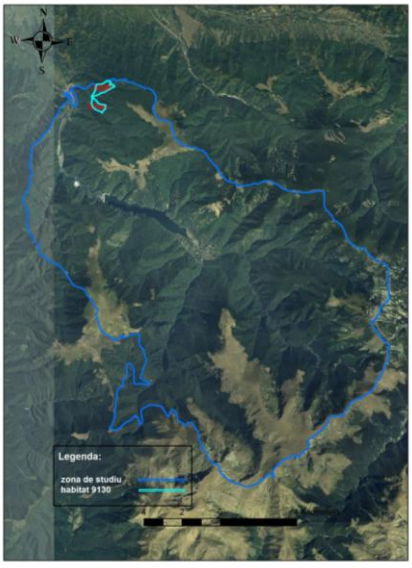

Figure 2 – Distribution of habitat 9130 within the studied area

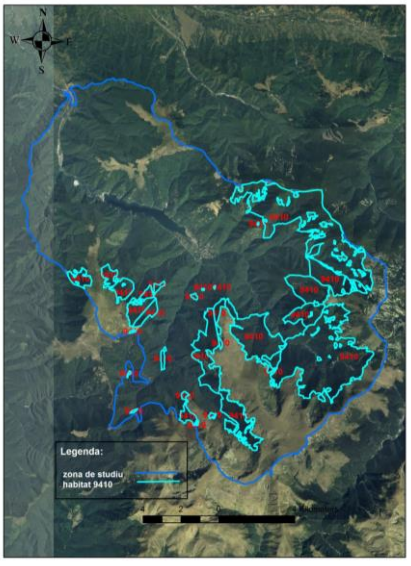

Figure 3 – Distribution of habitat 9410 within the studied area

CONCLUSIONS

At European Union level, Spain is the member state with the largest area of forests included in the Natura 2000 network (approximately 79800 km²), followed by Poland (approximately 33500km²) and France (30090km²). The forest area included in the Natura 2000 network in Romania is 22390 km² [**** Comisia Europeană. 2018].

By identifying, mapping and describing the forest habitats in the studied area, 6 forest habitats were identified during the year 2017. They are as follows :

• *9180 ** - are found on very small surfaces, with a more punctiform presence at the level of the studied area (1%);

• *91E0 ** - habitat along the watercourses, it forms relatively narrow corridors with variable lengths occupying 0.2% the content of the studied area;

• *91V0* - is the most widespread habitat, occupying 39.6% of the studied area,, being the most well represented habitat;

• *9110* - have a relatively large spread (12.2%);

• *9130* - occupy a very small area (0.3% of the total area);

• *9410* - occupying 21.5%, are encountered mainly around the alpine-clearing.

It has been noted that the forest habitats of Community importance occupy about 75% of the total area, other types of areas (enclave, urban, quarry, lake, etc.) occupying 25%.

The conservation status of forest habitats has been considered favorable for all six types of forest habitats described. Maintaining and / or improving the favorable conservation status depends largely on the limitation / mitigation of the pressures identified at present and the threats that will occur in the future.

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STUDY REGARDING THE ANTHROPOGENIC THREATS ON LUCANUS CERVUS SPECIES PROTECTED UNDER THE IUCN RED LIST IN THE PROTECTED AREA PRUNISOR

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Keywords*: anthropogenic threats, insect, protected area*

ABSTRACT

This paper present our research regarding the anthropogenic threats on Lucanus cervus, in the protected area Prunisor. From our observation regarding the protected area Prunisor, we have identified Lucanus cervus L. species protected under the IUCN red list. As part of the management plan of the protected area Prunisor during our research we have identified two major anthropogenic threats for this protected species: B02.04 - removal of dead trees or decaying wood and B03 - forestry Exploitation without replanting or natural recovery.

INTRODUCTION

Invertebrates constitute the large majority of biodiversity, accounting for N80% of the species described. Indeed, among multi-cellular organisms, invertebrates are dominant in terms of richness, abundance and often biomass (Cardoso et al., 2011b) and occupy most niches and food-web nodes.

Preserving invertebrates is of crucial importance to preserve biodiversity. Nonetheless, invertebrates are mostly underrepresented in international conservation measures and have largely been neglected in the literature on conservation, a result of a taxonomic bias (Cardoso,2012; Clark and May, 2002; Kremen et al., 1993; Zamin et al., 2010).

Lucanus cervus is one of the most charismatic saproxylic beetles, widely distributed in Europe. The species is typical of mature deciduous forests, especially oak woodlands. Loss and fragmentation of suitable habitats is one of the major threats for this species which is included in Annex II of the Habitats Directive.

Lucanus cervus (Linnaeus, 1758), belonging to the family Lucanidae, is the largest saproxylic beetle in Europe. Populations of this species inhabit mature deciduous forests, especially the lowland and medium-altitude oak woodlands having rotten dead wood at ground level. *Lucanus cervus* is considered a flagship species and is included in Annex II of the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora) (Bardiani et al, 2017).

In the past, the species was thought to be confined to large woodlands (Tochtermann 1992). However, more recent studies in NW Europe have shown that sag beetles can occur in an open and more urban habitat such as gardens, parks, trees on

road verges, sunken lanes, orchards and a forested slopes often in the vicinity of large woodlands (Sprecher 2003, Rink and Sinsch 2006, Smit and Krekels 2006).

This species adults has an massive elongated body, black with matte gloss, males have mandibles and elytres of brown-chestnut. The antennas are quite long. For this species there is a pronounced sexual dimorphism. The male has a massive head and jaws in the form of very large branched horns. Body length: 25-75 mm. The female has the head and jaws in size, and the color of the elytres is black. Body length: 25-50 mm (Tatole et al. 2009). The larvae go through three stages, the development period can be 5 years in some cases even 6-8 years until the filling (Petersen et al. 2003). It is an indicator for natural forests with structures and sufficient dead wood. The larvae live about 5 years underground in dead wood of different tree species on loamy soils (Klausnitzer 1995, Pratt 2000). After pupation the beetle will wait nearly a full year before emerging, bringing the length of the total life cycle to 6 years (Klausnitzer 1995).

For the colonization of new sites the dispersal ability of females, which amounts to less than 1 km, is decisive (Rink and Sinsch 2007).

In Romania this species can be found in the old forests with deciduous species, preferring especially the oak forests, but can also occur in the forest and steppe areas. Often adults fly in gardens and parks. During the day, adults can be seen on the trunks of oaks and other trees feeding on their sap. It flies in the twilight, during the period May-July. Larvae develop in the strong roots of the old trunks of Quercus sp., Fagus sp., Salix sp. , Populus sp., Tilia sp., Aesculus sp. or fruit trees from orchards, sporadically in conifers or compost (Tatole et al. 2009).

MATERIAL AND METHODS

As part of the management plan of the protected area Silvostepa Olteniei, during our research we have to identify the major anthropogenic threats for Lucanus cervus L. species protected under the IUCN red list. In order to determine the major anthropogenic threats for this species we had to identify and locate the habitats of this species in the protected area Prunisor.

For the inventory of the *Lucanus cervus* L. species, several field exits are required. The most efficient method is generally the method of twilight visual transect. This method is addressed to the *Lucanus cervus* L. species as the males have twilight flight.

The movement is made on forest roads without compact crown or along the border, approximately between 8:00 pm and 2:00 pm on hot and dry evenings. Particularly noted are the males in flight, but also the specimens on the ground or on the vegetation.

The transects carried out have a length of 500 m and a width of 20 m, and between the ends of two neighboring transects there must be a distance of 25 m. In the case of small surface habitats the transects may be shorter, and if the species has a very low density they can be longer. If the habitat surface allows, there are five transects.

RESULTS AND DISCUSSIONS

Following our studies we have identified two anthropogenic threats: removal of dead trees or decaying wood, forestry exploitation without replanting or natural recovery.

B02.04 - removal of dead trees or decaying wood

Eliminating rotting trees and shrubs of the forest ecosystem, lead to the extinction of species habitat

This threat has been identified in the northwest part of the site. Among the factors that negatively influence the conservation status of *Lucanus cervus* L, the uncontrolled cutting of old trees in the forests of the site is listed. Hundreds of places where the larval stages of this species develop as well as the loss of feeding sites will be irreversibly destroyed by the uncontrolled felling of old trees.

All the impacts caused by the current pressures are valid also for the impacts caused by the future threats, because the way of managing the wooded surfaces remains unchanged.

B03 - Forestry Exploitation without replanting or natural recovery

Generally, in the forests of this area wood is extracted only by local for domestic use. This practice leads to the fragmentation of the species habitat

Logging activities without planting were identified in the area in the plateau areas where *Quercus dalechampii* predominates. They are located on the right side of the road that leads to Cerveniţa. In order to locate this area as well as possible, we have some GPS coordinates: N44º37'337 "; E22º56'001"; N44º37'424 "; E22º56'974". This activity has been identified on small areas in the perimeter of the habitat with the best representation in the area: 91M0.

Fig. 1. Lucanus cervus L. male, Prunisor (orig.)

CONCLUSIONS

Following our studies, regarding Lucanus cervus L. species we have identified two major anthropogenic threats:

B02.04 - removal of dead trees or decaying wood

B03 - Forestry Exploitation without replanting or natural recovery

All the impacts caused by the current pressures are valid also for the impacts caused by the future threats, because the way of managing the wooded surfaces remains unchanged.

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STUDY REGARDING THE ANTHROPOGENIC THREATS ON TESTUDO HERMANNI SPECIES IN THE PROTECTED AREA OF PRUNISOR, MEHEDINTI COUNTY, ROMANIA

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Keywords*: anthropogenic threats, Hermann's tortoise, protected area*

ABSTRACT

This paper present the research regarding the anthropogenic threats on Testudo hermanni G., in the protected area Prunisor. In our country the main threats for the Testudo hermanni G. are represented by the loss of habitat and its degradation due to the extension of the agricultural landscapes, deforestation, tourism and recreation areas, agricultural crops, climate change, droughts, temperature extremes. As part of the management plan of the protected area Prunisor during our research we have identified two anthropogenic threats: F03.02.01 collecting of animals.

INTRODUCTION

The Hermann's tortoise (*Testudo hermanni*) benefits from an extremely positive image and is very popular as a pet. Yet the tortoise is not safe from human threats in its natural habitat. Wild populations of the tortoise are constantly decreasing and the reduction of favourable habitats has triggered its classification as an endangered species.

The Hermann tortoise is a European species, and its range overlaps the Mediterranean climate from Spain (Catalonia) to Turkey, with infiltration through the area with sub-Mediterranean influence in Romania and Bulgaria (Gasc et al. 1997). The spatial distribution of the Hermann tortoise in SW Romania has been assessed in several papers, covering past and present situations (Fuhn & Vancea 1961, Iana & Petcu 1976, Covaciu-Marcov et al. 2005, Iftime 2005, Covaciu-Marcov et al. 2009a). The Hermann tortoise is a terrestrial tortoise of medium size, with an accentuated sexual dimorphism (Rozylowicz & Pătroescu 2004). The average age for the sexual maturity is 8 years for males and 9 years for females or for females with straight shell length > 150 mm (Cruce & Răducan 1975a, Cruce & Răducan 1976).

The Hermann tortoise has an annual life cycle divided into two parts: the sleep-hibernation period (November–March/April) and the active period (March/April–November). During the sleep-hibernation period, there can be interruptions when the temperatures are extremely high.

During the tropical hot summer days, when the tortoises are not moving for more than 5 consecutively days, the aestivation phenomena appears (Cruce & Răducan 1975b, Cheylan 2001).

The species prefers tessellated habitats, with high fragmentation, open vegetation, relatively small areas and surrounded by brushwood and forests (Rozylowicz et al. 2003). This habitat structure allows the development of large densities of tortoise groups, especially because of the habitat's capacity for offering protection in critical development phases (Pătroescu & Rozylowicz 2007).

Habitat loss and degradation contributes the most to the decline of the tortoise population (Necşuliu & Popescu 2003, Pătroescu & Rozylowicz 2007).The loss of habitat and its degradation is happening because of land use changes such as the extension of the agricultural landscapes, deforestation, forestation, and development (Necşuliu 2007).

As the species habitats overlay a border area, there are cases when the tortoises are illegally collected and trans-ported over the border to be sold as pets (Rozylowicz 2008). Furthermore, many tortoises are collected by tourists and abandoned outside their habitat range without any chance to survive during the winter. In other cases, local inhabitants kill the tortoises as they are entering the vegetable gardens for feeding (Pătroescu & Rozylowicz 2007).

However, for the long term conservation plans of the species, measures need to be established to minimize the fragmentation of the habitat range.These measures should be based on landscape level studies (Hartel et al. 2008), identification of new protected areas in the Eastern part of the habitat range (Iojă et al. 2010) and growth of the suitable habitats, especially as the area will be constantly under development stress (Pătroescu & Rozylowicz 2007). The community-based initiatives could be one of the most important measures for the future of the species (Rozylowicz 2008).

The main threats for the Hermann tortoise are due to housing and urban area encroachment, tourism and recreation areas, annual and perennial non-timber crops, mining and quarrying, energy production and mining, recreational activities, increase in fire frequency/intensity, droughts, temperature extremes, climate change and severe weather (Rozylowicz & Dobre 2008).

MATERIAL AND METHODS

As part of the management plan of the protected area Silvostepa Olteniei, during this research there were identified the major anthropogenic threats for Testudo hermanni species protected under the IUCN red list.

For the inventory of the Testudo hermanni G. species, several field exits are required.

During our research we have used the terrestrial visual transect, that consists in travels for a determined period of time in terrestrial habitats, visually detecting the specimens. The transects have a length of 1000 m and a width of 20 m, between the ends of two neighboring transects being a distance of 100 m.

RESULTS AND DISCUSSIONS

In our country the main threats for the Testudo hermanni G. are represented by The loss of habitat and its degradation due to the extension of the agricultural landscapes, deforestation, tourism and recreation areas, agricultural crops, climate change, droughts, temperature extremes.

Following our studies, in the protected area Prunisor we have identified two anthropogenic threats: F03.02.01 collecting of animals.

Collecting individuals of this species leads to a reduction in the number of species. In the area of monitoring the species *Testudo hermanni* G. animals were identified grazing, horses and cows. The pasture determines the fragmentation of the habitats of the species, reducing the usable areas of the protected species for food and reproduction.

Both threats have great impact on this species, reducing the number of individuals and the areas used for food and reproduction.

Fig. 1. Testudo hermanni G., Prunisor (orig.)

CONCLUSIONS

Following our studies, regarding Testudo hermanni G. species we have identified two major anthropogenic threats: F03.02.01 collecting of animals and A04 – Grazed.

All the impacts caused by the current pressures are valid also for future threats that may come.

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STUDY OF SOIL ERODIBILITY BY WATER ON TILLAGE AND NO TILLAGE TREATMENTS OF A HELIANTHUS TUBEROSUS CROP USING FIELD MEASUREMENTS, SOIL LABORATORY ANALYSES, GIS AND DETERMINISTIC MODELS

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Keywords*:* Soil erodibility, tillage, soil laboratoty analyses, GIS, Spatial analysis.

ABSTRACT

The paper presents a spatial modeling approach of Soil erodibility (K factor)-which is a complex soil property-on conventional tillage (CoT) and no tillage (NOT) treatments of a Helianthus tuberosus crop using field measurements, soil laboratory analyses, GIS and determenistic models. A split-plot design with 4 treatments×3 replications of experimental field plots was used. Results of Anova statistical analysis (P=0.05) between K data groups revealed that the two tillage systems significantly differ (Sig.=0.008) and also the 4 treatments (A, B, C and D) were significantly different (Sig.=0.032). Final results showed that the best tillage system NOT and treatment C (No Tillage with Vegatation Cover) in hilly farmfields of Greece can be regarded as potential ecological good practices for the farmers, in order to reduse soil erodibility, erosion risk and preserve the soil environment and its valuable nutrients.

INTRODUCTION

Soil erosion is the process of detachment and transport of soil materials by wind or water (**Foster & Meyer 1972**). Nowdays, soil erosion is a great challenge to agricultural sector development and to food security at regional, national and global scales (**Filintas 2005, Filintas 2011**). Greece is an agricultural country with declining farmer population, a high farming history, and intensive cultivation tasks which have resulted in accelerated erosion. In order to reduce soil erosion and conserve valuable soil resources, various soil erosion models have been widely developed and applied worldwide. Soil erosion is considered a serious environmental problem in land parts of Greece.

Soil erodibility is a key factor in erosion prediction models, such as USLE (Universal Soil Loss Equation) (**Wischmeier & Smith 1978)** and RUSLE (Revised Universal Soil Loss Equation) (**Renard et al. 1997, USDA 2002**). Soil erodibility (K factor) is a complex soil property and is essentially the ease with which soil is detached by water splash during a rainfall or irrigation (mostly with sprinklers or waterjets) incident or by surface water flow or both (**Filintas 2011**). It is difficult to obtain the key parameters of erosion prediction models, such as soil erodibility, expressed as K factor (**Panagos et al. 2012**). To remedy this situation, indirect methods are applied to estimate this factor and make these studies feasible (**Bonilla & Johnson 2012**).

The purpose of the present research is to evaluate the effect of conventional tillage (CoT) and no tillage (NOT) treatments on Soil erodibility (K factor) using experimental field plots, field measurements, soil laboratory analyses, GIS and field's spatial deterministic modeling and GIS mapping, under the environmental conditions of central Greece (at Larisa city).

MATERIAL AND METHODS

Study area: The experiment was conducted at the farmland of Gaiopolis campus-University of Thessaly at Larisa city in Central Greece. It was located in a typical hilly and gully area of the farmland. The study area has a temperate Mediterranean climate with warm dry summer and a mild winter, and is designated as Csa according to the Koeppen climatic classification (**Filintas 2005**), and also it is characterized as XERIC MOISTURE REGIME according to **Soil Survey Staff (1975)**, with mean annual temperature and rainfall of 18.8 °C and 513.68 mm, respectively. The higher mean monthly rainfall for the year 2016 was r_w= 116.40 mm month^{-1} and it was observed in March, while the lowest one was r_d= 0.00 mm month^{-1} in February (Fig. 1). The total rainfall of year 2016 was r_{totw}= 410.80 mm year^{-1}.

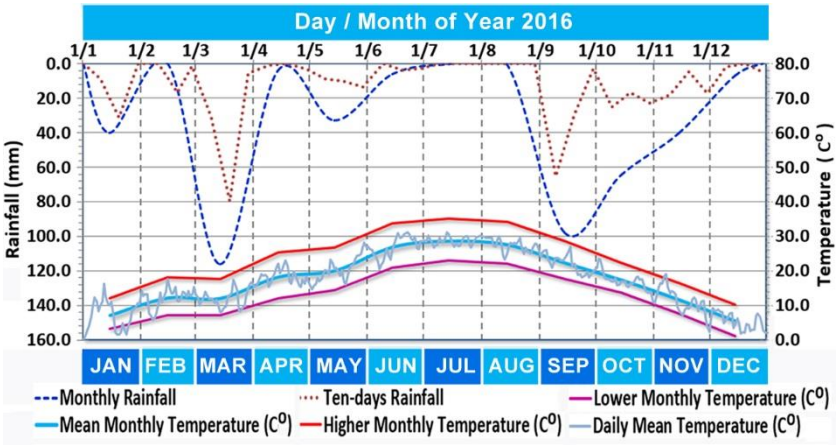

Figure 1. Graph of Rainfull and Temperature variation.

Experimental Site description: A split-plot design with 4 treatments × 3 replications of experimental field plots was used and a Helianthus crop (*Helianthus tuberosus*) was seed in order to facilitate vegetation cover to some treatments:

Treatment A was conventional tillage (CoT) with vegetation cover (VC),
Treatment B was CoT with no vegetation cover(NOVC),
Treatment C was no tillage (NOT) with vegetation cover (VC), and
Treatment D was no tillage (NOT) with no vegetation cover (NOVC).

Each experimental field plot was 6 m width x 22 m length (downslope), giving a plot area of 132 m^2 and a total number of 12 experimental plots. The plots slope is about 7.5 % and the direction of slope (south-east facing) was similar for all plots.

Soil sample collection and soil's characteristics determination: At each experimental plot, topsoil samples (0–5 cm) were collected in an Grid pattern to

determine texture [(clay content (Cl), silt (Si) content, sand (Sa) and very fine sand (vfS) contents and gravel (Gr) content)], organic matter content (OM), soil's structure and permeability classes. A Global Positioning System (GPS) receiver was used to identify the sampling locations. A total of 40 top soil samples were air-dried, and passed through a 2 mm mesh to determine soil texture by the method Bouyoucos (**Bouyoucos 1962, Page et al. 1982**). Organic matter was analyzed by chemical oxidation with 1 mol L^{-1} $K_2Cr_2O_7$ and titration of the remaining reagent with 0.5 mol L^{-1} $FeSO_4$.

Soil classification was performed according to USDA classification system (**Soil Survey Staff 1975**). The soil structure (which is the arrangement of soil particles and soil aggregates into recognizable particles or lumps) classes and the soil's Permeability classes were determined according to **USDA 1951** and **USDA 2002**. Soil erodibility as K factor (t ha h ha^{-1} MJ^{-1} mm^{-1}) was estimated by the nomograph equation in **Wischmeier et al., 1971** model since the data of soil texture and soil organic matter (%) (**Wu et al., 2003**) were measured. The formula for K factor nomograph calculation for soils with less than 70% silt plus vfS can be expressed by the following relationship (**Wischmeier et al. 1971, Wischmeier and Smith 1978**) :

$$K = \left[2.1 \times 10^{-4}(12-OM)M^{1.14} + 3.25(S-2) + 2.5(P-3)\right]/100 \qquad (1)$$

where *K* is the USLE soil erodibility *K* factor (t ha h ha^{-1} MJ^{-1} mm^{-1}), *M* is the product of percent of silt+Vfs and the percent of all soil fractions other than clay in the US Soil Texture System (0.05 mm < sand < 0.1 mm, 0.002 mm < silt < 0.05 mm, clay < 0.002 mm), *OM* is soil organic matter content (%), *S* is the soil structure class, and *P* is the soil permeability class.

Statistical Data Analysis: Data analysis was performed using the IBM SPSS (**Norusis 2008**) and the MINITAB (**Ryan et al. 2005**) statistical software packages. The results are means of the samples and measurements. Analysis of variance (ANOVA) was used to assess tillage systems and treatment effects.

The statistical Levene test of Homogeneity of Variances was used in order to validate the assumption of variance equality of soil erodibility data groups. Mean separation was made using LSD test when significant differences (P=0.05) between treatments were found. Moreover, the erodibility results obtained were associated with soil physical properties (texture and organic matter) using Spearman's correlation. The significant correlations at a 95% confidence interval were considered to evaluate soil prediction models for the studied experimental farmfields.

Soil erodibility modeling and interpolation methodology: For the experimental plots, spatial interpolation was used with a deterministic interpolation model, the Inverse Distance Weighting (IDW) model, which is used to estimate an unknown value, given the observed values at sampled plots (**Lu and Wong, 2008, Filintas 2011, Stamatis et al. 2011**). This method is based on the assumptions that the attribution values [(of soil classes, OM, soil structure, permeability and soil erodibility (K factor)] at the unsampled soil sites are a weighted average of values at sampled soil sites of the experimental plots in the vicinity and that the weights of the

deterministic interpolation model are inversely proportional to the field distance between the sampled and prediction locations.

In the present paper, we used inverse-distance weights of powers of 2 for modeling and GIS mapping of soil texture classes, organic matter content, soil structure and permeability classes respectively and also for the soil erodibillity. Using the modeled parameters (which were digitally mapped in a GIS environment) as input factors, we delineated soil's erodibility field map with the help of spatial analysis and the use of a GIS software (ArcGIS©). In addition, the evaluation of K-factor equation require analysis of residual errors, the difference between predicted and observed values and prediction characterization between over- and underestimates. To that end, we used the statistical parameters described by **Loague & Green (1991),** such as the equations for the Mean Prediction Error (MPE), and the Root Mean Square Error (RMSE). From the modeling results on a digital GIS map of soil erodibility (K factor) of the experimental plots, the K data were extracted for the validation procedure of the deterministic modelling using the training and test soil and K datasets.

The obtained measured and predicted values were interpreted by calculating different validation indices, including the MPE, the RMSE **(Lin 1989, Meersmans et al. 2012, Mishra et al. 2010).** The MPE and RMSE values should approach zero for an optimal prediction.

RESULTS AND DISCUSSIONS

Soil erodibility depends on four main parameters: soil texture, soil structure, permeability and organic matter content.

The results and statistical analysis showed that soil erodibility K during the measurement period is oscillating from a minimum 0.1911 $t \cdot ha \cdot h \cdot ha^{-1} \cdot Mj^{-1} \cdot mm^{-1}$ to a maximum 0.3562 $t \cdot ha \cdot h \cdot ha^{-1} \cdot Mj^{-1} \cdot mm^{-1}$ (mean K=0.2743, standard deviation StdD=0.0512), as illustrated in Table 1. Sand contents were generally between 55.46% and 67.24%. Most soils contained between 16.20% and 24.00% silt and from 14.40% and 24.12% clay. The organic matter content ranges from a minimum 1.440% to a maximum 3.216% (Table 1). Analysis showed that 86.11% of the soil series contained ≤ 2.5% organic matter in the surface horizon.

Table 1

Results of soil's characteristics statistics

Soil Parameter	Min	Max	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Soil Erodibility K	0.1892	0.3562	0.2743	0.0085	0.0512	0.0026
Organic Matter	1.4405	3.2160	2.1161	0.0572	0.3435	0.1180
Sand	55.4600	67.2400	59.8700	0.4043	2.4257	5.8839
Silt	16.2000	24.0000	19.9136	0.3206	1.9238	3.7011
Clay	14.4000	24.1200	20.2164	0.3881	2.3285	5.4220

Soil erodibility (K factor) units are: t ha h ha^{-1} MJ^{-1} mm^{-1},
Organic Matter, Sand, Silt and Clay units are: percentage (%).

A split-plot design with 4 treatments × 3 replications of experimental field plots was used on a Helianthus crop (*Helianthus tuberosus*) in order to facilitate vegetation cover to some treatments. The treatments of the experimental design were:

Treatment A was conventional tillage (CoT) with vegetation cover (VC),
Treatment B was CoT with no vegetation cover(NOVC),
Treatment C was no tillage (NOT) with vegetation cover (VC), and
Treatment D was no tillage (NOT) with no vegetation cover (NOVC).

The soil characteristics of *Helianthus tuberosus* experimental field that were measured and analyzed, were digitized according to their GPS locations in WGS 1984 Geographic Coordinate System and saved in a digital geodatabase in a GIS (Geographical Information System) environment. Then the soil, tillage and treatment data were Projected to the WGS 1984 UTM Zone 34N Coordinate System for better use in Greece's Coordinates.

Finally, spatial interpolation was performed with the deterministic interpolation model of Inverse Distance Weighting (IDW), which is used to estimate an unknown value, given the observed values at sampled plots (**Filintas et al. 2007, Lu and Wong 2008, Filintas et al. 2008, Filintas 2011, Stamatis et al. 2011, Filintas 2011b**). The spatial GIS modeling results are depicted on a digital soil erodibility GIS map (K factor in t·ha·h·ha^{-1}·Mj^{-1}· mm^{-1}) of the *Helianthus tuberosus* plots with treatments (A, B, C and D) symbols in Figure 2 (a). Also, results of soil erodibility classes vs. Percentage of K area of classes are presented in Figure 2 (b).

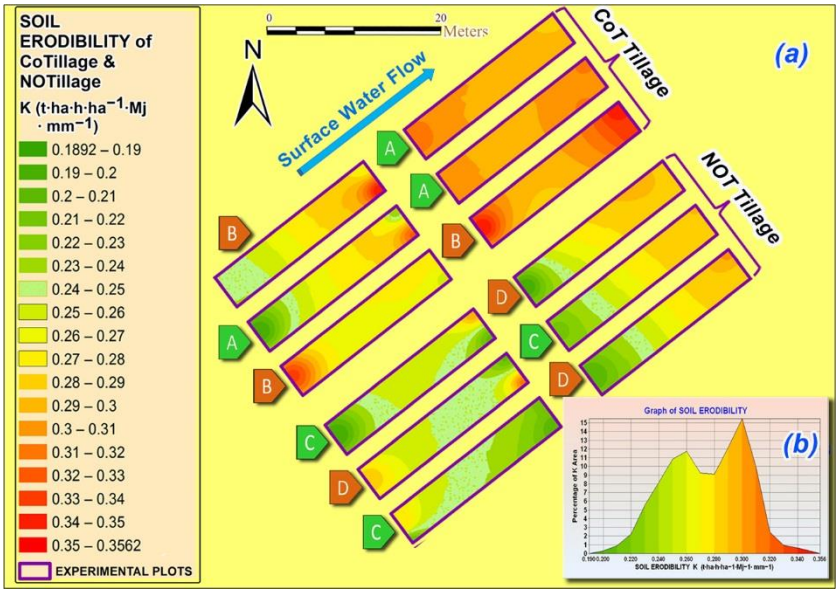

Figure 2. (a) Modeling results on a digital soil erodibility GIS map (t·ha·h·ha^{-1}·Mj^{-1}· mm^{-1}) of the *Helianthus tuberosus* plots with treatments (A, B, C and D) symbols, (b) Graph of soil erodibility (K factor) classes vs. Percentage of K area.

Modeling validation of the digital soil erodibility GIS map of the experimental plots showed the following results:

Mean Prediction Error (MPE)=0.000869 and

Root Mean Square Error (RMSE)= 0.049991.

Both results are well accepted since the MPE and RMSE values should approach zero for an optimal prediction. These results confirm the validity and precision of the produced digital soil erodibility GIS map of the experimental plots of *Helianthus tuberosus.*

Also, these results proved that the deterministic model of IDW performed well and it is considered very suitable for soil erodibility and other soil parameters (clay, sand, silt, organic matter, etc.) modeling and mapping.

Next step was the ANOVA statistical analysis (P=0.05) between soil erodibility data groups in correlation with tillage systems. The ANOVA results revealed that the two main tillage systems [conventional tillage (CoT) and no tillage (NOT)] significantly differ in some way (Sig.=0.008), so it was needed to learn more about the structure of their differences. Therefore, in order to validate the assumption of variance equality of soil erodibility data groups it was performed the statistical Levene test of Homogeneity of Variances. The results of the statistical Levene test for soil erodibility K on the tillage systems and on treatments are presented in table 2. The Levene test established that the soil erodibility homogeneity variances across tillage systems (CoT and NOT) and also across treatments (A, B, C and D) data groups are not significantly different (Sig.= 0.318 and Sig.=0.663) meaning that the assumption of variance equality was found true.

Table 2

Results of the statistical Levene test of Homogeneity of Variances for soil erodibility K on the tillage systems and on treatments

No.	System or Treatment	Levene Statistic	df1	df2	Significance at the 0.05 level
1	Tillage System	1.028	1	38	0.318
2	Treatment	0.533	3	36	0.663

Since the assumption of variance equality of soil erodibility was found true, ANOVA and LSD (Least Significant Differences) statistical tests were performed to assess treatment effects and mean separation of treatment effects.

The best tillage system in Central Greece for hilly and gully farmfields at erosion risk with a slope >= 7.5 % downslope was found to be tillage NOT.

The results of ANOVA (P=0.05) showed that treatments (A, B, C and D) data groups of soil erodibility are significantly different (Sig.=0.032). The mean difference is significant at the 0.05 level. The best treatment in order to reduse soil erodibility (K factor) and preserve the soil environment was found to be treatment C [(NOT-VC) (No Tillage with Vegatation Cover)] for hilly and gully farmfields at erosion risk with a slope >= 7.5 % downslope.

CONCLUSIONS

The prediction errors results (MPE=0.000869 and RMSE=0.049991) of modeling validation for soil erodibility GIS mapping confirmed the validity and precision of the produced K factor digital GIS map of the *Helianthus tuberosus* experimental plots. These results proved that the deterministic model of IDW performed well and it is considered very suitable for soil erodibility and other soil parameters (clay, sand, silt, organic matter, etc.) modeling and mapping.

Considering the results of tillage systems and treatment effects on soil erodibility, the best tillage system (NOT) and the best treatment C [(NOT-VC) (No Tillage with Vegatation Cover)] for hilly and gully farmfields on erosion risk with a slope >= 7.5 % downslope can be regarded as potential ecological good practices for the farmers, in order to reduse soil erodibility and erosion risk of their farmfields' and preserve the soil environment and its valuable nutrients.

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SOIL ORGANIC MATTER MODELING AND DIGITAL MAPPING OF A TRITICUM TURGIDUM CROPFIELD USING AS AUXILIARY VARIABLES THE PLANT AVAILIABLE WATER, TEXTURE, FIELD MEASUREMENTS, SOIL LABORATORY ANALYSES, GIS AND GEOSTATISTICAL MODELS

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Keywords*:* Organic matter, soil's plant availiable water, soil laboratoty analyses, GIS and Spatial analysis.

ABSTRACT

The paper presents a spatial modeling-mapping approach of soil's organic matter (SOM) correlation with soil's plant availiable water (PAW) and with soil texture of a triticum turgidum cropfield using field measurements, soil laboratory analyses, GIS and geostatistical models. The geostatistical model of CoKriging Interpolation was used as the base for SOM modeling-mapping at field level with 4 (treatments) different auxiliary variables: PAW, Soil's Clay, Silt and Sand Contents. Results of geostatistical modeling-maping revealed that the best model and map was the output of SOM with PAW as auxiliary variable (Modeling Prediction Errors were MPE=-0.0035, MSPE=-0.0068 and RMSSE=1.0021). This method of CoKriging Interpolation can be used for digital modeling-mapping with high accuracy for precision farming applications and better irrigation and fertility decisions for the farmers benefit.

INTRODUCTION

Soil organic matter (SOM) is the organic component of soil, consisting of three primary parts including small (fresh) plant residues and small living soil organisms, decomposing (active) organic matter, and stable organic matter (humus) (USDA 2013). SOM and soil organic carbon (SOC) is an important component of soil that helps to determine crop yield and carbon sequestration (Manlay et al. 2007).

Soil organic matter is actually a reservoir of nutrients for cultivated crops, which provides soil aggregation, helps and increases nutrient exchange, reduces topsoil compaction and also topsoil's surface crusting, retains soil's water content and increases water infiltration into soil (Filintas 2011). It is a key property that affects soil quality and the assessment of soil resources. The amount of carbon stored in soil is three times that in the atmosphere (Post and Kwon, 2000). Consequently, small losses of soil carbon to the atmosphere can have a significant impact on the overall emissions of greenhouse gases and the greenhouse effect (Raich and Potter, 1995). The digital mapping of soil organic matter at fine resolution (farmfield level) is a challenging task (Filintas 2008) and the spatial GIS mapping is also a high priority for SOM assessment and monitoring (McBratney 2003, Filintas 2008, Filintas 2011). Spatial models on SOM prediction have various example studies (Jenny et al. 1968,

McBratney et al. 2003, Filintas 2008, Filintas 2011). A range of techniques have been used to predict and map SOM and SOC from landscape to national or continental levels and Minasny et al. 2013provided a comprehensive review.

The purpose of the present research is to present and evaluate a spatial modeling and mapping approach of soil organic matter (SOM) correlation with soil's plant availiable water (PAW) and with soil texture (Clay, Silt and Sand contents) of a *triticum turgidum* cropfield using field measurements, soil laboratory analyses, GIS and geostatistical models. The geostatistical model of CoKriging Interpolation was used as the base for SOM modeling-mapping at field level with four (4 treatments) different auxiliary variables: PAW, Soil's Clay content, Silt and Sand Contents in order to find the best model to be used in precision farming applications and fpr better fertility decisions for the farmers benefit.

MATERIAL AND METHODS

Study area: The experiment was conducted at the farmland of Gaiopolis campus-University of Thessaly at Larisa city in Central Greece. It was located in a typical cultivated area of the farmland. The study area has a temperate Mediterranean climate with warm dry summer and a mild winter, and is designated as Csa according to the Koeppen climatic classification (Filintas 2005), and also it is characterized as XERIC MOISTURE REGIME according to Soil Survey Staff (1975), with mean annual temperature and rainfall of 18.8 °C and 513.68 mm, respectively. The higher mean monthly rainfall for the year 2016 was r_w= 116.40 mm month^{-1} and it was observed in March, while the lowest one was r_d= 0.00 mm month^{-1} in February. The total rainfall of year 2016 was r_{totw}= 410.80 mm year^{-1}.

Experimental Site description: The geostatistical model of CoKriging Interpolation was used as the base for SOM modeling-mapping at field level with four (4 treatments) different auxiliary variables: PAW, Soil's Clay content, Silt and Sand Contents.

Treatment A was modeling-mapping of SOM with auxiliary variable PAW (% volumetric) from the samplings and measurements at the experimental farm field, Treatment B was modeling-mapping of SOM with auxiliary variable Soil's Clay content (%) of the experimental farm field, Treatment C was modeling-mapping of SOM with auxiliary variable Soil's Silt content (%) of the experimental farm field, and Treatment D was modeling-mapping of SOM with auxiliary variable Soil's Sand content (%)of the experimental farm field.

The experimental farm field was 60 m width x 80 m length, giving a total field area of 4800 m^2.

Soil sample collection and soil's characteristics determination: At the experimental farmfield, topsoil samples (0–10 cm) were collected in an Grid pattern to determine texture [(clay content (Cl), silt (Si) content, sand (Sa) content and gravel (Gr) content)], soil organic matter content (SOM), soil's structure and texture classes, and plant available water (PAW) that was determined by Field Capacity water content and wilting point water content measurements.

A Global Positioning System (GPS) receiver was used to identify the sampling locations. A total of 54 top soil samples were air-dried, and passed through a 2 mm mesh to determine soil texture by the method Bouyoucos (Bouyoucos 1962, Page et al. 1982). Organic matter was analyzed by chemical oxidation with 1 mol L^{-1} $K_2Cr_2O_7$ and titration of the remaining reagent with 0.5 mol L^{-1} $FeSO_4$. The water available (PAW) for plant growth is the difference between soil's Field Capacity (FC)

water content and wilting point (WP) water content. The FC and WP water contents were mesured with the porous ceramic plate method placed into a container that is pressurized with 1/3 atmosphere of pressure (about 5 psi) for FC and with 15 atmospheres of pressure (about 225 psi) for WP. Soil classification was performed according to USDA classification system (Soil Survey Staff 1975). The soil structure (which is the arrangement of soil particles and soil aggregates into recognizable particles or lumps) classes were determined according to USDA 1951.

Statistical Data Analysis: Data analysis was performed using the IBM SPSS (Norusis 2008) and the MINITAB (Ryan et al. 2005) statistical software packages. The results are means of the samples and measurements. The statistical Levene test of Homogeneity of Variances was used in order to validate the assumption of variance equality of SOM, PAW, Clay, Silt and Sand data groups. Mean separation was made using LSD test when significant differences (P=0.05) between treatments were found.

Moreover, the SOM results obtained were associated with soil physical properties (texture and PAW) using Pearson correlation statistical test. The significant correlations at a 95% confidence interval were considered to evaluate soil organic matter prediction models for the studied experimental farm field.

Soil Organic Matter, texture (Clay, Silt and Sand content) and PAW modeling and interpolation methodology: For the experimental farm field, spatial interpolation was used with geostatistical model, the CoKriging model, which is used to estimate an unknown value, given the observed values at sampled plots (Lu and Wong, 2008, Filintas 2011, Stamatis et al. 2011). The method is based on the assumptions that the attribution values (of SOM, soil structure, soil texture) at the unsampled soil sites are a weighted average of values at sampled soil sites of the experimental farm field. Using the parameters found from measurements and laboratory analyses (which were digitally mapped in a GIS geodatabase environment) as input auxiliary variables, we delineated SOM field maps with the help of spatial analysis and the use of a GIS software (ArcGIS©).

In addition, the evaluation of SOM require analysis of residual errors, the difference between predicted and observed values and prediction characterization between over- and underestimates. To that end, we used the statistical parameters described by Loague & Green (1991), such as the equations for the Mean Prediction Error (MPE), Mean Standardized Prediction Error (MSPE) and the Root Mean Square Standardized Error (RMSSE).

The modeling results on various digital GIS SOM maps of the experimental field were used to extract SOM data for the validation procedure of the geostatistical modelling using the training and test soil texture, PAW and SOM datasets. The obtained, measured and predicted values were interpreted by calculating the above mentioned different validation indices, including the MPE, the MSPE and the RMSSE (Lin 1989, Meersmans et al. 2012, Mishra et al. 2010, Filintas 2011, Stamatis et al. 2011).

The MPE and MSPE values should approach zero for an optimal prediction and the RMSSE should approach one.

RESULTS AND DISCUSSIONS

Digital soil mapping is the generation of geographically referenced soil databases based on quantitative relationships between spatially explicit environmental data and measurements made in the field and laboratory (McBratney et al. 2003). The results and statistical analysis showed that SOM during the

measurement period is oscillating from a minimum 1.54% to a maximum 3.16% (mean SOM=2.13%, standard deviation StdD=0.33), as illustrated in Table 1.

Sand contents were generally between 55.52% and 67.11%. Most soils contained between 16.07% and 24.21% silt and from 12.40% and 24.31% clay. The PAW % volumetric content ranges from a minimum 5.14% vol. to a maximum 10.08% vol. (Table 1).

Table 1

Statistical results of soil's characteristics

Soil Parameter	Min	Max	Mean	Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic
Organic Matter	1.54	3.16	2.13	0.33	0.11
Plant Availiable Water	5.14	10.08	7.70	1.45	2.09
Clay	12.40	24.31	19.74	2.91	8.47
Silt	16.07	24.21	19.76	1.89	3.57
Sand	55.52	67.11	60.53	2.85	8.13

Organic Matter, Sand, Silt and Clay units are: percentage (%) and PAW in % vol.

Pearson correlation statistical results signifying a positive correlation between SOM and PAW and the correlation coefficient of r=0.194 indicate thetendency of SOM and PAW to increase together. Also, a positive correlation exists between SOM and Silt (r=0.212). On the contrary, between SOM and Clay and also between SOM and Sand were found negative correlations, which arise when SOM increases as Clay or Sand decreases. Correlation is significant at the 0.05 level (2-tailed).

The geostatistical model of CoKriging Interpolation was used as the base for SOM modeling-mapping at field level with four (4 treatments) different auxiliary variables: PAW, Soil's Clay content, Silt and Sand Contents.

Treatment A was modeling-mapping of SOM with auxiliary variable PAW (% volumetric) from the samplings and mesurements at the experimental farmfield,

Treatment B was modeling-mapping of SOM with auxiliary variable Soil's Clay content (%) of the experimental farmfield,

Treatment C was modeling-mapping of SOM with auxiliary variable Soil's Silt content (%) of the experimental farmfield,

Treatment D was modeling-mapping of SOM with auxiliary variable Soil's Sand content (%)of the experimental farmfield.

The soil characteristics of *triticum turgidum* experimental cropfield that were measured and analyzed, were digitized according to their GPS locations in WGS 1984 Geographic Coordinate System and stored in a digital geodatabase in a GIS (Geographical Information System) environment. Then the soil data and treatment data were Projected to the WGS 1984 UTM Zone 34N Coordinate System for better use in Greece's Coordinates.

Finally, spatial interpolation was performed with the geostatistical interpolation model of CoKriging, which is used to estimate an unknown value, given the observed values at sampled plots (Filintas et al. 2007, Lu and Wong 2008, Filintas et al. 2008, Filintas 2011, Stamatis et al. 2011, Filintas 2011b). The spatial GIS modeling results are depicted on various digital GIS soil maps of the *Triticum Turgidum Cropfield* for treatments (A, B, C and D). In Fig.1 (a) are

depicted the modeling results on a Sand GIS map (%) of the *Triticum Turgidum Cropfield*, in Fig.1 (b) a Clay GIS map (%), in Fig.1 (c) a Silt GIS map (%) and in Fig.1 (d) a Plant Availiable Water (PAW) GIS map (% Vol.). Next step was the calculation and comparison of the semivariograms (Fig. 2) of the various CoKriging modeling approaches.

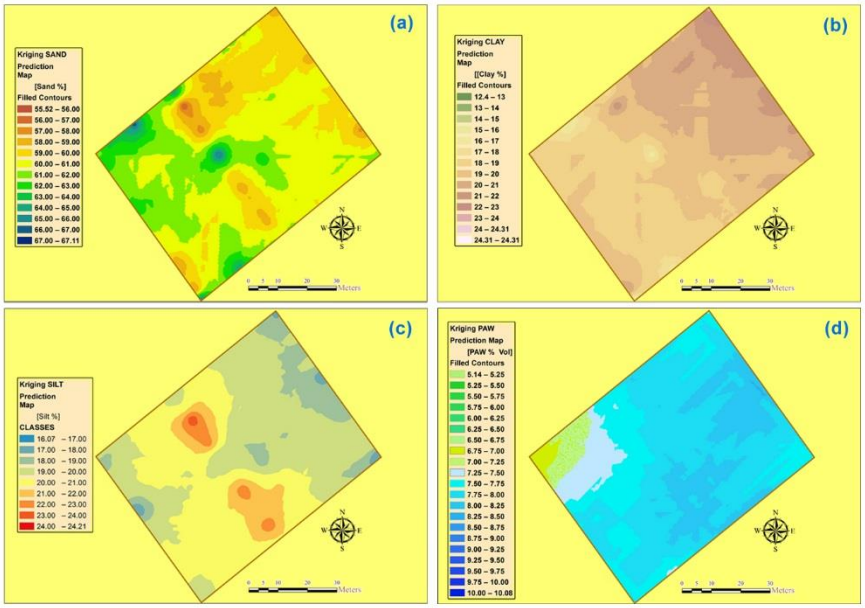

Figure 1. Modeling and mapping results on a digital soil : (a) Sand GIS map (%) of the *Triticum Turgidum Cropfield*, (b) Clay GIS map (%), (c) Silt GIS map (%), and (d) PAW GIS map (% Vol.).

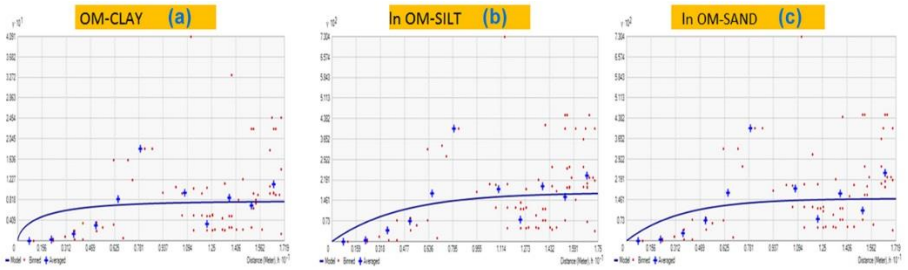

Figure 2. Modeling results of the Semivariograms for: (a) SOM-Clay, (b) ln SOM-Silt, and (c) ln SOM-Sand.

Regarding the semivariograms presented in Figure 2, the best modeling result for each variable was found to be the spatial correlation between: SOM with Clay shown in Fig.2.(a), logarithmic (ln) SOM with Silt shown in Fig.2.(b), logarithmic (ln) SOM with Sand shown in Fig.2.(c) and finally between SOM and Plant Availiable Water shown in Fig.3.(d).

The semivariogram model of SOM and PAW (treatment A) in Fig.3.(e) outperformed as the top ranked of the best models and the output farm field map of organic matter with PAW as auxiliary variable was found as optimum solution

(Modeling Prediction Errors were MPE=-0.0035, MSPE=-0.0068 and RMSSE=1.0021). The prediction error results are well accepted since the MPE and MSPE values should approach zero for an optimal prediction and the RMSSE should approach one. Moreover, geostatistical results confirm the validity and precision of the produced digital soil organic matter and other GIS maps at field level.

The results of the corresponding final GIS digital SOM prediction maps of the various semivariogram models that were tested are depicted in Fig. 3.(a), (b), (c) and (d).

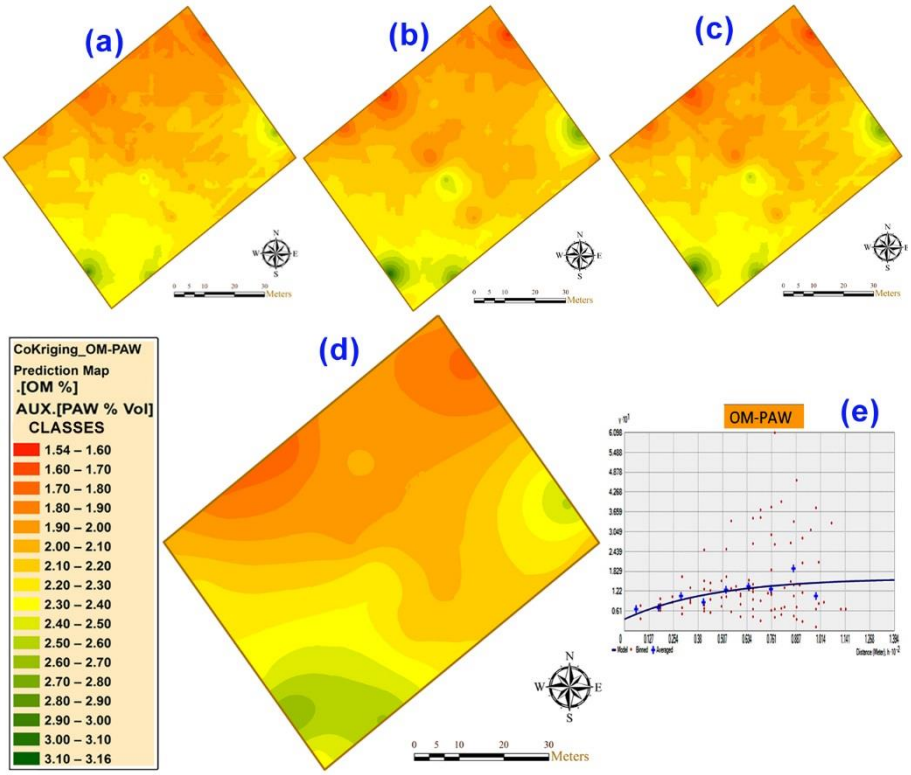

Figure 3. Digital GIS modeling-mapping results of soil Organic Matter GIS maps produced with various auxiliary variables: (a) SOM with Clay (b) SOM with Silt (c) SOM with Sand (d) SOM with Plant Avalaible Water (that was found the best prediction variable combination for a high accuracy GIS map) and (e) statistical semivariogram model of SOM with PAW as auxiliary variable.

Materials transformation and movement within SOM pools is a dynamic process influenced by soil type, climate, vegetation and soil organisms. All these important factors operate within a hierarchical spatial scale. Knowing the spatial scale and variability of SOM at field level could be beneficial for the farmers. The above presented digital soil maps revealed an obvious soil spatial variability at field level and shed light to soil's studied variables spatial variability. The soil maps at field level could possibly act as assisting tools for site-specific management, irrigation and fertilizing precision applications.

CONCLUSIONS

The prediction errors results (MPE=-0.0035, MSPE=-0.0068 and RMSSE=1.0021) of modeling validation for soil SOM GIS mapping confirmed the validity, precision and high accuracy of the produced SOM digital GIS maps of the *Triticum Turgidum* experimental Cropfield. These results proved that the geostatistical model of CoKriging performed excellently well and it is considered very suitable for soil organic matter, Plant Availiable Water and other soil parameters (clay, silt, sand, etc.) modeling and geospatial GIS mapping.

Results of geostatistical semivariogram modeling and mapping revealed that the best model and the optimal prediction variable combination for a high accuracy GIS map was the output digital map of organic matter with PAW as auxiliary variable (geostatistical tests outputs revealed the lowest modeling Prediction Errors and highest accuracy). This method of CoKriging Interpolation SOM-PAW can be used for digital modeling-mapping with high accuracy for precision farming and site specific management applications, for better irrigation and fertility decisions for the farmers benefit and wellfare, as well as for environmental purposes (reducing fertilizers quantities, reducing valuable water ammounts, preserve and protect the soil environment and its valuable nutrients).

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THE INFLUENCE OF TREATMENT OF SOIL IN OBTAINING BIOLOGICAL MATERIAL USED FOR PLANTING THE SWEET POTATO ON SANDY SOILS

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Keywords*: treatment, sandy soil, basamid grain, sweet potato shoots.*

ABSTRACT

The results obtained on the monitoring of greenhouses microclimate influence on growth and development of sweet potato shoots showed the importance of treatment of soil with Basamid Grains (Dazomet 97%), aplied at a dose of 5 kilograms/100 metric square, in obtaining biological material used for planting the sweet potato on sandy soils. Observations and determinations of growth rate average showed a slow pace in April, when climatic factors have fluctuated greatly from night to day. The average rate of growth of shoots within 30 days after emergence, showed lower values for tubers planted on untreated soil compared to those planted on soil treated with Basamid Granules (Dazomet 97%). Disinfection of the soil with Basamid Granules (Dazomet 97%) resulted in vigorous shoots, with a higher growth rate than in the control variant and less affected by the diseases and pests identified in the solarium during the growth of shoots.

INTRODUCTION

Sweet potato [Ipomoea batatas (L) Lam] is a perennial or annual plant with major importance as a food crop (Woolfe, 1992), who combines a number of advantages that make it a plant that plays an important role in the sustainability of food security. In developed countries, sweet potato is primarily intended for fresh or preserved consumption, but it is often found on the market in the form of processed food products with added value and biological products (Nicholas et al., 2011). Ipomoea batatas is a thermophilic plant, drought tolerant, which grows well on medium fertile soils, well drained with loose structure. In our country, the sandy soils of southern Oltenia region offer favourable pedoclimatic conditions for sweet potato crop (Drăghici et al., 2013, Iamandei Maria et al., 2014, Diaconu Aurelia et al., 2016,2017, BOIU-SICUIA Oana-Alina et al., 2017). Culture is vulnerable to diseases and pests, and can be competed by weeds (Harrison and Jackson, 2011, Iamandei Maria and co.,2014). Under conditions in Romania, sweet potatoes are multiplied by shoots obtained in the solar (Draghici et al.,2018) and the ratio of multiplication in case of using the shoots is estimated at 1:15 to 1:20 (Fuentes și Mwanga, 2011). Planting material is typically produced in plastic tunnels (hotbeds) by planting sweetpotato roots from the previous year. After sprouting, the stems are cut, and these stem cuttings or 'slips' which do not have any roots, are used as planting

material in the production fields (about 37,000 slips per hectare) (Stoddard et al., 2013). Soil disinfection with chemical methods, such as pesticides, herbicides and fumigants, has been applied to control weeds, plant diseases and soil borne toxic pathogens all over the world (Pimentel D, 2005). Pests and diseases of sweetpotato are generally well controlled by the use of pathogen-tested for planting material, pheromone trapping and pesticides (Clark et al., 2013).

MATERIAL AND METHODS

The experiment was initiated in the first decade of March and was placed in a double-walled solarium, in which climatic factors were controlled (soil and air temperature and relative air humidity). There were tested two variants of obtaining shoots: planting sweet potato tubers in untreated soil and planting in the field treated with *Basamid Granule (Dazomet 97%)* product, a soil sterilizer with nematocidal, insecticidal, fungicidal and herbicidal action. The product was applied at a temperature of 6 ° C, at a dose of 5 kg / 100 square meters, by spreading it on the soil surface, then being incorporated into the soil with the cultivator. To stimulate the herbicidal action and to retain the sterilizing gas for as long as possible in the soil, the treated soil surface was watered using micro-spray and covered with PE foil. Waiting period between the treatment and planting depend on soil temperature, moisture, type and structure (beetwin 15-30 days). The Creson test was performed to verify the proper ventilation of the soil, and maked with salad seeds sprouted in treated soil samples. At the planting, tubers obtained in 2018 year from ten lines of sweet potato of Korean origin were used for two variants of planting, respectively on untreated soil and on soil with *Basamid Granules (97% dazomet)*, the surface of each variant being 10 square meters. After planting, during the day was maintaining an air temperature between 25-28 ° C into the solar and overnight, by double protection in the tunnel covered with PE foil, was maintaining a temperature of at least 12 ° C. During the growth of shoots in solar they were monitored, in three moments of the day the air and soil temperature with air thermometer and thermometer of soil as well as the humidity of the air with the hygrometer. In the solar can be obtained in about 3 generations of shoots that are planted in the field in such a way as to ensure at least 120 days until harvest.

RESULTS AND DISCUSSIONS

In 2018 year, at the Research and Development Station for Plant Culture on Sands, Dabuleni reported infections caused by: *Alternaria sp., Fusarium sp., Botrytis cinerea, Pythium sp., Penicillum sp. and Rhizopus stolonifer*, diseases that can be transmitted by using infected tubers at planting in the following year. In order to obtain healthy shoots, the soil in the greenhouse was disinfected with *Basamid Granules (Dazomet 97%)*, which is effective against soil-borne phytopathogens as fungi of the genera *Pythium, Phytophthora, Rhizoctonia, Verticillium, Fusarium, Phoma, Didymella*, against nematodes *Pratylenchus sp.,Rotylenchus sp., Meloidogyne sp.* and other species of the genus *Heterodera,* against other soil pests (*Agriotes sp., Melolontha melolontha* and others) and weeds (monocotyledonous, dicotyledonous). Leaf staining caused by *Alternaria sp.* it is a widespread disease, including in greenhouse. The disease is usually most serious when dry and wet periods alternate during growth of shoots, such as when overhead irrigation is used. The pathogen produces small, oval, brown or gray spots, both in the foliar tongue

and on the petioles. In humid weather, these spots spread faster, producing circular necrosis around the petioles, obstructing the circulation of sap to and from the leaves. Although no effective preventive treatments have been detected, differentiated infection of sweet potato cultivars suggests that the varieties have different tolerance to this pathogen. In order to prevent the contamination of the sweet potato with phytopathogenic fungi, a series of prophylactic measures have been identified which involve: selecting the biological material for planting, applying preventive treatments (biological or chemical) and observing the specific storage conditions. Of the insects that appeared in the solarium during the growth period of the shoots, a significant proportion had *Myzus persicae, Aphis gossypii* and *Frankliniella occidentalis* and *Nezara viridula* and *Drasterius bimaculatus* had a small presence. *Nezara viridula* is known as the southern green stink bugs and both larvae and adults cause damages of sweetpotatoes leaf in solar. Two aphid species (*Aphis gossypii* Glov. and *Myzus persicae* Sulzer), one thrips species (*Frankliniella spp*.) and one whiteflies (*Bemisia tabaci Gen*.), recognized as efficient sweet potato viruses vectors, were found in sweet potato greenhouse (Table 1).

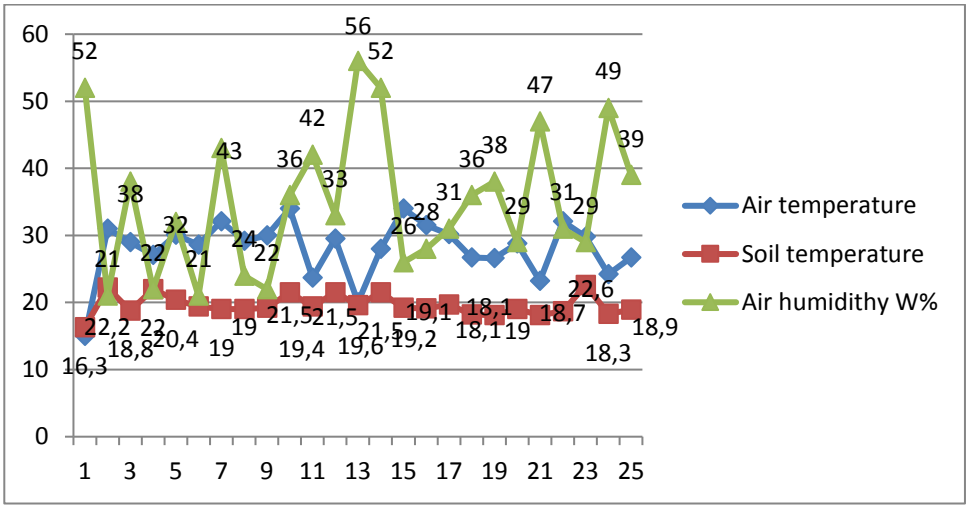
Table 1

Species of pests in gowth period of shoots in solar

Taxonomic group	**Species**	Untreated soil		Treated with Basamid Granule	
		Barber Traps	Visual observations	Barber Traps	Visual observations
Acarina Tetranychidae	*Tetranychus urticae* Koch	0	+	0	+
Hemiptera Aleyrodidae	*Bemisia tabaci* (Gennadius, 1889)	+	++	+	+
Hemiptera Aphididae	*Myzus persicae* (Shulzer, 1776) *Aphis gossypii* Glover	++	+++	+	++
Thysanoptera Thripidae	*Frankliniella occidentalis*	++	++	+	+
Hemiptera Pentatomidae	*Nezara viridula* (Linnaeus, 1758)	0	++	0	+
Lepidoptera Noctuidae	*Agrotis spp.*	+	+	0	+
Lepidoptera	Microlepidoptere	+	++	+	+
Coleoptera Elateridae	*Drasterius bimaculatus* (Rossi, 1790)	+	+	0	+

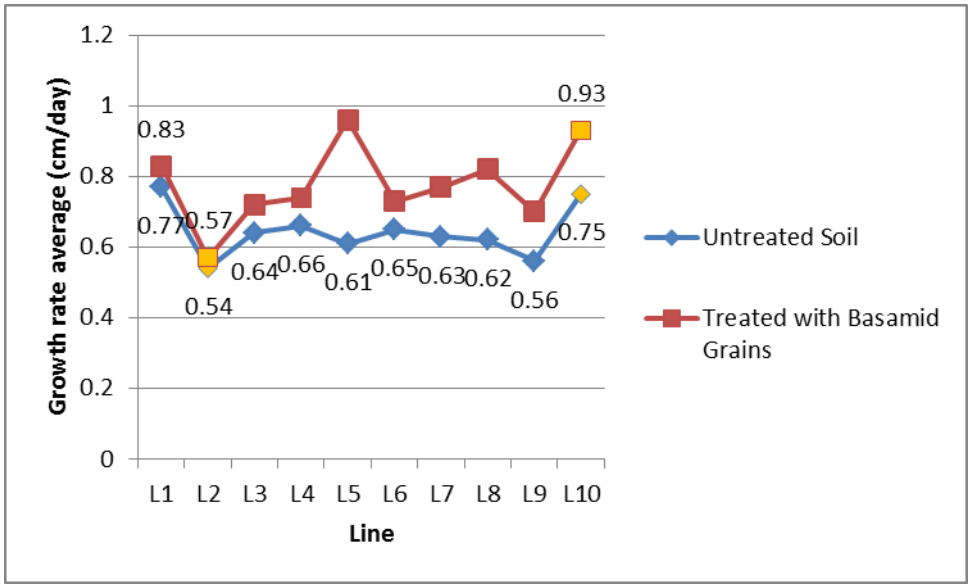
Legendă: (0) nu a fost prezent; (+) prezenţă redusă; (++) prezenţă moderată; (+++) prezenţă ridicată

In 2019 year, analyzing the evolution of daily variation of relative air temperature, soil temperature and air humidity in the solar (Graph 1), air temperature limits was beetwin15-34 ° C (28.04 °C average), 16,3-22,6 °C soil temperature (19.58 °C average), and air humidity 21-56% (mean 35.08%). At the beginning of April when the shoots sprouted, a PE foil tunnel was installed to protect the shoots, especially at night and in the first part of the vegetation.



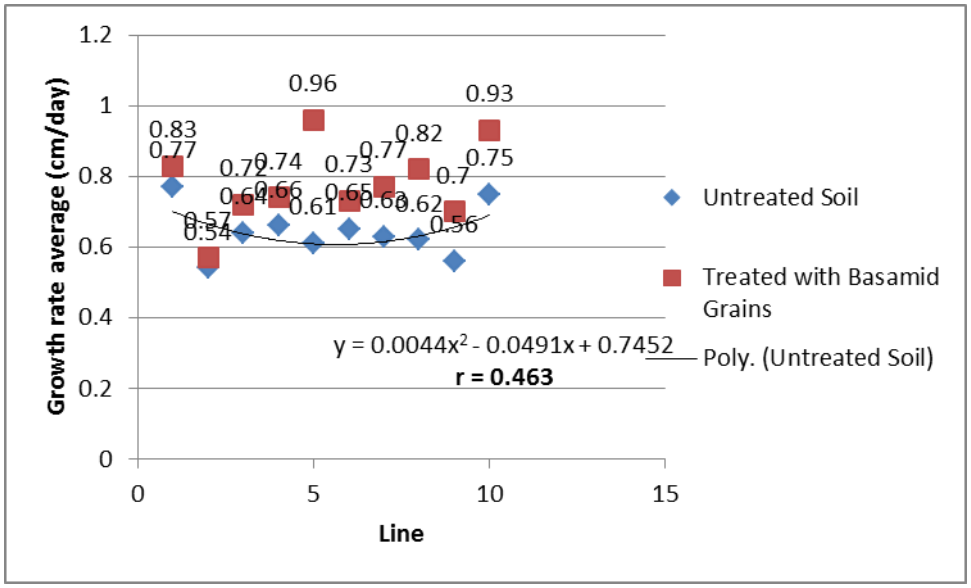
Graph 1. Evolution of daily variation of relative air temperature, soil and humidity

After 20 days after administration of *Basamid Granules* (*Dazomet 97%*), both in the soil variant treated with 5 kg / 100 square meters and in the planting variant on the untreated soil, tubers with diameters between 2.9 cm and 5.2 cm were used and length between 17-26 cm. The average rate of growth of shoots within 30 days after emergence, showed lower values for tubers planted on untreated soil compared to those planted on soil treated with *Basamid Granules* (*Dazomet 97%*). Thus, on untreated soil, the average growth rate of shoots showed values between 0.54-0.77 cm / day and, on soil treated with Basamid Granules (Dazomet 97%), average increases between 0.57-0.93 cm / day (Graph 2).



Graph 2. The average rate of growth of shoots within 30 days after emergence

Between the growth rate of shoots obtained on untreated soil and that of shoots obtained on soil treated with Basamid Granules (Dazomet 97%) at a dose of 5 kg / 100 square meters, a polynomial correlation with an insignificant factor was established (r = 0.463) (Graph 3).



Graph 3. Polynomial correlation between the growth rate of shoots

CONCLUSIONS

After soil desinfection with *Basamid Granule* (*Dazomet 97%*), to obtain the quality shoots in the solar, it is necessar to achieve an optimal microclimate, respectively maintaining the air temperature about 25-28°C, with double PE foil protection (solar + tunnel), and by repeated ventilation and regular watering.The physical quality of the biological material used in planting is an essential technological element in achieving a uniform field culture. The average rate of growth of shoots within 30 days after emergence, showed lower values for tubers planted on untreated soil compared to those planted on soil treated with *Basamid Granules (Dazomet 97%*). Disinfection of the soil with *Basamid Granules (Dazomet 97%*) resulted in vigorous shoots, with a higher growth rate than in the control variant and less affected by the diseases and pests identified in the solarium during the growth of shoots.

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RESEARCH ON THE BEHAVIOR OF SOME GENOTYPES OF *CAPSICUM ANNUUM SSP. GROSSUM* IN THE AREA OF SANDY SOILS IN SOUTHERN OLTENIA

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Keywords*: sweet pepper, morphological characteristics, production, sandy soils*

ABSTRACT

This paper presents the results of the researches on the behavior of some genotypes of sweet pepper (Capsicum annum ssp. grossum) in the area of sandy soils from Dăbuleni, an area subject to thermohydric stress. Four local populations of sweet peppers were studied in comparison with the Cornel variety, created at RDIVF Vidra. Under the conditions of 2019 the total average production was between 16.36-30.58 t/ha, significant production increases registering the local Populations of Amărăști and Dobrești (+12.74; +14.22 t / ha, compared to the control variety Cornel). The average weight of a fruit was between 107.4 g at the local population of Grădinari and 147.1 g at the local population of Amărăști, this population registering, from a statistical point of view, very significant differences from the control variant. Between the leaf surface, the thickness of the pericarp and production were established statistically positive correlations, the best results being recorded at the local population of Amărăști.

INTRODUCTION

Of the vegetable species grown in Romania, pepper occupies an important place, having numerous uses and high economic value. In the conditions of our country, pepper is an annual species, pretentious to the vegetation factors (Ioan Pintilie,1998). he cultivation of pepper, which lends itself to a high degree of intensification, requires a full correlation between the requirements of the species, variety or hybrid and the natural factors. The environmental factors can favor or limit the possibility of exploiting the biological potential of the studied species or genotype, printing a pronounced zonal character (Ion Ceaușescu et al., 1980). The need to research the plant genetic resources adapted to the current environmental conditions, generated by climate change, is of particular importance, especially if we refer to the area of sandy soils in southern Oltenia (area with high thermohydric stress) and having in view the fact that soil forms in the process of pedogenesis, in which four basic processes occur: transformations, translocations, additions, and losses (Popa, Daniela; Coyne, Mark S., 2007).

In order to develop agriculture in this area and to emphasize the intensive and sustainable character of this economic sector, it is necessary to create and promote in cultivation of varieties with high productivity, resistant to diseases and pests, suitable for cultivation in certain areas and the application of the most appropriate technologies, according to local agro-climatic conditions.

In this regard, at Dabuleni RDSPCS were studied 5 sweet pepper cultivars (*Capsicum annuum ssp. grossum*), in order to evaluate and select valuable native germplasm tolerant to abiotic stress, for its use in breeding programs.

MATERIAL AND METHODS

In order to reach the proposed objectives, 5 sweet pepper cultivars were studied from the behavioral point of view at RDSPCS Dăbuleni. Four of the five cultivars were represented by local populations of sweet peppers from different areas of Oltenia, which were compared with the *Cornel* variety, created at The Research-Development Institute for Vegetables and Floriculture Vidra (table 1).

Table 1

The experimental variants studied at Dăbuleni Research-Development Station for Plant Culture on Sands

No.	Cultivar	Provenance
1	Local population of Amărăști	Amărăști, Dolj county
2	Local population of Dobrești	Dobrești, Dolj county
3	Local population of Grădinari	Grădinari, Olt county
4	Local population of Secui	Secui, Dolj county
5	*Cornel* variety	The Research-Development Institute for Vegetables and Floriculture Vidra

The culture was established in the field in the first decade of May, by planting the seedlings obtained in the solar greenhouse. The experimental variants were placed in 3 repetitions, following the randomized blocks method. The distance between the rows of peppers was 0.7 m, and between plants in a row 0.3 m, with a density of 47619 plants / hectare. The preparation of the land and the maintenance works carried out during the vegetation period were carried out in accordance with the technology of cultivation of vegetable plants on sandy soils, elaborated by Dăbuleni RDSPCS (Toma Vasile et all, 2014). Irrigation was done using the drip irrigation method. The meteorological data were recorded at the weather station of the research unit. The observations and determinations made aimed at knowing the agronomic value of each cultivar tested. The statistical-mathematical interpretation of the experimental results was performed by analysis of variance (Săulescu N. A., Săulescu N. N., 1967).

RESULTS AND DISCUSSIONS

In Romania, the negative effects of global warming, represented by the increase in air temperature and the reduction of precipitation, are strongly felt in the area of sandy soils in southern Oltenia. The climatic data recorded at the weather station of the Dăbuleni Research-Development Station for Plant Culture on Sands

(table 1) shows that during the analyzed period (May-September) the average air temperature was higher than the multiannual average.

Noteworthy are the months of August and September, which, in addition to being extremely hot, were also very dry, the amount of precipitation being well below the multiannual amount recorded between 1956-2016.

Table 1

Climatic conditions recorded during the growing season of sweet pepper (2019)

Year	Climatic element	Month				
		May	June	July	August	September
2019	Medium temperature (°C)	17,4	23,4	23,8	25,4	20
	Minimum temperature (°C)	4,7	13,3	11	12,9	3,5
	Maximum temperature (°C)	31	34,5	37,6	38,4	34,1
	Precipitations (mm)	55,4	87,2	54,8	12	10
	Atmospheric relative humidity (%)	74,8	77,9	70,8	58,8	60
Multiannual medium temperature (1956-2016)		16,8	21,6	23,1	22,4	17,8
Precipitations, multiannual total (1956-2016)		62,12	69,30	53,15	37,28	47,83

In these conditions, the knowledge of the agronomic value of the studied cultivars is of particular importance. From the analysis of the results regarding the total production of the peppers cultivars (table 2), it resulted that the four local populations analyzed produced higher yields than the control variety *Cornel*.

Table 2

Average total production of sweet pepper cultivars studied at Dăbuleni RDSPCS

Cultivar	Production (t/ha)	Relative production	Difference (t / ha)	Significance
Local population of Amărăști	30.58	186.9	+14.22	*
Local population of Dobrești	29.10	177.8	+12.74	*
Local population of Grădinari	24.71	151	+8.35	-
Local population of Secui	22.49	137.4	+6.13	-
Cornel variety	16.36	100	0	Control variant

DL 5% = 9.90
DL 1% = 14.41
DL 0.1% = 21.62

The analysis of the significance shows that the production differences for the local populations of *Secui* and *Grădinari*, between 6.13-8.35 t / ha, are not statistically ensured.

In contrast, the local populations of *Dobrești* and *Amărăști* registered significantly positive production differences compared to the control variety *Cornel*, with a production increase between 12.74-14.22 t / ha. Similar research was conducted by G.O. Nkansah, A. Ayarna and T.J. Gbokie who behaviorally studied 10 lines of pepper they planted in two different ecological areas of Ghana, West Africa (G.O. Nkansah, A. Ayarna and T.J. Gbokie, 2011). The data on the average weight of a fruit are presented in table 3.

Table 3

The average weight of a fruit (g) at the *Capsicum annuum ssp. grossum* cultivars studied at Dăbuleni RDSPCS

Cultivar	The average weight of a fruit (g)	Difference (g / fruit)	Significance
Local population of Amărăști	147.1	+39.1	***
Local population of Dobrești	116.8	+8.8	-
Local population of Grădinari	107.4	-0.6	-
Local population of Secui	127.7	+19.7	*
Cornel variety	108	0	Control variant

DL 5% = 16.66
DL 1% = 22.33
DL 0.1% = 29.47

The average weight of a fruit was between 107.4 - 147.1 g. Compared to the control variant, the local population of *Secui* was highlighted, with a significant positive difference of 19.7 g and the local population of *Amărăști*, with a very significant difference of +39.1 g. *Table 4* presents the results regarding the average number of fruits per plant and the thickness of the pericarp, the local populations studied achieving values higher than the *Cornel* variety for both analyzed parameters. The highest number of fruits/plant was registered in the local population of *Dobrești* (5.2 fruits/plant), and the fruits with the thickest pericarp belonged to the local population of *Amărăști* (9.72 mm).

Table 4

Number of fruit / plant and thickness of pericarp in the experimental variants

Cultivar	No fruit / plant	Pericarp thickness (mm)
Local population of Amărăști	4,3	9,72
Local population of Dobrești	5,2	9,21
Local population of Grădinari	4,8	8,99
Local population of Secui	3,7	8,54
Cornel variety	3,1	6,91

Between the thickness of the pericarp and production, a positive, distinctly significant correlation was established, given by a polynomial equation of degree II, from which it results that the production increases directly in proportion to the thickness of the pericarp (figure 1).

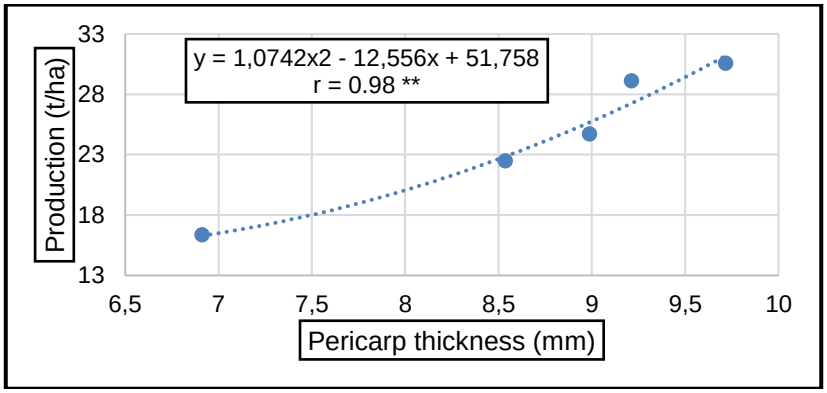

Figure 1. Correlation between the production and pericarp thickness of sweet pepper

At the studied cultivars the leaf area, expressed in m^2/ha, was also determined. The surface of the pepper leaves increases according to the order of their insertion on the plant, up to a certain level, so that the upper leaves show a diminution of their surface (Steer B.T., 1971, quoted by Ion Nicolae, 2010).

The average surface of the pepper leaves was between 11904 m2/ha at the control variant and 31428 m2/ha at the population of Dobrești, between this physiological parameter and production, being establish a positive, distinctly significant correlation, which demonstrates the importance of the leaves, in obtaining some high yields (figures 2). In the present case, the large leaf surface also ensured high production.

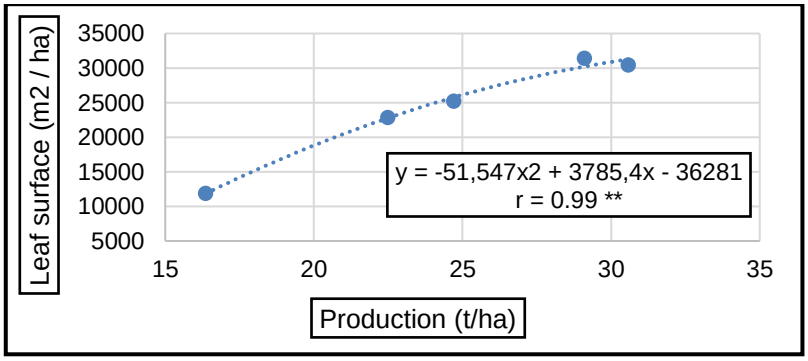

Figure 2. Correlation between the leaf surface and the production of sweet pepper

CONCLUSIONS

Following the study conducted in Dăbuleni RDSPCS on cultivars of *Capsicum annuum ssp. grossum*, it was found that:

- the local populations recorded higher yields compared to the *Cornel* variety, significantly positive differences registering the local populations of Dobrești and Amărăști.
- the average weight of a fruit had values between 107.4 - 147.1 g, very significant differences (***) registering the local population of *Amărăști* (+39.1 g compared to the *Cornel* variety).
- In order to obtain high yields it is necessary that the sweet pepper plants to have a large foliar surface, which ensures the optimum of nutrients for the whole plant, and on the other hand to protect the peppers' fruits from the strong solar radiation.

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PROFESSOR CORNEANU GABRIEL, PhD. (1942-2019) – A LIFE DEDICATED TO GENETICS

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Key words*: professional development, teaching and scientific activity, commemoration*

ABSTRACT

Born on September 28th, 1942, in the town of Craiova, Mr. Corneanu attended the studies of the University of Bucharest, the Faculty of Biology (he graduated in 1965). The doctoral thesis "Comparative radiogenetic study of species belonging to Nigella (Ranunculaceae) genus" was carried out within Biological Research Center in Cluj-Napoca, and the treatments with physical mutagens were conducted in the USA at Brookhaven National Laboratory, Upton, NY, under the guidance of Prof. Dr. Harold H. Smith. His teaching activity mainly took place at the University of Craiova (1967-2009), passing through all teaching degrees from assistant to full university professor. The professor contributed to the development of material basis of Plant Genetics and Biotechnologies teaching subject through numerous research contracts carried out over time. He opened new research directions in genetics, thus contributing to the development of the subject. He has published numerous studies in the field of genetics, and he organized international scientific symposia, and published numerous scientific papers and trained many young teachers and researchers. He was a member of numerous national and international scientific societies, and the recognition of scientific probity and the prestige of the professor was confirmed by his inclusion in organizing and scientific committees of prestigious international conferences, the inclusion in the editorial board of numerous scientific publications and journals, as well as the awarding of numerous distinctions and awards conferred by national and international academic and scientific institutions. Paying tribute to this great teacher and leader of genetics, we would like to express our full gratitude to him. We all thank Professor Gabriel Corneanu for all that he has accomplished for horticulture's higher education of Craiova. We thank you, Professor, for the great science you have bequeathed to us!

Professional development

Born on September 28th, 1942, in the town of Craiova, Professor Corneanu attended the courses of the University of Bucharest, Faculty of Biology (graduated in 1965). By Romanian government assignment to the job, he held the position of researcher at the Biological, Geological and Geographic Research Station Stejarul in Pangarati, part of A.I Cuza University in Iasi. (1965-1967). There, he approached as a research topic, the study of zooplankton in accumulation lakes on Bistrita valley (Izvorul Muntelui-Bicaz, Vaduri, Pangarati and Batca Doamnei lakes). The obtained results were published in four scientific papers, two being cited in the monography

by C.B. Wilson, Smithsonian National Museum of Natural History, The World of Copepods (Bibliography, 2009).

From 1967 to 2009, he worked at the University of Craiova, in the subjects of Genetics - Evolutionism - Plant Biotechnology, going through the stages of teaching activity from teaching assistant to the degree of full university professor (attested in 1994). In 2004-2007, he taught Genetics and Biotechnology at the Biology Section, Faculty of Natural Sciences and Agronomy at Ovidius University in Constanța. During 2009-2011, he was assigned to the University of the West "Vasile Goldis" in Arad, Faculty of Natural Sciences, Department of Animal Biology, performing teaching activity at the master's courses. He was an associate professor at Babeș-Bolyai University in Cluj-Napoca, Faculty of Biology and Geology, being doctoral supervisor at this University in the fundamental area of Natural Sciences, in the field of Biology - Genetics (since 2003).

In order to improve his professional activity, in 1968-1969, he attended the courses of Medical Genetics, at the Faculty of Physicians and Pharmacists' Training, the Bucharest Institute of Medicine and Pharmacy (UMF-Bucharest), specializing in human cytogenetics, under the guidance of Dr. Alexandru Caratzalis, European renowned specialist. During 1970–1974 he carried out documentation and research activity for elaboration of doctoral thesis "Comparative radiogenetic study of species of *Nigella (Ranunculaceae*) genus", within the Center for Biological Research in Cluj-Napoca, under the guidance of prof. Dr. Doc. Andreas Lazányi. The experimental part of doctoral thesis was conducted in Romania (University of Craiova, CCB Cluj-Napoca), and the treatments with physical mutagens (fission neutrons) were done in the USA at Brookhaven National Laboratory, Upton, NY, under the guidance of Prof. Dr. Harold H. Smith, director of radiobiology department and Prof. Dr. Arnold H. Sparrow, director of BNL. After receiving his PhD, he completed two specializations in Cluj-Napoca, in the field of electron microscopy (Babes-Bolyai University) and in vitro plant tissue cultures (CCB Cluj-Napoca).

Teaching activity

Teaching activity was carried out mainly at the University of Craiova (1967-2009), initially teaching practical lessons in the subjects *Genetics* (Biology and Horticulture sections), *Medical Genetics* (Faculty of Medicine, General Medicine section), having completing courses to adjacent subject: *Physiology, Human Anatomy*, or *Plant Breeding*. Beginning with 1988, he taught the genetics course at the Horticulture section. After 1990, with the re-establishment of Biology section, he became the holder of the group of subjects *Genetics - Evolutionism - Biotechnology*, teaching the course and practical lessons of *General Genetics, Medical Genetics, Evolutionism*, and in the first years the *Plants in vitro propagation*.

For teaching activity, he wrote courses and tutorials for practical lessons, as well as specialized summaries, printed at the University of Craiova Publishing House, or in central publishers (Biological Synthesis, All publishing house, Bucharest a.o.). He contributed to informing his colleagues in pre-university education, by actively participating in their societies (Genesis, Society of Biological Sciences of Romania), he published in the journals of these societies (Genesis and Nature) and wrote four biology textbooks, for classes IX and XII (printed at Coresi Publishing House in Bucharest).

Also in order to improve teaching activity, he invited renowned professors from abroad to hold specialized lectures at the University of Craiova. These include: Prof.

Dr. Junko Ebata, Osaka City University, Japan; Prof. Dr. Hideyuki Furukawa, Meijo University Nagoya, Japan; Prof. dr. Silvano Scannerini, University of Turin, Italy; Prof. Dr. Italo Barrai, University of Ferrara, Italy; Prof. dr. Nello Bagni, University of Bologna, Italy; Prof. Dr. Traianos Yupsanis, Aristotelian University of Thessaloniki, Greece; Prof. dr. Petru Tarhon, Chisinau State University, Republic of Moldova; Acad. Prof. dr. Boris Matienco and dr. Eugenia Maximova, Academy of Sciences of the Republic of Moldova, Chisinau; Prof. Dr. Ivan Iliev, Forest University, Sofia, Bulgaria; Prof. Dr. Williams Bachus, Tennessee University, USA, s.a. Also, they gave lectures, invited specialists from Romania: Prof. Ion Bara (A.I. Cuza Iasi University); Prof. Dr. Nicolae Coman (Babes-Bolyai University Cluj-Napoca); Prof. Dr. Gogu Ghiorghita (University of Bacău), CPI dr. Ioan Blada (ICAS, Bucharest) a.o.

Professor Gabriel Corneanu was invited and held specialized lectures, representing syntheses of the activity carried out in the area of Genetics and Biotechnology, at: Meijo University, Nagoya, Japan; University of Turin, Italy; University of Ferrara, Italy; University of Padua, Italy; Institute of Genetics of the Academy of Sciences of the Republic of Moldova, Chisinau, s.a. At Babes-Bolyai University in Cluj-Napoca, he worked in the Institute of Doctoral Studies within that University, guiding the activity of doctoral students enrolled in the field of Biology-Genetics.

Scientific research activity

Scientific research activity has been carried out in apparently varied, but related fields, in biology, having as research theme of the living organism and its functions through different methods, as well as the relationships of the fossil forms with the current corresponding forms. In this way, the research activity was carried out both by his own efforts, as well as by collaboration with different specialists in Romania or abroad, within the collegial relations or through contracts, respectively research grants. The main research directions were: general genetics, cytogenetics, mutagenesis, medical genetics, cell biology, ultrastructural studies, biochemistry, evolutionism a.o.

Among the achievements in research activity, some of them representing valuable contributions to the introduction of new technologies or scientific approaches, I mention:

✓ Using ICV value as an index for establishing the polyploidy degree in plants - the new method of investigation.

✓ Using the ICV value from the interphase nuclei (G1) to establish the Do value in radiobiology. In this way, the applicability of "Sparrow rule" has been extended to the prediction of radio sensitivity of biological species.

✓ The use of magnetic fluids in the *in vitro* culture of samples and establishing of relationships between their presence in culture environment and an electromagnetic field, researches carried out in collaboration with Prof. Dr. Mihaela Corneanu and a research team from Polytechnic University of Timisoara; absolute priority at international level, confirmed by two references printed in Agricell Report, signed by Prof. E.B. Hermann, U.S.A., editor of this publication): vol. 25 (5), p. 33, 1995 (Stimulation of Micropropagation by Magnetic Fluids) and Agricell Report, vol. 30 (5), p. 36, 1998 (Effects of Ferrofluids on Plant Tissue Culture).

✓ Studies on the effect of variation of the value of geomagnetic field on structural and functional characteristics of cells (bacterial, vegetal) and plant tissues, researches with application in space biology.

✓ Studies on behaviour of prokaryotic cells (bacteria) and eukaryotes (higher plants) under simulated conditions in extra-terrestrial space - research in collaboration with Prof. Dr. Mihaela Corneanu; research has applications in space biology.

✓ Use of ultrastructural features of nucleus (bodyguard, NABs) to establish normal or pathological metabolic changes (viral infection, etc.) of the cell.

✓ Establishing the anti-stress effect of some natural extracts or products of different origin.

✓ Nano-bio-technology studies: interaction of TiO2 nanoparticles with eukaryotic cell.

✓ Interaction of exogenous heavy metal and / or radionuclide particles with the plant cell. These investigations allow detection and confirmation of new phytoremediation species, involved in biological "cleaning" of polluted environment.

He was a passionate, critical and very rigorous researcher, leaving behind a series of valuable papers for science and practice. We are fortunate to have met and worked with such a remarkable personality. I had the chance to collaborate with Professor Corneanu C. Gabriel, PhD, from the University of Craiova.

Prestige and recognition in Romania and abroad

Professional prestige in the area that Professor Gabriel Corneanu enjoys worldwide has also materialized through numerous invitations as invited professor, specialist or moderator of sections of prestigious international conferences, among which we mention: the international seminar Genotoxicity and Diet Cancer Prevention, Pisa, Italy , September 14-16, 1997; Conference on Biophysics, Cluj-Napoca, October 16-10, 1997; the Radiationional Research Symposium in the Republic of Moldova, Chisinau, November 2000; Bio nanomaterials Workshop, Timisoara, December 14-15, 2006; member of the European Association of University Departments and Faculties of Biology (EUROBIO), Vrije Universiteit Brussel.

Appreciation of professional and scientific activity at national level of Professor Gabriel Corneanu materialized by granting the quality of expert-evaluator for analysis of scientific research projects (CNCSIS projects, CNMP), granting the quality of doctoral supervisor in the fundamental field of Natural Sciences, Biology - Genetics at the Babes-Bolyai University in Cluj-Napoca (since 2003).

As a recognition of professional and scientific merits at world and national level of the distinguished professor, the numerous distinctions and prizes offered by prestigious academic and research institutions can be mentioned, among which there are: Diploma of Excellence, awarded by the University of Craiova, Faculty of Horticulture, at the jubilee of 40 years (2002); Diploma of Honour, granted by the University of Craiova, Faculty of Agriculture, on the occasion of the anniversary of "60 years of agronomic higher education in Oltenia", Craiova, November 22, 2007; Diploma Professor of Honour, “Iuliu Hatieganu” University of Medicine and Pharmacy of Cluj-Napoca, Cluj-Napoca, 2008; Diploma of Promoter of the OutNobel Laureate Gheorghe Benga, awarded by The Outnobel Foundation, Cluj-Napoca, Romania, founded 2004, Cluj-Napoca, 2008; Diploma of Excellence, granted by the Timisoara County School Inspectorate, Timis County Council, Timisoara, June 5-8, 2008; Diploma of Excellence by Universitay of Craiova, Faculty of Agriculture and Horticulture, on the occasion of anniversary of «65 years of higher agronomical education and 50 years of higher horticultural education in Craiova», Craiova, November, 2012.

He was nominated as International Man of the Year for 2000/2001, by the International Biographical Center, Cambridge, England; Man of the Year - 2000, by A.B.I., Bur Oak Circle, USA), and his bibliography was included in Who's Who in the Worls, edition 1d8, 2000; in Dictionary of International Biography, ed. 28, I.B.C.-Cambridge, England; in Who's Who in Romania (Bucharest, 2002) and in Hübners Who is Who - Encyclopedia of Personalities in Romania, Verlag für Personenenzyklopädien AG (Zug, Schweitz, 2008).

Numerous research topics were approached through research projects that he conducted as a person in charge (1973 - 1994) or project manager (1994 - 2011), with different economic units or Ministries in Romania. Participated in the COST-821 program (regional project manager: Arbuscular Mycorrhizas in Sustainable Soil-Plant Systems, 1994-1998), COST-838 (Managing Arbuscular Mycorrhgizal Fungi for Improving Soil Quality and Plant Health in Agriculture, 2000), COST- 843 (Quality enhancement of plant production through tissue culture, 2001).

Many of scientific papers, published in specialized journals, have passed through scientific filter, recognized as demanding, by Professor Corneanu Gabriel. He was a member of Editorial Board of Journal “Genetics and Evolutionism” (Iasi), Annals of Al. I. Cuza University Iasi, Genetics and Molecular Biology series, Journal of Genetics (Bucharest), Nature - Biology (Arad), Journal of Medicinal Plants Research (Pakistan), etc.

Professor Gabriel Corneanu honoured us with his presence at numerous scientific events that took place in the faculty. We will always remember the interventions of His reign that have always ensured the success of these events. He has permanently protected scientific truth and value of information. Professor Gabriel Corneanu was a fighter. His struggle was only within science and for his scientific beliefs, for morality in science and in the field he served for years and decades, for a life - GENETICS.

Paying tribute to this great scholar and leader of genetics, we would like to express our full gratitude. We thank Professor Gabriel Corneanu for all that he has done for the horticultural education of Craiova.

Thank you, Professor, for the science you have transmitted to us.

May God rest him in peace!

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IN MEMORIAM

LECTURER PhD. IULIAN COSTACHE

(1964-2012)

It is always very difficult to put into words what you feel about a colleague, a person to whom you are attached by feelings of affection, a friend... who left us too soon. However, in this written material, I shall try to present some thoughts that take shape when I recall the memory of this good friend, as well as some moments that particularly marked me during the fifteen years we spent together in the *Systematic Botany* discipline, at the Department of Biology of the University of Craiova.

I became acquainted with our colleague Iulian Costache during faculty, in the *Systematic Botany* classes. Perhaps he, along with our late university professor, PhD Gheorghe Popescu, were the two people who subtly inspired my passion for nature, which I then relentlessly followed.

The chance, or maybe the destiny, led this colleague to examine my botanical knowledge in all the university stages that I have followed so far. The encouragement and the advice I received whenever I needed, but especially the field trips with a colleague and, subsequently, a true friend with high professional background, made a major contribution to my career in this field; this is especially true with regard to the performance of scientific documentation, which we published together over fifteen years of teamwork. I can say that the period spent with Iulian Costache ("nenea" as he liked to be called in a familiar manner) was the most fruitful from a professional point of view.

During the fieldtrips with our colleague Iulian, I managed to discover a good part of the spontaneous flora of Oltenia and even more. The numerous publications that we had over the years stand as evidence.

Together, we managed to complete the PhD theses, which comprise scientifically valuable information. Throughout the years spent in the office and the laboratory in order to identify the collected plant material, I admired the meticulousness and the critical character of my good friend. I was particularly impressed with the patience he devoted to the examination of the botanical material, making sure that he rigorously determined the taxa and the infraspecific taxa by confronting several different bibliographic sources. When the determination could not be conducted because of the lack of references, he consulted renowned Romanian botanists (Professor PhD Vasile Ciocârlan, 1st Senior Researcher PhD Gheorghe Dihoru etc.).

Following his participation in numerous scientific sessions in the country (Bucharest, Cluj-Napoca, Iași, Alba Iulia) and abroad (Croatia, Bulgaria), he was known and appreciated by all Romanian botanists.

The work style characterized by high professionalism led to the identification of new taxa for the Romanian flora (e.g. *Hesperis pycnotricha* Borbás et Degen, *Trifolium hirtum* All., *Kickxia elatine* (L.) Dumort. subsp. *sieberi* (Arcang.) Hayek) or for science (*Trifolium strictum* L. var. *pubescens* Costache 2005), of new stations for rare species (*Acanthus balcanicus* Heywood et I.B.K. Richardson); he also conducted discussions on the status of some plant taxa (*Euphorbia jacquinii* Fenzl ex Boiss.). He made taxonomic observations with additions to the diagnosis of taxa *Agrostis canina* L., *Cirsium creticum* (L.) D'Urv., *Carex guestphalica* (Boenn.) Ex O. Lang and he characterized seventy-seven vulnerable, endangered and rare taxa in Romania from the ecological, chorological and cenological viewpoints. These species were included on the National *Red Lists* at that time, while three of them were proposed and included on the European lists.

He made a differentiation of the Moesic beech forests (*Helleboro odori – Fagetum* Soo & Borhidi in Soo 1960) based on the group of Balkan elements, while on the basis of the Central European and Mediterranean elements, he differentiated the mixed sessile oak forests (*Potentillo micranthae Quercetum* (*petraeae* resp. *dalechampii-cerris* A.O. Horvát (1956) 1959).

There are many outstanding aspects to emphasize within the botanist activity of our colleague Iulian Costache.

However, I shall end here this recollection of our fellow university lecturer, PhD. Iulian Costache, to whom I keep a pious memory and gratitude for the moments spent together, but especially for the generosity and humanity that he has shown throughout his life.

Lecturer PhD. Daniel RĂDUȚOIU

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IN MEMORIAM

Professor PhD. Gheorghe POPESCU

(1939-2017)

More than two years have passed since the disappearance of the man who was a first-class specialist in the botany of Southwestern Romania and beyond, i.e. Professor PhD. Gheorghe Popescu. He was just 78 years old, he loved life and the job he served until the very last moment.

I remember the distant days, in the beginning of 1995, when I met him. From the first moment, the professor granted me the privilege of a warm welcome, which he sealed, before having any argument, with a gift: a book bearing his signature. During the following years, the professor offered me as presents some of the books that he had written over time.

He was a perfect professional. He always knew exactly what the optimal solution was in order to solve the arising issues.

He participated in numerous scientific sessions in Romania (Bucharest, Iași, Cluj-Napoca, Timișoara...) and abroad (Germany, Greece, Finland), where he presented valuable botanical works, carried out with colleagues or collaborators.

The continuous training activity that the professor practiced, both as university educator and as researcher, was also transmitted to the collaborators (from the Botany Department and from the "Al. Buia" Botanical Garden). All his achievements were intended for the progress of higher education and research.

In order to explore the flora and vegetation of Oltenia, professor PhD. Gheorghe Popescu made his way everywhere: on the rocky cliffs, among the high and frightening pyramidal peaks of the Oltenia mountains, among the tangled mountain pines, on the alpine meadows, on the pasturages or meadows of the hill or plain areas, in the floodplains or through the cultivated fields, as well as through those that carried a wild footprint.

He has been a paragon of ethics for any of the young people whose talent and activity in botanical research have always been correctly understood.

Professor Popescu also participated in the elaboration of numerous monographs and specialty treatises recognized at national level and beyond.

The last reference treatise published by professor Gh. Popescu in 2009 and entitled "Introduction to phylogenetic botany" is a very broad one, as mentioned by the author himself.

The teaching activity was very well combined with that of director of the botanical garden within Craiova university center. Professor Popescu played an important role in the sustainment and development of this institution. He had the most significant longevity as director of the above-mentioned institution (about twenty-four years). During this period, he showed a real organizational capacity, inducing a rigorous discipline and a high work spirit to the team he coordinated.

Professor PhD. Gh. Popescu can be characterized as a man of few words and of significant action.

He was not only an accomplished professional, but also a long-time family man, with fifty years of exemplary marriage.

The professor's departure from us leaves a void, but also the memory of a man who has been talked about and who will be recollected in future speeches.

Lecturer PhD. Daniel RĂDUȚOIU

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