RESEARCH ON THE PRODUCTIVITY OF THE COUNTRIES FROM N-V OF BIHOR COUNTY, LOCATED ON PSAMOSOLES

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Abstract

The productivity of natural grasslands is largely conditioned by the elements of the natural environment. The research on the productivity of the meadows from the N-V county of Bihor county, located on psamosols was carried out between 1999 and 2018. The values of the climatological elements were provided by the weather stations in Oradea, Săcuieni, Nuşfalău, Pocsaj, Berettzoufalou and Szeghalom. The research, description, and delimitation of the elementary forms of relief from the morphological and morphogenetic point of view were necessary in establishing the distribution of soil taxonomic units. Additional information was obtained directly in the field and in the case of hydrography and hydrogeology on the character of the hydrographic network (permanent, temporary, torrential), frequency and duration of floods, degree of water mineralization, presence of stagnant water (its nature, degree of mineralization, period occurrence, extension, duration).

Key words: soil genetic type, climatic regime, relief, plant associations, productivity

INTRODUCTION

The research territory presents the following geographical coordinates: 47 degrees, 18 minutes, 24 seconds latitude and 21 degrees, 52 minutes, 43 seconds longitude, being located in the northwestern part, Bihor County, being geographically located within to the Crişuri cross-border river basin, to the Barcau river basin. From the hydrogeological point of view, the territory of the city of Şimian is included in the structure of the Dune Plain (Măhăra, 1972; 1977; Pop, 1968; Pop, 2005; Posea, 1997)

It is located in the High Plain of the Nir, the limit being in the Voievozi localities - the west of Valea lui Mihai, Pişcolţ, continuing with a transition area that connects with the corridor of Ier. The appearance is cloudy, due to the sand dunes of wind nature, deposited on a layer of impermeable clays. The groundwater is at depths between 5 - 10 m in areas with dunes, reaching critical depths of 0 - 4 m on the lands between dunes, with flows between 0.2 - 0.6 l/s. The leakage occurs through fine and medium sands, located under the impervious clay layer (Florea, Munteanu, 2012; Ianoş, 1999; Rogobete, 1993; Rogobete, Ţărău, 1997; Sabău, Domuţa, Berchez, 1999; Petrea, 2001; Miclăuş, 1991).

From a geomorphological point of view, the territory of Şimian locality occupies a plain relief, located within the Valea lui Mihai Plain.

MATERIAL AND METHOD

He first operation performed in the field was the general recognition of the territory for the purpose of spatial delimitation, confrontation of the situation on the ground with the one resulting from documentation, identification of the main physical-geographical units and establishment of the working itineraries so that all the main relief, lithology and vegetation formations, following the correlation of the soil cover with the natural factors (Berchez, 2015; Blaga, Rusu, Udrescu, Vasile, 1996; Canarache, 1980; Canarache, Merculiev, Dumitru Rozalia, Trandafirescu, Chiochiu, Miciov, 1971; Sabău, Domuța, Berchez, 2002; Șandor, 2007).

The research, description, and delimitation of the elementary forms of relief from the morphological and morphogenetic point of view were necessary in establishing the distribution of soil taxonomic units.

In this phase, besides the data obtained in the documentation stage, detailed observations were made regarding surface lithology, hydrography, hydrogeology and vegetation.

RESULTS AND DISCUSSION

The mapping works carried out led to the identification and research of 39 soil units, belonging to 3 classes: Protisols, Cernisols, Cambisols and Hydrosols. The study area is included in the climatic province Cf, the sub-province Cfbx, with the average of the hottest month between 20 and 22 degrees Celsius and with the maximum precipitation in early summer. Aridity index values range from 25 to 30.

For the analysis of the spatial distribution of rainfall, data provided by the National Environmental Agency for the weather stations in Săcuieni (the meteorological station in Nuşfalău was closed in 2001) and the data provided by Ticovizig Debrecen for the Pocsaj station.

For the determination of the average annual precipitation quantities (average annual precipitation), a period of 20 years has been taken into account, based on the data provided by the Săcuieni Meteorological Station. Thus for the Săcuieni weather station there is an annual average rainfall of 621 mm, for Oradea 631,73 mm and for Pocsaj 608.36 mm. The study territory benefits from a climate characterized by annual average rainfall similar to the values recorded at the Săcuieni Meteorological Station, with an average of between 610 and 645 mm with oscillations from one year to another. In Fig. 1 is graphically represented the evolution of the average annual precipitation quantities recorded between 1999 and 2017 in the N-V part of Bihor County.

The average number of days with snow covered soil in the observation area of the five stations studied is approximately 35 days, with the snow

layer having a protective role on the soil, influencing the thermal conditions and implicitly the specific biochemical processes.

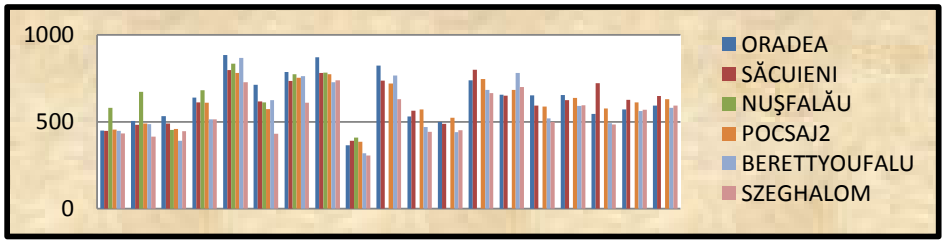

Fig. 1. Graphical representation of average annual rainfall amounts recorded in Săcuieni
(Source: National Environment Agency and Tikovizig Debrecen)

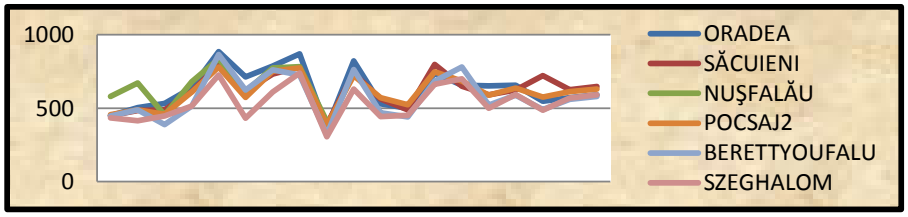

Fig. 2. Evolution of annual average rainfall in Săcuieni
(Source: National Environment Agency and Tikovizig Debrecen)

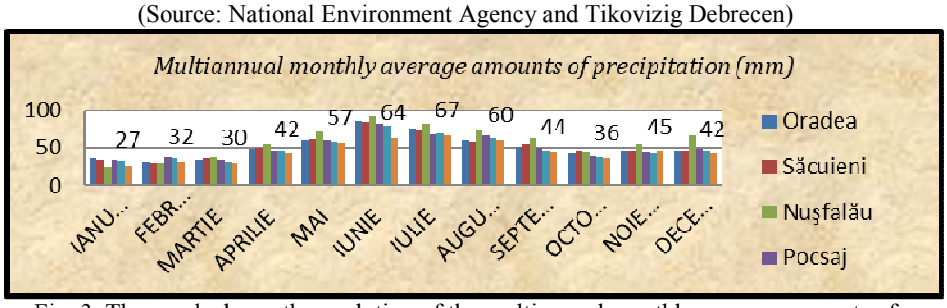

Fig. 3. The graph shows the evolution of the multiannual monthly average amounts of precipitation in the N-V part of Bihor county
(Source: National Environment Agency and Tikovizig Debrecen)

Precipitation by their value and character (long-term precipitation, torrential rainfall, precipitation whose values exceed the average values) can negatively influence the physical, chemical and biological properties of the soil, having direct pedological, hydrological and ecologically, following the orientation of the pedological processes in the direction of smoothing, debasing, acidifying and stagnogleizing.

The air temperature presents variations in time and space, being the result of the complex interaction between the solar radiation, the atmospheric circulation and the peculiarities of the active surface. The temperature regime was studied for the period 1999-2017, based on data transmitted by the National Meteorological Agency, (for the stations Oradea, Nuşfalău and Săcuieni) and Tikovizig Debrecen (for the Debrecen station).

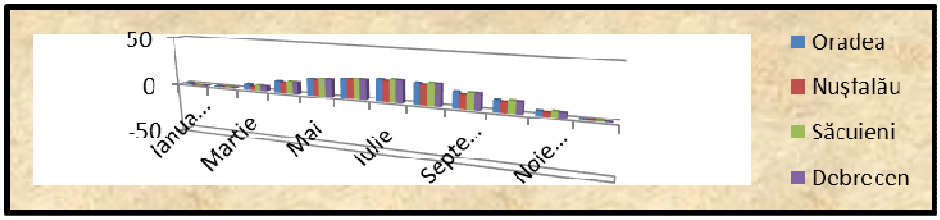

Fig. 4. Multiannual monthly average air temperature (ºC)
(Source: National Environment Agency and Tikovizig Debrecen)

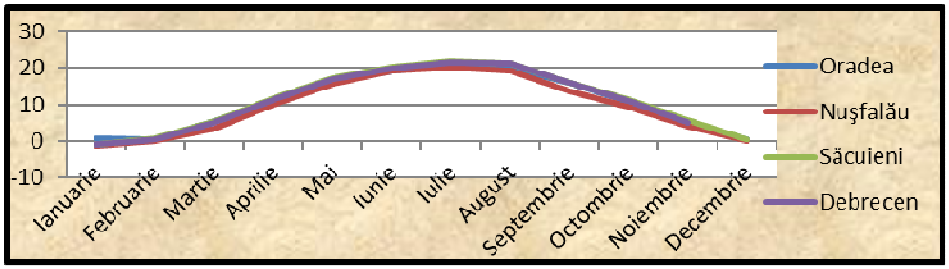

Fig. 5. Multiannual monthly average temperature variation (° C)
(Source: National Environment Agency and Tikovizig Debrecen)

For the studied territory, there is a minimum in January (Oradea -0.9 ºC, -1.24 ºC- Nuşfalău, -0.82 ° C-Săcuieni, -0.96 ºC-Debrecen) and a maximum in July (Oradea-21 ° C, Nuşfalău-20.01 ° C, Săcuieni-21.79 ° C, Debrecen-21.52 ° C).

The highest annual average temperatures are recorded in the Hungarian territory at Debrecen (° C), and the lowest in the Romanian territory at Nuşfalău station (ºC). The average annual temperatures have values between 8.3 ºC in Nuşfalău (1996) and 12.3 ° C in Săcuieni (2000). There is a relative uniformity of values for the stations Oradea, Săcuieni and Debrecen. The number of summer days (max. 25 ºC) was between 93 and 97 in Oradea, Săcuieni and Debrecen and 82 in Nuşfalău.

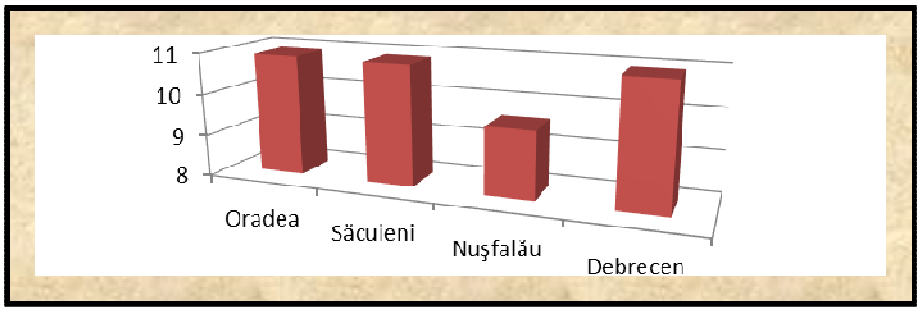

Fig. 6. The multiannual average air temperature (° C).
(Source: National Meteorological Agency and Tikovizig Debrecen).

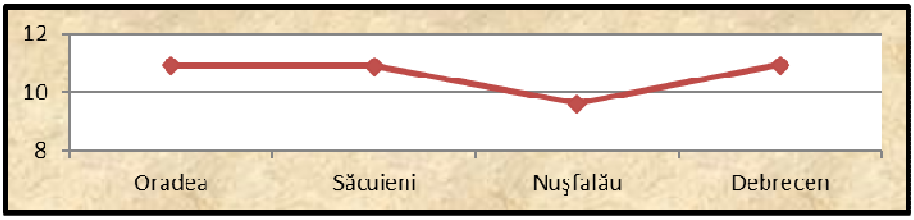

Fig. 7. Variation of the average annual air temperature (ºC)
(Source: National Meteorological Agency and Tikovizig Debrecen)

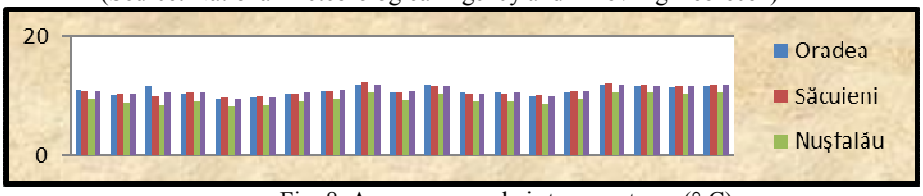

Fig. 8. Average annual air temperatures (° C)
(Source: National Meteorological Agency and Tikovizig Debrecen

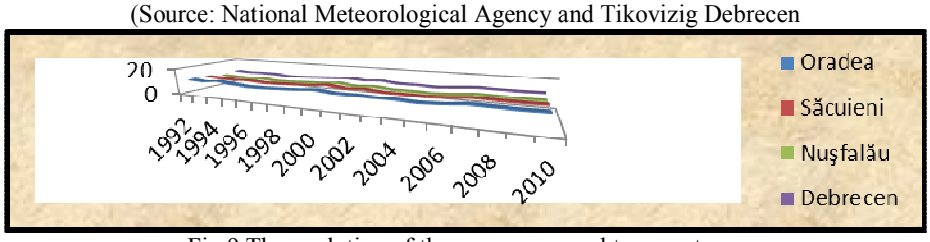

Fig.9 The evolution of the average annual temperatures
(Source: National Meteorological Agency and Tikovizig Debrecen)

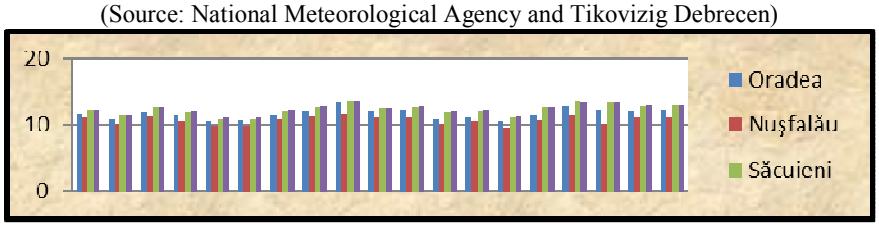

Fig. 10. Average annual soil temperature 1999-2017 (gr C)
(Source: National Meteorological Agency and Tikovizig Debrecen)

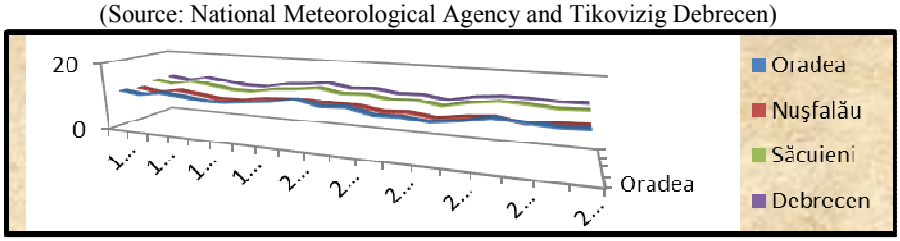

Fig. 11. Annual average temperature variation (gr.C).
(Source: National Meteorological Agency and Tikovizig Debrecen)

The number of winter days (max. 0 ° C), for Oradea Săcuieni and Debrecen was between 26 and 29 and for Nuşfalău 38.

The number of frost days ranges from 93 to 101 in Oradea, Nuşfalău and Debrecen and a maximum of 118 in Nuşfalău. The average annual temperature of the soil registers a maximum in 2007 with an average of

13.07C (Oradea-13.4C, Nuşfalău-11.6C, Săcuieni-13.6C, Debrecen-13.7C), and a minimum in 2012, with an average of the four stations of 10.62C (Oradea-10.6C, Nuşfalău-9.8, Săcuieni-11C, Debrecen-11C).

The multiannual average temperature on the surface of the soil records values between 10.76 ° C and 12.58 ° C (Oradea-11.64 ° C, Nuşfalău-10.76 ° C, Săcuieni-12.3 ° C, Debrecen-12.48 ° C).

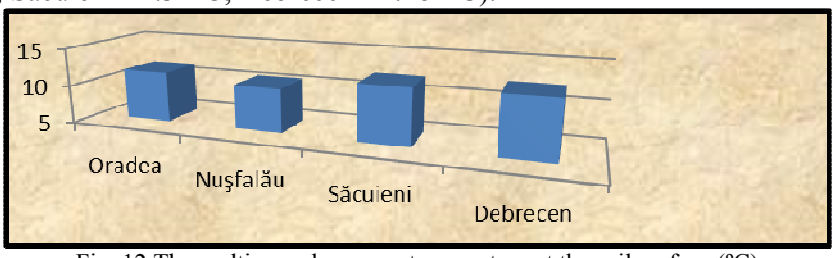

Fig. 12 The multiannual average temperature at the soil surface (ºC)
(Source: National Meteorological Agency and Tikovizig Debrecen)

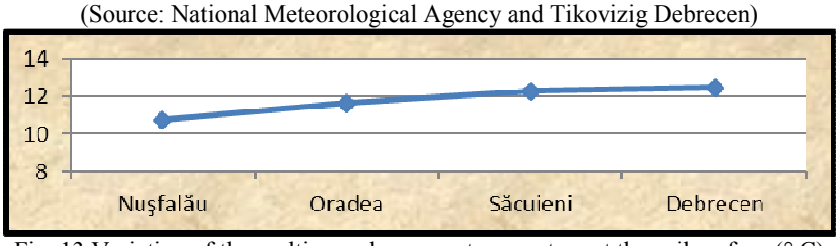

Fig. 13 Variation of the multiannual average temperature at the soil surface (° C)
(Source: National Meteorological Agency and Tikovizig Debrecen)

The average monthly temperature at the soil surface during the study period 199â9-2017 presents minimum values at Nuşfalău station (-1.9 ºC) and maximum values at Oradea station (-1.1°C).

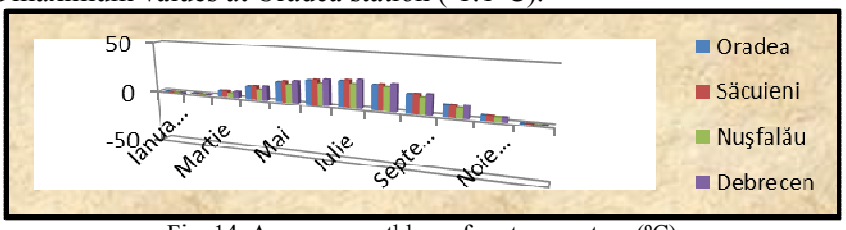

Fig. 14. Average monthly surface temperature (ºC)
(Source: National Meteorological Agency and Tikovizig Debrecen)

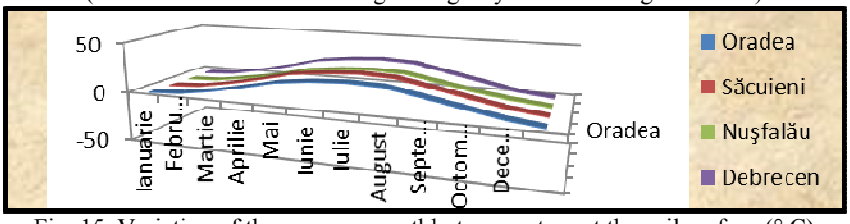

Fig. 15. Variation of the average monthly temperature at the soil surface (° C)
(Source: National Meteorological Agency and Tikovizig Debrecen)

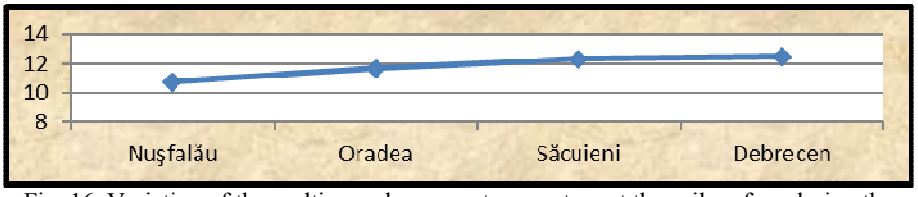

Fig. 16. Variation of the multiannual average temperature at the soil surface during the period (° C)
(Source: National Meteorological Agency and Tikovizig Debrecen)

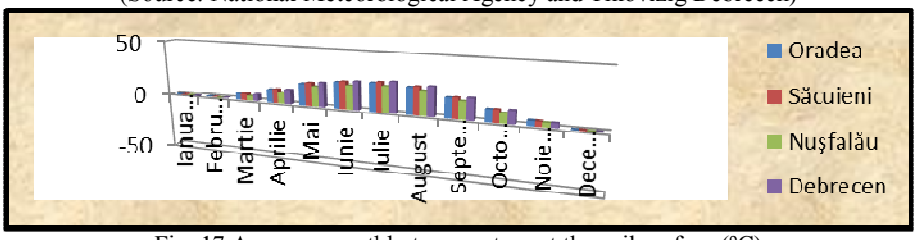

Fig. 17 Average monthly temperature at the soil surface (°C)
(Source: National Meteorological Agency and Tikovizig Debrecen)

The negative action is manifested as a result of the wind erosion process, recorded at the bioaccumulative horizon level.

Within the study area, the wind action in soil formation and evolution is minimal, during the study period for Oradea station the minimum average frequency was 4.7m/s in the NE direction and maximum 18.2m/s in the S. direction. The average minimum săcuieni was 1.7m/s in the NV direction and the maximum of 9.8m/s in the NE direction.

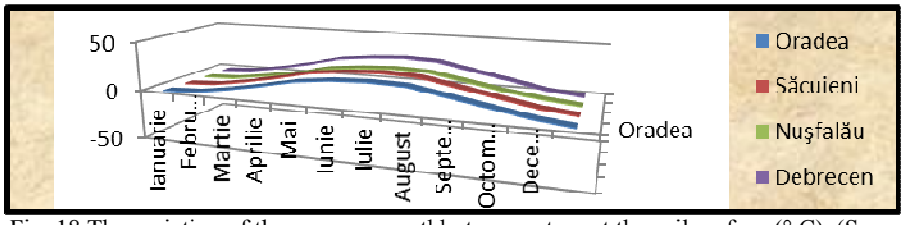

Fig. 18 The variation of the average monthly temperature at the soil surface (° C). (Source: National Meteorological Agency and Tikovizig Debrecen)

Debrecen station has maximum values of maximum values of 10.4m/s in the NE direction and minimum values of 1.9m/s in the NV direction. The average wind speed for all four stations had a minimum value of 2.2m/s in the E direction and maximum values of 4.2m/s in the SV and S direction.

The average monthly temperature at the soil surface for the study period 1999-2017 presents minimum values at Nuşfalău station (-1.9°C) and maximum values at Oradea station (-1.1°C).

Characteristic of this subzone is the fact that over time, primary steppe vegetal associations have been replaced with agricultural crops or with secondary herbaceous vegetation, often degraded or ruderalized.

CONCLUSIONS

In order to achieve high productions of fodder and of a suitable quality, the grass carpet of the permanent (natural and semi-natural) and temporary (sown) grasslands needs to be supported by fertilization (organic and / or chemical) and, as the case may be, the correction of the soil reaction by fine-tuning.

The most important factor of degradation of the grass carpet is the lack or excess of fertilizing elements of which nitrogen, phosphorus and potassium (NPK) are noted. For the production of one ton of dry matter (SU) the equivalent of 4-5 tons of grass per harvest (hay or grass), from the soil is extracted on average 20 - 25 kg N, 2 - 3 kg P, 22 - 25 kg K and 4 - 5 kg of calcium. The quantities of fines used to correct the soil reaction are calculated according to the value of the hydrolytic acidity. The average quantities of fertilizers, kg/ha/year, expressed as active substance required for grassland fertilization are: 150 kg N, 50 kg P2O5 (P), 60 kg K2O (K) active substance

When dealing with an arable crop when fertilizing a meadow, we must take into account several specific features, such as:

- the spread of meadows under more special seasonal conditions,
- the slope of the slopes up to 30 - 500,
- soils with physical-chemical handicaps (gravel, sand, salt, high acidity, excess humidity, etc.);
- the large number of perennial species that make up the grass carpet;
- several harvest cycles or permanent removal by grazing in a season of vegetation;
- use by mowing, grazing with animals or mixed, in one year or differentiated by years;
- maintaining an optimal balance between perennial grasses (50-60%) legumes (35-40%), species from other families (5-10%);
- the conservation of biodiversity;
- ensuring optimum and multifunctional density of grass carpet for erosion protection, water and thermal balance, landscape aesthetics, increased carbon sequestration capacity and more, besides the main role of ensuring high quality, cost-effective feed production reduced.

The first and most important fertilizer resource for meadows is organic fertilizers (manure, compost, turbidity, urine, etc.).

In view of the great diversity of the component species in the grass meadow and the varied ratio of them, first of all for fertilization it is necessary to know:

• floristic composition of grass carpet;
• the main agrochemical characteristics of the soil such as pH, degree of

saturation in bases (V%), humus content, P, K, Ca, mobile aluminum, sodium, etc .;
• the level of intensification of the grass production that can be extensive, semi-intensive (medium) and intensive;
• meadows invaded over 20-30% of valuable grass (weeds) and woody (shrubs and tree seedlings) vegetation that need to be removed by different methods, before being fertilized;
• the meadows to be sown, in order not to stimulate the development of spontaneous species that can stifle the young plants that appear from the seed, the fertilization to be done after the first sowing or a grazing cycle;

All types of meadows that have been degraded due to the lack of application of fertilizers respond positively to fertilization, provided they have more than 70-80% valuable fodder species in the grass carpet.

Organic fertilizers include manure, compost, gülle, urine and manure, etc. Manure is a basic fertilizer used in agriculture, consisting of a mixture of animal manure and material used as bedding. The average content in fertilizing elements of this type of fertilizer is: 0.55% N; 0.22% P2O5; 0.55% K2O and 0.23% CaO. The quality of the manure depends on the animal species from which it comes. The application of the well fermented manure (3-5 months in the platform) to the surface of the land, late autumn or early spring in quantities of 20-30 t / ha is frequently done on the natural grass near the farms.

Manure is best utilized when administered in combination with low doses of chemical fertilizers. The effect of fertilizing with manure lasts on average 3 to 5 years. The use of chemical fertilizers on the meadows has produced a true green revolution through large increases in grass production and the quality of the feeds, also reflected in the increase of the number of animals and their productions in the surface unit of the zootechnical farms. The administration in moderate and balanced doses of the chemical fertilizers on the meadows according to the agrochemical characteristics of the soil, the level of production and the intended use mode is one of the most important levers for increasing the productivity of permanent (semi-natural and natural) and temporary (sown) meadows .

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RESEARCH ON LEGAL ASPECTS OF AGRICULTURAL LANDS IN BIHOR COUNTY FROM THE INTERBELICIAN PERIOD TO THE PRESENT

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Abstract

This issue needs to be treated from a legal point of view in order to better understand the evolution of agriculture over time in Bihor county, due to the absence of administrative and legislative continuity, and implicitly of the stability of the entire agricultural system.

The situation of the territories held by the inhabitants of Bihor must be understood in the context in which only in 1918 Transylvania was united with the Kingdom of Romania, following that, in 1940, through the Vienna Dictate, Romania to give Hungary a large area of land, including from Bihor county.This situation was maintained until the 1946 Paris Peace Conference.

It will follow the evolution of agricultural lands in Bihor county, begining with the inter-war agrarian reforms, the privatization of agriculture after the fall of the communist regime in 1989 and until the 1991 agricultural reform, valid and current, with an impact on agriculture and implicitly on agricultural production at the level of Bihor County.

Keywords: (Bihor, land, agricultural, agriculture, interwar, legal)

INTRODUCTION

The present paper presents aradiographyon the legal situation of the agricultural lands and of the historical events that marked the destinies of the Bihorians, with a spatio-temporal limitation, respectively the Bihor County, from the interwar period to the present.

Bihor County is located in the northwest of Romania, with an area of 7544 km², of which 499,600 ha is represented by agricultural land, according to (Wikipedia). It is bordered on the north-east by the counties of Satu Mare and Salaj, on the east by the county of Cluj, on the south-east by the counties of Alba and Arad, and on the west by the Republic of Hungary.

MATERIAL AND METHOD

The study presents a series of general information that have been taken from the specialized literature, according to the mentioned bibliography, and those that refer to accurate data come from the records of the Ministry of Agriculture and Rural Development (MADR), the National Institute of Statistics (INS) and The Agency for Payments and Intervention

for Agriculture (APIA).We also used the information sources by accessing the websites: MADR, INSSE, APIA, and online publications with agricultural profile.

RESULTS AND DISCUSSION

After the "Great Union" of 1918, another important historical moment took place in 1921, resulting in the appropriation of the peasants with land due to the expropriation of the big agrarians.As we know by "vocally" from our predecessors, the majority population was the peasantry who led a life "from day to day", so the necessity of a “reform” law was imposed.

By Law no. 3610/1921 for the Agrarian Reform of Transylvania, Banat, Crisana and Maramures, the colonization was regulated, aiming the formation of new villages or the enlargement of the existing ones,aspect also noted in Bihor county, respectively from the mountain area to the plains.

Dumitru Sandru considered this reform "the most radical of all the reforms carried out in the countries of south-east Europe".

Florin Constantin in the work “A sincere history of the Romanian people”, showed that in 1912 Romania had a total area of 130,177 km², and in 1920 it had an area of 295,049 km².He pointed out that in the rural area the main occupation was land exploitation, in percentage of 90.4%. At that time, the population of Bihor was marked by massive losses of labor force, due to disability, as well as economic losses suffered after the First World War.

Shortly, the economic crisis took place in the inter-war period in 1929-1933.

According to the study conducted by Horia N. Lupan on the price and rent of the land in Romania, between years 1929-1930, in all the communes of the country, at the country level, the value of the lease was, according to the situation presented below.

Table 1

Table showing the comparative situation of the average tariff of agricultural land (by Horia N. Lupan)

Land category	Sale price (lei)	Lease value ha (lei)	Lease %
Arable	20240	1438	7,10
Vegetable gardens	39080	3967	10,15
Natural hay	23939	1870	7,81
Pastures	9708	726	7,78
Apple orchards	38100	4160	10,88
Vineyards	56000	9000	16,03

The price of the lease had different values, depending on the location, region, soil quality, aspects that we encounter even at the present time.

In Bihor county, in the area called "Tara Motilor", until 1929, the communes were not owned. Given this situation, through the Decision of the Minister of Agriculture no. 2211 of April 29, 1929, it was decided to divide the meadows and the mountain gaps, distributing them to 59 communes in the area of Vascau and Beius: the Romanian state resumed the lands of Pietroasa and Budureasa commune, and the citizens became leases of the state.

Later, with the elections won by the Communists, another great agrarian reform was outlined through the preparation of the agricultural cooperativization. In 1945, there were political tensions concludedwith the dissatisfaction of the masses followed by the approval of Law no. 187/1945 for carrying out the agrarian reform; certain aspects were provided that would correct the shortcomings in the real situation regarding the Romanian peasant.

Currently, we observe a reluctance of the Romanian peasant regarding the association, which probably appears as a consequence of the experience of the former CAPs. A series of important events have affected the life of the Romanian peasant, as follows:

-Starting with 1948, the struggle of the communist state against the rich peasantry is deepened.

-In 1949, appeared the Law on agricultural tax which provided for a progressive tax on the agricultural and non-agricultural income of the peasants.The year 1949 marks the forced collectivization. Through collectivization, the peasant remains the owner of the land, but only in impartible, the state being the decision maker.The state took by force from the peasants land areas through expropriations, donations, mergers and collectivization.

-The last agrarian reform with validity up to the present time and which essentially established the problem of retrocessions is the one enforced by Law no. 18/1991 of the land fund.

-Another big change is the one given by Law no. 247/2005.

CONCLUSIONS

Compared to other European countries, it is acknowledged that the Romanian has the mentality of owning land.

I am of the opinion that, starting from this mentality, arises the fear of any form of association, having as result a lower production compared to other Member States of the European Union. The Romanian and Bihorians farmers choose to work their agricultural land in their own regime.

The current law of the land fund has suffered 24 major amendments, which indicates that this domainstill has to suffer, implicitly affecting the Romanian agriculture and that of Bihor county.

Although it has been tried to be a modernized agrarian reform, in fact many abuses have been committed, starting from the possibility of the awarding commissions to decide if the refunds are made on the old or the new sites.

On the role of the courts there are even in present a long series of lawsuits aiming application of Law no. 18/1991, fact which indicates that he had many gaps.

Although there have been several changes and completions, the legal situation of agricultural land is not fully resolved even at the present moment.

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DACIC- A NEW WINTER WHEAT CREATED AT ORADEA

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Abstract

The paper present some results regarding the new winter wheat cultivar created, Dacic, comparative to other ones. The cultivar Dacic vas obtained by repeated genealogical selection from hybrid combination Dropia // Atlas 66 / Fundulea 4, where ATLAS 66 / Fundulea 4 were a breeding line with the same parents with Crisana. Like Crisana too, Dacic has a good tolerance to aluminium ions toxicity, which are presents in acid soils. In addition, our new cultivar has a better resistance to fusarium head blight (FHB), is shorter, with better precocity and better grain yield potential than Crisana.

Our results demonstrated that the cultivar Dacic has good yield stability in different areas where the soils are different. In addition, it has a superior yield capacity on soils with decreased natural fertility. The bread making qualities of Dacic are good, being included in B value group regarding this character.

Key words: cultivar, wheat, yield, quality, stability, fusarium.

INTRODUCTION

In Romania, the tolerance of wheat to aluminium ions toxicity from acid soils was studied for the first time in 1987 (Bunta et al.), when started a breeding program regarding this target. The researches started with study of a large collection of genotypes, especially to genetically tolerance to aluminium. After this, we initiated genetically studies, trying to explain the heredity of aluminium tolerance in wheat (Bunta, 1999/a; Bunta, 1999/b.).

The variety Crişana, which vas, ap to the moment, the single Romanian wheat variety with high tolerance to ions toxicity, has another qualities too, like a good backing quality. Our new cultivar Dacic is the second Romanian winter wheat with high tolerance to aluminium ions toxicity, registered this year in Official Catalogue of Varietyes and Hybrids from Romania.

Its tolerance to aluminium inherited too, from the old cultivar, Atlas 66. In adition, Dacic has a good bread making quality, according to the standard values for wheat quality in Romania (812- ISO 7970/2001): hectoliter weight more than 75 kg/hl, falling number between 180-260 seconds, wet gluten more than 22%, gluten index between 65 and 80%. (Tabără et al, 2009).

Another important character for wheat is the resistance to diseases, like fusarium, an disese that can produce big damages in wheat in the years with favorable climatical conditions, like in 2019.

MATERIAL AND METHOD

The Dacic variety was created by genealogical repeted selection from hybrid combination Dropia//Atlas 66/Fundulea 4. Mor exactelly, the breeding line Oradea 128 G (Atlas 66/Fundulea 4), having the sames parents with cultivar Crisana, was crossed in 2002, in paternal position, with the cultivar Dropia.

The Romanian cultivar Fundulea 4 vas utilized like genitor becouse its high yield capacity, being the most addapted to our zone, an ideotype for north-west of Romania.

Atlas 66, an old variety from United States of America (South Carolina), has a lot of defficiences: sensibility to diseases, tall, sensitive to falling and with a too long vegetative period. Hovewer, this variety have a very high content in protein and high tolerance to aluminum ions toxicity, beeing an etalon in all genetical studyes for this character.

Dropia, an romanian cultivar, has a very good quality and precocity and is shorter than Crisana.

The hibridation Dropia/ Oradea 128 G was efectuated in the year 2002. During the period 2004 - 2007 (F_2 – F_4 generations) we selected every year plantes with aluminum tolerance, in solution with growing concentration of aluminum ions.

Beginning with the year 2008 (F_5 generation) and finishing with 2010 (hybrid generation F_7), the selection has agronomical objectives, in experimental fields, at Oradea. During 2010 – 2013 the breeding line Oradea 6X was tested in network of Romanian Agricultural Research Stations, in 8 locations, spreaded all over Romania.

Starting to 2014, the breeding line Oradea 6 X vas included for testing at Romanian State Institute for Testing and Registration of Variety. Finally, in 2019 this breeding line vas registred like variety with the name Dacic.

Simultaneoussly, we started the multiplication of seeds, than today the new variety is cultivated on more than 70 ha at Agricultural Research and Developed Station Lovrin, in west Romania.

The qualities analyses were effectuated in the wheat breeding laboratory of Agricultural Researches and Development Station Lovrin.

RESULTS AND DISCUSSION

In table 1 are presented the results regarding yield capacity of breeding line Lovrin 6X (the future cultivar Dacic) comparative to checks (Dropia, Glosa and Apullum). The results are obtained in the romanian State Institute of Variety Testing and Registration (S.I.V.T.R.), during 2014 – 2018.

Every year, our breeding line exceeded the first check (from 108% to 120%) and the averages of checks (from 107.1% to 110.4%). It must be mentionated thar the results are the averages of yields obtained in 7 locations. The maximum average level of yield vas realised by Lovrin 6X in the year 2017: 8364 kg/ha. In the same year, the breeding line Lovrin 6X realised, at Târgu Secuiesc, 9925 kg/ha (Bunta Gh., 2018).

We must underline the yield potential of another own line, Lovrin 5X (Getic), that exceeded, in 2018, even the genotype Dacic.

Table 1

Yield capacity of cultivar Dacic in S.I.V.T.R. network, 2014-2018.

Class.	Genotype	Yield (Kg/ha)	Relative yield (%)	Checks average
2014-2015				
1	DROPIA	5406	100	5920
2	GLOSA	5843	108	
3	APULLUM	6510	120	
4	LOVRIN 6X (DACIC)	6490	120	**109,3%**
2016-2017				
1	LITERA	7057	100	7578
2	GLOSA	7330	104	
3	APULLUM	7850	111	
4	ANDRADA	8076	114	
5	LOVRIN 6X (DACIC)	8364	119	**110,4%**
2017-2018				
1	LITERA	7009	100	7078
2	GLOSA	7154	102	
3	ANDRADA	7070	101	
4	LOVRIN 6X (DACIC)	7584	108	**107,1%**
5	LOVRIN 5X (GETIC)	7677	110	108,5%

To compare our new cultivar with others performants ones, in 2019 Dacic vas tested at Oradea together with 12 romanian or foreigner genotypes (table 2).

It must be mentioned that the agricultural year 2018-2019 vas extremely droughty and the intensity of fusarium atack vas at maximum level. In these unfavorable conditions, the cultivar Dacic performed well because of its drought tolerance and resistance to fusarium head blight.

Comparative to experimental average, Dacic realised 869 kg/ha in surplus, that means an 117.0% relative yield. A good reaction to these conditions had Lovrin 5X (Getic), too, the yields being the averages of 6 replications.

In all 3 years and in all 7 locations, the new wheat cultivar Dacic realised an averaged yield biger with 108.9% than the average yield of three checks.

Table 2

Yield capacity of Dacic comparative to another wheat cultivars.
Oradea, 2019

Class.	Cultivar	Yield		Diferences (kg/ha)
		kg/ha	relative (%)	
1	**DACIC**	**5973**	**117,0**	**+869**
2	OTILIA	5808	113,8	+704
3	LOVRIN 5X	5642	110,5	+538
4	UNITAR	5441	106,6	+337
5	ALEX	5216	102,2	+112
6	CIPRIAN	5151	100,9	+47
Experimental average		5104	100,0	0
7	INGENIO	5099	99,9	-5
8	LOVRIN 9T	5024	98,4	-80
9	PANNONIKUS	4857	95,2	-247
10	ANAPURNA	4816	94,4	-288
11	UBICUS	4543	89,0	-561
12	ARNOLD	4418	86,6	-686
13	CRIȘANA	4359	85,4	-745

The yield capacity is the result of the sum of all morpho-phisiological characthers. In table 3 are presented some of the characteres of Dacic, comparative to other 24 genotypes tested in an experiment at Oradea.

Because the spring of wheat vas recorded at the end of february, the number of plants vas small (363 plants/m^2 in case od Dacic). However, the number of ears/m^2 vas good, 553 in case of Dacic.

By it date of earing (18 May), our cultivar had the longest period of vegetation, a positive characteristique in the conditions of the year 2019. But the most important fact vas the resistance of Dacic to fusarium, at the same level with Otilia, Abundent and Ursita, cultivars realised at A.R.D.I. Fundulea and recognised to be the most resistants to thise disease and to another ones.

Most correlations among the yield components are negative, illustrating the difficulty of combining in one cultivar high values of more than one component, because of compensation between yield components (Mandea et all, 2019). The strongest negative correlation was found

between the number of spikes per unit area and the number of grains per spike.

Dacic had a bigest number of grains in ears with up to 2 grams/ear, fact that associated with its ears density concured in realisation of superior grain yield performance.

The height of the cultivar Dacic is around of 84 cm, a midle one that confers a good resistance to falling, even in conditions of fertilization with high quantity of nitrogen.

Table 3

Some morpho-phisiological characters of 25 wheat genotypes.
Oradea, 2019.

Nr.	Genotype	Density/m^2		Date of earing	Fusarium (notes)	Ears characters		Height (cm)
		plants	ears			weight (g)	numbers	
1	GLOSA	400	497.3	**7/05**	4/5	1.84	24.3	78.3
2	BOEMA	424	512.0	9/05	3,7/5	1.93	25.7	79.0
3	LITERA	335	473.3	10/05	4,7/6	1.98	26.0	80.0
4	MIRANDA	357	461.3	9/05	4,7/6	1.90	26.0	84.3
5	IZVOR	320	566.7	9/05	5,7/6	1.69	22.3	81.3
6	OTILIA	380	497.3	11/05	**3/3**	1.92	25.0	80.0
7	PITAR	324	476.0	10/05	7/7	1.82	24.7	**74.7**
8	PAJURA	337	541.3	9/05	5,3/6	1.88	24.3	76.0
9	SEMNAL	355	494.7	12/05	5/5	1.87	24.7	75.0
10	URSITA	329	541.3	10/05	3/4	1.81	23.0	78.0
11	VOINIC	345	552.0	12/05	3,7/4	**2.11**	27.0	78.3
12	ZAMFIRA	319	522.7	12/05	3,7/4	1.94	26.3	80.7
13	AMURG	393	520.0	8/05	6/7	1.75	23.7	78.3
14	ARMURA	372	521.3	14/05	4/4	1.94	26.0	85.7
15	ABUNDENT	397	537.3	13/05	3,7/4	**2.05**	26.7	80.7
16	14.078 GP 1	**427**	564.0	12/05	3/3,7	1.82	23.7	75.3
17	A4-10	379	553.3	14/05	7/8	1.50	20.7	85.0
18	ADELINA	401	578.7	11/05	4,3/5	1.63	21.3	80.7
19	ŞIMNIC 60	373	532.0	13/05	4/5	1.69	22.7	85.0
20	DACIC	363	553.3	**18/05**	**3,3/4**	**2.03**	**28.7**	84.0
21	LV. 5X	415	524.0	14/05	5,7/6	1.81	25.0	77.7
22	LV. 9T	384	557.3	15/05	6,7/8	1.74	24.3	77.7
23	LV. 6107	383	548.0	13/05	6,7/7	1.80	24.7	79.3
24	LV. 6111	391	**586.7**	13/05	5,7/6	1.83	23.7	75.0
25	BEZOSTAIA	345	548.0	17/05	4/4	1.64	21.3	**101.0**
Averages		370	530.4	11/05	4.7/5.4	1.84	24.5	80.4

Because the wheat is the most important food in human nutrition, an major importance has its quality. Dacic has a superior content of total protein (14.5%) and midle wet gluten (37.2%), but in normal parameters (table 4).

The hardness (55%) and starch content (68.9%) are in optimal parameters, thus, we can concludet that the cultivar Dacic coresponded too in regard of quality.

Yield stability ia another important character target in wheat breeding. In figure 1 is presented phenotipical variance of 25 genotipes in 8 locations during the year 2018.

The cultivar Dacic has a reduced variance at an high level of yield, being the best regarding to this character that confeerig it a very good stability of yield.

Table 4

Quality results of some Romanian wheat genotypes.
Oradea, 2019.

Class.	Genotipe	Yield (kg/ha)	Protein (%)	Wett gluten (%)	Hardness (%)	Starch (%)
1	F. 14.078 GP 1	5936,0	13,9	36,2	52	69,4
2	ABUNDENT	5865,2	14,1	37,6	50	69,1
3	OTILIA	5743,2	13,9	36,1	52	69,8
4	DACIC	5660,8	14,5	37,2	55	68,9
5	VOINIC	5491,6	14,5	38,1	50	68,6
6	LOVRIN 5X	5447,6	14,2	38,3	54	69,5
7	ARMURA	5239,8	14,7	38,5	53	69,2
8	BOEMA 1	5187,5	14,4	37,5	52	70,1
9	MIRANDA	5008,9	14,2	38,0	50	69,7
10	LOVRIN 6111	4999,9	14,1	37,5	52	69,6
11	SEMNAL	4979,3	14,2	38,3	53	69,6
12	ZAMFIRA	4977,7	14,9	39,0	52	69,2
Experimental average		**4900,3**	**14,4**	**38,1**	**52,3**	**69,4**
13	URSITA	4892,8	14,0	38,1	53	69,7
14	ȘIMNIC 60	4848,9	13,8	36,2	56	70,3
15	LOVRIN 6107	4782,6	15,1	39,9	53	68,9
16	A 4-10	4738,7	14,6	38,0	53	69,8
17	ADELINA	4671,2	13,6	34,6	53	70,0
18	GLOSA	4619,2	13,3	35,6	50	70,1
19	PITAR	4613,5	14,2	38,5	51	69,4
20	LOVRIN 9T	4483,5	14,3	38,6	52	69,6
21	PAJURA	4318,3	14,4	37,7	51	69,3
22	LITERA	4202,2	14,5	37,8	53	69,9
23	BEZOSTAIA	4105,7	**16,4**	**43,7**	54	67,3
24	AMURG	4062,8	**15,7**	**42,8**	53	68,0
25	IZVOR	3630,6	14,6	37,9	51	69,9

The new cultivar Dacic has a good tolerance to acid soils wich are characterized by low pH, low natural fertility and aluminium ions toxicity. Figure 2 is suggestive for this. Dacic has the best yielding capacity in unfavorable pedological and climatical condition, comparative to another 24

varieties tested in the same conditions. Another Romanian winter wheat with good reaction to unfavorable condition of environment are: Boema, Litera, Miranda and Trivale (Voica and Lazăr, 2017).

By its ability to ensure stable grains yield in unfavorable soil conditions, the new wheat cultivar Dacic is recommanded to be cultivate in hil zone but not only there. It is able to valorise in efficient manner the soils with high natural fertility or high levels of fertilizants.

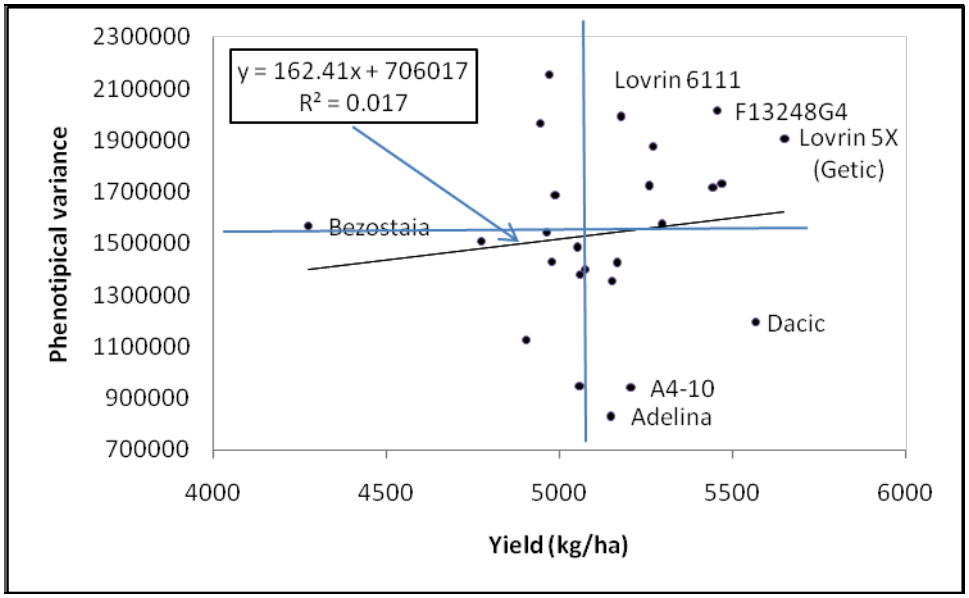

Fig. 1. Yield stability of Dacic cultivar comparative to other genotypes.

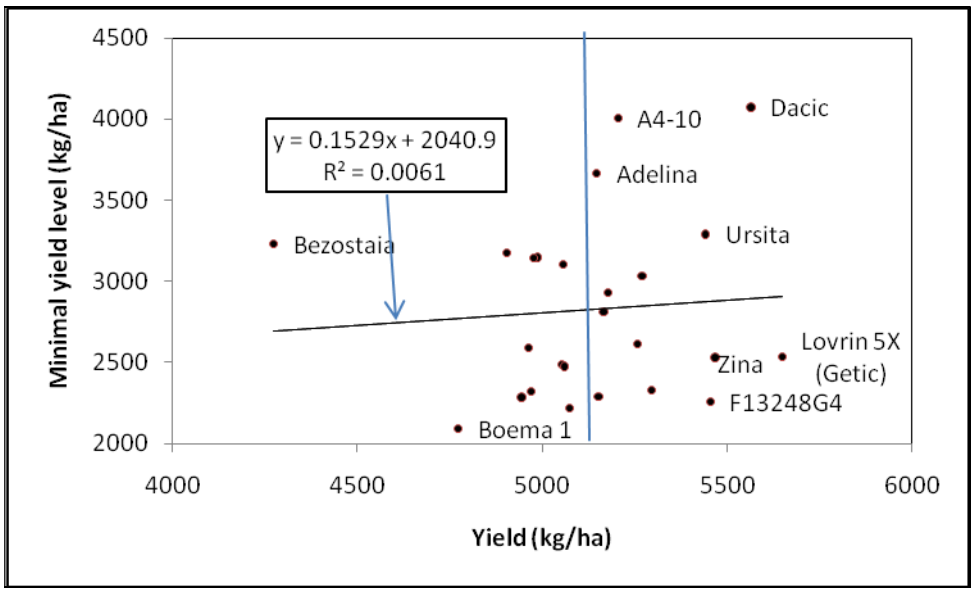

Fig. 2. Yield capacity of Dacic in unfavorable pedo-climatical conditions.

CONCLUSIONS

The cultivar Dacic is a new genotype that has a good yield capacity in favourable and unfavourable soil conditions.

By its resistance to fusarium head blight and drought tolerance, the new cultivar is superior to the most spread ones in our zone.

The bread making quality of Dacic is corresponding to standard parameters.

The cultivar Dacic is recommended to be cultivated in Tisa Plain, Transylvania and north of Moldavia.

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RESEARCH ON PSAMOSOLS FORMED ON WIND WAREHOUSES FROM THE BLACK FIELD

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Abstract

Higher recovery of sands and sandy soils is a problem very topical, not only worldwide but also in our country. Their cultivation on increasing areas it has emerged from the need to increase agricultural production.In agronomic acceptance, these soils are at least 50 cm thick (but usually on more than 2,00m), coarse texture (sandy, sandy, with less than 12% clay below 0.002mm and relatively low humus content (usually below 2%). To unlike sand, which from the point of view of agricultural use is a made up rock usually from quartz resistant to alteration or from particles of other minerals – small white, garnets, pyroxenes, staurolite, rutile, etc. sandy soils are developed on 160 - 2.20 cm thick, with clearly differentiated horizons, containing substances nutritious and have greater capacity to retain them.

Key words:sandy soil, spreading, relief, formation of sandy soils, grouping sandy soils, solutions.

INTRODUCTION

The paper presents the Plain of the Nir River where the type of soil is intended Psamosol sand, on wind farms (sands transported and deposited by winds), characterized by a low content in fine fractions (below 12%), which print a coarse or medium-coarse texture. The plain of Nir is part of The Western Plain of Romania and covers the territory of two counties; Bihor yes Satu Mare arriving in neighboring country Hungary. In the territory of Bihor county, The plain of Nir starts in the western part of Voievoz and stretches in West of localities; Simian, Mihai Valley, continuing on the communal territories of Satu Mare county in their west; Piscolt, Sanislau, Ciumesti, Foieni and Urziceni.

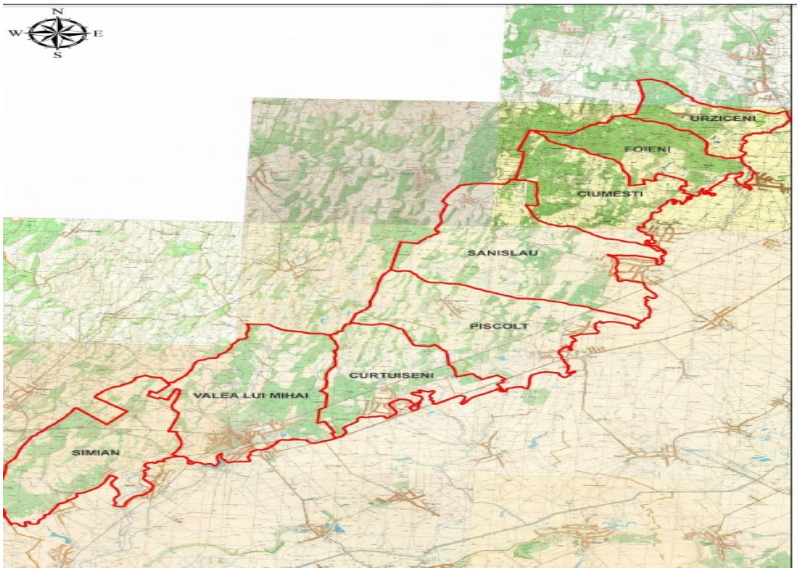

Fig. 1CampiaNirului Map

MATERIAL AND METHOD

The research of the sandy soils of the Nir River Plain requires inventory existing surfaces as well as establishing the study perimeters. So in this case, the area of Ciumest localities was established, where a soil profile sandy Psamosol. The samples were collected at a depth 0-180c, after which they were processed in the lab. OSPA Satu Mare.

Specific to the territories with sandy and sandy soils is the relief and the distribution parental materials of different textures, as a result of transport wind or fluviatil and wind sorting. The relief of these territories is corrugated, in the form of high dunes 10.-20 m or low 5-10 m and wide tens or hundreds of meters, which close between them small areas of variable width called interdune (Patrichi M., Oancea C., 1984). In the conditions of the relief wind, the texture of the sandy material changes depending on the distance source of sand and mezorelief.

The coarsest texture is encountered on the ridge of dunes, it frequently becomes sandy in the lower third of dunes and bays or even lutonisiposa with some coarse sand in wide areas.

Processes on pogenetics, specific to sandy soils in the temperate zone semiumeda - semiarida, are strongly influenced by the characteristics parental material. It determines, on the one hand, 'drying' microclimate solulus (compared to that in the atmosphere), as a result strong heating and accumulation of small water reserves, accentuating moisture deficiency with consequences in the poor carpet

development vegetation and favoring deflation, and on the other hand intensifying the circuit (mineralization) of organic matter and more active mobilization of the different constituents of the soil, intensifying the softening of substances including a nutrients due to excessive permeability and capacity reduced retention, as rats encountered in other (non-sandy) soils.

The use of sandy soils in the agricultural agricultural production is greatly influenced by the physical and chemical characteristics, determined by the texture sandy (over 88-90% sand, often with much coarse quartz sand).

Profile of Psamosol sandy soil from CampiaNirului, in the perimeter of the locality Ciumesti. Satu Mare county in fig. 2, character. physical and chemical sandy soil in tab.nr.1, and in tab.nr.2.

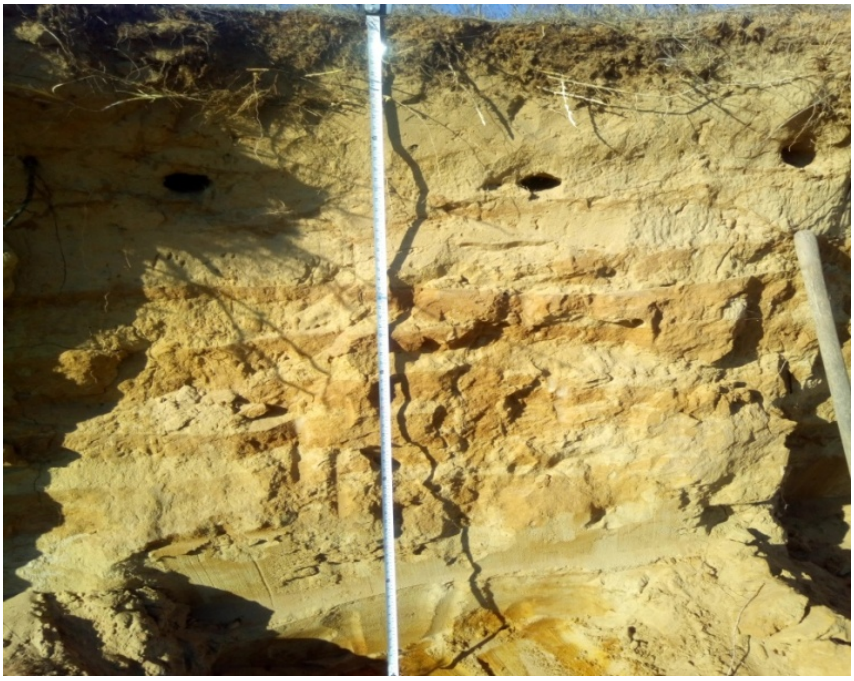

Fig. 2. Soil profile Psamosol UAT Ciumesti

Physical characteristics. With a small content of fine particles, soils sandy areas have a reduced surface area of sorption and large lagoon spaces. that is why they have a high permeability for air and water, but they have a capacity reduced by water retention.

I can't store large water reserves, this one losing by infiltration; a better situation is presented by the soils sandstones that are based on a slightly permeable layer above which they are can accumulate water,

situation similar to that of sandy soils with bands that can accumulate more water in the intervals.

The capacity of field for water is small and the coefficient of hygroscopicity and that of wilting are very small, make good use of summer rains (Table 1)

Table 1

The physical characteristics of Psamosol from U.A.T.Ciumesti

Crt. No	Orizont	Ap	Ao	Cn 1	Cn 2	Cn3Go
1	Depth cm	0-22	22-49	49-91	91-129	129 -180
2	coarse sand ,2-0,2mm	69,74	71,23	72,69	75,42	70,23
3	fine sand ,0,2-0,02mm	23,35	25,61	24,59	22,84	27,63
4	dust I, dust II 0,02-0,002mm	3,02	1,11	0,96	0,85	1,o2
5	clay ,< 0,002 mm	3,89	2,05	1,76	0,89	1,12
6	physical clay , <0,01mm	2,24	1,45	1,30	0,95	1,14
7	Texture	**NG**	**NG**	**NG**	**NG**	**NG**
8	The apparent density g/cm3	1,30	1,44	1,52		
9	Coef.dehigroscopicitate **%**	1,12	0,84	0,71	0,51	0,43
10	Hydraulic conductivity mm/ora	18				

Chemical characteristics.

The reduced content of clay and humus also causes poverty in other elements nutrients of sandy soils. The presence of humus, even in small quantities (0.8-1.0%) greatly improves trophic conditions, increasing their capacity of retention and implicitly the content of water and nutrients, have a potential low trophic, the natural fertility of these soils is even lower, the poorer they are in clay and humus. Aerobic microorganisms find very favorable development conditions, mineralizing strong material.

Table2

The chemical characteristics of Psamosol from U.A, T.Ciumesti.

Nr.crt	Orizont	Ap	Ao	Cn 1	Cn 2	Cn 3
1	Depth cm	0-22	22-49	49-91	91-129	129 -180
2	pH in H2O	5.95	7.18	7.29	7.41	7.62
3	Humus, %	0.48	0.42	0.08		
4	Total nitrogen , %	0.026	0.013	0		
5	CaCO3 %	0	0	0	0	0
6	P(AL) ppm	42	35	32		
7	K(AL) ppm	56	50	47		
8	Ah(Kappen),me/100g	1.73	0.52	0.35		
9	SB(Kappen),me/100g	5.54	5.93	5.14		
10	V,%	76.20	91.94	93.62		
11	S,me/100g	5.54	5.93	5.14		
12	SH,me/100g	1.98	0.59	0.49		
13	T,me/100g	7.53	6.52	5.63		
14	V,%	73.67	90.95	91.30		

Landscaping with sandy soils For the superior valorisation of the lands with valuable sandy soils wind, the following works must be considered; modeling of dunes by uncovering and depositing material in low areas, especially on landwetlands; discovery and storage of humus-rich material, followed by modeling and leveling until the parameters provided by calculation are reached and then the covering of the land surfaces with stored humiferous material.

In the case of sandy soils with Bt horizon in strips it is good that its discovery should not be made more than 20 cm, as it is present these strips in the soil profile mean the increasing possibility of retention of soil water for a longer period of time (Patrichi, Cozos, 1992).

After these works will be done the improvement fertilization of of the open surfaces, of the covered ones and of the surfaces with modified profile by mixing the layers as a result of leveling; amending the soil concerned.

To combat wind deflation in the Nirul Plain are necessary measures to prevent and combat wind erosion. The phenomenon is widespread in all sandy territories, especially on dunes. They are considered different measures of which we mention;

- a certain crop structure, in order to keep the soil covered more long time with vegetable carpet;
- practicing successive cultures;
- the smallest tillage of the soil and the failure of the autumn crops;
- establishment of protective curtains;

- thearealelo afforestation intensely affected by wind or erosion maintenance under the forest of those areas with high danger of deflation;

- creation of strips with grassy plants (rye strips), especially for legume crops;

- application of chemical fixing substances, good results being obtained in the case of bituminous substances and polymers PAM, CUSTOM, etc .;

- the establishment of the fences or the use of straw mulch.

RESULTS AND DISCUSSION

The sandy (quartiferous) material disintegrates and is slightly altered, that is why psamosols are very poor in fine fractions (clay and dust), from thoseseveral times below 10-12%. Due to poverty in organo-mineral colloids, psamosols have a low cohesion, being easily blown by the winds from it the cause of the solubilization processes are permanently interrupted.

These processes the genesis specific to the sandy areas cause the psamosols to have a profile of poorly contoured and slightly evolved soil.

Psamosols have sufficiently different characteristics, from one subtype to another to attract the need to apply technologies (or variations of technologies) differentiated from breeding and cultivation.

Although it is very easy to work, due to the fact that I do not retain water nutrients, psamosols have very low natural fertility.

In order to be cultivated it requires radical measures of improvement through;

- application of irrigation to fill the large humidity deficit. On sandy soils small water norms are recommended and often applied 2-3 days;

- organic fertilization for the growth of humus content, garbage the stable is recommended to be incorporated 30-40 cm deep, to avoid it rapid aerobic decomposition;

- chemical fertilization to fill the deficiency of nutrients. Because psamosols have a power of retaining the missing nutrients it is recommended to apply chemical fertilizers with small incantations and in several times, to avoid smoothing them towards the groundwater.

CONCLUSIONS

Psamosol sandy soils are of particular importance as a resource land for agriculture of the country, because it has certain characteristics that I make them valuable, of which we mention the following; faster heating compared to other soils, thus offering the possibility of obtaining

crops early; easier soil work and in a longer time long, with lower fuel and energy consumption; capacity high mineralization of organic waste; easier prevention a phenomena of salinization, alkalization or excess humidity in the case of irrigation.

By applying the improvement works, the productive capacity of the soilSandPsamosol from the CampiaNirului its production capacityit grows a lot, being able to obtain big and economically efficient productions. Afterimprovement is suitable for the following crops; wheat, barley, corn, flower sun, soy, vines, trees, early potatoes, watermelons, etc.All for sands are specific to certain plants such as: tobacco, melons, potato early, vines some species of trees (apricot, peach).

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SOME ASPECTS OF DATA FOR AGRICULTURAL DECISION SYSTEM SUPPORT

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Abstract

The pressure to produce more food has led to the need for accelerate innovation in the agriculture. These innovations are primarily related to the digitization of agriculture and the implementation of precision farming techniques with the help of new technical achievements such as IoT (Internet of Things), AI (Artificial Intelligence), Big Data, Cloud and Decision System Support.

The digitization of agriculture from the point of view of the DSS consists mainly of the acquisition of the data from the sensors through IoT or other applications, their storage in Big Data realized in the Cloud, their processing in the Cloud with the help of AI and the sending to the DSS for final processing and visualization. Decision support systems, data analysis and data mining have become significant tools for precision agriculture to increase production and lower costs.

The absence of legal and regulatory frameworks around the collection, sharing and use of agricultural data contributes to the range of challenges currently being faced by farmers considering adoption of smart farming technologies. Farmers' concerns arise from data licenses, lack of privacy, security, and benefit-sharing.

This article gives a brief overview of the issue of agricultural data and the importance of using DSS for an efficient implementation of precision agriculture.

Key words: DSS, AgriDSS, IoT, precision agriculture, Big Data, Data Management.

INTRODUCTION

The pressure to produce more food, due to population growth at the same time as the decrease in the labor force and its qualification, has led to the need for identification of applicable solutions to improve the sustainability of production processes and accelerate innovation in the agriculture. Sustainable agriculture production and processing systems have become more complex with involvement of biological, chemical, physical processes such as soil, water, climatic scenarios and crop management practices respectively. Agricultural Decision Support System (AgriDSS) offers a framework within which complex systems is more easily understood and helping to draw out additional information and new insights. It is an interactive, computer-based expert system, which helps decision makers to utilize data and models to solve unstructured problems. The applicable use of successful decision support, based on the important parameters in agriculture such as type of soil, seed, irrigation, fertilizers, and climatic data, can assist in the sustainability of agricultural resources.

By integrating and analyzing the captured data, DSS are meant to

become more accurate as well as reliable. Companies from the sector have the ambition to make AgriDSS more ergonomic and user-friendly.

MATERIAL AND METHOD

Farmers can only be able to make optimal decisions if they have correct climate, soil and plant data.

AgroDSS bridges the gap between agricultural systems and decision support methodology. AgriDSS are software-based systems that gather and analyze data from a variety of sources. Their purpose is to smoothen the decision-making process for management, operations, planning, or optimal solution path recommendation. It helps farmers to solve complex issues related to crop production. As tools for diagnosis, risk assessment and reasoning assistance, AgriDSS use agronomic models and calculations based on water, climate, energy and genetic data but they also take into account other factors such as human and economic inputs.

Data is collected nowadays from practically everything and "Big Data" is the latest buzzword, so used because enormous quantities of data are involved.

The agricultural sector is already gathering and making use of big data. Data collection is also increasingly an accepted phenomenon that happens automatically, as more of us embrace automation and 24/7 connectivity. The GPS system, the autopilot, machines and implements are, in fact, recording what they are doing and where at any given time for every square centimeter. The manufacturers are also recognizing the importance of this, and are assisting users to access and analyze this data using cloud environments and online software applications.

Because of pay for wireless communication, for the storage, analysis and processing of data, is increasingly giving rise to resistance from farmers across the world against data collection and processing. There is also the fear that their data will be used against them.

Some tractors and other machines are already constantly connected, and send their data to manufacturers' cloud environments. This can be useful for the purposes of service, preventative maintenance, and track & trace, but, in spite of privacy legislation, questions are being raised as to what is happening to all of that data.

There are a number of AgriDSS systems on the market today. Although the current acceptance of such products among farmers is low, it is expected to change in the future. As world population grows and the availability of arable land diminishes, there is an increasing need to make a smart use of each piece of land.

John Deere Field Connect™ system uses a system of probes and

environmental monitors installed in the field, which are connected to the web and provide data on soil moisture, soil and air temperature, humidity, solar radiation, leaf wetness, rainfall, and wind speed. The data can be seen on a computer or on mobile.

TopCon is a diversified manufacturer of geospatial solutions - both software and hardware - for use across a variety of industries. Their catalogue of agricultural decision support system products includes solutions for preparation and planning, planting and seeding, growing, harvesting, and animal feeding.

Best known for GPS technologies, Trimble has an array of agricultural products, including both field solutions (such as guidance and steering, correction services, flow and application control, yield monitoring, and water management), as well as software's (farm software, crop advisor software, ag retail software, and food processor software), and agronomics services.

SMART! Fertilizer Management is a unique web platform for optimizing and managing fertilizer use in agriculture, enabling farmers to increase crop yields and reduce fertilizer costs, while protecting the environment. The platform enables growers to manage fertilizer utilization for any crop at any stage, under any condition and growing method, taking into account the multiple dynamic factors required for optimizing fertilizer use. Using the right fertilizers and the right amount of fertilizers, on the right timing, will allow better control of the field outcome, and can improve yields significantly. It is difficult as it is for farmers to find a reliable source for unbiased fertilizer recommendations.

PLANET (Planning Land Applications of Nutrients for Efficiency and the environmenT) is a free nutrient management decision support tool for use by farmers and advisers in England/Wales and Scotland for field level nutrient planning and for assessing and demonstrating compliance with the Nitrate Vulnerable Zone (NVZ) rules.

Agricolus DSS is a cloud platform available on web and mobile devices. It provides weather data and very innovative forecast models of the spread of phytopathology's on crops. These data promptly support farmers in fighting phytopathology that could attack crops, suggesting the best time to do treatment also in a specific part of the plot. Forecast models provide precise information about circumstances nurturing the spread of a phytopathology, often before it will appear.

Simulation based DSS models are widely applied in agriculture, as these models provide viable input to the management decisions because of their effective predictive capability. The main DSS models developed and applied in different areas of agriculture are:

- CROPWAT, for land and water management,

- SWASALT, for Soil and Water Resource Management,
- CROPMAN, for Crop Production and Management,
- DSS-ET, for soil evapo-transpiration estimation,
- DSS-FS, with Fertigation Simulator for application of fertilizers.
- IPM, for Integrated Pest Management.

There are a range of initiatives under way to collect tractor data and transmit it wirelessly. Such as the Dutch initiatives Agrobox from FARM24 and an ISOBlue derivative from Trekkerdata.nl. Purdue University in the USA developed this ISOBlue box for the North American market. Technical experts from FarmHack, Trekkerdata.nl and Purdue adapted it to enable it to 'understand' European tractors. The slogan on the website www.isoblue.org reads 'Freeing Ag Machinery Data', and that is also essentially what it is: 'freeing' tractor and machine data from the CAN bus / Isobus to render them independent of any brand and making them available for use by the farmer free of charge. The Agrobox works in a similar way. Both boxes use 4G to continuously send the data that has been recorded. The data from the Agrobox becomes available on MyFarm24. Recently, a number of Dutch arable farmers and contractors have started testing these solutions. Contractors regard it mainly as a means of being accountable to customers (as well as the Government) with regard to fuel consumption, use of fertilizers and crop protection chemicals, and the impact on soil and the environment.

In order to protect the data of the farmers, a document was created that stipulates the way of sharing the agricultural data. Following its launch on 23rd April 2018, the EU Code of Conduct on Agricultural Data Sharing by contractual agreement, has received the support of two additional international federations: Centre de Liaison International des Marchands de Machines Agricoles et des Reperateurs (CLIMMAR) and Animal health Europe. One year after its release, the EU Code of Conduct on Agricultural Data Sharing has been accepted and signed by over ten key European agricultural sector organizations. All signatories are convinced of the importance of setting transparent principles and guidelines to support the development of digital farming, which demonstrates the need for increased data sharing in agriculture.

To fully benefit from digital farming, data must be shared between all partners in the agri-food chain in a fair and transparent way. This Code of Conduct, designed in 2018, aims to promote the benefits of sharing data and enabling agri-business models, including agri-cooperatives and other agri-businesses, to swiftly move into an era of digitally enhanced farming. The Code of Conduct explains contractual relations and provides guidance on the use of agricultural data, particularly on the rights of access and use of the data. All signatories of the Code of Conduct recognize the need to grant

the data originator a leading role in controlling access to and the use of data. The guidelines also underline that the right to determine who can access and use the data should be granted to the data originator. In practice this means that the rights to data collected on the farm or during farming operations are granted to the farmer and may be used as he or she sees fit.

So far, Copa and Cogeca, CEMA, Fertilizers Europe, CEETTAR, CEJA, ECPA, EFFAB, FEFAC, ESA have agreed to sign the contractual arrangement which is part of this Code of Conduct. CLIMMAR and Animal health Europe, which represent the Agricultural Machinery and Equipment Dealers and the manufacturers of animal medicines and health products respectively, have decided to show their support by becoming the latest signatories of the Code of Conduct.

RESULTS AND DISCUSSIONS

Most farmers feel there is value in their data. The proof of this is that almost every farm has a stack of paper records, old planter notebooks, binders of printed spreadsheets, and soil test results from days gone by. They keep this "data" because, that stack of paper is a concrete reminder of the annual battles fought with nature, people, money, and chance. They keep it because as years pass by and details of our memories begin to fade, They could go back to those hard copies and revisit the lessons of all those ideas, successes, and failures. The other proof of the farmer's belief in the value of their data is the rapid adoption of yield monitors in harvesters.

Several models exist that are or could be used for DSS involving precision agriculture data. However, for DSS some data is needed in real-time or near real-time and some is not. Decisions and definitions of minimum data is different for each scale. Thus, starting with the decision to be made and working backward to come up with the supporting dataset should improve effectiveness and efficiency. Once pertinent decisions are identified, usable crop models and DSS for on-farm sub-field management decisions with spatial accuracy need to be created.

CONCLUSIONS

We can conclude that the agricultural industry is about to be disrupted and will transform into a high-tech industry and will need a high skilled farmers. Some of the best techniques for extracting information from data include the use of traditional techniques for data mining that are linked to but not constrained by biophysical processes. Thus, machine learning (e.g., decision trees, neural networks, random forest), geospatial statistics and time series analyses need more testing and validation within the precision agriculture sphere. Ultimately, data mining techniques need to turn data into

action or decisions.

Useful agricultural data will help to fight food scarcity and empower small farmers, help managing crop diseases and pests, investigating agricultural niches to identify patterns and relationships that may otherwise remain hidden, help to cope with climate change, help to make yield predictions and help to provide images of crops and land for inspection.

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CHEMICAL CONTROL OF WEEDS IN SUNFLOWER CROPS

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Abstract

The present paper aims to determine the effectiveness of controlling segetal species in sunflower crops, using a diverse range of preemergent and/or post emergent herbicides. The effect of controlling weeds in sunflower was monitored. Research was carried out in 2017 and 2018, in the experimental field of the didactic farm in Timişoara, Romania. Initial weeding was 211 plants/m^2 in 2017 and 183 plants/m^2 in 2018. The annual grasses Setaria viridis and Echinochloa crus-galli shared, together, over 30%, but overall, seven annual dicotyledonous species were dominant. The best efficacy in controlling segetal species in the two years (92.15% and 89.23%, respectively) was registered in the V_9 variant, in which post emergent Pulsar Plus (imazamox 25 g/l) -1.5 l/ha, was applied early during vegetation and Gramin 5 EC (quizalofop-P-etil 50 g/l) -1.5 l/ha, was applied during vegetation. Very close results (89.47% and 88.21%, respectively) were recorded in V_{10} variant – Wing P (250 g/l pendimetalin + 212.5 g/l dimetenamid-P) – 4.0 l/ha + Gramin 5 EC. The level of sunflower productions in the trial has been clearly influenced by the effectiveness of weed control, but also by the climatic conditions of the two years.

Key words: sunflower, weed control, herbicides, crops

INTRODUCTION

Segetal species (weeds) are unwanted plants in agricultural crops. The causes and size of the damage caused by weeds in agricultural crops are diverse, wide-ranging and irrecuperable (Berca, 2004; Chirilă, 2001).

The essential aspect of weed control is part of controlling plant populations. Its target is not simply the harvest or the weeds, but maximizing the production of the plant cultivated in the presence of plants of other species (Mortensen et al., 2000; Post, Wijnants, 1996).

Controlling weeds means reducing the weeding degree down to the level at which they no longer produce significant damage (Pötsch, 1991).

Sunflower occupies has a significant share in the structure of agricultural crops in our country; however, it is very affected by the presence of weeds, especially if they are installed at the beginning of the vegetation period (Anhel et al, 1972, Manea, 2006).

MATERIAL AND METHOD

The research was carried out in two years, 2017 and 2018, in the experimental field of the didactic farm in Timişoara, Romania. The trials

were monofactorial, located in the field after the method of randomized blocks, with 10 variants in 4 repetitions. The initial weeding was assessed by the numerical quantitative method. Approximately 30 days after the last treatment, we determined the effectiveness of controlling segetal species in sunflower crops (expressed in %), but also the selectivity of the herbicide tested on the hybrid of cultivated sunflower (through notes granted according to the EWRS scale). The production of sunflower (expressed in q/ha) was determined, both in the control variant and in the variants treated with various herbicides. Both the efficacy of herbicides and production results were processed and interpreted through variance analysis. The cultivated sunflower hybrid was SY Neostar CLP, a hybrid adapted to Clearfield Plus technology.

Experimental variants were: V_1 – control; V_2 – Gramin 5 EC (quizalofop-P-etil 50 g/l) -1.5 l/ha; V_3 – Pledge 50 WP (flumioxazin 50%) – 0.12 kg/ha; V_4 – Pulsar Plus (imazamox 25 g/l) -1.5 l/ha; V_5 – Successor Tx (petoxamid 300 g/l + terbutilazina 187.5 g/l) – 4.0 l/ha; V_6 – Tender (960 g/l S-metolaclor) – 1.5 l/ha; V_7 - Wing P (250 g/l pendimetalin + 212.5 g/l dimetenamid-P) – 4.0 l/ha; V_8 – Pledge 50 WP (flumioxazin 50%) – 0.12 kg/ha + Gramin 5 EC (quizalofop-P-etil 50 g/l) - 1,5 l/ha; V_9 – Pulsar Plus (imazamox 25 g/l) – 1.5 l/ha + Gramin 5 EC (quizalofop-P-etil 50 g/l) – 1.5 l/ha; V_{10} - Wing P (250 g/l pendimetalin + 212.5 g/l dimetenamid-P) – 4.0 l/ha+Gramin 5 EC (quizalofop-P-etil 50 g/l) - 1.5 l/ha.

RESULTS AND DISCUSSION

In 2017, the initial weeding was 211.0 plants/m^2. The annual monocots *Setaria viridis* and *Echinochloa crus-galli* shared 17.27% and 15.77%, respectively, of the weeds, followed by the annual dicots *Ambrosia elatior* (13.47%), *Hibiscus trionum* (12.56%), *Amaranthus retroflexus* (10.83%), *Chenopodium album* (9.99%), etc. Perennial dicots shared less, being represented only by two species: *Convolvulus arvensis* (1.10%) and *Cirsium arvense* (0.55%). *Sorghum halepense*, a perennial monocot, was represented by 7.15 plants/m^2, representing a real danger to the sunflower crop (Fig. 1).

The best efficacy, in 2017, of the control of segetal species (92.15%) was registered in the V_9 variant, in which the post emergent Pulsar Plus was applied early during vegetation and Gramin 5 EC was applied during vegetation. Very close results (89.47%) were recorded in the V_{10} variant – Wing P + Gramin 5 EC. The Pulsar Plus product, even in the V_4 variant in which it applied itself, due to the wide spectrum of species controlled, had good efficacy (86.70%). Among the self-applied preemergent herbicides, Tender, Wing P and Successor Tx ensured good weed control (75.93-82.12%). In V_3 variant – Pledge 50 WP, because the weed grasses were not

affected, the control had unsatisfactory values (64.57%), but considerably improved (85.66%), due to the addition, during vegetation, of the product Gramin 5 EC (Tab. 1).

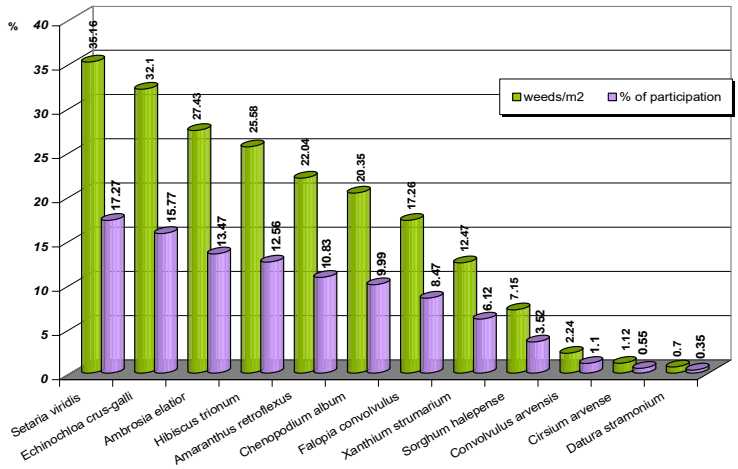

Fig. 1. Initial weeding of sunflower crop in 2017

Table 1

Controlling segetal species in sunflower crop, in 2017

Variants	Weeds/m^2	Weed control (%)	Diference	Meaning
V_9 – Pulsar Plus +Gramin 5 EC	16.56	92.15	-194.44	000
V_{10} - Wing P + Gramin 5 EC	22.22	89.47	-188.78	000
V_4 – Pulsar Plus	28.06	86.70	-182.94	000
V_8 – Pledge50WP+Gramin5EC	30.26	85.66	-180.74	000
V_5 – Successor Tx	37.73	82.12	-173.27	000
V_7 - Wing P	39.12	81.46	-171.88	000
V_6 – Tender	50.79	75.93	-160.21	000
V_3 – Pledge 50 WP	74.76	64.57	-136.27	000
V_2 – Gramin 5 EC	118.54	43.82	- 92.46	000
V_1 – neerbicidat	211.00	0.00	Control	-

$DL_{5\%}$ = 4.87 weed./m^2 $DL_{1\%}$ = 7.45 weed./m^2 $DL_{0.1\%}$ = 9.36 weed./m^2

As a principle, the best production results were achieved in the variants in which the weeds were most efficiently controlled. Thus, the largest sunflower production in ha, in 2017, was obtained on the V_9 version – Pulsar Plus + Gramin 5 EC (29.16 q/ha), the difference of 4.29 q/ha compared to the field average being very significantly positive. Good crops, over 28 q/ha, were recorded in V_{10} variant – Wing P + Gramin 5 EC and V_8 variant – Pledge 50 WP + Gramin 5 EC, with distinctly positive differences from the field average (Fig. 2).

The unilateral application of the Pulsar Plus product (1.5 l/ha) or Wing P (4.0 l/ha) resulted in significant production increases exceeding 2 q/ha. Both the average of the field of 24.87 q/ha and the production from the control variant (8.12 q/ha) were largely influenced by the climate conditions of 2017 (Fig. 2).

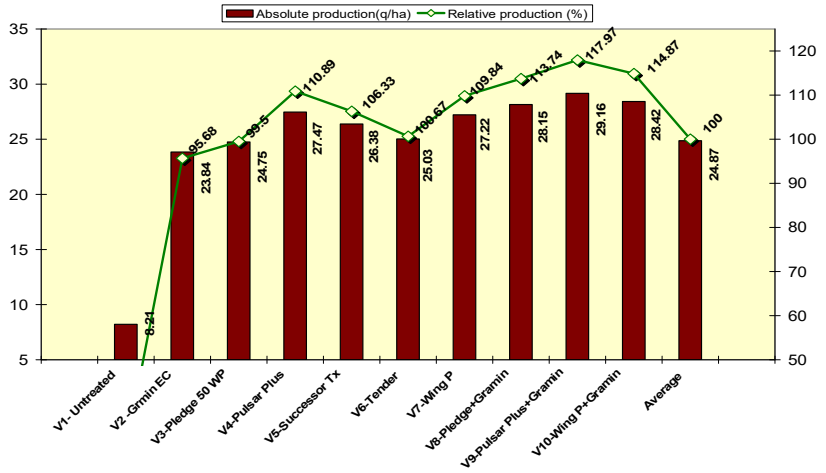

Fig. 2. Sunflower productions obtained in the year 2017

In 2018, the number of weeds in the control variant was 183 plants/m^2. Among them, 34.29 plants/m^2 and 24.56 plants/m^2, respectively, were annual monocots *Echinochloa crus-galli* and *Setaria viridis*. The most significant share was that of annual dicots *Amaranthus retroflexus*, *Chenopodium album*, *Ambrosia elatior*, *Hibiscus trionum*, *Datura stramonium*, *Falopia convolvulus*, *Xanthium strumarium* etc. Perennial dicots were represented by two species, *Cirsium arvense* and *Convolvulus arvensis*; these weed species, although they had a relatively low share of the general weeding (7.73%), together with perennial monocot *Sorghum halepense*, were a notable competition for the sunflower crop, difficult to control (Fig. 3).

The degree of weed control had values ranging from 45.16% to 89.23%. the best efficacy in controlling segetal species (89.23%) was registered in the V_9 variant, in which the post emergent Pulsar Plus was applied early during vegetation and Gramin 5 EC was applied during vegetation. Very close results (88.21%) were recorded in the V_{10} variant – Wing P + Gramin 5 EC (Tab. 2).

The largest sunflower productions, in 2018, were obtained in the 3 variants in which combinations of two herbicides were applied (V_9, V_8 and V_{10}). In 2018, both the average field of 22.77 q/ha and the production of the control variant (8.95 q/ha) were largely influenced by the climate conditions of the year (Fig. 4).

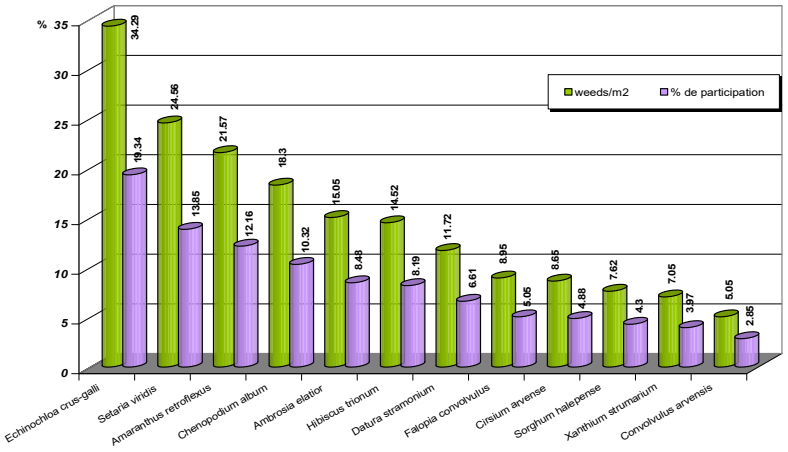

Fig. 3. Initial weeding of sunflower crop, in 2018

Table 2

Controlling segetal species in sunflower crop, in 2018

Variants	Weeds/m^2	Weed control (%)	Diference	Meaning
V_9 – Pulsar Plus +Gramin 5 EC	19.86	89.15	-163.14	000
V_{10} - Wing P + Gramin 5 EC	21.58	88.21	-164.42	000
V_4 – Pulsar Plus	26.12	85.73	-156.89	000
V_8 – Pledge50WP+Gramin5EC	27.41	85.02	-155.58	000
V_5 – Successor Tx	31.95	82.54	-151.05	000
V_7 - Wing P	41.63	77.25	-141.37	000
V_6 – Tender	52.50	71.31	-130.50	000
V_3 – Pledge 50 WP	57.10	68.80	-125.90	000
V_2 – Gramin 5 EC	100.36	45.16	- 82.64	000
V_1 – neerbicidat	211.00	0.00	Control	-

DL $_{5\%}$ = 6.23 weed./m^2 DL $_{1\%}$ = 9.85 weed./m^2 DL$_{0.1\%}$ = 12.87 weed./m^2

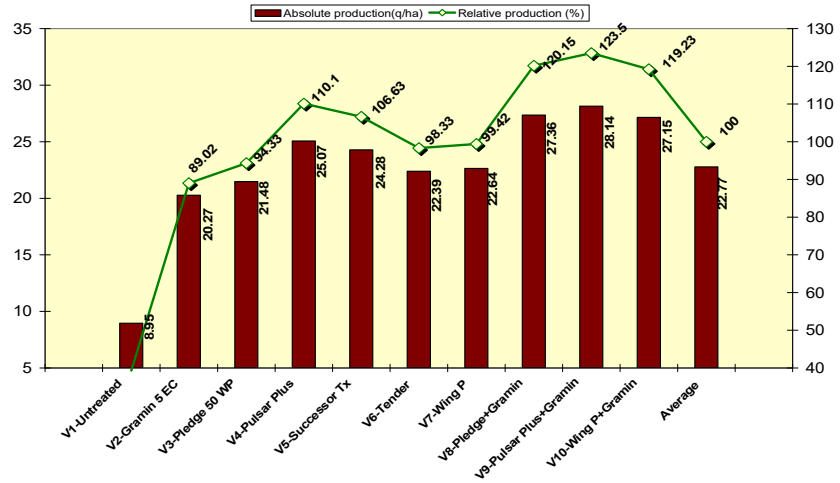

Fig. 4. Sunflower productions obtained in the year 2018

CONCLUSIONS

- Initial weeding was 211.0 plants/m^2 in 2017 and 183.0 plants/m^2 in the following year. The annual grasses *Setaria viridis* and *Echinochloa crus-galli* shared a cumulated percentage of over 30%, but overall, the dominant ones were seven annual dicot species;
- The three species of perennial weeds were identified: *Convolvulus arvensis*, *Cirsium arvense* and *Sorghum halepense*; although they had a relatively low share, they were present in a number large enough to cause considerable damage;
- The best efficacy in controlling segetal species in the two years (92.15% and 89.23%, respectively) was registered in the V_9 variant, in which the post emergent Pulsar Plus was applied early in vegetation and Gramin 5 EC was applied during vegetation. Very close results (89.47% and 88.21%, respectively) were recorded in the V_{10} variant – Wing P Variant + Gramin 5 EC
- In 2017, in the trial, sunflower production had values ranging from 23.84 q/ha to 29.16 q/ha. The largest sunflower production was obtained in the V_9 variant – Pulsar Plus + Gramin 5 EC (29.16 q/ha), the difference of 4.29 q/ha compared to the field average being very significantly positive;
- The following year, the best production results, exceeding 27 q/ha, were obtained in the variants in which the weeds were most effectively controlled in the sunflower crop, specifically in the variants V_9, V_8 and V_{10}, variants in which a combination of two herbicides was applied;
- Both the average field and the production of the control variant were largely influenced by the climate conditions of the years.

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RESEARCH ON THE BIOREMEDIATION OF SOILS POLLUTED WITH PETROLEUM PRODUCTS FROM THE EXTRACTION AREA OF SUPLACU DE BARCAU, BIHOR COUNTY

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Abstract

The soil contamination has increasingly become a problem of the present that requires durable solutions. There are various bioremediation methods and they are more and more used for attenuating major accidents as well as for systematic contaminations. The decontamination of the soils polluted with petroleum products consists of excavating the lands and treating them ex-situ in order to reintegrate the soil in the agricultural circuit. The technology for reducing the hydrocarbon content from the waste accepted in a bioremediation station is made by applying biological treatments to stimulate the bacterial activity. A prompt and careful planning of the disposal of the waste resulted after the remediation, in accordance with the laws and regulations in force, applicable to the transportation, recycling and disposal of waste, is highly important for the successful completion of a remediation action in an efficient manner from the time and cost point of view. The remediation objectives are derived from the present legal/regulatory requirements and they must be feasible from a technical and economic point of view and they should be realised within a definite time range. The lands polluted with petroleum products from Suplacu de Barcau area are treated in a bioremediation station from that area.

Key words: contaminated site, petroleum product, bioremediation, ex-situ, human health, environmental factors, pollutants, soil decontamination, waste disposal, biological treatments, legislation.

INTRODUCTION

The European Union policies in fields such as agriculture, water, waste, chemical substances and industrial pollution prevention contribute indirectly to soil protection.

The problems related to soil degradation must be solved beyond the degraded areas, and this fact implies high costs. These areas can extended across borders, generating macro-implications when it comes to adopting a specific legislation on environmental protection, especially in the soil - subsoil field.

According to the commitments of Romania towards the European Commission, all the necessary measures must be taken for the protection of human and environmental health against the effects of soil contamination, through the regulation of the measures dedicated to the quality of the environmental factors affected by the confirmed presence of pollutants at levels that represent a significant risk for human and environmental health, taking into account the present and the future use of lands.

The oil extraction industry from the Suplacu de Barcau area has been developing since 1959, when, in the drilling performed for groundwater exploitation, it was noticed that there is asphalt oil field at relatively small depths (200-300m). In 1961 begins the exploitation of the mineral resource through drilled and closed wells, by free eruption. The transport is carried out with tank cars to the bitumen extraction station from Derna. After the extraction of large quantities of crude oil, the area has been developing as there are implemented tank batteries, the Suplac refinery, waste storage facilities, bioremediation stations and various related activities.

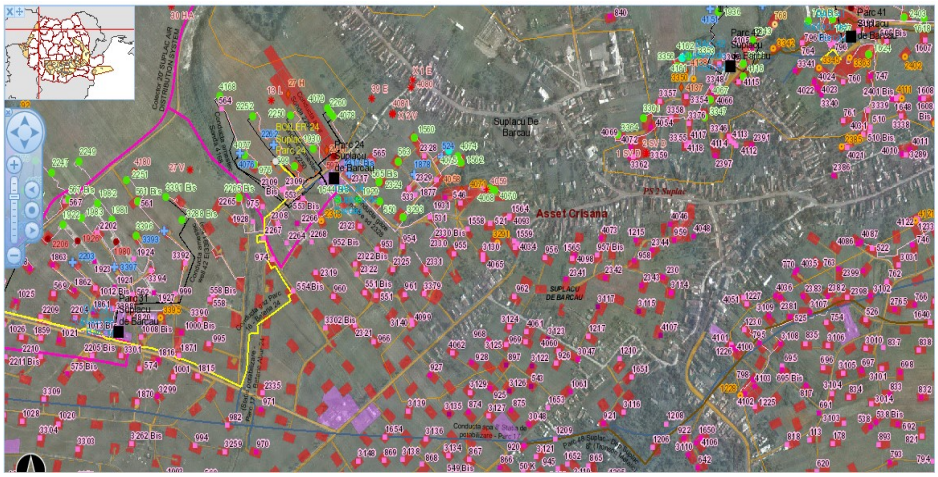

Fig.1. The situation of the polluted lands from the oil exploitation area of Suplacu de Barcau. (OMV Petrom, 2018)

Due to political, economic and environmental changes, the crude oil extraction activity undergoes certain organisation modifications. With Romania's participation in the agreements with the other European and non-European states, Petrom Romania SA has been privatized, the majority of shares being taken by OMV Austria. Following this contract and the environmental international legal requirements, it is obliged to carry out the bioremediation of the lands polluted with petroleum products. The lands polluted with petroleum products are registered based on the exploitation

record and whether there were effects on the environmental factors: surface water, groundwater, soil pollution, subsoil pollution, vegetation, etc.

In Bihor county, there are 17 contaminated sites and 67 potentially contaminated sites, registered until now. In the last 5 years, over 50 sites have been remedied, occupying an area of 29.130 sq m, as well as the areas of the three facilities for storing the derived petroleum products resulted from the storage facilities of Salonta, Beius and Vascau. The quantity of soil contaminated and subject to bioremediation occupied 4,171.3 m^3.

The concentration level of the pollutants in soil are regulated in the national legislation by Order 756/1997 on the assessment of environmental pollution.

Table 1

The reference values for (TPH) according to Order 756/1997 of MAPPM (Romanian Ministry of Environment, Water and Forests) expressed in mg/kg DM

Traces of pollutant	Normal values	Alert thresholds/ Types of use		Intervention thresholds/ Types of use	
		Sensitive	Less sensitive	Sensitive	Less sensitive
1	2	3	4	5	6
Total Petroleum Hydrocarbons (TPH)	<100	200	1000	500	2000

Based on the classification of the land into types of use, according to the urban planning of the locality, they are classified in conformity with Ord. 756/1997, according to article 8:

a) the sensitive land use represents the use of the land for residential and recreational areas, for agricultural purposes, as protected areas or as sanitary areas with restriction regime, as well as the land areas provided for such future use;

b) the less sensitive land use includes all the current industrial and commercial uses, as well as the land areas provided for such future use;

c) if there are doubts on how to classify a land use, the alert and intervention thresholds for the sensitive land use will be considered.

The method of intervention and transportation of the contaminated soil to the bioremediation stations is established according to the results of the laboratory analyses regarding the values of the TPH indicator in the samples collected from the contaminated sites. The remediation of contaminated sites is one of the main components of a sustainable development of the communities on any administrative level. It can form the basis for improving the environmental conditions, the social cohesion and the economic growth.

Fig. 2. The excavation of the soil contaminated with petroleum residue from the perimeter of the Suplacul de Barcau locality

The soils contaminated with petroleum products, accepted at the bioremediation station, undergo various processes in order to reduce the concentration of TPH below the threshold stipulated in the legislation. The 9% average concentration is accepted as result from the waste with TPH content between 0.3% and 15%. By applying biological treatments, the bacterial activity (existing in the soil) is stimulated, which can reduce significantly the content of hydrocarbons from the waste accepted at the bioremdiation station.

The stages of the remediation process consist in:

- Reception and weighing of the contaminated soil
- Initial sample collection in view of analysing the content of TPH
- Sorting and sifting
- Homogenisation
- Selection of necessary nutrients
- Addition of biological material (straw, sawdust, manure, etc.)

The optimal bioremediation parameters are:

- Soil pH – in order to facilitate the bacterial growth, the pH must be comprised between 6 and 8 %, the optimal values being around 7.
- Humidity – the optimal recommended soil moisture is between 40-85% of the water retention capacity (field capacity). The micro-organisms from soil need water for proper growth.
- Soil temperature – influences the bacteria growth speed. The optimum temperature for the microbial activity of most of the bacteria important for the biodegradation of petroleum hydrocarbons is between 10 and 45^0C.
- Concentration of nutrients – the micro-organisms require inorganic nutrients, nitrogen, phosphorus and potassium (N, P, K) in order to grow

and achieve the biodegradation process. Most soils contain nitrogen between 0.2-0.3%, phosphorus between 0.03 and 0.24%, and potassium between 100-300 mg/kg, the latter having the role of activating certain enzymes that catalyse the protein synthesis.

- Micro-elements – copper, manganese, cobalt, zinc, selenium, wolfram and molybdenum have a very important role for the micro-organism.

- Salinity - the assessment of the biodegradation feasibility is obtained by measuring the electrical conductivity µS/m. The biological activity is carried out under normal conditions up to values of electrical conductivity of 4000 µS / cm.

- Oxygen – plays an essential role in the metabolism of aerobic bacteria. The increase of the oxygen quantity can be obtained by aeration, realised through agricultural work, addition of soil aeration agents (straw, sawdust, hay).

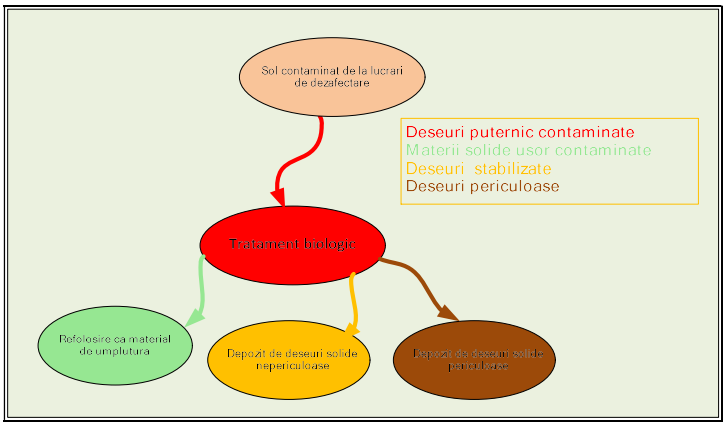

Fig. 3. Contaminated soil waste management scheme (OMV Petrom, 2014)

MATERIAL AND METHOD

With in the bioremediation station at Suplacul de Barcau, a series of stages are carried out, which involve preparing the contaminated soil, arranging the sorted material into mounds of about 200-100 tons with a width of 3m and a height of about 1.6 m.

RESULTS AND DISCUSSION

The soil will be turned over with a Bachus 15:50 aeration equipment and moistened to ensure the optimum humidity, and also the supply of

possible nutrient supplements. The mechanical aeration takes place once a week.

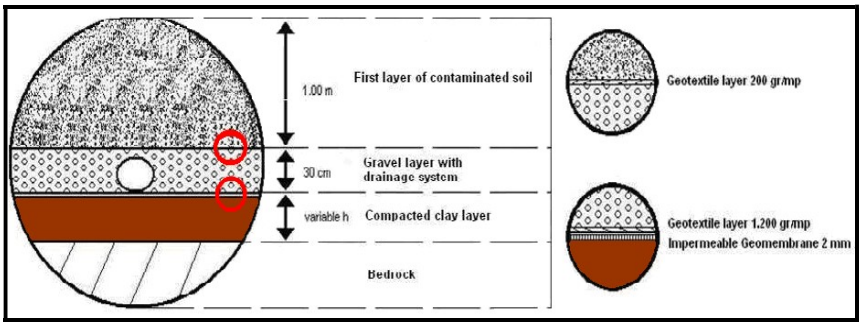

Fig. 4. Plan view of the waste distribution on the storage platform (according to OMV, Petrom, 2014).

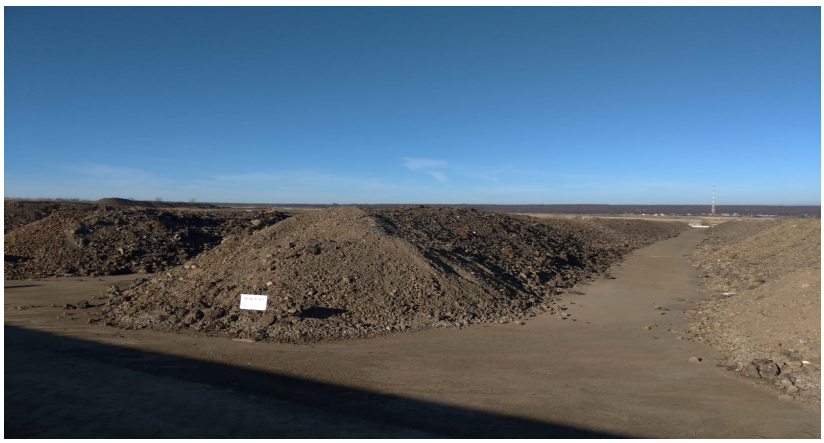

Fig. 5. Aspects regarding the bioremediation of the soil polluted with petroleum products at Suplacu de Barcau

The biological materials used in the bioremediation process are the sawdust, hay and straw with aeration role. The nutrients are applied as follows: 0.250 kg for each m3 of soil. After approximately 2 months, a mixture of NPK in a proportion of 5 kg/1 ton is added, after another 4 months, depending on the results and on the progress regarding the rate of hydrocarbon degradation, it will be decided whether the soil subject to bioremediation needs further treatment for the material to reach an acceptable level in order to be used as a filler soil (its TPH concentration should be below the 2000 mg/kg threshold according to Order 756/1997). If the soil can no longer be treated to the extent required by the law, it will be stored in a storage facility of non-dangerous or dangerous products.

CONCLUSIONS

In the process of bioremediation within the exploitation perimeter of Suplacu de Barcau, a series of stages are carried out, which involve:

- storing the soil contaminated with petroleum products resulted from the oil exploitation activity from Suplacul de Barcau; the solution of a waterproofing platform was chosen, which would ensure the insulation against the site soil, of the stored product, in any environmental conditions, and the monitoring of the waterproofing degree

- the amount of nutrients potentially required for the bioremediation process can be established only based on actual measurements in the field, without a predetermined recipe, the key element in the biodegradation process being the balance of the C: N: P ratio, which also depends on the natural content of nutrients in the soil.

- the bioremediation process itself is a simple process and it consists of arranging the material into mounds on the bioremediation platform, maintaining an optimum humidity and mechanically mixing/re-mixing it with aeration material (straw, sawdust, manure, etc.) in order to provide the necessary oxygen supply.

- biodegradation is a natural phenomenon, because soil, subsoil and groundwater represent the normal living environment for many micro-organisms (bacteria, fungi), which exert a biodegrading action on organic pollutants. The effectiveness of bioremediation depends on the presence of suitable microbial populations, on how they can be grown and maintained in the environment.

The creation of the Suplac bioremediation station lead to finding ways of recovery, treatment and storage of the waste resulted from the activities of extraction and primary separation of crude oil, from the activities of decommissioning certain wells and other related activities.

Through bioremediation stations, the soil is bioremedied and it can be used for different agricultural purposes.

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USE OF RENEWABLE ENERGY SOURCES IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

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Abstract

Currently, the most debated issues globally are those related to the sustainable development of society, to the depletion of natural resources caused by the production of electricity and heat, to environmental pollution and, last but not least, energy wastes. Research into the use of renewable energies has emerged in response to these issues that bring to the forefront the use of alternative sources of energy such as solar, aeolian, geothermal, etc., also called green energy. As Romania is one of the most polluted countries in Europe because of energy production through the use of coal, green energy becomes a real necessity in producing energy in our country. In this context the authors of the paper present the alternative energy resources that can be exploited at national level in order to produce clean energy.

Key words: sustainable development, energy, pollution, alternative sources

INTRODUCTION

The concept of sustainable development or sustainable development of society has been clarified in particular in recent years, as part of international scientific events designed to identify solutions to the economic, social and environmental problems of the present and future, and the countries of the world have addressed this concept in the context of globalisation. (*Strategia Naţională pentru Dezvoltare Durabilă a României*)

The concept of sustainable development emerged after the second half of the 20th century and was clearly defined in 1987, in the report called "*Our Common Future*" or "*Brundtland Report*" prepared by the World Committee on the Environment and Development.

In this report, sustainable development was defined as the development of society aimed at "*Satisfying current needs, without jeopardising the capacity of future generations to satisfy their own needs*."

The Brundtland Commission also emphasised the existence of two major topics related to sustainable development, namely:

- The development of society must be of a fair nature and including, by increasing the standard of living of all citizens;
- The development of society can only be achieved by protecting the environment from the adverse effects of pollution, preserving ecological balance and rational use of natural resources. (Otiman et al., 2006)

Sustainable development, in this context, aims at merging three essential dimensions: ecological, economic, and social, as well as the establishment of a ratio between the three dimensions. (Coşea & Dunărinţu, 2013)

The EU is among the main supporters of the process of extending the application of the principles and practices of sustainable development globally, of the reduction of poverty, economic, and social disparities, and of the promotion of policies responsible for the conservation and rational use of the planet's natural resources. (Mateoc-Sîrb & Mănescu, 2012)

The Financial Perspective 2014-2020 focuses on the principles of sustainable development with specific targets such as improving environmental conditions (measures to combat soil degradation and protection of flood-prone areas, to maintain plantations at a sufficient and sustainable level, to support disadvantaged areas, to improve the quality of the landscape), enhancing the competitiveness of certain sectors with environmental impact (use of renewable energy sources, improving water, waste, manure, fertilisers, pesticides, and herbicides management), improving the quality of life in rural areas (increasing incomes from agricultural, forestry and fisheries activities, expanding services and public utilities, diversifying of non-agricultural activities and entrepreneurial spirit). (*Strategia Naţională pentru Dezvoltare Durabilă a României*)

MATERIAL AND METHOD

One of the methods used to prepare raw analysis material was to document the official databases provided by the National Institute of Statistics (*INS-Tempo Online*), the Statistical Yearbook of Romania – data collections published by EUROSTAT, as well as different publications or complementary information taken from the Internet.

RESULTS AND DISCUSSION

Increasing global demand for energy as a result of economic development, the gradual depletion of fossil fuel resources, the increase in gas emissions, and the unforeseeable oil price fluctuation have led to research into finding existing renewable energy resources around the globe.

Studies on the production of conventional energy highlight that this process can become an important source of environmental pollution. Through the combustion process occurring in the production of conventional energy are generated toxic pollutants in the atmosphere, with harmful effects both on the environment and on human health. Studies conducted by many NGOs campaigning for environmental protection have revealed that tens of thousands of Europeans are suffering from air pollution, with numerous cases of acute and serious respiratory diseases.

Protecting the environment from pollution caused by energy production, as well as promoting measures limiting the consumption of non-renewable natural resources, intervene as an obligation for the present society for future generations. (Otiman et al., 2011)

Romania's energy strategy 2019-2030 with the prospect of 2050 is an important document in terms of environmental protection in Romania, which draws the direction of our country's energy field for the future, having as its *main objective, ensuring clean energy and energy efficiency for consumers, thereby contributing to ensuring energy security, sustainable economic growth, improving the quality of life of citizens, all of which represent the components of the sustainable development process of Romanian society*. At the same time, particular attention is also given to the renewable energy sector, our country having real potential in the production of renewable energies, known to be environmentally friendly.

Romania aims at increasing its energy efficiency by putting particular emphasis on the exploitation of renewable energy sources, which can contribute to reducing the energy dependence of our country on imports, to limiting adverse effects on the environment and, last but not least, to increasing the supply of food to the population as a result of the use of renewable sources in agriculture such as geothermal waters which are in abundance in the western area of Romania.

The problem of alternative sources of energy is not a novelty of the last few years, when their use has been made more acute only because of the requirements of the European Union, but also the need to reduce sources of environmental pollution due mainly to residues resulting from the combustion of fuels, derived from fossil hydrocarbons (petroleum, natural gas). As far as the alternative energy resources to fossil sources is concerned, which can be used mainly in rural areas, but not only, currently the most used forms of renewable energy that can be utilised are:

- Wind power (of air currents and winds);
- Solar energy (light and heat);
- Biomass energy (plants, which store, during their growth and development, large amounts of energy);
- Geothermal energy;
- Hydraulic energy. (Cristina et al., 2015)

Wind energy is obtained with wind, a form of renewable energy known for a long time and with a strong development in the field of renewable energy. This form of energy can be used in non-electrified areas in parallel with energy storage systems.

Wind energy is known and used since the beginning of humanity, as a means of propulsion on water for various boats, and later as energy for windmills. The documents record that windmills were used from the 7th

century BC, by the Persians for grinding grain. European windmills were constructed since the 20th century in England and France, being used both for grinding grains and cutting logs, shredding tobacco, making paper, pressing linseed for oil and stone grinding for paints, etc., and evolved up to the modern wind turbines that turn wind energy into electricity producing between 50-60 KW (the smallest wind turbines) to 500-1500 KW (the large ones).

At the end of 2010, the global capacity of wind generators ensured 2.5% of world energy consumption. In 2011, the share of wind energy of the total domestic consumption was 24% in Denmark, 14% in Spain and Portugal, about 10% in Ireland and Germany, and 5.3% at EU level. In Romania, the share was 3% at the beginning of 2012, and there were over a thousand wind turbines, half of which were located in Dobrogea. Currently, Europe's largest terrestrial wind park is located in Scotland, Whitelee Wind Park.

Solar energy is the energy from the sun, being an important source of renewable energy available for everybody. The life span of the solar body is five billion years, according to our scale of time, the sun representing an inexhaustible, renewable energy.

"*It is said that solar energy is the safest source of energy. The availability of solar energy depends on the day-night cycle, on the latitude where it is captured, on the season and on the degree of clouding*". (Daniel, 2009)

Solar energy can be used for heating water or rooms (housing, greenhouses in aquaculture, etc.) by producing electricity using solar cells (photovoltaic) through solar thermal plants (solar power plants) by heating directly or using heat pumps or with the help of thermal solar panels. (David *et al*., 2016)

Germany is the country with the largest production and market of solar energy in the world, followed by South Korea, France. Spain, Italy, and Greece.

Biomass and biogas energy are the energy that field specialists say has a safe future. Biomass is the main fuel mainly used in rural areas. In the context of sustainable development, biomass is a renewable energy, which supplies biofuels, generally in solid form, but that can also be easily transformed into liquid or gaseous fuels. Biomass is the biodegradable part of plants, waste and residues from agriculture, forestry or industry-related sectors, including plant and animal materials or industrial and urban waste. For example, ***biogas*** with a concentration of 60% methane and which can be produced from waste or manure can provide electricity for lighting or cooking. (Mateoc-Sîrb et al., 2013)

France, Finland and Germany have designed important units producing biomass-based energy. In France, 15% of final electricity consumption is ensured by consumption of biomass and biogas (obtained from organic, domestic or non-recyclable waste.

Geothermal energy is a form of energy obtained from the heat inside the earth. Hot water and steam captured in areas with volcanic and tectonic activity are used for heating water, housing, for the production of electricity, heating of greenhouses and solaria, pasteurization of milk, etc., most often in rural areas provided that the distance from the place of extraction of hot water does not exceed 35 km.

The use of geothermal energy where possible reduces the consumption of fossil fuels considerably and an important point to remember is that geothermal systems can function continuously without being affected by climate conditions. (Daniel, 2009)

The Pannonian Depression, which, in Romania, includes Banat and western Apuseni Mountains, is rich in geothermal deposits. The counties of Timiş, Arad and Bihor have the most localities that could benefit from the existence of these resources in the area. In Timisoara, there is thermal water up to 80^0C. (David et al., 2017)

Hydraulic or water energy is the energy that can be obtained in micro-hydropower plants, especially in areas where other forms of energy cannot be used, such as mountain areas, but the flow of rivers on which they are placed is to be taken into account as they can cause significant damage in the biodiversity of the areas.

At global level, wind energy, water energy, geothermal energy or biomass are used to produce electricity and supply it to national energy networks. Table 1 summarises the sources and forms of energy used to produce electricity for supply in national energy networks.

Table 1

Energy sources and forms for the production of electricity

Energy Form	Energy Source	Capacity	Great Producers
Wind energy	Kinetic wind energy	300 kWel…5 MWel	USA, Germany, Spain, India, etc.
Water energy	Kinetic water energy	5 GWel – rivers 1 MWel – small ones	Canada, Austria, Scandinavia, etc.
Deep geothermal energy	High temperature water or vapour	20…50 Mwel	Philippines, Kenya, Costa Rica, Iceland, USA, etc.
Biomass energy	Wood, agricultural crops, vegetable mass	100 kWel…50 MWel.	Switzerland, Germany, Scandinavia, etc.
Solar energy	Direct or diffuse solar radiation	1 kWel…a few MWel	Germany, Japan, Luxembourg, etc.

Source: After Clima Therm Center, Energii regenerabile

The beneficial effect of renewable energies is manifested in the protection of the environment, but also in economic and social terms. The

main objectives pursued by promoting renewable energies are: increasing air quality, energy security, and increasing employment and developing the business environment. Reducing energy dependence is perhaps the most important aspect of renewable energies, which is why we believe that exploiting these types of resources must be promoted and financially supported.

CONCLUSIONS

- The World Bank defines sustainable development as a process of "*economic growth, poverty eradication and healthy environmental management*";
- The concept of sustainable development defines a certain type of economic growth and human activity that brings together environmental considerations and the principles of progressive allocations and uses of resources, largely renewable, to achieve rational development;
- In economic growth, account must be taken of a number of ecological concepts with temporary connotations, such as uncertainty, deterioration threshold, degree of exhaustion, irreversibility, stability, shock resistance of the environment, etc., conditions in which the environment is a key factor in sustainable development;
- Sustainable development is a lasting phenomenon consisting of changes that must enable economic development while maintaining the quality of the environment at an appropriate level. This concept requires that natural resources be used in such a way that they do not exhaust or degrade, and are not affected by their use for future generations;
- In the current conditions of the economy, it is necessary to find an optimal ratio between agricultural technologies and between productions and ecology, ensuring the balanced economic and social development of rural area by:

- Satisfying food and social requirements;Improving the quality of the environment and the sustainable exploitation of natural resources;Using with optimum and sustainable efficacy scarce, non-renewable resources; Improving the quality of rural life.

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POPULATIONAL REDUCTION OF *AMBROSIA ARTEMISIIFOLIA* SPECIES FROM SOYBEAN CROP

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Abstract

Ambrosia artemisiifolia is an annual herbaceous weed within the Asteraceae family, native to North America.

In recent years, this species is increasingly present in Romanian crops (corn, sunflower, soybean, sugar beet), causing significant damage by decreasing the quantity and quality of production as well as by decreasing harvesting efficiency. A study by Coble et al. (1981) revealed that Ambrosia artemisiifolia, at a density of 4 plants per 10 m, reduced production of Glycine up to 8%. Similarly, Shurtleff and Coble (1985) reported that at a density of 1.6 plants / m^2, Ambrosia artemisiifolia caused a decrease in soybean production up to 12%. The damage caused by the common ragweed is numerous and continues to grow with along to its spreading into crops. Ambrosia artemisiifolia is a very competitive towards to soybean plants.

There are postermergent herbicides which control Ambrosia artemisiifolia in soybeans, but the weed's reaction can be altered if they are applied in mixture or with adjuvants that can influence the degree of control. This study aimed to assess the efficacy of herbicides in the population reduction of Ambrosia artemisiifolia from soybean culture. The research was carried out in 2018, near Folea, Timis county. The experience included 5 variants / replicates. The substances used in the control of the species were: 480 g/l bentazone + 22.4 g/l imazamox, 40 g/l imazamox, bentazone 480 g/l, 50% thifensulfuron-methyl. After application of herbicides, observations were made regarding their efficacy Ambrosia artemisiifolia population reduction and at the end of the vegetation period the yield was determined. Applied herbicides had an efficacy in population reduction of Ambrosia artemisiifolia, ranging between 71.5-93.25%. The population of Ambrosia artemisiifolia was significantly reduced in the variants treated with 480 g/l bentazone. The lowest control of this invasive species was achieved in the variant treated with 50% methyl thifensulfuron. Soybean yield correlated with the degree of control and had values ranging from 1550 kg/ha to 3159.67 kg/ha.

Key words: reduction, population, Ambrosia artemisiifolia, herbicide

INTRODUCTION

Soy was credited alongside barley, wheat, millet Holy plant (b. Zamfirescu, 1965, cited by Manea, 2006). The oldest reference to soy given Shows From the year 2838 B.C, written by Chinese Emperor Sheng-Nung. It grew mainly in China, spread to other countries in Asia, happened at the end of the 19th century. In Europe, although it was brought in the middle of the 18th century, its cultivation on smallarea only begins at the end of the 19th century, following the Vienna Agricultural exhibition in the year 1873.

In Romania, first attempts to introduce the culture of the soybean, dates since 1911 – 1913, failed due to the tardivity of the varieties. In the

year 1931 they oververetaken experimentations using earlier varieties with satifying results.

Soy is considered a valuable culture, being useful for human nutrition, animal nutrition and industry. It is also a vegetable that contributes substantially to increasing the fertility of the soil, but can be the main raw material for obtaining bio-diesel (USA and Brazil) (Rusu, 2018).

Soy, being a small-middle-waist plant, is easily competed by weeds, which produce large production losses (30-80%), sometimes even compromising culture (Rusu, 2016). It is a sensitive culture to weeding, the critical period being in the early stages of growth. The most common weeds encountered in soy culture are those with late spring germination (classification by biological criterion).

In the last ten years, in the western part of Romania, the invasive species *Ambrosia artemisiifolia* is increasingly common in soybean culture.

Ambrosia artemisiifolia L. is an annual weed, which belongs to the *Asteracea* family and is native to North America (Dickerson and Sweet, 1971; Coble et al., 1981). This weed has spread being present on and other continents: Asia, Australia and Europe (Ştef, 2017).

In Europe, it was introduced for the first time in the 19th century (Brandes and Nitzsche, 2007). Expanding species *Ambrosia artemisiifolia* it has been delayed, but since the mid-twentieth century it has become a harmful species in several Eastern European countries and Central Europe (Chauvel et al. 2006; Brandes and Nitzsche 2007; Dullinger et al. 2009; Smolik et al., 2010; Richter et al., 2012).

Studies conducted so far show that *Ambosia artemisiifolia* is an invasive species with a negative impact on agriculture, human health and biodiversity. (Brandes and Nitzsche 2007; Essl, Dullinger and Kleinbauer 2009; Vilà et al., 2010; Ziska et al. 2011; Bullock et al., 2012).

The main problem of this plant is the production of pollen with a strong allergen character, which generates huge medical costs and a reduced quality of life among the allergic population (Fumanal et al., 2007), a single plant can produce, on average, approximately 1 billion pollen grains (Fumanal, Chauvel and Bretagnolle 2007).

Ambrosia artemisiifolia it has also became a major weed in European agriculture, especially in spring-drilled crops such as sunflower, maize, sugar beet and soybeans (Ştef, 2017).

Ambrosia artemisiifolia successfully competes crop plants in respect to light, water and nutrient substances in the soil, producing direct losses. Competitiveness is also given by morphological characters being a plant that can grow to 2 m in height (Bassett and Crompton, 1975; Clewis and Colab., 2001), producing even 62 000 seeds (Dickerson and Sweet, 1971) that can remain viable in the soil for 39 years (Bassett and Crompton, 1975).

Coble et. al. (1981) reported that four plants of *Ambrosia artemisiifolia* to 10 m^{-1} reduced soy yield by 8%. Similarly, Shurtleff and Coble (1985) and Weaver (2001) reported that 1.6 plant *Ambrosia artemisiifolia/*m^{-1} reduced soy yield by 12 and 11% respectively.

It is clear from the foregoing that the need to combat species *Ambrosia artemisiifolia*, both agro-ecosystems and ecosystems.

Research carried out by Byker H. et al., 2018 showed that by applying preemergence herbicide (PP) (2.4-D, saflufenacil/dimetenamid-P, linuron and metribuzin) reduced the population density of *Ambrosia artemisiifolia* from soy culture of 82% - 94% and 55%, respectively - 89%. They (Byker H. et. al., 2018) notes that the eradication of the species can reach 97% - 99% and 93% - 98%, respectively, if a PP herbicide followed by fomesafen applied as post emergence is applied.

Metribuzin applied to 824 and 1015 g.a.i. $ha^{(-1)}$ controlled *Ambrosia artemisiifolia* 90% to 4 and 8 weeks respectively after application.

Prosulphuron, clopyralid, mesotrione controls *Ambrosia artemisiifolia* from the corn crop in the proportion 90% (Hodişan N., 2008).

Chemical control of the species *Ambrosia artemisiifolia* became more difficult because its populations developed resistance to ALS inhibitors in the US in 1998, to FTA and protoxinhibitors in the state of Delaware in 2005 (Béres et. al., 2006).

Studies in Soy GR (glyphosate-resistant) showed that 37 species of weeds became resistant to glyphosate (Heap, 2017), among them being mentioned and *Ambrosia artemisiifolia* (Béres and colab., 2005; Ganie and Jhala, 2017).

In Romania, chemical control methods have not been developed sufficiently to eradicate *A. artemisiifolia* from soy culture. Therefore, the work aims at testing postemergent applied herbicides in reducing the population of *Ambrosia artemisiifolia.*

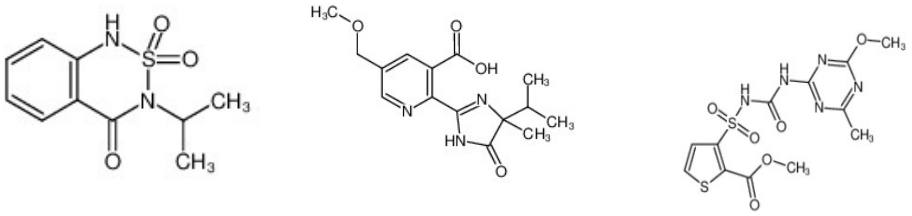
MATERIAL AND METHOD

Trial, reducing the population of *Ambrosia artemisiifolia*from the soybean culture, it was placed in Folea, a distance of 73 km from the municipality of Timisoara, Timiş County.

Soy was drilled on April 23, 2018, at a density of 55 gg (germinable grains)/m^2. The experiment was conducted using the randomized blocks method with 5 treatments in four repetitions. The plot was L/W-10 m/3.0 m. In reducing the population of the common ragweed, four herbicides were applied: Corum (applied with the adjuvant DASH-HC), Listego, Basagran SL, Harmony 50 SG (applied with Trend as adjuvant).

Fig. 1. The geographical location of the experimental field

The treatments were applied POST (postemergent), when soy plants were in the BBCH stage 13-15 (leaf trifoliate) with the recommended dose of the manufacturing company. Herbicides used in the experience are part of the following chemical groups: imidazolinone, sulfonyluretics, benzothiadiazine (Figure 2). For comparison, a control that has not been treated has been included.



Bentazone Imazamox Thifensulfuron-methyl

Fig. 2. Chemical structure of active substances use in species control *Ambrosia artemisiifolia* (https://www.molbase.com/moldata/28480.html)

In the day, before of application of herbicides, the degree of weeding in each variant was established.

Following application of herbicides, observations were made on efficacy in reducing the population of *Ambrosia artemisiifolia* L. and it was determined yield obtained.

RESULTS AND DISCUSSION

In recent years, in Romania, the species *Ambrosia artemisiifolia*, it is in a continuous expansion, being increasingly common in agricultural cultures, which is also revealed in figure 3. That plays the percentage of participation in soy culture.

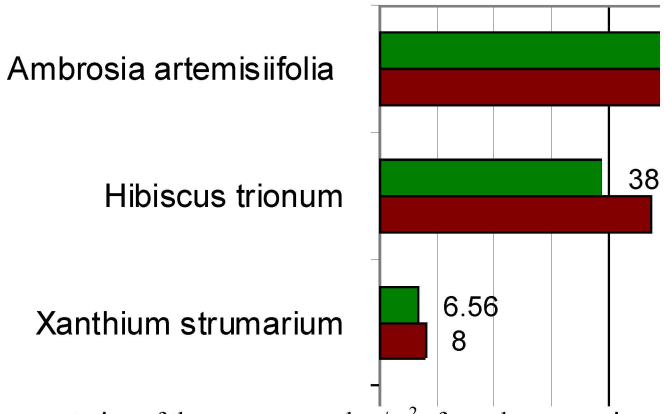


Fig. 3. Graphical representation of the average number/m^2 of weeds per species, present in the control variant (non-herbicidated)

The untreated variant presented a degree of weeding 122 plants/m^2. In the experimental variants, the present species were: *Echinochloa crus galli*, *Xanthium strumarium, Hibiscus trionum, Ambrosia artemisiifolia* (Figure 3.). It is noted that *Ambrosia artemisiifolia* showed the highest percentage of participation (50.82%). The species *Hibiscum trionum* was present in the experimental variants with a percentage of 38.80%, registering a number of 47.33 plants/m^2. The species *Echinochloa crus galli* showed the lowest percentage of participation.

From the data presented in table 1 it can be observed that by post-em application of the treatments, when the soybean plants were in the BBCH 13-15 growth stage, reductions in the degree of weeding with *Ambrosia artemisiifolia* were in the range 71.5 - 93.25%

By applying the substances imazamox s.a. 20-40 g/ha (Listego) and thifensulfuron-methyl sa6 g/ha (Harmony 50 SG), acting as inhibition of acetolactate synthase (ALS), an 85% and respectively 71.5% control of *Ambrosia artemisiifolia* species was obtained.

The results recorded by Hodişan N. et al. (2008) with Béres et al. (2005) claim that the active substance imazomax controls *Ambrosia artemisiifolia* from pea, soybean, sunflower crops if applied in optimum period (2-4 leaves) and under optimum conditions (temperature of 15-20°C and humidity).

The control of the species *Ambrosia artemisiifolia* from the plots treated with bentazone 960 g/ha increased to 93.25%. The bentazone substance reduced the common ragweed population by inhibiting photosynthesis - photosystem II.

The population of *Ambrosia artemisiifolia* was reduced by 90.5% in the plots where the herbicide Corum associated with the DASH-HC adjuvant was applied.

Table 1

The effect of herbicides on the population of *Ambrosia Artemisiifolia* present in soybean culture, 30 days after application

Herbicide/adjuvant (active ingredient)	Trade Name	Content of in a.i..	Dose		Control *A. artemisiifolia* (%)
			Commercial product	a.i.	
Untreated Control	-	-	-	-	0.0
Imazamox + Bentazone	Corum + Dash-HC	22.4 g/l 480 g/l	1.9 L/ha + adjuvant (DASH-HC)	955 g/ha	90.50***
Imazamox	Listego1.0 l/ha	40 g/l	1.0 l/ha	20-40 g/ha	85.0***
Bentazone	Basagran SL 2l	480 g/l	2.0 l/ha	960 g/ha	93.25***
Tiphensulfuron – Methyl	Harmony 50 SG 0.012 kg/ha + Trend 0.1	50%	0.012 kg/ha + 0.1% Trend 90	6 g/ha	71.50***

The studies performed by Hager, A. et al., 2015 reported a control of the species *Ambrosia artemisiifolia* of 95-97% by applying the substance bentazone 560 g/ha. Similar results were reported by Hodişan N. et al. (2015), Béres et al. (2005), Hager A. et al. (2015) regarding the effectiveness of herbicides used in the control of the species *Ambrosia artemisiifolia* from soybean culture.

The research carried out so far, highlights the importance of applying pre-plant, pre-em and post-em herbicides as well as adjuvants to increase the effectiveness of the substances in reducing the degree of weeding, of agricultural crops, with *Ambrosia artemisiifolia*

The most used active substances for post-emergence application are:

- For dicotyledonous weeds and some annual monocotiyedones: imazamox,
- For annual dicotyledonous: bentazone, thiofensulfuron-methyl;

The lowest production of soybean was obtained in the untreated control (1550 kg/ha) and in the plots treated with thifensulfuron - methyl a.i. 6 g/ha (2370 kg/ha). The application of 960 g/ha bentazone active substance brought the highest production increase (203.85 kg/ha).

Use of herbicide Corum brought a very significant production increases (194.73 kg/ha), by reducing the population of *Ambrosia artemisiifolia* up to 90%.

Table 2

Herbicide efficacy on soybean production

Herbicide/ adjuvant(active ingredient)	Trade name	Dose	Yield kg/ha	Relative yield	Absolute yield
Untreated	-		1550	100	0
Imazamox + Bentazone	Corum + Dash-HC	1.9 l/ha + adjuvant (DASH-HC)	3018.33***	194.73	1468.33
Imazamox	Listego1.0 l/ha	1.0 l/ha	2695.67***	173.91	1145.67
Bentazone	Basagran SL 2l	2.0 l/ha	3159.67***	203.85	1609.67
Thifensulfuron-methyl	Harmony 50 SG 0.012 kg/ha + Trend 0.1	0.012 kg/ha + 0.1% Trend 90	2370***	152.90	820

DL 5% = 77.57; DL 1% = 112.84; DL 0.1% = 169.25

CONCLUSIONS

The results of this study show that by post-emergence application (BBCH 13-15) herbicides (Corum + Dash-HC, Listego 1.0 l/ha, Basagran SL 2l, Harmony 50 SG 0.012 kg/ha + Trend 0.1), *Ambrosia artemisiifolia* is effectively controlled. Most herbicides tested in this study were effective, controlling 71.5% - 93.25% of the common ragweed. Soybean yields were correlated with the effectiveness of herbicides.

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THE INFLUENCE OF PLANTING DISTANCES, ON THE QUANTITY AND QUALITY OF THE PRODUCTION IN THE EGGPLANT CROP CULTIVATED IN THE FIELD

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Abstract:

Eggplants are not consumed raw, but only in various forms. Eggplants have a low energy value, but they are rich in vitamins, mineral salts, anthocyanins and other substances beneficial for health. The density of the plants in the crop, influences the quantity and the quality of the production. The research aimed at finding an optimum density that satisfies the demands of the cultivators, both quantitatively and qualitatively. The studied varieties react differently at certain distances between the rows, both in terms of quantity and quality. The superior quality of the eggplant has a decisive influence on the price of recovery.

Keywords: eggplant, density, varieties

INTRODUCTION

Cultivated eggplant, Solanum melongena L., var. esculentum Dun., originate from a similar ancestral species, which was found in tropical and subtropical areas of Asia, India and Burma, between the parallels 100-300 north latitude, along with the similar spontaneous varieties S. melongena L. var. insanum and lime. incanum (Chaux and Foury, 1994.)

These cultures were widespread throughout the geographical area of the Indo-Burmese climate and then migrated through China (500 BC), and later through Persia and the Middle East to countries around the Mediterranean Sea (Apahidean, 2016).

From the eggplants the fruits are consumed to the maturity of consumption, being used in the preparation of different dishes: salad, moss, pot, breaded eggplant.Mixed with other vegetables are used in the preparation of preserves (Ciofu, 2004).

Fruits contain 7-10% carbohydrate dry matter 3.5%, carbohydrates 1-1,6%, carbohydrates 4.8 g, fat 0.2%, fiber 2.58 g, 100 g fresh product, the rest of 93.3% being water (Apahidean, 2016). Eggplants have a relatively low energy value of 24-28 kcal / 100g.

Eggplants, especially those with dark skin, are rich in antioxidant pigments from the anthocyaninscategory.The concentration of anthocyanins

in eggplants varies between 8-85 mg / 100g depending on the variety (Saurabh, 2015). Eggplant bark is edible even though the vast majority of people remove it. This is the main natural source of nasunin. Nasusina belongs to the category of anthocyanins, and has a high antioxidant activity (Saurabh et al., 2015).

MATERIAL AND METHOD

The objective of the present research is to establish the optimum density for the eggplant culture in the field, cultivated in a conventional system. In order to reach the proposed objective, in 2018, in a locality from NW Romania (Husasau de Tinca) in a vegetable microfarm, a mono factorial experience was implemented with 21 variants in 3 repetitions. Each variant had 10 plants. The variants were placed using the subdivided blocks method. The biological material was represented by seven varieties of eggplant, namely; Zaraza, Violeta di Firenze, Black Beauty, Japanese Pickling, Dourga, Monstruese NY, Listed by Gandia. For each variety there were three planting distances, 50cm, 40cm, 30cm.

RESULTS AND DISCUSSION

The experimental culture was established in the last decade of April, through seedlings planted on mulch with black foil, provided with drip irrigation.

Table 1

Production of eggplant(Husasău de Tinca, 2018)

Crt. no.	Variant And the distance between the raws(cm)	Absolute production of eggplant kg/m^2	Relative production of eggplant %	± d kg/m^2	Signifi cance
1	Zaraza 50	6.25	101.29	+0.08	-
2	Zaraza 40	5.31	86.06	-0.86	oo
3	Zaraza 30	9.86	159.80	+3.69	xxx
4	Violeta di Firenze 50	9.71	157.37	+3.54	xxx
5	Violeta di Firenze 40	6.64	107.61	+0.47	-
6	Violeta di Firenze 30	6.29	101.94	+0.12	-
7	Black Beauty 50	5.81	94.16	-0.36	-
8	Black Beauty 40	5.20	84.27	-0.97	oo
9	Black Beauty 30	5.90	95.62	-0.27	-
10	Japanese Pickling 50	3.83	62.07	-2.34	ooo
11	Japanese Pickling 40	4.34	70.34	-1.83	ooo
12	Japanese Pickling 30	4.89	79.25	-1.28	oo
13	Dourga 50	6.26	101.45	+0.09	-
14	Dourga 40	6.81	110.37	+0.64	-
15	Dourga 30	7.65	123.28	+1.48	xxx
16	Monstruese NY 50	5.31	86.06	-0.86	oo
17	Monstruese NY 40	7.57	122.69	+1.4	xxx
18	Monstruese NY 30	7.84	127.06	+1.67	xxx
19	Listada da Gandia 50	4.20	68.07	-1.97	ooo
20	Listada da Gandia 40	4.89	79.25	-1.28	oo
21	Listada da Gandia 30	5.15	83.46	-1.02	oo
22	Media Mt.	6.17	100.00	0.00	-

$LSD_{5\%}$=0.74 $LSDl_{1\%}$=0.97 $LSDl_{0.1\%}$=1.29

Table 1 shows the eggplant production, for each variant, obtained until the beginning of September, when the crop was abolished. The witness was the average of the experience. Analyzing the production of the eggplant as a whole the 21 variants, it can be observed that compared to the average of the experience there were differences both in the positive and in the negative sense, while some variants approached the witness.

The best eggplant harvest was obtained at V3, the Zaraza variety planted at 30 cm, with a production increase compared to the average of 59.80%, a statistically significant positive difference. A short distance from V3, the second place was obtained by the variety Violeta di Firenze. The difference from the witness was greater with 57.37%, which was ensured statistically very significant positive. Other variants that have obtained positive productions, which are worth mentioning are: V15, Dourga variety at 30 cm, New York Monsters V18 at 30 cm and V17 at 40 cm. In all these varieties, the differences from the witness were very statistically significant positive.

The variant that recorded the lowest production was V10, Japanese Kipling 50 cm between the rows. In absolute production it obtained 3.83 kg / m2 and only 62.07% of the average production experience. The difference was ensured statistically, very negative negative. Low strength productions also obtained the V11 and V19 variants, in which the differences from the control were provided with very significant negative statistics. Also small productions also recorded variants V2, V8, V16, V20 and V21. In these, the differences from the witness were somewhat smaller and were provided statistically, significantly distinct negative. The other variants obtained eggplant productions close to the control, smaller or larger, but the difference from the average of the experience did not exceed the 5% threshold, not being statistically assured.

Establishing the quality of the eggplant fruit is an essential element in the general characterization of a variety. Table 2 of the present experience presents, in all 21 variants, the three-step quality distribution of eggplant production. Of these, the extra category represents the most important step, because these fruits are valued at the highest price. From this point of view, the V19 Listada da Gandia variant at 50 cm between rows managed 70% of the total production to be of extra quality. This was followed closely by the same variety but at the distance between 40cm rows, from the V20 variant

It can be appreciated that all the varieties from six varieties registered more than 50% of the total production, fruits of the extra quality. It should be noted that all varieties from the variety Violeta di Firenze, and from Black Beauty, had extra quality fruit of over 60%. The Zaraza variety, with all three variants, had the lowest quality. At these the production of extra quality was below 50%. Along with the varieties of the Zaraza variety,

a single variant, respectively V12, Japanese Pikling at 30 cm between the rows, had 49, 69%, extra quality fruits. In many variants, even if in absolute production, the values were higher than in others, the percentage situation completely changed the hierarchy of values. Thus, the V3 variant obtained the highest production of extra quality in absolute value, of 4.25 kg / m2, and in percentages they represented only 43.10%, the lowest value.

Quality I, in all variants registered lower percentages compared to the previous qualitative stage. Specifically, the values were from 14.72% at V20, respectively Listada da Gandia and 34.65% at V14 the Dourga variety spaced between rows at 40 cm.

The quality of the II had even lower values, this denotes that the eggplant production in all the variants taken into consideration is of quality. At this level of quality the values were between 10.17% at V17 Monstruos of New-York, at 40cm between rows and 28.43% at V2 Zaraza with 40 cm between rows.

Table 2

The quality of the eggplant production(Husasău de Tinca, 2018)

Cr no.	Variant and the distance between the raws (cm)	Absolute production kg/m^2	Extra quality out of total		1st quality out of total		2nd quality out of total	
			Kg/m^2	%	Kg/m^2	%	Kg/m^2	%
1	Zaraza 50	6.25	3.12	49.92	2.05	32.80	1.08	17.28
2	Zaraza 40	5.31	2.60	48.96	1.20	22.59	1.51	28.43
3	Zaraza 30	9.86	4.25	43.10	3.25	32.96	2.36	23.93
4	Violeta di Firenze 50	9.71	5.88	60.55	2.15	22.14	1.68	17.30
5	Violeta di Firenze 40	6.64	4.07	63.00	1.45	23.23	1.12	16.86
6	Violeta di Firenze 30	6.29	3.89	61.84	1.25	19.87	1.19	18.91
7	Black Beauty 50	5.81	3.79	65.23	1.31	22.54	0.71	12.22
8	Black Beauty 40	5.20	3.41	65.57	1.03	19.80	0.76	14.61
9	Black Beauty 30	5.90	3.85	62.25	0.96	16.27	1.09	18.47
10	Japanese Pickling 50	3.83	1.97	51.43	1.05	27.41	0.81	21.14
11	Japanese Pickling 40	4.34	2.17	50.00	1.15	26.49	1.02	23.50
12	Japanese Pickling 30	4.89	2.43	49.69	1.31	26.78	1.15	23.51
13	Dourga 50	6.26	3.48	55.59	2.12	33.86	0.66	10.54
14	Dourga 40	6.81	3.55	52.12	2.36	34.65	0.90	13.21
15	Dourga 30	7.65	3.84	50.19	2.51	32.81	1.30	16.99
16	Monstruese NY 50	5.31	3.12	58.75	1.35	25.42	0.84	15.81
17	Monstruese NY 40	7.57	4.19	55.35	2..61	34.47	0.77	10.17
18	Monstruese NY 30	7.84	4.23	53.95	2.50	31.88	1.11	14.15
19	Listada da Gandia 50	4.20	2.94	70.00	0.78	18.57	0.48	11.42
20	Listada da Gandia 40	4.89	3.35	68.50	0.72	14.72	0.82	16.76
21	Listada da Gandia 30	5.15	3.31	64.27	0.93	18.05	0.91	17.66

CONCLUSIONS

Research on the influence of density on the quantity and quality of eggplant production, on several varieties cultivated in the field has revealed some conclusions, namely:

1. The distance between the rows has a greater influence on the production than on its quality.
2. In some varieties, regardless of size, the production increases exceed the average of the experience (Violeta di Firenze), and in others (Monstruos de New-York), there are variants that exceed the production of the control and variants that do not reach its production.
3. The highest production of eggplants of 9.86 kg / m2 with a production increase of 59.80%, was realized at V3 the variety Zaraza, with the distance between rows of 30 cm.
4. From the Japanese Pikling variety, cultivated 50 cm between rows, from the V10 variant, 3.83 kg / m2 was harvested, respectively 70.34% of the control production. This was the weakest productive variant.
5. Some variants had productions close to the average of the experience, respectively V1, V5, V6, V9, V13 and V14.
6. The highest quality production of the total production, was found at V19 Listada da Gandia variant, with 70%.
7. The highest quality harvest in absolute production of 4.25 kg / m2 was obtained at V3 Zaraza variety.

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BIHOR COUNTY WINE QUALITY STUDY IN "VINUM VARADINUM" CONTEST

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Abstract

National wine competitions stimulate the care of specialists, production units for wine quality, to get as many winners as possible of quality wines. These competitions also contribute to maintaining and increasing the attention paid by decision-makers to improve the quality of wines, to improve the structure of varieties, to develop the vineyard heritage in areas of maximum favorability. Tasting is the only way to appreciate the qualitative value of wines, hence holding these wine competitions is mandatory to reach to the core of the wines în discussion, to their essence and truth. This essay is based on the results of the first edition of Vinum Varadinum Wine County Contest that took place at the "Spring in the Garden" event organized during 26-28 May 2018 in the city of Oradea by the Association for Research and Promotion of Agricultural Products "Crişana" together with Oradea City Hall and the Bihor County Council. The event was dedicated to supporting and promoting domestic producers of vegetables, fruits, honey, oils, traditionally processed products and was organized by the Millésime Wine Culture and Civilization Association.

Key words: wine, contest, quality, tasting, analysis

INTRODUCTION

The first edition of Vinum Varadinum Wine County Contest took place at the "Spring in the Garden", event organized during 26-28 May 2018 in the city of Oradea by the Association for Research and Promotion of Agricultural Products "Crişana" together with Oradea City Hall the Bihor County Council. The event is dedicated to supporting and promoting domestic producers of vegetables, fruits, honey, oils, traditionally processed products.

MATERIAL AND METHOD

On the occasion of the national wine competitions, it takes place a fruitful and useful exchange of experience between specialists such as viticulturists, winemakers, researchers in the field of genetics and vine improvement, wine chemistry specialists or those who follow the quality of wines in large production units, as well as those engaged in the marketing of wines. Also on this occasion, new wine-tasting cadres are formed and trained, who will acquire the systems of appreciation and classification of wines, as well as the notations used during the international competitions.

National wine competitions stimulate the care of specialists and production units for wine quality to get as many winners of quality wines as possible. These competitions also contribute to maintaining and increasing the attention paid by decision-makers to improve the quality of wines, to improve the structure of varieties, to develop the vineyard heritage in areas of maximum favorability.

The international wine contest is reserved only for products previously selected by the state authorities of the participating wine-producing countries or for bodies authorized by them. Products must be produced in the country participating in the competition from grapes harvested on its territory. With the exception of wine distillates, the number of which is not contingent, each wine-growing country may not submit more than the maximum awarded to it by the organizers. The appreciation by tasting is done by international juries agreed by O.I.V. Such a jury is composed of experts, each representing a different country. The jury may, under the conditions set forth, exclude from the contest any sample of a product which does not comply with the definitions and regulations specified by O.I.V. The removal decision must be motivated.

Participating in international wine competitions offers the opportunity to find out:

• Wine production in each participating country

• The quality of the wines produced by the participating countries as an expression of their pedoclimatic conditions, of the elaboration, maturation and conditioning technologies that apply, the technical and material basis available

• Share of wines with the designation of origin of each participating wine country

• The opportunities of each wine country to participate in the international wine trade

• Global trends in vine cultivation systems, varieties and varieties practiced, types of wine made, machine and machine systems that support the practice of new winemaking technologies, oenological materials used.

International wine competitions are opportunities for a wide and useful exchange of experience between specialists from participating wine countries, for the knowledge and appreciation of the people, for joining efforts to find new means for maintaining and lifting new quality wines that will be made available to people as the most hygienic and healthy drink of all time.

Organization and management of the competition. Reception and management of samples is done by the cellar committee. The Commission will have a special, well-managed, spacious and cool room. The Cellar Commission completes the cellar register on the basis of the data included

in the registration sheet. The cellar register closes at the deadline for entry in the contest after no further evidence is received.

Preparation of the response sheets is done by the secretariat under the guidance of the president of the jury. Samples will be grouped by product category according to the tasting order, excluding those with major defects.

The record sheets will have two components, one in sight and a secret one. The contest tournament will have the following documents:

• Product category
• Product code number - harvest year
• Column for the mark received in the contest and the award

The secret sheet is filled in after the deadline for registration, remaining sealed throughout the contest. It will have the following documents:

• The manufacturer
• Assortment, brand, composition characteristics
• The vineyard, the wine-growing center and the plain, if necessary
• The code under which it was registered in the contest

Tasting glasses - special glasses approved by O.I.V. - which will be mandatory:

• with foot
• colorless
• without inbreds
• perfectly clean
• odorless

The sample service temperature should be optimal, as close as possible to:

• 4-6 ℃ for effervescent drinks
• 2-14 ℃ for dry white wines
• 14-16 ℃ for young red wines
• 18-20 for old red wines

It is strictly forbidden that products belonging to the same categories be served at different temperatures.

Serving flow will be organized so that:

• From the opening of the glass until the presentation of the samples on the table of the tasters to trace as short as possible (maximum 5 minutes)
• Avoid flow crosses (presentation, discarding) and stagnation
• It is forbidden to decipher the identity of the evidence being sanctioned with the exclusion of the responsible person from the contest
• Ensure an optimal rhythm, agreed with the jury's president

The contest room must meet a number of conditions, respectively:

• Be bright with natural light

• Be spacious and airy
• Protected by strange odors and noises
• The tables for the tasters should be lighted naturally abundantly, preferably from the left, with a sufficient distance between them în order that the tasters will not be disturbed or influenced by one another
• Presidium table will have 3-5 seats
• The table for the calculation committee will be placed near the display panel and close to the presidium

The tables of the tasters will be covered with white cloth and will have:
• Space for minimum 7-8 glasses of tasting
• Wine surplus cup
• Plate with neutralizing products: pieces of unsalted white bread, cubes of cheese, apples
• Flatwater glass
• Convenient space for inscription in the tasting sheet
• Discharge vessels

Tasting sheets are those regulated by O.I.V. and U.I.O.

The calculation committee performs the calculations. The results are entered by the committee in the filing records and then displayed on the panels.

Criteria for Distinction: distinctions are awarded according to the score of each test. (Table 1)

Table 1

Distinction and obtained points

Distinction	**Points**
Diploma of Honor and Great Gold Medal	90-100
Diploma of Honor and Gold Medal	80-89
Diploma of Honor and Silver Medal	70-79
Diploma of Honor and Bronze Medal	60-69
Diploma of participation	50-59

The number of shots and medals may not exceed 40% of the total number of samples entered in the contest.

The awards will be handed to the producers at the festivity that will be held after the competition in the exhibition hall. Distinctions to which participants have not submitted for delivery will be dispatched by the organizers at the address mentioned by the participant.

The wines are served to the jury in numbered glasses, after which the jury members analyze, through a scoring system of up to one hundred points, both the clarity and the color, the smell and the taste of the wines presented. Every wine has a scorecard.

RESULTS AND DISSCUSIONS

The results of this contest, with the scores and distinctions obtained by the wines participating in different categories, can be found in the following table.

Table 2

The results of the contest

Sample no	Sort	Year	Mark 1	Mark 2	Mark 3	Mark 4	Final mark	Producer
1	FETEASCA REGALA	2016	77	76	77	80	77.5	FOFOR ISTVAN
2	FETEASCA REGALA	2016	83	82	81	82	82.0	HEGEDUS ARPAD
3	FETEASCA REGALA	2016	67	67	68	74	69.0	KUN BARNA
4	FETEASCA REGALA	2016	87	85	87	87	86.5	CZAPP ARPAD
5	RIZLING	2016	83	82	82	84	82.8	GALIS NARCIS
6	FETEASCA REGALA		82	82	84,5	82	82.6	KORTELYESI BARNA
7	FETEASCA REGALA-SZARAZ	2016	83	80	79	83	81.3	ERDEI TAMAS
8	FETEASCA REGALA	2014	72	66	66	66	67.5	CZAPP ARPAD
9	RIZLING	2016	88	87	87	86	87.0	TANKI JOZSEF
10	CUVEE	2016	89	88	89	89	88.8	CRAMELE TOROK
11	RIZLING	2016	80	76	80	82	79.5	NAGY SANDOR
12	PINOT GRIS	2015	87	85	86	87	86.3	NAGY SANDOR
13	FETEASCA ALBA ALIGOTE	2016	86	83	83	87	84.8	CASA TOMMASI
14	CHARDONNAY	2015	82	84	82	84	83.0	NAGY SANDOR
15	CUVEE	2016	80	81	75	83	79.8	PAPP ZOLTAN
16	CHARDONNAY	2016	91	90	90	91	90.5	PUSZTAI ALEXANDRU
17	SASZLA	2016	69	68	67	70	68.5	MIKO KAROLY
18	RIESLING ITALIAN	2016	64	63	63	64	63.5	CORBUT
19	FETEASCA REGALA		83	82	78	80	80.8	CORBUT
20	CUPAJ SAUVIGNON-BLANC		89	87	88	89	88.3	CORBUT
21	CUPAJ		87	89	87	88	87.8	CORBUT
22	SAUVIGNON-BLANC		91	91	92	91,1	91.3	CORBUT
23	ROZE	2016	82	78	75	86	80.3	ERDEI TAMAS
24	ROZE CABERNET SAUVIGNON	2016	89	89	89	88	88.8	PUSZTAI ALEXANDRU
25	KEK FRANKOS	2016	87	87	74	87	83.8	PAPP ZOLTAN
26	ROZE COVEE	2016	71	73	65	68	69.3	NAGY SANDOR
27	ROSE	2016	85	76	80	76	79.3	FETH IMRE
28	CUVEE ROSE	2016	77	75	74	76	75.5	CRAMELE TOROK
29	ROZE CABERNET MERLOT		76	77	76	74	75.8	CORBUT
30	SIRAZ		83	82	80	79	81.0	NAGY SANDOR
31	KEK FRANKOS ZWEINGELT		83	80	82	80	81.3	ADAM GERGELY
32	COVEE	2016	58		55	54	41.8	MIKO KAROLY
33	MERLOT	2015	90	89	90	89	89.5	NAGY SANDOR
34	CABERNET	2015	87	86	86	85	86.0	NAGY SANDOR
35	COVEE		63	63	62	62	62.5	NAGY SANDOR
36	FETEASCA NEAGRA	2016	73	73	73	74	73.3	BALOGH JOZSEF
37	CABERNET SAUVIGNON		83	76	74	80	78.3	HORVATH ZSOLT
38	FETEASCA NEAGRA	2016	87	85	85	86	85.8	CETOSEL DE HIDISEL
39	MERLOT	2016	67	67	65	66	66.3	TOMMASI FRANCESCO
40	CABERNET SAUVIGNON	2015	84	79	80	80	80.8	KZAPP ARPAD
41	MERLOT+FETEASCA NEAGRA+CUPAJ	2016	67	63	60	65	63.8	TOMMASI FRANCESCO
42	FETEASCA NEAGRA+CABERNET SAUVIGNON+MERLOT		92	91	91	91	91.3	CORBUT
43	FETEASCA NEAGRA		92	90	90	89	90.3	CORBUT
44	ALIGOTE	2016	77	76	76	80	77.3	FETH IMRE
45	MUSCAT OTTONEL	2015	76	73	76	80	76.3	CZAPP ARPAD
46	MUSCAT OTTONEL	2016	83	76	77	83	79.8	PUSZTAI ALEXANDRU
47	MUSCAT OTTONEL	2016	87	79	80	85	82.8	PAPP ZOLTAN

Table 3

Ranking on medals

Distinction	No. of medals
Diploma of Honor and Great Gold Medal	4
Diploma of Honor and Gold Medal	10
Diploma of Honor and Silver Medal	23
Diploma of Honor and Bronze Medal	7
Diploma of participation	3

The contest was won by viticulture farmer Dan Corbuţ, who received no less than three gold medals for his wines, along with another passionate of the field, Pusztan Alexandru, who received a gold medal.

Following the judging, four gold medals were awarded to wines from the Diosig and Alesd vineyards: Sauvignon Blanc, Fetească-Merlot-Cabernet and Fetească Neagră, all three produced by Dan Corbuţ and a Chardonnay produced by Pusztan Alexandru.

There were also 10 gold medals, 23 silver medals and 6 bronze medals. The first edition of the county contest brought to the jurors' table 47 selected wines from the most appreciated vineyards of the county.

The event was organized by the Millésime Wine Culture and Civilization Association and aimed to promote Bihor County wines. Participants were wine producers from the main viticultural centers in Bihor such as Diosig, Săcuieni, Sanniob, Sântimreu, Alesd, Petreu, Biharia, and the Episcopate.

CONCLUSIONS

Tasting is the only way to appreciate the qualitative value of wines. Physical and chemical laboratory analysis can identify the composition of a wine that can be perfectly composed from this point of view, but sensory appreciation may not suit it. The tasting is also used to detect so-called 'scientific' falsifications, which take into account the normal composition of the wine and the ratio between its various components, which are not suspect in the laboratory analysis but have a great influence on taste and smell. Also by tasting one can obtain information about the typical character of the wine, determined by its place of production. The French phrase ”gout de terroir” is well suited to expressing the different character imprinted by the place of production.

Defining for a wine is the sensory analysis. Performing sensory analysis on the production flow from harvesting grapes to the final product of wine is very important because it can lead to technical decisions on certain conditioning and stabilization operations, the emergence of illnesses and defects.

Contests, whether on a peer or international basis, give us a trend in wine consumption or what is being consumed at the time. The success of the tasting depends on a multitude of factors, among which: the digging place, the inventory required for tasting, the tasting glass, the temperature of the tasting samples, the tasting order, the tasting schedule, the number of samples tasted in a tasting session. All of these and each of them in part have their importance, more or less, to the taste of tasting, and some of them are of major importance.

The quality of one wine is determined by the following criteria:

- Organoleptic and compositional characteristics
- Physico-chemical and biological stability
- Nature and hygiene
- Origin and authenticity
- Presentation on sale
- Presentation for consumption

All these attributes must be stable, wine should not lose its clarity, it must not oxidize by changing its color and taste, aroma and flavor, all at least during the warranty period. So the quality of the wine is not only verified at the time of sale but also after that, during the warranty period.

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THE STUDY OF THE ECONOMIC INDICATORS REGARDING THE ESTABLISHMENT AND MAINTENANCE OF A SUPER INTENSIVE BUCKTHORN PLANTATION IN IRRIGATED SYSTEM

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Abstract

Since buckthorn is a relatively new crop in Europe its cultivation technology is still under investigation. Especially should be focused on more efficient harvesting method, new cultivars suitable to European climate, bigger yields by right cultivation methods and pest and disease control. The eco-pedo-climatic conditions and the adequate relief, make Romania the perfect homeland for growing valuable crop species. The assortment of sea buckthorn grown in Romania, obtained from the local gene pool, is valuable through the complex substances of the fruit and is well adapted to the Carpathian-Danubian-Balkan geographical region. From the business management aspect, the advantage of buckthorn production is that it provides better income and return at a planting cost which is similar to that of other small fruits and berries. At the same time, the disadvantage of sea buckthorn production is the fact that yields are harvested every two years due to the technological characteristics of harvesting.This paper resembles the importance of the buckthorn plantation from the tehnological and economical point of view.

Key words: buckthorn, super intensive, expenses, yield, economic return on investment

INTRODUCTION

The sea buckthorn (Hippophae rhamnoides L.) is a fruit bearing shrub from the Eleagnacee family, existent both in the spontaneous flora and in plantation as cultivated system. The sea buckthorn is known in different areas of the world under several custom names, which are expressing always the origin place, the presence of thorns, fruits color and fruits effect upon the human body. (Dumitru, 2019). The sea buckthorn is remarkable by its incredible adaptation capacity to the soil and climate conditions, which are enabling her to grow on some lands or to occupy them.

The sea buckthorn presents like a 1.5-3.5 m high bush with many thorns. (Kovacs, 2016). Depending on the soil and climate conditions, she grows different under the shape of low crawling bushes in the dry areas and poor soils, or under the shape of shrub in height of 8-10 m on the fertile soils.

Sea buckthorn blossoms in the month April - May and begins to produce fruits after 2-5 years after planting. Following the fruits are produced yearly but only each second year the harvest is abundant.

The sea buckthorn fruits are ripe in September - October, but they stay on the shrubs until spring when they fall on the soil. As a consequence the harvesting period is very large.

The sea buckthorn is a unique and valuable plant in breeding system. The fruits and seeds are the main nutritional and therapeutic sources. Due to these beneficent effects, from the sea buckthorn are obtained a great diversity of products, especially oils and its derivative products.

MATERIAL AND METHOD

The buckthorn realizes big productions on lands of average fertility, light and permeability.

For setting up the chain plantation you can choose flat lands or terraces in unpowered slope. The orientation of the rows must be north-south, for the best exposure to the sun.

The distance of planting in the researched plantation is according to the soil vigor, the form of plant management, the mode of harvesting, the fertility and the configuration of the land, 3m/1,25 m (super intensive). In case of planting done on terraces, the distance between plants is calculated according to the size of the terrace.

In order to prepare the planting ground for the researched plantation, the rows are drawn and the planting place marked. The pitch is pitched from the edge, with the distances presented above. Before planting, the plants are prepared by refreshing the root cuttings, shortening the longest ones to 20-25 cm and removing the diseased and broken roots. After this operation, the roots move and settle in the pit with the roots broken. The plant is positioned in the middle of the pit in an upright position. The roots are covered, pressed for efficient contact with the substrate, a watering plate is made and it is abundantly moistened with 6-8 liters of water. (Paschold, 2012)

The chain plantation is kept clean of weeds and is regularly watered during the drought. (Gosch, 2014)

Repeated weeds are made, and in the middle of the chain rows other low-altitude plants, such as root vegetables, potatoes are grown. Also, to ensure optimal development, herbicides are applied within the first two years after planting.

The terrain between the rows is worked with the disc and the milling machine, at a depth of 8-10 cm. (Spiridon, 2008). In order not to destroy the roots that grow scratching, close to the surface of the soil the manually executed grass will be made at a depth of 6-7 cm.

The trunks of the buckthorn are covered in winter with strips of waxed paper, stems of sunflower or plywood. (Chira, 2014)

Irrigation of the chain plantation is very important in the first two years after planting, this prevents the drying of the plants, stimulates the growth and forms crowns, being the support of the production from the first years of fruiting.

For a rich harvest, in the soil there must be a humidity of 70-60%, on the medium and heavy soils, clay-clay and clay soils and 60-70% on the sandy and clay-sandy soils. It is recommended a watering standard of 300-400 m3/ha. (Botez, 1984)

Cutting the crown eases the picking, stimulates the growth of fruit branches. (Prat, 2016) It has been shown that, as soon as the cuttings are made earlier in the young trees, the tempering and limiting the growth in the case of vigorous varieties favors the fruiting. (Schmid, 2007)

Harvesting the fruit of the bitch is a laborious process, because the fruits are very small, with short and rigid tails, arranged in piles around the branches.
If the fruits are not picked in time, they will burst when picked or eaten by birds.

Depending on the method of use, the buckthorn is harvested more raw or after reaching full maturity. (Cociu, 1998)
The chosen varieties for the researched plantation are Clara and Mara. Clara is a pure variety, recommended for superintensive plantations, with large fruits, yellow-orange and a production potential of 15.3 t / ha in the 3rd year and 24.5 t / ha in the 5th year. (Braniste, 2007)

Mara is a plant with vertical growth, is suitable for mechanical harvesting. The fruits are large, bright yellow-orange, the production capacity being 14.7 t / ha in the 3rd year and 23.1 t / ha in the 5th year.

RESULTS AND DISCUSSION

Number of plants 2667/ ha
Plating distance 3m/ 1,25 m
Df= 18 years
De= 15 years
It= 77839,9 lei/ ha
Setting up expenses= 52221,5 lei/ ha

- Handmade works= 7822,5 lei
- Mechanical works= 8544,0 lei
- Materials= 35855,0 lei

Maintenance costs= 25618,4 lei/ ha

- Handmade works= 5373,2 lei
- Mechanical works= 3090,0 lei
- Materials = 17155,2 lei

Ca (annual depreciation rate) = 5189,3 lei/year
Operating expenses (Ce) = 18,275,6 lei

- Handmade works= 12563,2 lei

- Mechanical works= 1126,8 lei
- Materials= 4585,6 lei

Cd = 23464,9 lei/ha
Ci = 1407,9 lei/ha
Ct= 24872,8 lei/ year
P = 14000 kg/ ha
Cp= 1,77 lei/ kg
Pv= 4,0 lei/kg
Pab= 31127,2 lei/ ha
I= 4980,3 lei/ ha
Pn= 26146,9 lei/ ha
R= 105,1 %
T (term of investment recovery) = 3 years
Pt= 392203,5 lei
Rec (economic return on investment) = 503,8 %
C_d= annual direct expenditure
C_i= annual indirect costs
C_t=annual entire costs
P=Production
C_p=Cost of production =C_t/P
P_v=Selling price
V=Value of annual production
P_{ab}=Gross annual profit
I=Tax= P_{ab} x 16%
P_n=Net annual profit P_{ab}- I
R=Annual profit rate P_n : C_t x 100
T= Term of investment recovery= I_t /P_n
P_t= Entire operating profit= P_n x D_e

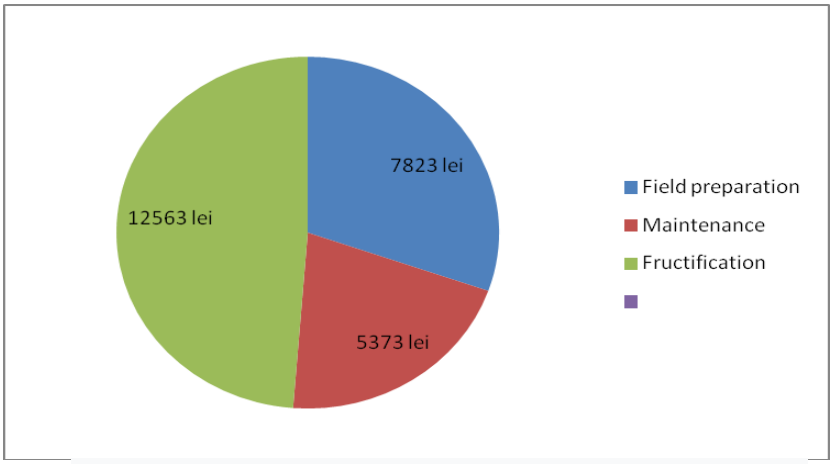

Fig.1. Labor costs from the establishment of the culture to the fructification

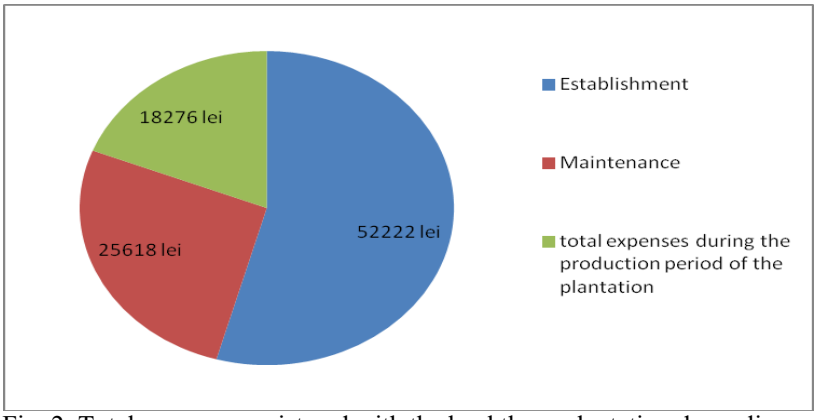

Fig. 2. Total expenses registered with the buckthorn plantation depending on the stages

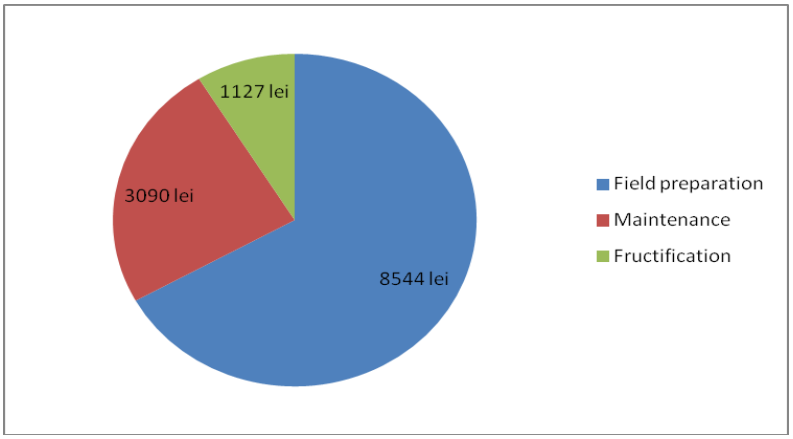

Fig. 3. The expenses with the mechanical works according to the stages of the plantation

CONCLUSIONS

The highest level of labor costs is reached during the fruitful period, when the highest expenses are recorded with the harvest of the buckthorn production. The highest level of total expenses is recorded at the establishment of the plantation, due to the value of the fruit planting material.

The highest values of the mechanical works are recorded during the period of preparation of the land for setting up the plantation, when performing more expensive mechanical works, with special machines.

The term of investment recovery for a 1 hectare buckthorn plantation is 3 years.

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STUDY ON THE REGENERATIVE AND ORGANOGENIC CAPACITYOF *Echinopsis (zucc.) chamaecereus f. lutea*IN VITRO CULTUREON AN ADDITION MEDIUM OF A MIXTURE FORMED IN EQUAL QUANTITIES OF 3-INDOLYLBUTIRIC ACID (AIB) AND OF BENZYLADENINE (BA)

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Abstract.

Cactus with yellow epidermis, Echinopsis chamaecereus f. lutea, is part of the group of chlorophyll-deficient cacti, which occur spontaneously in cultures due to mutations, which are unable to synthesize chlorophyll survive only if they are grafted.

In order to establish an in vitro culture of Echinopsis chamaecereus f. Lutea, we took explants represented by minibus (seedlings) from mother plants grown in the greenhouse. Inoculation of the explants was done on a culture medium consisting of macroelements and EDTA Murashige-Skoog Fe (1962), Heller microelements (1953), supplementation with medium supplemented with a mixture of equal amounts of 3-indolylbutyric acid (AIB) and of benzyladenine (BA).

The evolution of the explants was monitored for 90 days. Response of explants of Echinopsis chamaecereus f. lutea to the presence in the culture medium supplemented with a mixture of equal amounts of 2mg/l 3-indolylbutyric acid (AIB) and 2mg/l benzyladenine (BA), variant V_3, demonstrated the beneficial effect on the generation of new strains, finding an increase of 133,33%, and in terms of their dimensions, this parameter marked an increase of 150%, compared to the values of control group V_0 (average lacking growth regulators). It is worth noting that, during this experiment, the rhizogenesis and calusogenesis process did not take place.

Keywords: vitroculture, 3 indolylbutyric acid (AIB), benzyladenine (BA), newly formed stems.

INTRODUCTION

Echinopsis chamaecereus f. lutea, is a chlorophyll - deficient cactus, with yellow epidermis (Copăcescu, 2001), lacking the possibility of synthesizing chlorophyll due to the small number of chloroplasts, about 1/3 of the total plastids (Shemorakov, 2003).

The depigmentation process is determined by the spontaneous emergence in cultures of some mutations (Shemorakov, 2001) influenced to a large extent by temperature and light. According to Skoulkin (2000) plants kept at a lower temperature than the one obtained in the shade, rarely, or even at all, develop such mutations. Russian researchers have shown a special interest in the chlorophyll-deficient species of cacti, and thus they have been classified according to the color of the epidermis (Shemorakov,

2003), according to which *Echinopsis chamaecereus f. lutea* is part of the monocolor group.

According to Shemorakov (2001) the reversible mutation of the plastids during meiosis causes that by reproductive generation in *Echinopsis chamaecereus f. lutea* has minimal chances for it to retain its color (Kornilova, 2008). Thus it was concluded that plants can retain this particular property only reproduced by cloning.

In Vitro cultures, the combination of growth regulators called organogenesis hormonal balance adjustment can be achieved within certain limits by changing the concentrationratio of regulatory present in the growth medium. After theCachiță et al.(2004), the existence of aculturemedium of high concentration soft auxin, cytokinins with one, stimulate rooting process while an increase in the content promotes the formation of shoots cytokinins; in the culture medium in the present high concentrations, but equal, the two compounds will bedrivenwiththe morphogenesis process, the generation of callusandits growth.

Hormonalbalancein the culture mediumcan not be fully controlled, it is influenced to a large extent on the endogenous phytohormone ratio. TheRubluoet al. (1996), believes that invitro culturesofcactus, rooting is the result of interaction between cytokinins and auxins added to the culture medium in the form of exogenous growth regulators, but which, inTaizet al.(1998), are affected bythe amount of lightthey are exposedvitro cultures.

This experiment was aimed at studying the way they react cactus explantsinculture medium supplementation changes -V_0 -medium lacking growth regulators-with a combination of equal amounts between an auxin (3-indolilbutiric -IBA) andcytokinins(benzyladenine-BA), added in different concentrations, respectively, 1 mg/lIBA+1mg/lBA(V_1); 1,5mg/lIBA+1,5mg/lBA(V_2) and2mg/lIBA+2 mg/lBA(V_3).

The purpose of the experiment covered by this article is to analyze the reaction variability of the vitrocultures of *Echinopsis chamaecereus f. lutea*, in the presence in the culture medium of a mixture consisting of equal amounts of 3-indolylbutyric acid (AIB) and benzyladenine (BA).

MATERIALS AND METHODS

The biological material used in our experiments consisted of regenerated seedlings on *Echinopsis chamaecereus f. lutea* (fig. 1). The explants were about 1 cm long, 0,5 cm thick and a diameter of 0.5-1.5 cm, depending on the area from which they were harvested (fig. 2).

The vegetal material, seedlings of *Echinopsis chamaecereus f. lutea*, was asepsis by immersion, for one minute, in 96º ethyl alcohol, followed by its coating with 0.8% sodium hypochlorite solution, mixed with water in

relation to 1: 2; To the disinfectant solution, three drops of Tween 20 are added (as a surfactant) (Cachiţă et al., 2004).

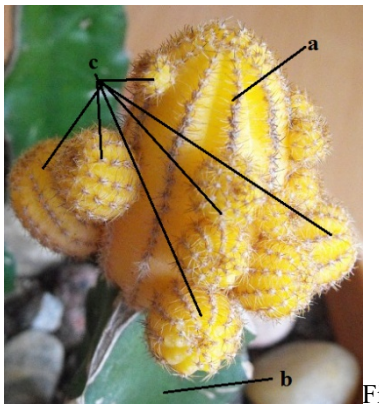

Fig.1. Young plant of *Echinopsis chamaecereus f. lutea*, grown in a greenhouse (where: a-grapes, b-rootstocks, c-buds newly formed)

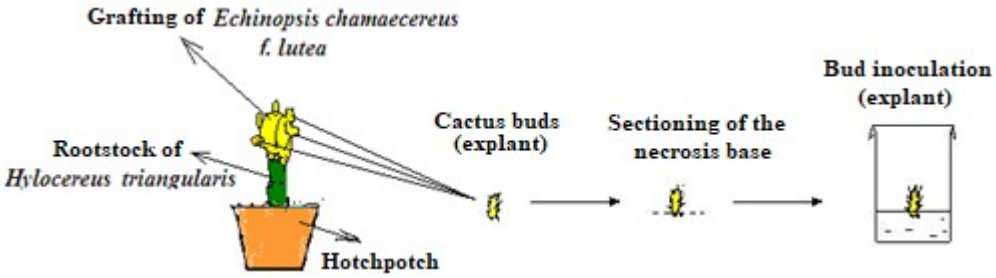

Fig. 2. Schematicrepresentation of the exploitation mode of the fragments of *Echinopsischamaecereus f. lutea*, whichwillbeinoculated on aseptic media.

During the asepticization the vegetative material was stirred continuously (Cachiţă et al., 2004). After 20 minutes, the disinfectant was removed and the plant material was washed with sterile distilled water, making five consecutive rinses, five minutes each. Then, the plant material was deposited in aseptic conditions, in the hood with horizontal laminar flow, of sterile air, in operation, on the filter paper rounds sterilized in the oven, introduced in aseptic Petri dishes. Subsequently, the necrotic parts of the future inocula were removed.

Culture medium used for growth explants consisted of: macro Murashige-Skoog EDTA and Fe (1962), Heller microelements (1953), mineral mixture to which was added vitamins: pyridoxine HCl, thiamine HCl and nicotinic acid (containing 1 mg/l each), m-Inositol - 100 mg/l, sucrose - 20 g/l and agar 7 g/l the pH ofthe medium wasadjusted to5,8, the first toautoclaving. Thebasal medium (MB) added amixture of equal amounts of mg/lIBAand 1 mg/lBA(variantV_1), 1,5 mg/lIBAand

1,5mg/lBA(variantV_2) or 2mg/lIBAand2 mg/lBA(variantV_3), obtaining the followingexperimental: V_0 - version control, medium without growthregulators; V_1 -1 mg/lIBAand 1 mg/lBA; V_2 - 1,5 mg/lIBAand 1,5 mg/lBA and V_3 -2 mg/lIBAand 2 mg/lBA.

Culture medium thus obtained was placed in a glass vial with a capacity of 15 ml (each container was placed 5 ml of medium). Medium vials were sterilized by autoclaving for 30 minutes at a temperature of 121°C. After cooling media proceeded to inoculate explants, aseptic room operation performed in a laminar flow hood with sterile air. To obstruction fitoinoculi containers we used polyethylene, immobilized with elastic. Containers were inoculated transferred to room for growth, under the following conditions: temperature ranged from 24ºC in the range of light and 20°C during the phase of darkness and light was the regime fotoperiodic 16 hours with light/ 4h, lighting achieving cultures with the white light emitted by fluorescent lamps, the intensity of 1700 lux.

Explantsandexplantsreactionprogresswas monitoredfor 90days.Inthis time periodwere conduct periodic observations andreadingsevery30 days.Values thus obtainedin the control group(V_0, the explants grow in basic medium, without growth regulators)were consideredhe referenceas 100% to these all the other recorded values are related.

RESULTS AND DISCUSSION

After 90 days of viticulture, the basal average diameter of the main strain of *Echinopsis chamaecereus f. lutea* exceeded for all experimental variants the values recorded in the control sample V_0 (the medium lacking growth regulators), by 0,1 cm at V_1 (supplemented medium), with a mixture of 1 mg/l AIB and 1 mg/l BA) which represents a further 22,22%, and 0,2 cm (Fig. 3A) in the case of explants belonging to V_1 variants (medium supplemented with a a mixture of 1 mg/l AIB and 1 mg/l BA) and V_3 (medium supplemented with a mixture of 2 mg/l AIB and 2 mg/l BA), thus increasing 33,33% (Fig. 4A).

During this time period, new strains were generated in explants belonging to variant V_3 (medium supplemented with a mixture of 2 mg/l AIB and 2 mg/l BA) which by an average of 0,1 numerically exceeded the new strains/variant (Fig. 3B), compared to control V_0, thus marking an increase of 33,33% (Fig. 4B), and with a mean basal diameter of 0,6 cm, they registered an increase of 50%. At the level of explants inoculated and raised on experimental variants V_1 (medium supplemented with a mixture of 1 mg/l AIB and 1 mg/l BA) or V_2 (medium supplemented with a mixture of 1,5 mg/l AIB and 1, 5 mg/l BA) no new strains were generated, probably due to the reciprocal inhibition effect on the two growth regulators. Our

results are in agreement with those published by Mata et al., (2001), who in the *Turbinicarpus cactus*, observed that by supplementing the culture medium with a combination of auxin and cytokinin, in different concentrations, it has become a restrictive factor for the formation of shoots.

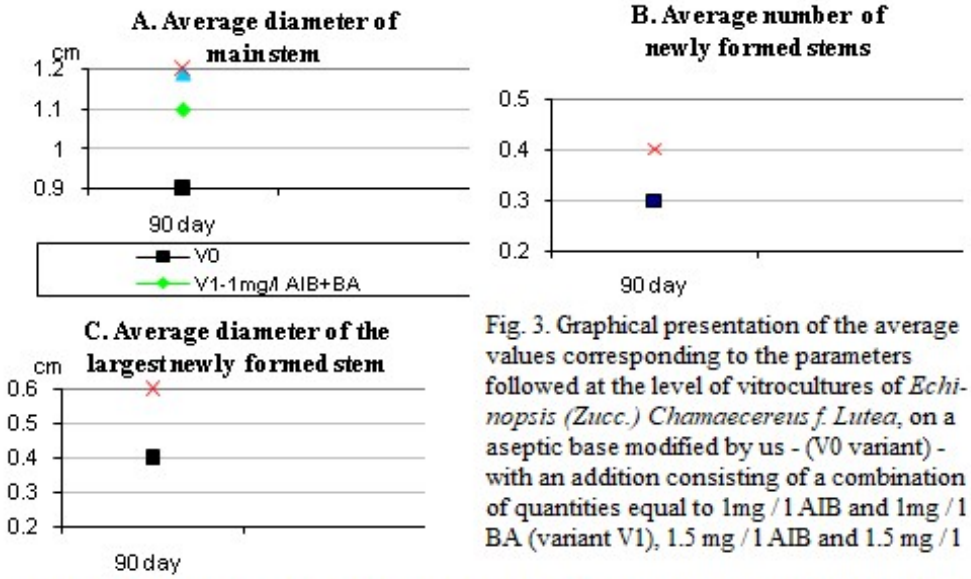

Fig. 3. Graphical presentation of the average values corresponding to the parameters followed at the level of vitrocultures of *Echinopsis (Zucc.) Chamaecereus f. Lutea*, on a aseptic base modified by us - (V0 variant) - with an addition consisting of a combination of quantities equal to 1mg / l AIB and 1mg / l BA (variant V1), 1.5 mg / l AIB and 1.5 mg / l BA (variant V2) or 2mg / l AIB and 2mg / l BA (variant V3), given expressed in absolute values; (where: A - average diameter of main stem; B - average number of newly formed stems; C - average diameter of the largest newly formed stem)

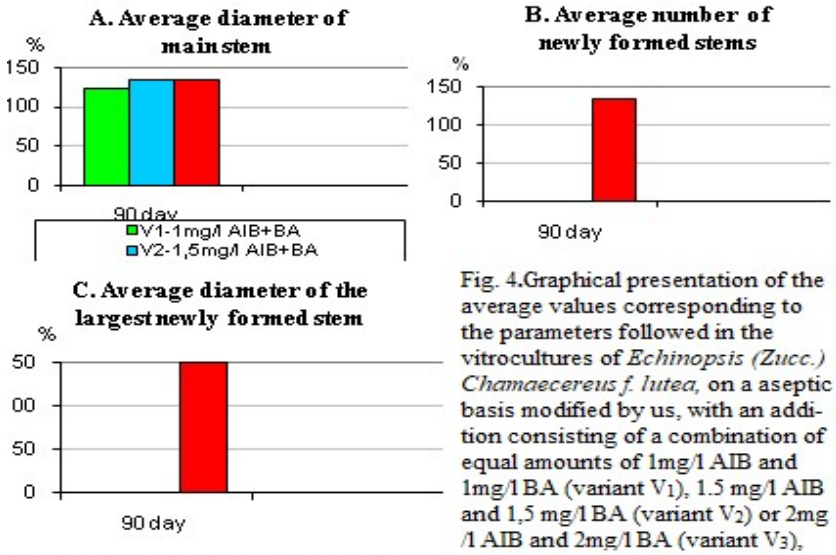

Fig. 4.Graphical presentation of the average values corresponding to the parameters followed in the vitrocultures of *Echinopsis (Zucc.) Chamaecereus f. lutea,* on a aseptic basis modified by us, with an addition consisting of a combination of equal amounts of 1mg/l AIB and 1mg/l BA (variant V_1), 1.5 mg/l AIB and 1,5 mg/l BA (variant V_2) or 2mg /l AIB and 2mg/l BA (variant V_3), /l AIB and 2mg/l BA (variant V_3), data expressed as a percentage, obtained from reporting the biometric values to the results recorded at the respective biometric parameters in the control group (V_0), without growth regulators, values considered to be 100%; (where: A - average diameter of main stem; B - average number of newly formed stems; C - average diameter of the largest newly formed stem).

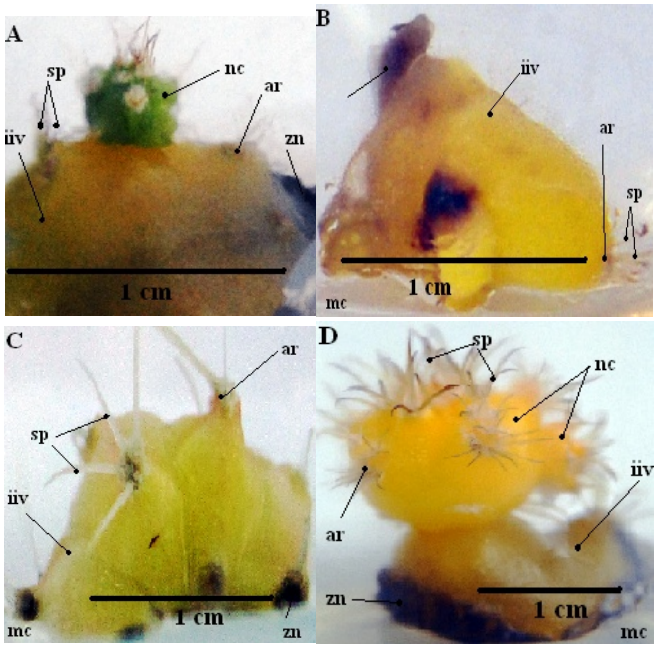

Fig. 5. Inoculi of Echinopsis (Zucc.) Chamaecereus f. Lutea, 90 days after inoculation of the explant "in vitro", where: A-base medium modified by us lacking growth regulators (V0); B-on basic medium with an addition consisting of a combination of equal amounts of 1mg/l AIB and 1mg /l BA (V_1); C-on basic medium with an addition consisting of a combination of equal amounts of 1,5mg/l AIB and 1,5mg/l BA (V_2); D-on basic medium with an addition consisting of a combination of equal amounts of 2 mg/l AIB and 2 mg/l BA (V_3); (iiv-inoc initially viable; mc-culture medium; nc-newly formed stem; ar-areola;sp-thorn; zn-area necrosis).

From figure 5B it can be seen that similar to the results obtained by us in other experiments (Vidicanet al.,2017), in the explants of *Echinopsis chamaecereus f. lutea* (yellow cactus) vitrocultivated on the control lot (culture medium without growth regulators - V_0), the new stems they are green (Fig. 5A), while those inoculated and grown on culture media supplemented with growth regulators, in this case with 2 mg/l AIB and 2 mg/l BA (V_3), they have retained yellow (Fig. 5D). In both the new strains and the explants, the areoles and spines have retained their species characteristics (white areola, also white spines, 1-1,5 cm long), being well developed (Fig. 5C). It is worth noting the presence of necrosis, regardless of the composition of the culture medium, located either in the contact area with the culture medium or on the surface of the explant (Fig. 5B and C).

For 90 days the presence in the culture medium of the mixture consisting of equal quantities of 3-indolylbutyric acid (AIB) and benzyladenine (BA), regardless of the amount in which it was added, did not stimulate either rhizogenesis (Vidicanet al.,2009) or calusogenesis.

Comparing the data obtained we found that the vitrocultures of Echinopsis *chamaecereus f. lutea* gave unsatisfactory results regarding their response to the composition of the nutrient substrate - in this case a mixture of an auxin (AIB) and a cytokinin (BA). - combination that failed to enhance the organogenic capacity of the explants.

CONCLUSIONS

1. After 90 days of in vitro culture initiation in *Echinopsis chamaecereus f. lutea* we found that supplementing the culture medium with a mixture of equal amounts (V3) of 2mg/l of 3-indolylbutyric acid (AIB) and 2mg/l benzyladenine (BA) had beneficial effects only on the generation of new strains, where it was found a 133,33% increase compared to the values of the control group V_0 (medium lacking growth regulators), in terms of their diameter, this parameter scored a 150% increase over the witness.
2. In explants of *Echinopsis chamaecereus f. lutea* (yellow cactus) grown on the control group (culture medium without growth regulators - V_0), the new strains are green while those grown on culture media supplemented with 2 mg/l AIB and 2 mg/l BA (V_3), remained yellow.
3. Regardless of the composition of the culture medium, the presence of necrosis located either in the contact area with it or on the surface of the explant is noted

4. The phenomenon of rhizogenesis and calusogenesis did not manifest in any of the variants the experiments taken in the study.

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THE INFLUENCE OF THE SUBSTRATUM ON ACCA SELLOVIANA CUTTINGS ROOTING

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Abstract

The Acca selloviana is cultivated as a fruit shrub and as an ornamental shrub. It has big flowers and eatable fruits, the size of a lemon. In present the acca selloviana is cultivated in open air and, in regions with unfavourable climate conditions, is cultivated in vegetable vases. These remain outdoor in the warm season and indoor in protected spaces, in the cold season. As a room-plant, the acca selloviana is very attractive by the many small cultivars.

In Romania Acca selloviana is less widespread as ornamental or economic utility plant. The reason is the lack of multiplication material as a consequence of low efficiency in multiplication.

Keywords: Acca selloviana, sand, beech sawdust, roots

INTRODUCTION

Experiences on the substrate influence on the rooting of Acca selloviana seedlings were performed between 2017-2019 in the dendrological nursery Santandrei, Bihor County.

Working hypothesis was that through the use of valuable cultivars in terms of providing an inexpensive and easily procured substrate, a favorable microclimate with a uniform tint, can be obtained production performance and economic efficiency.

The seedlings rooting is made in the sand, sand + peat in proportion of 1:1, garden soil + sand, sand + pearl stone. (John Broockes, 2004).

In Romania was recommended to us mixing peat and perl in proportion of 2:1 (Zaharia, Dumitru, 1992), beech sawdust and sand in proportion of 1:1 (Vlad, 2012).

In Germany is used with good results substrate composed of sand grains with mean of 1-2 mm, in proportion of 80% and Pine needles 20% (John Brookes 1999). Must be mentioned that both peat and peat are very expensive materials and replacing them with cheaper materials would reduce the cost of saplings.

MATERIAL AND METHOD

There were used semi-lignificated, top seedlings of 10-12 cm length. Experience has included 3 variants: V1 - rooted cuttings in sand, V2 - rooted cuttings in sand + sawdust beech, 25% / 75% and V3 - rooted cuttings in sand + sawdust beech, 50% / 50%, with 600 seedlings per variant.

The seedlings for rooting were planted in 15 May 2017, 2 June 2018 and 3 June 2019, at a distance of 6x6 cm and depth of 4-6 cm, with good settling of the substrate to remove air spaces of the rooting area.

Light was directed by covering seedlings with green plastic net with mesh 0.5/0.2 cm. In very warm periods were used 2-3 nets.

After rooting the cuttings were planted in pots with a diameter of 12 cm in garden soil 55% black soil 15%, peat 15% and 15% sand.

To differentiate the variants have been made observations and determinations regarding the duration of the rooting, the proportion of rooted cuttings, the number, size and form of the roots.

The calusation process on the base of seedlings begun at close intervals of time with an easy advance to Variant 2. (Table 1)

In 2017 cuttings the calusation duration was 35 days at Variant 1 (rooting in sand), 32 days at Variant 2 (rooting in sand 25% + beech sawdust 75%) and 34 days to Variant 3 (rooting in sand 50 % + beech sawdust 50%) (Table 1).

The period of cuttings rooting expanded during the three years from 118-137 days to Variant 2 (rooting in sand 25% + beech sawdust 75%) at 118-129 days in Variant 3 (rooting in sand 50 % + beech sawdust 50%) and 112-134 days at Variant 1 (rooting in sand).

Substrate composed of sand 50% + beech sawdust 50% leaded in rooting the cuttings in 6-10 days earlier than in the sand.

The number of rooted cuttings from that 600 cuttings put on rooting, had average values of 390 cuttings from Variant 1 (rooting in sand), 535 cuttings from Variant 2 (rooting in sand 25% + beech sawdust 75%) and 420 cuttings in Variant 3 (rooting in sand 50 % + beech sawdust 50%) (Table 2).

Table 1

Experimental data regarding on calusation and rooting period of *Acca selloviana* cuttings, Santandrei, 2017-2019

Nr. crt.	Rooting substrate	2017					2018					2019				
		Data in which the cuttings were rooted in	Data of calu-sation	The days number until calu-sation	Date of rooting	The days number until rooting	Data in which the cuttings were rooted in	Data of calu-sation	The days number until calu sation	Date of rooting	The days number until rooting	Data in which the cuttings were rooted in	Data of calu-sation	The days number until calu-sation	Date of rooting	The days number until rooting
1	Sand	15 V	20VI	35	2 X	137	2VI	30VI	28	5 X	123	3 VI	30VI	25	30IX	118
2	Sand 25% + beech sawdust 75%	15 V	17VI	32	24IX	129	2VI	27VI	25	30IX	118	3VI	25VI	20	20IX	108
3	Sand 50% + beech sawdust 50%	15 V	19VI	34	29IX	134	2VI	29VI	27	2 X	120	3 VI	27VI	22	24IX	112

Table 2

Experimental average data obtained in rooting of *Acca selloviana* cuttings, Santandrei, 2017-2019

Variants	Rooted cuttings		+ - D	Significance of difference
	Number	%		
V_1 – rooting in sand	390	100	-	-
V_2 - rooting in sand 25% + beech sawdust 75%	535	137	145	***
V_3 - rooting in sand 50 % + beech sawdust 50%	420	108	30	*

LSD 5% - 25.9
LSD 1% - 44.1
LSD 0.1 % - 74.8

Number of rooted cuttings of all those rooted in oscillates between 65% and 89.1%.

The differences are statistically analyzed provided positive very significant in Variant 2 (- rooting in sand 50% + beech sawdust 50%) and significant in Variant 3 (rooting in sand 75 % + beech sawdust 25%).

The rooting terms of quality is the average number of roots per slip (Table 3).

Table 3

Average number of roots per cutting, Santandrei, 2017-2019

Variants	Roots per cutting		+ - D	Significance of difference
	Number	%		
V_1 – rooting in sand	6.5	100	-	-
V_2 - rooting in sand 50% + beech sawdust 50%	11,7	180	5.2	***
V_3 - rooting in sand 75 % + beech sawdust 25%	8,2	126	1,7	*

LSD 5% - 1.41
LSD 1% - 2.11
LSD 0.1 % - 3.16

It is noted that between Variant 1 (rooting in sand) and Variant 2 (rooting in sand 50% + beech sawdust 50%) are large differences from 6,5 roots per cutting to 11,7. Values, expressed in percentage are equivalent of an overrun of 80% in Variant 2 and of 26% in Variant 3, compared to variant 1 (witness).

Differences are statistically considered, provided positive very significant on variant of the substrate composed of sand + 50% beech sawdust 50% and significantly on variant with a substrate composed of sand 75% + beech sawdust 25%

Increasing the rooting ability of the cuttings comes out from root length and thickness of the newly formed plants. Table 4 shows that the length and thickness of roots vary with relative wide limits with favorability for cuttings rooted in substrate composed of 50% sand + 50% beech sawdust.

Table 4

Length and thickness of the roots of *Acca selloviana* plants, Santandrei, 2017-2019

Variants	Length of roots (cm)	Grouping the roots by thickness		Total
		Roots number < 1 mm	Roots number > 1.1 mm	
V_1 – rooting in sand	1,2-8.3	5,1	3.1	8,2
V_2 - rooting in sand 50% + beech sawdust 50%	2,2-14.9	9,2	5.8	15,0
V_3 - rooting in sand 75 % + beech sawdust 25%	1.9-11.7	6,1	4.0	10,1

Length of roots varies between 1,2-8,3 cm in Variant 1, witness, cuttings rooted in the sand and between 2,2-14,9 cm in Variant 2, cuttings rooted in the sand 50% + beech sawdust 50%. By thickness, up to 1 mm in diameter roots category, had values ranging 5,1 pcs. per cutting on the Variant 1 (rooting in sand) and 9,2 pcs. per cutting on Variant 2 (rooting in sand 50% + beech sawdust 50%), while those with thickness greater than 1.1 mm in diameter was between 3.1 pcs. per cutting in Variant 1 and 5.8 pcs. per cutting in Variant 2.

CONCLUSIONS

The Acca selloviana is an ornamental plant, particularly valuable, least common to us, which is due on the lack of material, as a result of decreased efficiency in multiplication

The rooting period of the cuttings was 108-137 days.

The best option both in terms of the number of rooted cuttings and the number of roots per cutting and the roots length and thickness, was that in which the substrate was composed of sand 50% + 50% sawdust beech.

Decreasing the content of the rooting substrate in sawdust beech up to 25% causes a decrease in rooting yield to 78.5% but higher as variant witness (sand).

Increasing the rate of multiplication by cuttings of Acca selloviana can be stimulated by using appropriate substrates.

The method developed in the Santandrei nursery (Oradea) may contribute to expansion of Acca selloviana in our country.

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FORESTS VEGETATION, FOREST HABITATS OF COMMUNITY INTEREST IN NORTH-WEST ROMANIA, INCLUDED IN THE PROJECT "PRIORITY HABITATS OF FOREST STEPPE AND HILLY PIEDMONTS", POTENTIAL THREATS AND MONITORING OF CONSERVATION STATUS (II)

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Abstract

The purpose of this paper is to identify and describe the types of natural habitats of community interest in north-western Romania.

We have proposed to reach five working goals prior to reaching the proposed objective.

The working methods we used consist in the acquisition of informative materials, preliminary evaluation of the forests, field research, and a complete evaluation that led to the elucidation of the scientific content of the proposed objectives.

The scientific information obtained regarding the floral composition, the high conservation values, the state of conservation, the potential threats and the management of the forests included in the five natural habitats of community interest in the northwest of Romania are processed and analysed besides the results and discussions thereof.

The phytocenoses of these habitats were studied from the perspective of their belonging to seven rare plant associations, described for the first time. Four conclusions were formulated summarizing the research results and the original contribution of the authors of this work.

Key words: forests, forest habitats, phytocenoses, plant associations.

INTRODUCTION

In order to solve the objectives of this study we reviewed the scientific papers which have been published more recently and contain information on the habitats and sites of community interest included in the "Natura 2000 Ecological Network" of the following authors: Candrea Bozga et al ,2009; Doniță et al., 2005; Drăgulescu et al., 2007; Gafta, Mountford 2008; Lazăr et al., 2007; Stăncioiu et al., 2008, those containing information on high conservation value forests, Biriș et al., 2002, Ioraș, Abrudan, 2007; Jennings et al., 2003; Stanciu et al., 2004; Stăncioiu 2008; Vlad et al., 2013, and also sources providing information on habitat biodiversity and plants included in the Red lists by Angelstam et al. 2004; Boșcaiu et al., 1994, Coldea et al., 2008; Danciu et al., 2007; Dihoru, Negrean, 2009; Oltean et al., 1994; Radu, 2001; Schulze, Mooney,1993.

MATERIAL AND METHOD

We carried out our research in the foothills of Oradea Hills, the Lăzăreni Hills and the Western Plain of Romania on a total area of roughly 180 km^2.

In order to achieve the proposed goals, the research was divided into four successive stages of work as follows:

(i) The acquisition of informative materials (i.e. tree maps, plot descriptions, Red lists for rare and protected plant species, scientific papers on natural habitats and high conservation value forests);

(ii) The preliminary assessment of presumptive forest areas, with high conservation values, included in natural habitats of community interest;

(iii) The field research of selected forests declared as high conservation value forests (HCVFs);

(iv) The complete of the categories of high conservation value forests (HCVFs) which must be protected and managed sustainably based on a management plan.

RESULTS AND DISCUSSIONS

91MO Pannonian Balkan Turkey oak - sessile oak forests.

According to the The Interpretation Manual of European Union Habitats (European Commission 2003), this type of habitat consists of the sub-continental thermo-xerophilous forests of Turkey oak (*Quercus cerris*), sessile oak (*Quercus petraea*) and Hungarian oak (*Quercus frainetto*) spread in the plain and hilly regions of Pannonian Plain, in the north-Balkans, where the spreading of Tartarian maple (*Acer tataricum*) is a constant; however, the sub-Mediterranean species such as the oriental hornbeam (*Carpinus orientalis*) and the butcher's-broom (*Ruscus aculeatus*) are missing.

In Romania this habitat can be found in the continental areas of the south of the country i.e. Muntenia (Wallachia), Oltenia, Dobrogea, Banat and up to the north, in the Crișana region, at altitudes ranging between 250-500 m, where the forests of xero-thermophile oaks grow on brown, deep soils with sub-layer of limestone, andesite, basalt, loëss, clay and/or sand.

The tree layer is dominated by *Quercus petraea, Quercus cerris, Quercus frainetto, Quercus dalechampii, Tilia tomentosa, Carpinus betulus,* alongside the following species develop *Acer campestre, Acer tataricum, Acer platanoides, Sorbus torminalis, Fraxinus excelsior, Tilia cordata, Ulmus minor, Prunus avium, Malus sylvestris* and *Pyrus pyraster*.

The shrub layer consists of *Cornus mas, Crataegus monogyna, Ligustrum vulgare, Staphyllea pinnata, Euonymus europaeus, Fraxinus ornus, Viburnum lantana, Sambucus nigra* and *Prunus spinosa*.
The herbaceous layer consists of *Lithospermum purpurocoeruleum, Ruscus aculeatus, Potentilla micrantha, Tamus communis, Lychnis coronaria, Arum orientalis, Lathyrus niger, Lathyrus venetus, Polygonatum odoratum, Polygonatum latifolium, Convallaria majalis, Melittis melissophyllum, Vincetoxicum hirundinaria, Smyrnium perfoliatum, Cephalanthera damasonium, Platanthera bifolia, Viola hirta, Stellaria holostea, Veronica chamaedrys, Isopyrum thalictroides, Scilla bifolia, Corydalis cava, Melica nutans, Melica uniflora, Festuca heterophylla, Poa nemoralis, Silene nutans* ssp. *Nutans* and *Carex digitata*.
In the northwest part of Romania this type of habitat is represented by four types of forest ecosystems:
R4132 ecosystem. Pannonic & Balkan forests of sessile oak (*Quercus petraea*), Turkey oak (*Quercus cerris*) and European beech (*Fagus sylvatica*) with *Melittis melissophyllum*. PALAEARCTIC HABITATS 41.7696. PALAEARCTIC HABITATS 41.7696. Pre-Carpathian *Quercus cerris – Quercus petraea* forests. It is widespread in the northwest of Romania, Oradea Hills, Lăzăreni Hills, Măgura Șuncuiuș Hill, Bihor County.

Plant association: *Quercetum petraeae ceris, - ruscetosum aculeati* Morar – Burescu 2012.

Ecosystem type: 7724 high and medium productive sessile oak and Turkey oak stands, with mull-moder, growing on brown and brown-reddish, mesobasic soils with *Glechoma hederacea* and *Geum urbanum.*

This ecosystem contains high conservation values classified as: HCVFs 1.1, HCVFs 1.2, HCVFs 3 and HCVFs 4.2 with string plant populations of *Ruscus aculeatus*.

Ecosystem R 4140 Dacian - Balkan forests of sessile oake (*Quercus petraea*), Turkey oak (*Quercus cerris*) and European white lime also known as silver linden (*Tilia tomentosa*) with *Lychnis coronaria*. PALAEARCTIC HABITATS 41.7696, Pre-Carpathian *Quercus cerris – Quercus petraea* s.l. forests. It is spread throughout the Oradea Hills, Șomleu Hill, Băile 1 Mai Oradea, Bihor County.

Plant association: *Tilio argenteae – Qurcetum petraeae – cerris* Soó 1967 – *ruscetosum aculeati* Morar – Burescu 2012.

Type of forest ecosystem: 7114 High and medium productive Turkey oak stands with mull, growing on brown and reddish-brown, typical eubasic and mesobasic soils with *Glechoma hirsuta* and *Geum urbanum*. The forests included in this ecosystem contain high conservation values in

the class HCVFs 1.1 with compact and well-developed plant populations of *Ruscus aculeatus*.

Ecosystem R 4152, Dacian Turkey oak forests (*Quercus cerris*) and European hornbeam (*Carpinus betulus*) with *Digitalis glandiflora*. PALAEARCTIC HABITATS 41.769 Getic and sub-continental thermophyllus oak forests. This type of ecosystem can be found at Măgura Hill, Șuncuiuș, Oradea Hills, Lăzăreni Hills, Bihor County.

Plant association: *Carpino - Quercetum cerris Klika* 1938 (Boșcaiu et al. 1969).

Type of forest ecosystem: 7214 High and medium productive Turkey oak and European hornbeam stands, with mull growing on brown and brown-reddish luvic, eubasic-mesobasic soils with *Arum orientale* and *Brachypodium sylvaticum*.

This ecosystem contains high conservation value forests classified as HCVFs 1.2, HCVFs 1.3 and HCVFs 4.2, and enjoy a very high biodiversity.

Ecosystem R 4154 Danubian and Balkan forests of Hungarian oak (*Quercus frainetto*). PALAEARCTIC HABITATS 41.76814. Balkan and Danube *Festuca heterophylla* forest. This type of ecosystem is widespread in the form of isolated forest stands on the Oradea Hills, Lăzareni Hills, Bihor County.

Plant association: *Quercetum frainetto-dalechampii* (Bârcă 1984), Chifu et al. 2006.

Type of forest ecosystem: 7535 Medium productive Hungarian oak forests with moder growing on luvic vertisoils and brown luvic, oligomesobasic soils with *Genista ovata* and *Festuca heterophylla*. This ecosystem comprises high conservation value forests classified as HCVFs 1.1 and HCVFs 1.2 in which isolated plant populations of *Ruscus aculeatus* and *Convallaria majalis* grown.

Conservation status and potential threats: conservation of the forests in this habitat is endangered by the lack of a Natura 2000 specific Management Plan, changes in plant living conditions (through deforestation, clear cutting) leading to inadequate conditions for the development of rare, endangered, vulnerable, relic, endemic species, such as *Ruscus aculeatus, Cephalanthera damasonium, Convallaria majalis* and *Potentilla micrantha*, and smaller forests surfaces populated with Hungarian oak and reproductive isolation.

91 Yo Dacian oak-hornbeam forests

In the Annex of the Treaty of Accession of Romania (and Bulgaria) to the European Community (January 2005), this type of habitat was included in the list of habitats described as forests consisting of various plant species of *Quercus robur, Quercus petraea, Quercus dalechampii, Quercus cerris, Quercus frainetto* in mixture with European hornbeam

(*Carpinus betulus*) spread on the sizes and foothills of the eastern and southern Carpathians, in the Moesiac area of the plant alliance *Quercion frainetto*, in the eastern part of the Pannonian area, in the western part of the Danubian-Pontic forest steppe area, and in the pre-Pontic area of southeast Europe.

Dacian hornbeam-Turkey oak forests are widespread in Romania, and they can be found in the peri- and intra-Carpathian hills in the west, center and north parts of the country, the Transylvanian Plateau, the sub-Carpathians of Moldova and Curvature Carpathians, the Dobrogea Plateau and in the Danube Plain, growing on low to moderate steppe slopes, ridges, wide ridges, plateaus, wide valleys, high plains at altitudes ranging from 200 to 800 m, with average annual temperatures of 7.5-10°C, and average annual rainfall between 500 and 800 mm.

The sub-layers on which they develop are generally marl, calcareous sandstone, clay deposits, loëss, conglomerates, limestone and even crystalline shale with soils classified as luvisoils and cambisoils. The forest vegetation consists of mixtures of non-European, Balkan and Caucasian European plant species.

The phytocenoses of the oak trees stands have the tree layer composed of sessile oak (*Quercus petraea*), Dalechampii oak (*Quercus dalechampii*), European hornbeam (*Carpinus betulus*), exclusively or mixed with European beech (*Fagus sylvatica*), pedunculate oak (*Quercus robur*), Turkey oak (*Quercus cerris*), Hungarian oak (*Quercus frainetto*), small-leaved lime tree (*Tilia cordata*), European white lime (*Tilia tomentosa*), broad-leaved lime tree (*Tilia platyphyllos*), European sweet cherry (*Prunus avium*), Norway maple (*Acer platanoides*), sycamore (*Acer pseudoplatanus*), European ash tree (*Fraxinus excelsior*, *Fraxinus angustifolia*), flowering ash (*Fraxinus ornus*), smooth-leaved and wych elm (*Ulmus minor, Ulmus glabra*), field maple (*Acer campestre*), mounatin ash (*Sorbus torminalis*), Tartarian maple (*Acer tataricum*), European wild apple tree (*Malus sylvestris*), and European wild pear (*Pyrus pyraster*).

The shrubs layer consists of cornel-tree (*Cornus mas*), femal corenl-tree (*Cornus sanguinea*), European haze-tree (*Corylus avellana*), common hawthorn (*Crataegus monogyna*), common privet (*Ligustrum vulgare*), European spindle (*Euonymus europaeus*), way faring tree deciduous shrub (*Euonymus verrucosus*) (*Viburnum lantana*), elder (*Sambucus nigra*), common buckthorn (*Rhamnus catharticus*).

Depending on the specificity of its habitat, the herbaceous layer is differentiated into three categories of floristic compositions as follows:

(i) On weak-acid to neutral soils, saturated at the base, the species of mull flora are present: *Arum orientale, Asarum europaeum, Galium odoratum, Polygonatum latifolium, Geum urbanum, Lathyrus*

vernus, Lathyrus niger, Lathyrus hallersteinii, Stellaria holostea, Brachypodium sylvaticum, Lamium galeobdolon, etc.;

(ii) On moderately acid, mesobasic soils, herbaceous flora is predominantly composed of poaceae: *Poa nemoralis, Festuca drymeja, Melica uniflora, Calamagrostis arundinacea*, besides which one can meet *Carex sylvatica, Carex pilosa, Luzula luzuloides, Galium schultesii, Veronica officinalis, Glechoma hirsuta, Hieracium transsylvanicum* and *Lithospermum purpureocaeruleum*;

(iii) On acid, skeletal, oligotrophic soils on sunny, strongly inclined slopes the predominant sub-shrub species are: *Cytisus nigricans, Cytisus hirsutus, Cytisus austriacus* ssp. *heuffelii, Genista tinctoria* ssp. *tinctoria, Calluna vulgaris, Bruckentharia spiculifolia, Vaccinium myrtillus, Vaccinium vitis-idaea,*, besides which one can encounter *Luzula luzuloides, Poa nemoralis, Veronica officinalis, Fragaria viridis, Scutellaria alltissima and Lithospermum purpureocaeruleum*.

In the northwest of Romania this type of habitat is represented by two types of forest ecosystems, as follows:

R4124 Ecosystem. Dacian forests of sessile oak (*Quercus petraea*), European beech (*Fagus sylvatica*) and European hornbeam (*Carpinus betulus*) with *Lathyrus hallersteinii*. PALAEARCTIC HABITATS 41. 2C12. Dacian Lathyrus hallersteinii oak - hornbeam forests. It is spread in the northwest of Romania on the Oradea Hills.

Ecosystem type: 5216 High and medium productive sessile oak with European hornbeam, with mull growing on typical brown, luvic, eubasic and mesobasic soils with *Asperula odorata - Asarum europaeum - Stellaria holostea*.

Plant association: *Carpino-Quercetum petraeae* Borza 1941.

The physiognomy of the association is instilled by the two characteristic and uplifting species: *Quercus petraea* with an overall coverage of 62.5% and *Carpinus betulus* with an overall coverage of 13.34% alongside which also are present: *Prunus avium, Tilia tomentosa, Acer campestre, Quercus dalechampii, Acer platanoides, Fraxinus excelsior, Fagus sylvatica, Tilia cordata, Ulmus glabra, Ulmus minor* and *Quercus robur*.

The shrub layer consists of Cornus mas, Crataegus monogyna, Ligustrum vulgare, Euonymus europaeus, Staphylea pinnata, Sambucus nigra.

The herbaceous layer encompasses a number of 66 characteristic and recognizable cormophyte species specific for the sub-alliance *Lathyro hallersteinii* – the alliance *Symphyto cordati – Fagion: Ruscus aculeatus,*

Glechoma hirsuta, Festuca drymeja, Stellaria holostea, Lathyrus vernus, Dactylis polygama, Viola odorata, Polygonatum multiflorum, the order *Fagetalia sylvaticae: Lamium galeobdolon, Euphorbia amygdaloides, Allium ursinum, Alliaria peţiolata, Rubus hirtus, Carex pilosa, Mercurialis perennis, Stachys sylvatica, Galium odoratum, Scrophularia nodosa, Sanicula europaea, Circaea lutetiana,* the class *Querco-Fagetea: Dentaria bulbifera, Malica nutans, Melica uniflora, Anemone nemorosa, Hedera helix, Mycelis muralis, Geum urbanum, Viola reichenbachiana, Brachypodium sylvaticum, Symphytum tuberosum, Polygonatum latifolium, Athyrium filix-femina.* Some species migrated from the class *Querctea pubescenti-petraeae* are included in this plant association: *Quercus cerris, Quercus polycarpa, Sorbus torminalis, Acer tataricum, Polygonatum odoratum, Viola hirta, Melittis melissophyllum* (see Table 1).

High conservation values: In this habitat there are located high conservation values forests classified as HCVFs 1.2 and HCVFs 1.3, populated with rare species, relict plant species considered as monuments of nature: *Ruscus aculeatus, Sanicula europaea* and *Convallaria majalis*.

Conservation status and potential threats: Conservation of these forests is endangered by the lack of a Natura 2000 specific Management Plan, wood extractions performed improperly both in terms of the wood exploitation works application technique and the selection of tree specimens and species from a scientific, economic point of view, afforestation with wood species other than those characteristic for that habitat, inter-specific plant competition favoured by human factor, by which species such as hornbeam, field maple, linden trees totally or partially supress oak and sessile oak species, invasion of allochthonous species such as acacia, soil sodding that hinders the regeneration from advance grow, and the damage caused by entomofauna and phytopathogenic agents.

R4143 Ecosystem. Dacian forests of pedunculate oak (*Quecus robur*) with *Melampyrum bihariense*. PALAEARCTIC HABITATS 41.2C11 Dacian *Melampyrum bihariense* oak-hornbeam forests. This type of habitat is widespread in the northwest of Romania, across the Oradea Hills and the Lăzăreni Hills.

Ecosystem type: 6216 Medium productive oak-hornbeam forests, with mull growing on typical brown, luvic, eubasic and mesobasic soils with *Asperula odorata - Asarum europaeum - Stellaria holostea*.

Plant association: *Querco robori - Carpinetum* Borza 1937

The physiognomy of this plant association is instilled by the two characteristic and dominant species i.e. *Quercus robur* with a general coverage of 21.5% and *Carpinus betulus* with a general coverage of 29.5% alongside which plant species such as vegetează *Prunus avium, Acer campestre, Fagus sylvatica, Tilia tomentosa, Tilia cordata, Quercus*

petraea, Fraxinus excelsior, Ulmus minor, Malus sylvestris and *Pyrus pyraster* also develop.

The shrub layer consists of *Cornus mas, Crataegus monogyna, Ligustrum vulgare, Euonymus europaeus, Euonymus latifolium, Acer tataricum* and *Sambucus nigra*.

The herbaceous layer comprises a number of 64 characteristic and differential cormophyte species for the sub-alliance *Lathyro hallersteinii - Carpinenion*, the alliance *Symphyto cordati-Fagion: Glechoma hirsuta, Ruscus aculeatus, Stellaria holostea, Tamus communis, Arum maculatum, Melampyrum bihariense, Isopyrum thalictroides, Viola odorata, Melica picta, Potentilla micrantha*, the order *Fagetalia sylvaticae: Galium odoratum, Lamium galeobdolon, Allium ursinum, Veronica hederifolia, Rubus hirtus, Alliaria petiolata, Corydalis cava, Stellaria nemorum, Carex pilosa, Carex sylvatica, Euphorbia amygdaloides, Mercurialis perennis, Pulmonaria officinalis, Sanicula europaea,* the class *Querco-Fagetea: Polygonatum latifolium, Ranunculus ficaria, Anemone nemorosa, Melica nutans, Cruciata glabra, Viola reichenbachiana, Dentaria bulbifera, Carex digitata, Corydalis solida, Brachypodium sylvaticum, Geum urbanum, Campanula rapunculoides, Lathyrus niger, Symphytum tuberosum, Galium schultesii*.

In the association migrated species from the class *Quercetea pubescenti-petraeae* do appear: *Qurcus cerris, Quercus polycarpa, Sorbus torminalis, Acer tataricum, Polygonatum odoratum, Melittis melissophyllum* and *Pulmonaria mollis* (see Table 1).

High conservation values: this habitat contains high conservation value forests classified as HCVFs 1.2 and HCVFs 1.3, where rare and relict species, considered as monuments of nature, found shelter i.e. *Ruscus aculeatus, Arum maculatum, Melampyrum bihariense, Potentilla micrantha, Sanicula europaea* and *Convallaria majalis*.

Conservation status and potential threats: lack of a specific Natura 2000 Management Plan, inadequate management, improper timber extractions, afforestation with species other than those specific to this habitat, unfair interspecific competition by which the hornbeam, linden, field maple supress oak and sessile oak species, soil sodding the soil that hinders the regeneration from advanced grow, grazing and transit of the animals through the habitat.

Table 1

Forest habitat of community interest in north-western Romania and the categories of high conservation value forests (HCVFs) they contain

o.	Habitats			Plant associations	Type of forest ecosystem	High conservation values forest categories	Location
	Habitats codes according to Directive 92/43/EEC	Romanian equivalent code	PALAEARCTIC code				
1	2	3	4	5	6	7	8
1	9110. *Luzulo-Fagetum* beech forest	R4110. Southeast South-east Carpathian beech forests (*Fagus sylvatica*) with *Festuca drymeja*	41.1 D54 South Carpathian *Festuca drymeja* beech forest	*Festuco drymejae – Fagetum* Morariu et al. 1968	4136	HCVF 1.2, 1.3	Oradea Hills, Măgura Vadu Crișului Hill
2	9130. *Asperulo – Fagetum* beech forests	R4118. Dacian beech forests (*Fagus sylvatica*) and European hornbeam (*Carpinus betulus*) with*Dentaria bulbifera*	41.1D224 Dacian *Dentaria bulbifera* beech forests	*Carpino-Fagetum* Păucă 1941	4216	HCVF 1.2, 1.3	Oradea Hills, Măgura Vadu Crișului Hill, Lăzăreni Hills
3	91 HO* Pannonian woods with *Quercus pubescens*	R4160. Dacian pubescent oak forests – open wood (*Quercus pubescens*) with*Lithospermum purpurocoeruleum*	41.7373 Intra-Carpathian insular *Quercus virgliana* forests	*Corno – Quercetum pubescentis* Jakucs et Máthé et Kóvacs 1962	8771	Șeica Mică, Mirăslău Transylvanian Plateau, Crișul Repede Defile, Băile 1 Mai, HCVF 1.1, 3., 4.1, 4.2.	Măgura – Șuncuiuș Hill, Valea Toplița-Lunca Sprie Valley, Șomleu Hill – Băile 1 Mai Oradea
4	9110* Euro-Siberian forest steppeswith *Quercus sp.*	R.4138. Dacian Sessile oak forests (*Quercus petraea*) and pubescent oak(*Quercus robur*) with*Acer tatricum*. R. 4418. Psamophile Pannonic forests of pedunculate oak (*Quercus robur*) cu *Convallaria majalis*	41.7A225 Sarmatian*Acer tataricum – Quercus robur – Quercus petraea* forest steppe 41.7A213 Pannonic sand steppe oak woods	*Aceri tatarico – Quercetum roboris* Zólyomi 1957 facies with*Ruscus aculeatus, Polygonato latifolio-Quercetum roboris* (Hargitai 1940, Borhidi 1966) (Syn.: *Convallario-Quercetum roboris* Soó 1957)	6716 - -	HCVF 1.1, 1.2 HCVF 1.2, 1.3, 4.2	Oradea Hills Lăzăreni Hills, Nort-west Romania sandy areas, Șimian, Valea lui Mihai, Oradea Hills
5	91LO. Illyrian oak - hornbeam forest (*Erythronio - Carpinion*)	R4127. Mixed Dacian sessile oak (*Quercus petraea*), beech (*Fagus sylvatica*) and silve limetree (*Tilia tomentosa*) with*Erythronium dens-canis*.	41.2A12. Illyrian neutrocline sessile oak hornbeam forests.	*Tilio tomentosae - Quercetum dalechampii,* Sârbu 1979, *ruscetosum aculeati* subas. nova. *Fago-Quercetum petraeae* R.Tüxen 1955	5416 4516	HCVF 1.1, 1.2, 3, 4.2	Oradea Hills Vadu Crișului

o.	Habitats			Plant associations	Type of forest ecosystem	High conservation values forest categories	Location
	Habitats codes according to Directive 92/43/EEC	Romanian equivalent code	PALAEARCTIC code				
1	2	3	4	5	6	7	8
6	91 Mo. Pannonian - Balkan Turkey oak - sessile oak forest	R4132. Pannonic and Balkan sessile oak (*Quercus petraea*), Turkey oak (*Quercus cerris*) and beech (*Fagus sylvatica*) forests with *Melittis melissophyllum*.	41.7696. Pre-Carpathian *Quercus cerris* - *Quercus petraea* forests.	*Quercetum petraeae* - *ceris* (Soó 1957)1969 - *ruscetosumaculeati* Morar - Burescu 2012	7724	HCVF 1.1, 1.2, 3, 4.2	Oradea Hills Măgura – Șuncuiuș Hill, Lăzăreni Hills
		R4140. Dacian – Balkan Sessile oak (*Quercus petraea*)forests, Turkey oak (*Quercus cerris*) and silver lime tree (*Tilia tomentosa*) forests with *Lychnis coronaria*.	41.7696. Pre-Carpathian *Quercus cerris* - *Quercus petraea* s.l. forests.	*Tilio argenteae* - *Quercetum petraeae cerris* Soó 1967 - *ruscetosum aculeati* Morar - Burescu 2012	7114	HCVF 1.1	Oradea Hills, Șomleu Hill, Băile 1 Mai Oradea
		R. 4152. Dacian Turkey oak (*Quercus cerris*) andEuropean hornbeam (*Carpinus betulus*) forests with *Digitalis grandiflora*	41.769. Getic sub-continental thermophilous oak forests	*Carpino-Quercetum cerris* Klika 1938 (Boșcaiu et al. 1969)	7214	HCVF 1.2, 1.3, 4.2	Oradea Hills, Lăzăreni Hills, Măgura Șuncuiuș Hill
		R.4154. Pannonic and Balkan of Hungarian oak (*Quercus frainetto*)	41.76814. Danubian - Balkan *Festuca heterophylla* forests	*Quercetum frainetto – dalechampii* (Bârcă 1984) Chifu et al. 2006	7535	HCVF 1.2, 1.3	Oradea Hills, Lăzăreni Hills
7	91YO. Dacian oak – hornbeam forests	R 4124. Dacian sessile oak (*Quercus petraea*), beech (*Fagus sylvatica*) and European hornbeam (*Carpinus betulus*) forests with *Lathyrus hallersteinii*	41.2C12. Dacian *Lathyrus hallersteinii* oak – hornbeam forests	*Carpino – Quercetum petraeae* Borza 1941	5216	HCVF 1.2, 1.3	Oradea Hills
		R 4143. Dacian pedunculated oak (*Quercus robur*) forests with*Melampyrum biharіense*	41.2C11. *Dacian Melampyrum biharіense* oak – hornbeam forest	*Querco robori – Carpinetum* Borza 1937	6216	HCVF 1.2, 1.3	Oradea Hills, Lăzăreni Hills

Notes: The classification by forest ecosystems types (4136, 4216, 4516, 5216, 5416, 6216, 6716, 7114, 7214, 7535, 7724, 8771) was done according to the Romanian typological system elaborated by Doniță, Chiriță, Stănescu (coord.) 1990, Doniță, Gafta (1992):

High conservation value forests (HCVFs) were grouped into six distinct categories after processing, with comments to the practical guidelines by Stanciu, Mihul, Dinicu (2005), Vlad, Bucur, Turtică (2013) as follows :

HCVF 1.1. Forest areas from natural areas protected with role in the conservation of natural habitats and biodiversity, including forests of scientific interest in subgroups 1.5.a, 1.5.d, 1.5.f (taken after the Ministry of Forestry 1986, with comments and notes from Stăncioiu et al. 2008)

HCVF 1.2. Forests that contain rare, threatened or endangered species;

HCVF 1.3. Forests formed in natural habitats for endemic flora species and relict species;

HCVF 3. Forests that contain rare, threatened, endangered ecosystems or species included in rare plant associations;

HCVF 4.1. Forests with special role for the protection of drinking water sources and the prevention of floods with excessive alluvium transport;

HCVF 4.2. Forests with an important role in controlling soil erosion.

The classification of habitats by types was made according to European Directive 92/43/EEC which is legal framework for the implementation of the Natura 2000 Ecological Network, (9110, 9130, 91HO, 91IO *, 91LO, 91MO, 91YO) and according to the Romanian typology (R4110, R4118, R4160, R4138, R4148, R4127, R4132, R4140, R4152, R4154, R4124, R4143) adapted to the specific conditions of our country by Doniță et al. (2005).

The management mode and the measures necessary to maintain a favourable conservation status

According to the functional classification of forests in Romania, these habitats are generally classified into Group 1 - Forest vegetation with special protection functions, included in the functional Type II.

These forests will be managed under conservation regime in which the exploitation of main wood products by the classic regeneration cuts shall not be allowed anymore. Their management will be done through special conservation works that shall ensure the continuity of the forest and maintain a favourable conservation status for the fulfilment of the assigned protection functions.

The care and management of the tree stands shall be adopted and executed in relation to the assigned protection function, with a lower intensity yet with a higher periodicity.

In case of disturbance due to natural or anthropic causes in the studied tree stands, the restoration of the favourable conservation status will be done by natural regeneration from advance grow or from the neighbouring trees or, if not possible, from the trees with similar genetic ecotypes, but coming from the same geographical area.

CONCLUSIONS

We identified two types of forest habitats of community interest in European version and other four types of equivalent habitats on the Romanian territory.

The phytocenoses of forests included in these habitats are subordinated to six rare plant associations, described for the first time for that territory.

The floristic inventory was carried out for each plant association, classifying the species to the corresponding cenotaxa.

The habitats surveyed contain high conservation value forests classified as HCVF 1.1, 1.2, 1.3, 3, and 4.2.

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INDUCTION HEAT TREATMENT OF THE TRIANGULAR RECTANGULAR DRILL

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Abstract

This paper proposes an analisys of the induction hardening method of the triangular rectangular drill. In the case of the triangular rectangular drill the heating analysis needs solution in the thermal diffusion problems coupled with eddy currents case. We make the known simulation to be sure that the requirements parameter are the same in practice.

Keywords: Numerical simulation, Electromagnetic field, Electromagnetic field coupled with thermal, triangular rectangular drill.

INTRODUCTION

The triangular rectangular drill is used for digging seedlings

The drills used to dig holes for planting seedlings must meet very different conditions, which condition their construction:

The cutting area of the drill must have optimal linear and angular parameters, depending on the terrain conditions in which it is worked.

The drill must have such a construction that the dislocated soil should be evacuated freely, and should it remain in the pit, it should not prevent its advance and withdrawal.

The construction of the drill must ensure easy sharpening, or if possible self-sharpening of cutting edges is possible

During the work, the drills should not cause the walls of the excavated pits to be pressed, nor the mixing of the detached layers of earth, when this is required

In general the triangular rectangular drill must be have an homogeneous structure to respond of imposed requirements.

We know that the induction hardening simulation method is used for all kinds of geometry types of metal piece. This method consider the change of both parameters like the electromagnetic and thermal parameters.

Both parameters is accourding with the temperature.

We must verify that the B-H relation is dependend on temperature, passing from iron-magnetic environment form to air. In this case, we observe that the eddy's current problems and thermal diffusion are strongly coupled in the Curie point zone.
As we know the B-H relation is linear and the magnetic permeability is adjusting according to the highest effective value of the magnetic induction (Leuca, et al., 2007)

We adopt linear pattern (FLUX 2D – tutorial) and the B-H relation.

MATERIAL AND METHOD

For the simulation we use FLUX 2D software package.

In the analysis of this case we must solve the electromagnetic problem with a parallel – plane structure.

The magnetic field problem can be solved by reduced to the determination of a potential vector with a single component, which verifies an similar equation of the scalar potential.

The coupled of thermal diffusion problems with eddy currents is the main problem of every hardening method.
For a better analysis of the results we need to find the result of eddy currents problem (power density) and temperature (thermal capacity and thermal conductibility) (Leuca, 1997; Leuca et al., 2002)

RESULTS AND DISCUSSION

The numerical simulation with FLUX 2D software (FLUX 2D – tutorial) allows to determining accurately the relationship between the used frequencies, the desired treatment depth and also the power density.

The desired treatment depth is very important to make a complete map of the hardening process.

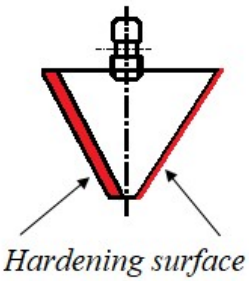

Fig. 1. The triangular rectangular drill

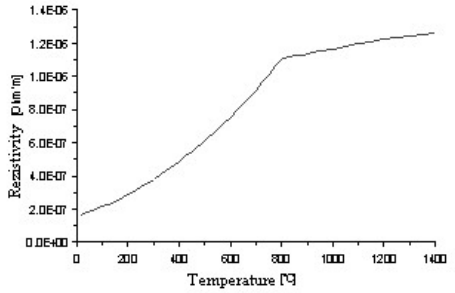

Fig. 2. The temperature dependence of the resistivity of steel

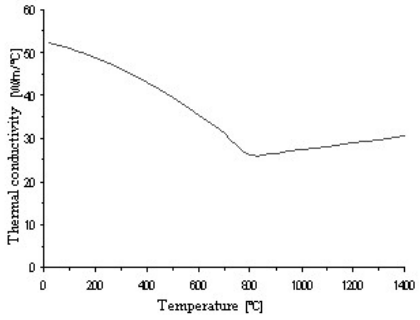

Fig. 3. The temperature dependence of the thermal conductivity of steel

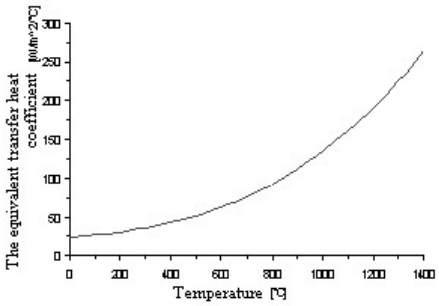

Fig. 4. The temperature dependence of the equivalent heat transfer coefficient

CONCLUSIONS

The thermal transfer to the surface of the workpiece is characterized by a convection coefficient with the value α = 20 W/m^2/°C and by a radiation coefficient (characteristic of the thermal transfer by radiation) ε = 0,75 by which the dependence of the thermal transfer coefficient α_e it's a function of temperature

The numeric simulation of the hardening process is a complex problem because the non-linear problems of eddy currents is provide from non-linear relation of **B-H.**

The non-linear of thermal problem provide from dependence with temperature of thermal parameters (Leuca T. et al., 2007; Leuca and Cheregi, 2009; Cheregi and Arion, 2008, 2010; Cheregi et al,, 2008; Arion and Cheregi, 2008; Maricaru et al., 2011; Hănţilă et al, 2012; Arion et al, 2012; Burca et al., 2012, 2013; Burca, 2014)

After the simulation process we observe that the coupled of two problems result from strong dependence of relation **B-H** with temperature. Through proposed heat treatment we get a homogenous structure.

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INFORMATION MANAGEMENT SYSTEM WITH DATA PROCESSING ALGORITHM APPLIED IN THE FORESTRY SECTOR

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Abstract

In this paper, it is proposed to design and implement a relational database in order to store, manage and apply a calculation algorithm on the information obtained based on the inventories carried out in the arboretums affected by downhills and wind breaks within the Production Unit VII Văratec, Sudrigiu Forestry District - Bihor Forestry Direction, to provide the desired data at any given time using appropriate computer tools.

The relational database contains the tables Amenity Units and Parties connected by the junction table Volume by species, in which were recorded the volumes by species evaluated in the parties constituted in the arboretums of the affected amenity units.

In the query Increase AU was calculated the annual increase of the arboretum in the amenity unit, and in the query AU P V was calculated for all constituted parties the volume corresponding to the amenity unit in the associated party. In the report AU P V are displayed the amenity units, the parties made for them, the volumes corresponding to each party and the corresponding volume was calculated for each amenity unit, as well as the total volume of amenity units.

Key words: relational database, algorithm, amenity unit, parties, volume

INTRODUCTION

A database is a tool for collecting and organizing information. A computerized database is a container of objects. It can contain one or more tables where information is stored, organized and classified. A relational database stores its tables in a single file, along with other objects, such as forms, queries, and reports.

Within the forestry sector, the use of relational databases is appropriate given the specificity of current and prospective activities, referring to a number of specific indicators. Consequently, the computerized management of the data related to the arboretums that have been affected by extreme meteorological phenomena (downhills and massive wind breaks) is

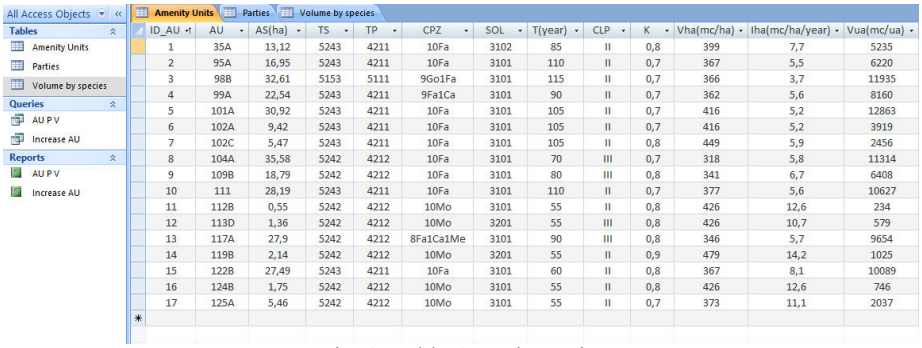
necessary for the elaboration and application of appropriate management strategies.

MATERIAL AND METHOD

The case study was carried out within the Production Unit VII Văratec, Sudrigiu Forestry District - Bihor Forestry Direction, in the arboretums that were affected by the downhills and the massive wind breaks from 17.09.2017.

Consequently, the inventory of the affected wood material in the mentioned arboretums was realized, the obtained information was organized in a database, implemented for the purpose of their efficient exploitation.

The data is stored in a relational database, which can be managed with a database management system, such as the Access application in the Microsoft Office software package, which provides the desired data at any given time. As a result, the stored data is structured and classified in the database tables, organized on different themes, well defined, so that there is no redundancy. One of the desires of designing a database is to eliminate duplicate data. To achieve this objective, the data is divided into several tables according to the subject, so that each aspect is represented once. In this regard, the following themes were considered for the implementation of the database tables: a table with data on the amenity units entitled "Amenity Units", as can be seen in fig. 1 and a table with data on parties entitled "Parties", as can be seen in fig. 2.


All Access Objects

Tables
- Amenity Units
- Parties
- Volume by species

Queries
- AU P V
- Increase AU

Reports
- AU P V
- Increase AU

Amenity Units | Parties | Volume by species

ID_AU	AU	AS(ha)	TS	TP	CPZ	SOL	T(year)	CLP	K	Vha(mc/ha)	Iha(mc/ha/year)	Vua(mc/ua)
1	35A	13,12	5243	4211	10Fa	3102	85	II	0,8	399	7,7	5235
2	95A	16,95	5243	4211	10Fa	3101	110	II	0,7	367	5,5	6220
3	98B	32,61	5153	5111	9Go1Fa	3101	115	II	0,7	366	3,7	11935
4	99A	22,54	5243	4211	9Fa1Ca	3101	90	II	0,7	362	5,6	8160
5	101A	30,92	5243	4211	10Fa	3101	105	II	0,7	416	5,2	12863
6	102A	9,42	5243	4211	10Fa	3101	105	II	0,7	416	5,2	3919
7	102C	5,47	5243	4211	10Fa	3101	105	II	0,8	449	5,9	2456
8	104A	35,58	5242	4212	10Fa	3101	70	III	0,7	318	5,8	11314
9	109B	18,79	5242	4212	10Fa	3101	80	III	0,8	341	6,7	6408
10	111	28,19	5243	4211	10Fa	3101	110	II	0,7	377	5,6	10627
11	112B	0,55	5242	4212	10Mo	3101	55	II	0,8	426	12,6	234
12	113D	1,36	5242	4212	10Mo	3201	55	III	0,8	426	10,7	579
13	117A	27,9	5242	4212	8Fa1Ca1Me	3101	90	III	0,8	346	5,7	9654
14	119B	2,14	5242	4212	10Mo	3201	55	II	0,9	479	14,2	1025
15	122B	27,49	5243	4211	10Fa	3101	60	II	0,8	367	8,1	10089
16	124B	1,75	5242	4212	10Mo	3101	55	II	0,8	426	12,6	746
17	125A	5,46	5242	4212	10Mo	3101	55	II	0,7	373	11,1	2037

Fig. 1. Table Amenity Units

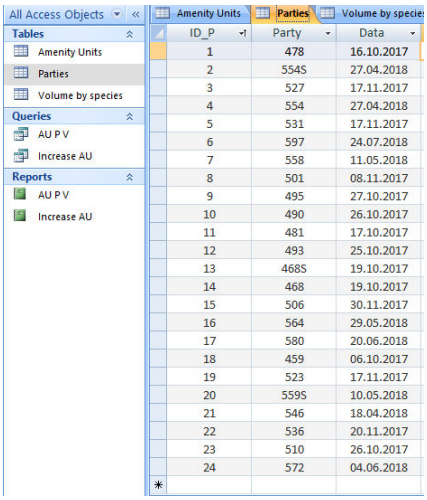


Fig. 2. Table Parties

The Name, the type of data and the description of the fields in the Table Amenity Units are shown in fig. 3.

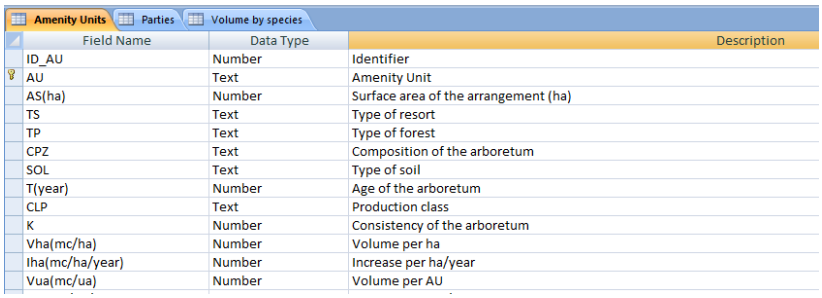


Fig. 3. Name, type of data and description of the fields in the Amenity Units table.

In order to make the database as flexible as possible, so that the information that has been divided by themes can be put together, the database tables are connected by means of connection relations. Consequently, queries can be created that question the database and reports that arrange the information extracted from the database for printing.

The connection relationship between the Amenity Units table and the Parties table is considered. A amenity unit can be evaluated in one or more parties. On the other hand, a party may evaluate one or more amenity units. Therefore, for each record in the Amenity Units table, there may be multiple records in the Parties table. At the same time, for each record in the Parties table there may be several records in the Amenity Units table.

Consequently, the Amenity Units table connects with the Parties table through a *many-to-many* type relationship. To achieve this, a third table, called the junction table, is created, which records the result of each evaluation of a amenity unit by a party. In the table entitled "Volume by species", the volumes by species identified in each party made for each amenity unit are recorded, as can be seen in fig. 4.

Amenity Units | Parties | Volume by species

ID	AU	Party	Fa	Go	Ca	Mo	Ci	Fr	Ju	Pam	Pac	Ulm	Me	Plt	Ann
1	35A	478	1235	0	0	0	0	3	12	4	0	0	0	0	0
2	95A	554S	1204	0	0	0	0	0	0	0	0	0	0	0	0
3	95A	527	871	54	16	0	0	0	0	0	0	0	0	0	0
4	95A	554	430	29	12	0	5	0	0	0	0	0	0	0	0
5	98B	531	131	2148	3	0	0	0	3	0	0	0	0	0	0
6	98B	597	9	32	2	0	0	0	0	0	0	0	0	0	0
7	99A	558	34	0	3	0	0	0	0	0	0	0	0	0	0
8	99A	501	764	84	140	4	0	0	0	0	0	0	0	0	5
9	99A	495	1445	72	71	11	17	0	0	4	0	0	0	0	0
10	101A	490	333	0	0	2	2	0	7	0	0	0	0	0	0
11	101A	481	1309	6	4	0	31	7	0	10	16	0	0	0	0
12	101A	493	2284	32	0	2	23	0	0	13	19	5	0	0	0
13	102A	468S	1081	0	0	0	0	0	0	0	0	0	0	0	0
14	102A	468	135	0	0	0	20	0	0	45	0	0	0	0	0
15	102C	506	1044	13	0	0	39	0	0	34	0	0	0	0	0
16	104A	564	4012	106	31	0	0	0	0	0	0	0	0	0	0
17	104A	580	1098	0	0	0	0	0	0	0	0	0	0	0	0
18	109B	459	2575	164	2	0	5	0	0	4	0	0	0	0	0
19	111	523	4343	0	0	0	0	0	0	5	0	0	3	0	0
20	112B	559S	32	0	0	175	1	0	0	0	0	0	11	1	0
21	113D	559S	25	0	1	303	1	0	0	0	0	0	14	2	0
22	117A	546	65	0	2	0	0	0	0	0	0	0	0	0	0
23	117A	536	2754	4	49	9	0	0	0	35	0	0	140	0	0
24	119B	559S	64	0	0	784	0	0	0	8	0	0	54	13	0
25	122B	510	2829	0	24	0	0	0	0	9	0	0	3	0	0
26	124B	572	2	0	0	23	0	0	0	0	0	0	1	0	0
27	125A	572	31	0	5	601	0	0	0	1	0	0	19	3	0

Fig. 4. Table Volume by species

In a relational database it can be created queries that query the database. The query is a powerful tool for analyzing and summarizing information from a database. It is a question asked to the tables in a database, allowing the selection of the data of interest, the use of various criteria that can sort, filter and calculate the selected data. Filters are applied to limit the displayed records to those that correspond fit certain criteria, the sortings to sort the records and the algorithms to perform calculations with the data stored in the tables.

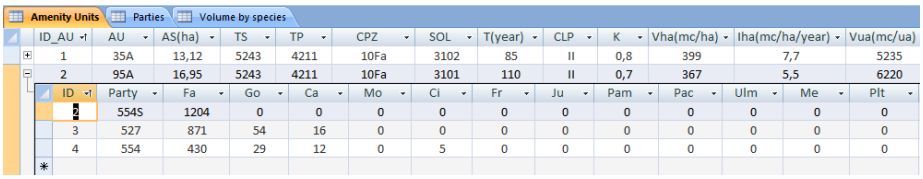
In order to print the data extracted from a database it can be created reports that are objects of the database specially designed for this. They organize the data in the most readable way, allowing the grouping, sorting and summarizing of the data from the displayed records. A report consists of data extracted from tables or queries, which are also called record sources, and graphical information stored with the report's design.

The group or report footer is used to print summary information for the group, respectively for the entire report. When placing a calculated control that uses the Sum aggregate function, the sum is calculated for the

current group if the footer of the group is used, respectively for the entire report in the case of the report footer.

RESULTS AND DISCUSSION

Following the connection of the Amenity Units table with the Parties table through a many-to-many type relationship, for each amenity unit from the Amenity Units table, the corresponding party from the Parties table can be seen, as well as the results of each evaluation stored in the Volume by species table, as can be seen in fig. 5. Also, for each party from the Parties table it can be seen the evaluated amenity units, from the Amenity Units table, as well as the results of each evaluation, as in fig. 6.

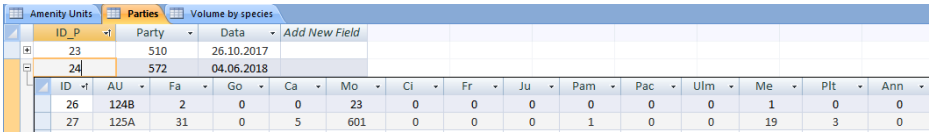


Amenity Units | Parties | Volume by species

ID_AU	AU	AS(ha)	TS	TP	CPZ	SOL	T(year)	CLP	K	Vha(mc/ha)	Iha(mc/ha/year)	Vua(mc/ua)
1	35A	13,12	5243	4211	10Fa	3102	85	II	0,8	399	7,7	5235
2	95A	16,95	5243	4211	10Fa	3101	110	II	0,7	367	5,5	6220

ID	Party	Fa	Go	Ca	Mo	Ci	Fr	Ju	Pam	Pac	Ulm	Me	Plt
2	554S	1204	0	0	0	0	0	0	0	0	0	0	0
3	527	871	54	16	0	0	0	0	0	0	0	0	0
4	554	430	29	12	0	5	0	0	0	0	0	0	0

Fig. 5. The parties corresponding to the amenity unit and the results of each evaluation.



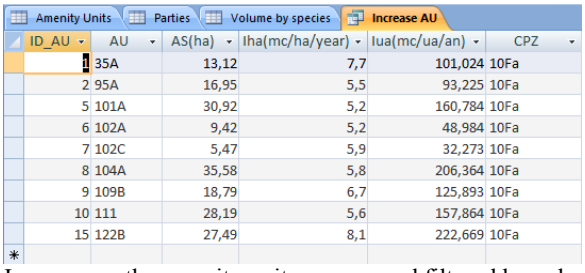
Amenity Units | Parties | Volume by species

ID_P	Party	Data	Add New Field
23	510	26.10.2017	
24	572	04.06.2018	

ID	AU	Fa	Go	Ca	Mo	Ci	Fr	Ju	Pam	Pac	Ulm	Me	Plt	Ann
26	124B	2	0	0	23	0	0	0	0	0	0	1	0	0
27	125A	31	0	5	601	0	0	0	1	0	0	19	3	0

Fig. 6. The amenity units corresponding to the party and the results of each evaluation.

In the query entitled "Increase AU", the fields AU, AS (ha), Iha (mc / ha / year), CPZ from the table of Amenity Units were selected, the increase on the amenity unit per year was calculated and filtered by Composition of the arboretum for the value 10Fa , as can be seen in fig. 7.



Amenity Units | Parties | Volume by species | Increase AU

ID_AU	AU	AS(ha)	Iha(mc/ha/year)	Iua(mc/ua/an)	CPZ
1	35A	13,12	7,7	101,024	10Fa
2	95A	16,95	5,5	93,225	10Fa
5	101A	30,92	5,2	160,784	10Fa
6	102A	9,42	5,2	48,984	10Fa
7	102C	5,47	5,9	32,273	10Fa
8	104A	35,58	5,8	206,364	10Fa
9	109B	18,79	6,7	125,893	10Fa
10	111	28,19	5,6	157,864	10Fa
15	122B	27,49	8,1	222,669	10Fa

Fig. 7. Increase on the amenity unit per year and filtered by value 10Fa.

In the query entitled "AU P V", the AU field was selected from the Amenity Units table, respectively the Party field from the Parties table, and the volume corresponding to the amenity unit from the associated party was calculated for all performed parties based on the evaluated volumes of the identified species, as can be seen in fig. 8.

AU P V

AU	Party	Volum
95A	527	941
95A	554	476
98B	531	2285
98B	597	43
99A	558	37
99A	501	997
99A	495	1620
101A	490	344
101A	481	1383
101A	493	2378
102A	468S	1081
102A	468	200
102C	506	1130
104A	564	4149
104A	580	1098
109B	459	2750
111	523	4351
112B	559S	220
113D	559S	346
117A	546	67
117A	536	2991
119B	559S	923
122B	510	2865
124B	572	26
125A	572	660

Fig. 8. The volume corresponding to the amenity unit from the associated party based on the volumes of the identified species.

In the design of the report entitled "AU P V" controls were placed to display data from the ID_AU and AU fields of the Amenity Units table, from the Party field of the Parties table and from the Volume field of the query AU P V. Also, the displayed records were sorted by field ID_AU, grouped by field AU and the corresponding volume for each amenity unit was calculated based on the volumes corresponding to each performed party for that amenity unit, as well as the total volume of the amenity units, as can be seen in fig. 9.

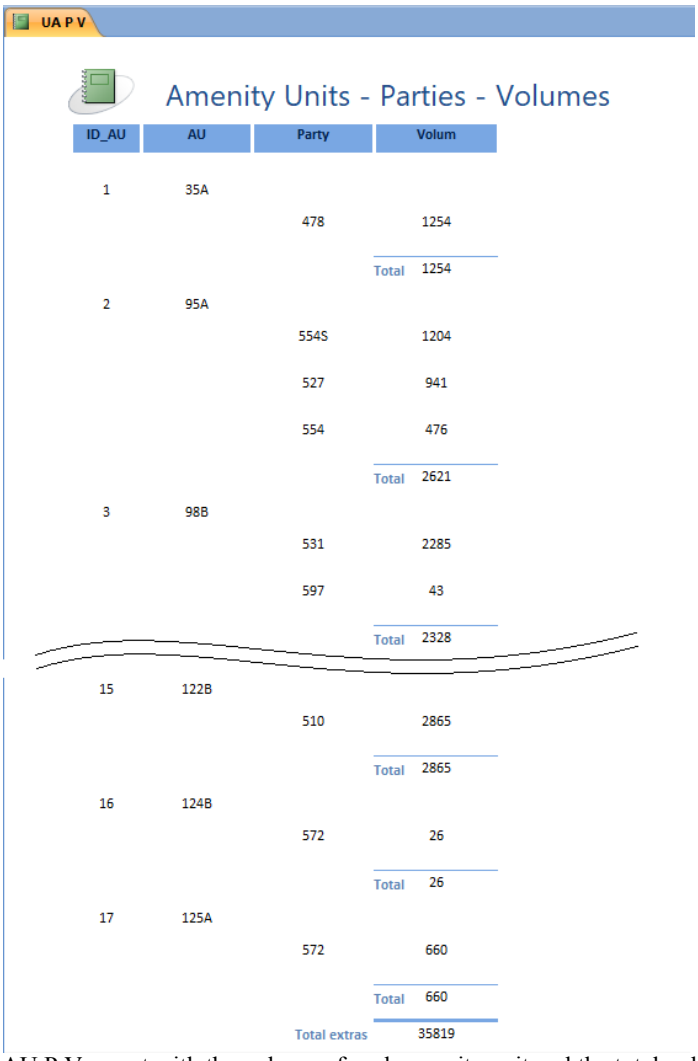


Fig. 9. AU P V report with the volume of each amenity unit and the total volume of amenity units.

CONCLUSIONS

A relational database has been implemented which contains the table Amenity Units with data on the existing amenity units in the plots of the Sudrigiu Forest District in Bihor county and the Parties table with data on the parties performed for the evaluation of these amenity units.

The Amenity Units table was connected with the Parties table through a *many-to-many* type relationship, by the junction table Volume by

species, in which the volumes by species identified in each party made for each amenity unit were recorded.

In the Increase AU query the fields: Amenity Unit, Surface area of the arrangement, Increase per hectare per year, Composition of the arboretum were selected, the Increase on the amenity unit per year was calculated and filtered after Composition of the arboretum for the value 10Fa. In the AU P V query the fields: Amenity Unit, Party were selected and the volume corresponding to the amenity unit from the associated party was calculated for all performed parties.

In the AU P V report were displayed the amenity units, the parties made for them, the volumes corresponding to each party and the corresponding volume for each amenity unit was calculated, as well as the total volume of the amenity units.

This database can be used to store information obtained from field surveys and use them as needed. The computerized management of the results of the various applications made in the field, allows the development of real-time strategies and the adoption of alternative solutions for the various current practical problems.

Acknowledgment

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STUDY ON CIRCUMFERENTIAL PROCESSING ON MILLING MACHINES IN 5 AXIS CNC

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Abstract

The front milling is applied to large surfaces with complicated shape.

Side (circumferential) milling is applied to long, narrow and twisted shapes. In the 2 cases, the shape of the processed region differs and will be analyzed separately. The estimation of the positioning error of the tool is necessary when determining the accuracy of the calculations and the approximation of the trajectory. In the case of 3-axis milling, the errors are measured in the normal direction of the surface. These situations rarely occur, but the NC system must have an option for the exact calculation of the diameter of the processed region.

Key words: milling machine, 5 axis CNC,.vectors

INTRODUCTION

To represent a solid we use points and vectors. The difference between them is that the vectors are the difference between 2 points and they are not related to a certain point in space; they only have direction and mode. The sum and difference of 2 vectors is a vector, the difference of 2 points is also a vector, but the sum of 2 points does not make sense.

We will note the lower case vectors, and the capital letters.

Transforming objects involves changing position, orientation and shape. The set of transformations, essential in geometric modelling, includes the movements of the rigid solid (translation and rotation), symmetry, scaling and their overlays.

All these are particular cases of general blueberry Euclidean transformation. A related transformation is the overlap between a translation and a linear transformation.

In a cartesian coordinate system, a linear transformation of a vector can be described as follows:

$$\begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} = \begin{bmatrix} L_1^1 & L_1^2 & L_1^3 \\ L_2^1 & L_2^2 & L_2^3 \\ L_3^1 & L_3^2 & L_3^3 \end{bmatrix} \cdot \begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix}$$

or v=L·u. Here u is the vector before, and v is the vector after transformation. The matrix L is called the transformation matrix. (Derecichei et al., 2015)

The fact that a vector is invariant in space implies the idea that the transformation to be refined is reduced to a linear transformation. The affine transformation of a point is described by the formula:

$$W=L\cdot U+t.$$

MATERIAL AND METHOD

Circumferential processing on 5-axis milling machines

This procedure is especially applicable to long and twisted surfaces (fig.1)

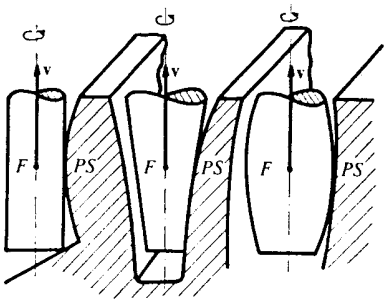

Fig. 1 The processing of a long and twisted surface

Processing of the surfaces covered with cylindrical tools (Derecichei et al., 2013, 2014)

There is a surface defined by 2 curves Q (u) and R (u) and mapping P (u, v) of the form:

$$P(u, v)=v\cdot Q(u)+(1–v)\cdot R(u)$$

We can look at this definition as a family of straight lines W (u) defined as:

$$W(u)= v\cdot Q(u)+(1–v)\cdot R(u)$$

Let a cylindrical tool positioned so as to form a common line W (u), as in fig.2. It can be seen that the tool causes underfeeding. We can minimize the depth e (u) of the undercut by aligning the axis of the symmetrical cylindrical tool, where only the surface between the curves Q (u) and R (u), as seen in fig. 2, is taken into account. https://www.haascnc.com/productivity/5-Axis-Simplified.html

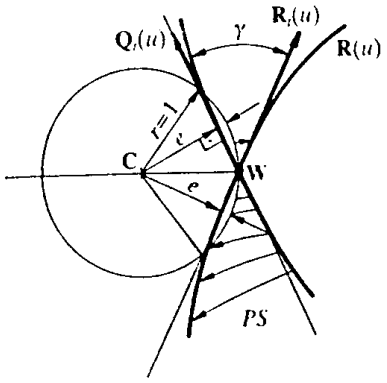

Fig. 2 Positioning of a cylindrical tool

If γ (u) is the angle between the projections of Qu (u) and Ru (u) on a plane perpendicular to W (u), then for small curves of the surface bounded in comparison with the curvature of the tool we obtain:

$$e(u)= 1–\cos(\gamma/2)= \gamma^2/8$$

For example, if γ = 7 ° and the radius of the tool is 10 mm, we obtain e (u) = 0.0125 mm. (Derecichei, et al., 2013)

It can be observed that the error disappears if γ = 0, namely the vectors Qu (u) and Ru (u) have the same direction. This can only occur if the surface is a curvilinear cone. (Derecichei et al., 2016)

It can be seen that a cylindrical tool can be translated along without changing the distance between the tool and the part. This additional degree of freedom can be eliminated by positioning the tangent tool to an additional guiding surface as in fig. 3. (Derecichei et al., 2015)

If the error e (u) is too large, the tool position must be corrected, but in this case more complicated programming methods, described in the following sections, must be applied.

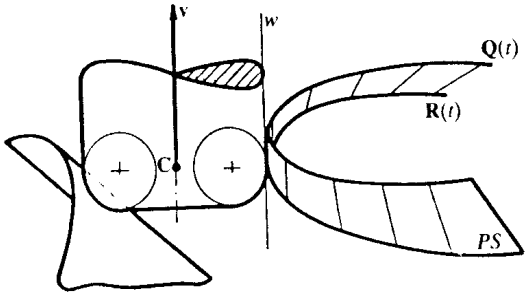

Fig. 3 The tangential position with respect to the guiding surface

RESULTS AND DISCUSSION

Acceptable tool positions

If the tool is positioned as in fig. 4 and x, y, kx, ky are the main directions and curves of the piece, then u, w, ku, kw are the main directions and curves of the tool (Marciniak, 1991; Yoshimi, 2008). We assume ky <kx and ku <kx in the circumferential milling and in addition, we assume that the parallel curvature of the tool is large, that is:

$$k_u<k_w$$

It has been shown before that if φ is the angle between the x and u axes, then the distance between surfaces measured in the direction of the normal verse n can be approximated in the system (P, x, y, n) with:

$$\Delta n=½\cdot(ax^2+2bxy+cy^2),$$

where:

$$a=k_u.\cos^2\varphi+k_w.\sin^2\varphi-k_x$$
$$b=(k_u-k_w)\cdot\sin\varphi\cdot\cos\varphi$$
$$c=k_u.\sin^2\varphi+k_w.\cos^2\varphi-k_y$$

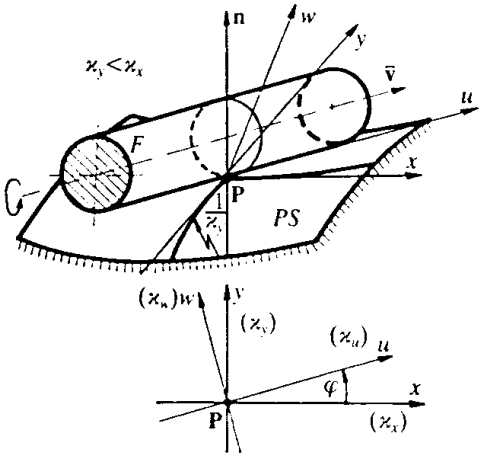

Fig. 4 An acceptable tool position

We distinguish 2 cases:

1. Unrestricted φ angle. If ky≤kx≤ku≤kw then no sub-region appears and all values of φ are admissible. For example, milling a convex surface with a cylindrical tool (Derecichei et al., 2017, 2018).

2. Angle φ restricted. If ky≤ku≤kx≤kw then the potential sub-region

appears and the allowable values of φ are limited by the sub-condition:

$$\frac{(k_u - k_x)(k_w - k_y)}{(k_u - k_w)(k_x - k_y)} = s \le \sin^2 \varphi$$

which can be expressed as: φm≤φ, where φm = arcsin($\pm\sqrt{s}$). Such a situation occurs when milling concave-convex surfaces (kx · ky <0) with a cylindrical milling cutter. https://northwoodmachine.com/products/5-axis-moving-table/

Unrestricted φ angle

In this case ky≤kx≤ku≤kw, no undercutting occurs, and the processed region defined by the condition Δn≤h, where h is processing tolerance, is bounded by the ellipse of fig. 5.

The large semiaxis is inclined to the x-axis with the angle Ψ defined as:

$$\tan 2\Psi = \frac{\sin 2\varphi}{\cos 2\varphi - k}, \text{ where: } \qquad k = \frac{k_x - k_y}{k_u - k_w}.$$

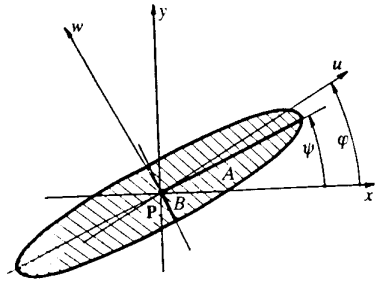

Fig. 5 The elliptical margin of a processed region

The maximum bandwidth is obtained for φ = 0 and γ = 0.

The projection of the tool axis on a tangent plane T is parallel to x, and the speed of the contact point is parallel to the y axis.

We find Ψ = 0 and the maximum width is dm = 2Amax.

In fig. 6 shows a typical example of the effect of the difference of curvature kx-ky on the maximum width of the processed strip.

If long and twisted surfaces are processed, we can further assume that the main curvature of the tool parallel is much larger than other curves.

In this case we can assume that ku – kw = kw.

It follows that k = 0, φ = Ψ and semiaxele ellipse region to be processed:

$$A = \sqrt{\frac{2h}{k_u + (k_x \cos^2 \varphi + k_y \sin^2 \Psi)}} \qquad \text{și} \qquad B=0$$

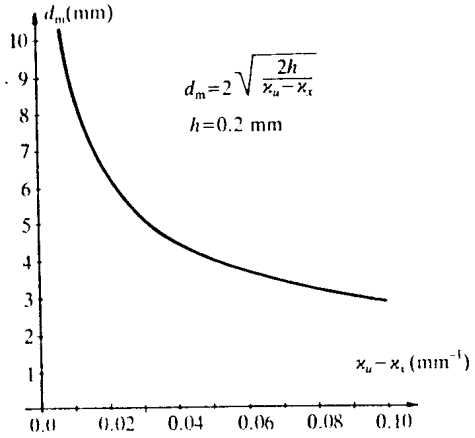

Fig. 6 The maximum width of the processed strip as a function of curvature difference

Substituting in the definition of the width of the processed strip we obtain:

$$d(\varphi, \gamma)=2A\cdot\cos(\gamma-\varphi)$$

In circumferential milling we are usually forced to move the tool along a predefined contact point trajectory and thus the maximum bandwidth is rarely obtained. www.gefanuc.com

This function is illustrated in fig. 7.

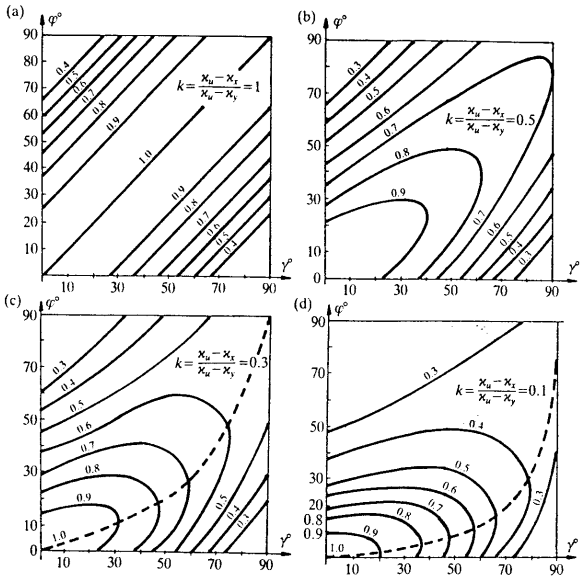

Fig. 7 Function ε(φ, Ψ)

In the case of almost spherical surfaces (fig. 7a), the optimal positions of the tool are defined by the condition φ = Ψ. https://northwoodmachine.com/materials/wood-cnc-routers/

When the difference of the curves of the surface is much greater than the difference between the smallest curvature of the tool and the largest curvature of the surface, that is kx – ky >> ku – ky (for example k = 0.1 << 1) as in fig. 7d, the tool position with cu = 0 must be chosen.

The intermediate effects of φ on the width of the processed strip are shown in fig. 7b and 7c

Angle φ restricted

In this case ky≤ku≤kx≤kw, the potential sub-region appears and the permissible values of φ are limited by the sub-condition:

$$\frac{(k_u - k_x)(k_w - k_y)}{(k_u - k_w)(k_x - k_y)} = s \le \sin^2 \varphi$$

The maximum bandwidth is obtained if the tool position is defined by the angle $\varphi=\varphi_m=\arcsin(\pm\sqrt{s})$. In this position both paraboloids representing the tool and the surface are tangent along a common parabola. The machined strips are large except for the movement of the contact point P defined by the angle φ_m.

The particular case of a convex-concave surface processed by a cylindrical tool is characterized by the conditions $k_u=0$, $k_w=1/R$, și $k_y<0<k_x$. By replacing these values in the previous relation, we obtain:

$$\varphi_m(R) = \arcsin\sqrt{\frac{k_x \cdot (1 - Rk_y)}{k_x - k_y}}$$

In practical cases we can approximate this function with its Taylor series development at R = 0:

$$\varphi_m(0) \cong \varphi_a(R) = \varphi_m(0) + \frac{d\varphi_m}{dR}(0) \cdot R \ ,$$

where:

$$\varphi_m(0) = \arcsin\sqrt{\frac{k_x}{k_x - k_y}} \qquad \text{and} \qquad \frac{d\varphi_m}{dR}(0) = \sqrt{\frac{-k_x k_y}{2}}$$

The error in this approximation can be estimated by analyzing the following parameters:

1) for $k_x=-k_y=0.1$, get:
$\Phi_m(0)=45°$, $\varphi_m(1)=47.87°$, and $\varphi_a(1)=47.86°$
2) for $k_x=-k_y=0.2$, get:
$\varphi_m(0)=45°$, $\varphi_m(1)=50.77°$, and $\varphi_a(1)=50.73°$

CONCLUSIONS

Finally, it should be specified that at the circumferential milling the processed region can be so large that the paraboidal approximation can be satisfactory only as a model for a first estimation of the tool position. For example, using angles φ slightly larger than φm to avoid undercutting is a good practice. In the case of spherical surfaces the extreme is flat and even large deviations from the optimum values do not cause a substantial decrease in the width of the processed strip, and when the difference of the curvature of the surface is much greater than the difference between the smallest curvature of the tool and the greatest curvature of the surface the extreme is flat and even large deviations from the optimal values can be acceptable.

It is also recommended that the visual inspection of the underfloor condition on a graphical screen as a final verification of the programmed trajectory of the tool.

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DYNAMIC ANALISYS OF VIBRATIONS MODES FOR RECTANGULAR WOOD PLATES

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Abstract

This paper presents the modal analysis calculation of total and modal dynamical responses expressed in displacements and bending moments for the rectangular plate loaded with a uniformly distributed forces over the entire surface. Using the multiplier dynamic function is simplifies the dynamic methodology calculation of plates. The method considered the shapes functions of plates vibrations as the product of beams shapes functions having the same limits conditions.The results obtained in this paper reveal the most dangerous sections of the structure relative to the x and y axes.

Key words::modal, wood, plate, vibration, shape, function.

INTRODUCTION

The flat plate considered for the study is reported by a Cartesian coordinate system with the origin in the upper plate left corner. The plate has dimensions a along the x axis and b along the y axis. The aspect ratio considered for the studied plate is

$$\alpha = \frac{a}{b} = 1{,}5$$

In applying the modal analysis method were considered only symmetric modes of plate vibration plate i, j . For the clamped plate, the symmetrical shapes appear for the following normal modes of vibrations (1,1), (1,3), (3,1). (3,3).When performing modal analysis was taken into account the shapes functions expressions functions of the beams (Birsan, 1979), (Fetea, 2010), (Warburton, 1954), (Zienkiewicz, 1971) having the same limits conditions.Modal analysis was performed for clamped rectangular plate with a harmonic loading having pulsation

$$\Omega = 10\frac{rad}{s}$$

The force is considered normal on the plate surface. The harmonic force has the expression (Birsan, 1979), (Birsan, 1971).

$$p(x, y, t) = p(x, y) \cdot f(t) \quad (1)$$

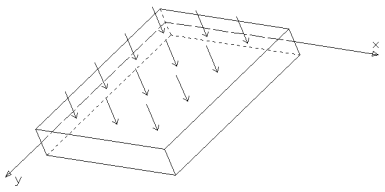

Fig.1 Plate load by uniform forces

Because of symmetry of plate was examined only defined domain by $a = 3, b = 2$ (Figure 2).

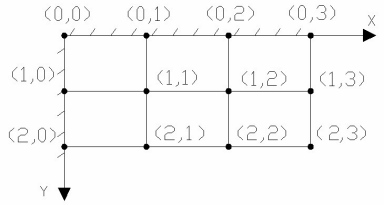

Fig.2 Nodes plate analisys

For this plate the bending moments on the edges along the x and y axes will have zero values.Applying the Galerkin-Vlasov method were determined the parameter pulsations for the plate ratio mentioned above.

MATERIAL AND METHOD

The own pulsations parameter values are calculated (table 1).The results obtained in (Birsan, 1979), (Fetea, 2010), (Lungu, 1990), (Soare, 1999).

Table 1

Pulsations parameters.

Modes	(1,1)	(1,3)	(3,1)	(3,3)
λ_{ij}	60,8	275,2	135,6	301,6
Ω_{ij}	7,79	16,59	11,64	17,36

Starting from the static moments expressions in relation to x, y axes, we express displacement as given by the product of the beams shapes functions (Timoshenko, 1962), (Warburton, 1976) resulting the bending moments expressions:

$$M_{ij}^{x}(x,y) = -D \cdot \left(\frac{\partial^2 w_{ij}(x,y)}{\partial^2 x} - \nu \cdot \frac{\partial^2 w_{ij}(x,y)}{\partial y^2} \right); \; M_{ij}^{y}(x,y) = -D \cdot \left(\frac{\partial^2 w}{\partial^2 y} - \nu \cdot \frac{\partial^2 w}{\partial x^2} \right)$$

$$M_{ij}^{x}(x,y) = -D \cdot \left(\frac{\partial^2 [G_i(x) \cdot G_j(y)]}{\partial^2 x} - \nu \cdot \frac{\partial^2 [G_i(x) \cdot G_j(y)]}{\partial y^2} \right)$$

$$M_{ij}^{y}(x,y) = -D \cdot \left(\frac{\partial^2 [G_i(x) \cdot G_j(y)]}{\partial^2 y} - \nu \cdot \frac{\partial^2 [G_i(x) \cdot G_j(y)]}{\partial x^2} \right)$$

Developing the expressions by explaining the shapes functions of the beams (Birsan, 1979),(Fetea, 2010), is resulting the relations for static moments. They have the expression derivatives of order 2 in relation to the axes and the shapes functions of the bars are given by the expressions (Bors, 2005),(Fetea, 2010)

$$M_{ij}^{'y} = -D\left\{\left(\frac{\beta_j}{b}\right)^2\left[\left(\cosh\beta_j\cdot\frac{y}{a}+\cos\beta_j\frac{y}{b}\right)-k_j\left(\sinh\beta_j\frac{y}{b}+\sin\beta_j\frac{y}{b}\right)\right]\right\} \quad (2)$$

$$G_i^{''}(x) = \left(\frac{\beta_i}{a}\right)^2\left[\left(\cosh\beta_i\cdot\frac{x}{a}+\cos\beta_i\frac{x}{a}\right)-k_i\left(\sinh\beta_i\frac{x}{a}+\sin\beta_i\frac{x}{a}\right)\right] \quad (3)$$

$$G_j^{''}(y) = \left(\frac{\beta_j}{b}\right)^2\left[\left(\cosh\beta_j\cdot\frac{y}{b}+\cos\beta_j\frac{y}{b}\right)-k_j\left(\sinh\beta_j\frac{y}{b}+\sin\beta_j\frac{y}{b}\right)\right] \quad (4)$$

$$M_{ij}^{x}(x,y) = -D\cdot\left\{\left(\frac{\beta_i}{a}\right)^2\left[\left(\cosh\beta_i\cdot\frac{x}{a}+\cos\beta_i\frac{x}{a}\right)-k_i\left(\sinh\beta_i\frac{x}{a}+\sin\beta_i\frac{x}{a}\right)\right]\cdot\right.$$
$$\cdot\left[\left(\cosh\beta_j\cdot\frac{y}{b}-\cos\beta_j\frac{y}{b}\right)-k_j\left(\sinh\beta_j\frac{y}{b}-\sin\beta_j\frac{y}{b}\right)\right]-$$
$$-\nu\cdot\left(\frac{\beta_j}{b}\right)^2\left[\left(\cosh\beta_j\cdot\frac{y}{b}+\cos\beta_j\frac{y}{b}\right)-k_j\left(\sinh\beta_j\frac{y}{b}+\sin\beta_j\frac{y}{b}\right)\right]\cdot$$
$$\left.\cdot\left[\left(\cosh\beta_i\cdot\frac{x}{a}-\cos\beta_i\frac{x}{a}\right)-k_i\left(\sinh\beta_i\frac{x}{a}-\sin\beta_i\frac{x}{a}\right)\right]\right\} \quad (5)$$

$$M_i^{y}(x,y) = \left(\frac{\beta_j}{b}\right)^2\left[\left(\cosh\beta_j\cdot\frac{y}{b}+\cos\beta_j\frac{y}{b}\right)-k_j\left(\sinh\beta_j\frac{y}{b}+\sin\beta_j\frac{y}{b}\right)\right]\cdot$$
$$\cdot\left[\left(\cosh\beta_i\cdot\frac{x}{a}-\cos\beta_i\frac{x}{a}\right)-k_i\left(\sinh\beta_i\frac{x}{a}-\sin\beta_i\frac{x}{a}\right)\right]-$$
$$-\nu\cdot\left(\frac{\beta_i}{a}\right)^2\cdot\left[\left(\cosh\beta_i\cdot\frac{x}{a}+\cos\beta_i\frac{x}{a}\right)-k_i\left(\sinh\beta_i\frac{x}{a}+\sin\beta_i\frac{x}{a}\right)\right]\cdot$$
$$\left[\left(\cosh\beta_j\cdot\frac{y}{b}-\cos\beta_j\frac{y}{b}\right)-k_j\left(\sinh\beta_j\frac{y}{b}-\sin\beta_j\frac{y}{b}\right)\right] \quad (6)$$

Dynamic modal responses in bending moments are [1], [3]:

$$M_{ij}^{x}(x,y,t) = M_{ij}^{x}(x,y,t)\cdot\Psi_{ij}\quad M_{ij}^{y}(x,y,t) = M_{ij}^{y}(x,y,t)\cdot\Psi_{ij}$$

$$M_{11}^{x}(x,y) = -D\cdot\left\{\left(\frac{\beta_1}{a}\right)^2\left[\left(\cosh\beta_1\cdot\frac{x}{a}+\cos\beta_1\frac{x}{a}\right)-k_1\left(\sinh\beta_1\frac{x}{a}+\sin\beta_1\frac{x}{a}\right)\right]\cdot\right.$$
$$\cdot\left[\left(\cosh\beta_1\cdot\frac{y}{b}-\cos\beta_1\frac{y}{b}\right)-k_1\left(\sinh\beta_1\frac{y}{b}-\sin\beta_1\frac{y}{b}\right)\right]$$
$$-\nu\cdot\left(\frac{\beta_1}{b}\right)^2\left[\left(\cosh\beta_1\cdot\frac{y}{b}+\cos\beta_1\frac{y}{b}\right)-k_1\left(\sinh\beta_1\frac{y}{b}+\sin\beta_1\frac{y}{b}\right)\right]\cdot$$
$$\left.\cdot\left[\left(\cosh\beta_1\cdot\frac{x}{a}-\cos\beta_1\frac{x}{a}\right)-k_1\left(\sinh\beta_1\frac{x}{a}-\sin\beta_1\frac{x}{a}\right)\right]\right\}\cdot\Psi_{11} \quad (7)$$

$$M_{13}^{x}(x,y) = -D\cdot\left\{\left(\frac{\beta_1}{a}\right)^2\left[\left(\cosh\beta_1\cdot\frac{x}{a}+\cos\beta_1\frac{x}{a}\right)-k_1\left(\sinh\beta_1\frac{x}{a}+\sin\beta_1\frac{x}{a}\right)\right]\cdot\right.$$

$$\cdot\left[\left(\cosh\beta_3\cdot\frac{y}{b}-\cos\beta_3\frac{y}{b}\right)-k_3\left(\sinh\beta_3\frac{y}{b}-\sin\beta_3\frac{y}{b}\right)\right]$$
$$-\nu\cdot\left(\frac{\beta_3}{b}\right)^2\left[\left(\cosh\beta_3\cdot\frac{y}{b}+\cos\beta_3\frac{y}{b}\right)-k_3\left(\sinh\beta_3\frac{y}{b}+\sin\beta_3\frac{y}{b}\right)\right]\cdot$$
$$\cdot\left[\left(\cosh\beta_1\cdot\frac{x}{a}-\cos\beta_1\frac{x}{a}\right)-k_1\left(\sinh\beta_1\frac{x}{a}-\sin\beta_1\frac{x}{a}\right)\right]\Big\}\cdot\Psi_{13}$$

$$M_{31}^{x}(x,y)=-D\cdot\left\{\left(\frac{\beta_3}{a}\right)^2\left[\left(\cosh\beta_3\cdot\frac{x}{a}+\cos\beta_3\frac{x}{a}\right)-k_3\left(\sinh\beta_3\frac{x}{a}+\sin\beta_3\frac{x}{a}\right)\right]\cdot\right. \quad (8)$$
$$\cdot\left[\left(\cosh\beta_1\cdot\frac{y}{b}-\cos\beta_1\frac{y}{b}\right)-k_1\left(\sinh\beta_1\frac{y}{b}-\sin\beta_1\frac{y}{b}\right)\right]$$
$$-\nu\cdot\left(\frac{\beta_1}{b}\right)^2\left[\left(\cosh\beta_1\cdot\frac{y}{b}+\cos\beta_1\frac{y}{b}\right)-k_1\left(\sinh\beta_1\frac{y}{b}+\sin\beta_1\frac{y}{b}\right)\right]\cdot$$
$$\left.\cdot\left[\left(\cosh\beta_3\cdot\frac{x}{a}-\cos\beta_3\frac{x}{a}\right)-k_3\left(\sinh\beta_3\frac{x}{a}-\sin\beta_3\frac{x}{a}\right)\right]\right\}\cdot\Psi_{31} \quad (9)$$

$$M_{33}^{x}(x,y)=-D\cdot\left\{\left(\frac{\beta_3}{a}\right)^2\left[\left(\cosh\beta_3\cdot\frac{x}{a}+\cos\beta_3\frac{x}{a}\right)-k_3\left(\sinh\beta_3\frac{x}{a}+\sin\beta_3\frac{x}{a}\right)\right]\cdot\right.$$
$$\cdot\left[\left(\cosh\beta_3\cdot\frac{y}{b}-\cos\beta_3\frac{y}{b}\right)-k_3\left(\sinh\beta_3\frac{y}{b}-\sin\beta_3\frac{y}{b}\right)\right]$$
$$-\nu\cdot\left(\frac{\beta_3}{b}\right)^2\left[\left(\cosh\beta_3\cdot\frac{y}{b}+\cos\beta_3\frac{y}{b}\right)-k_3\left(\sinh\beta_3\frac{y}{b}+\sin\beta_3\frac{y}{b}\right)\right]\cdot$$
$$\left.\cdot\left[\left(\cosh\beta_3\cdot\frac{x}{a}-\cos\beta_3\frac{x}{a}\right)-k_3\left(\sinh\beta_3\frac{x}{a}-\sin\beta_3\frac{x}{a}\right)\right]\right\}\cdot\Psi_{33} \quad (10)$$

$$M_{11}^{y}(x,y)=-D\cdot\left\{\left(\frac{\beta_1}{b}\right)^2\left[\left(\cosh\beta_1\cdot\frac{y}{b}+\cos\beta_1\frac{y}{b}\right)-k_1\left(\sinh\beta_1\frac{y}{b}+\sin\beta_1\frac{y}{b}\right)\right]\cdot\right.$$
$$\cdot\left[\left(\cosh\beta_1\cdot\frac{x}{a}-\cos\beta_1\frac{x}{a}\right)-k_1\left(\sinh\beta_1\frac{x}{a}-\sin\beta_1\frac{x}{a}\right)\right]-$$
$$-\nu\cdot\left(\frac{\beta_1}{a}\right)^2\cdot\left[\left(\cosh\beta_1\cdot\frac{x}{a}+\cos\beta_1\frac{x}{a}\right)-k_1\left(\sinh\beta_1\frac{x}{a}+\sin\beta_1\frac{x}{a}\right)\right]\cdot$$
$$\left.\left[\left(\cosh\beta_1\cdot\frac{y}{b}-\cos\beta_1\frac{y}{b}\right)-k_1\left(\sinh\beta_1\frac{y}{b}-\sin\beta_1\frac{y}{b}\right)\right]\right\}\cdot\Psi_{11}$$

$$M_{13}^{y}(x,y)=-D\cdot\left\{\left(\frac{\beta_3}{b}\right)^2\left[\left(\cosh\beta_3\cdot\frac{y}{b}+\cos\beta_3\frac{y}{b}\right)-k_3\left(\sinh\beta_3\frac{y}{b}+\sin\beta_3\frac{y}{b}\right)\right]\cdot\right. \quad (11)$$
$$\cdot\left[\left(\cosh\beta_1\cdot\frac{x}{a}-\cos\beta_1\frac{x}{a}\right)-k_1\left(\sinh\beta_1\frac{x}{a}-\sin\beta_1\frac{x}{a}\right)\right]-$$
$$-\nu\cdot\left(\frac{\beta_1}{a}\right)^2\cdot\left[\left(\cosh\beta_1\cdot\frac{x}{a}+\cos\beta_1\frac{x}{a}\right)-k_1\left(\sinh\beta_1\frac{x}{a}+\sin\beta_1\frac{x}{a}\right)\right]\cdot$$
$$\left.\left[\left(\cosh\beta_3\cdot\frac{y}{b}-\cos\beta_3\frac{y}{b}\right)-k_3\left(\sinh\beta_3\frac{y}{b}-\sin\beta_3\frac{y}{b}\right)\right]\right\}\cdot\Psi_{13} \quad (12)$$

$$M_{31}^{y}(x,y)=-D\cdot\left\{\left(\frac{\beta_1}{b}\right)^2\left[\left(\cosh\beta_1\cdot\frac{y}{b}+\cos\beta_1\frac{y}{b}\right)-k_1\left(\sinh\beta_1\frac{y}{b}+\sin\beta_1\frac{y}{b}\right)\right]\cdot\right.$$
$$\cdot\left[\left(\cosh\beta_3\cdot\frac{x}{a}-\cos\beta_3\frac{x}{a}\right)-k_3\left(\sinh\beta_3\frac{x}{a}-\sin\beta_3\frac{x}{a}\right)\right]-$$

$$-\nu\cdot\left(\frac{\beta_3}{a}\right)^2\cdot\left[\left(\cosh\beta_3\cdot\frac{x}{a}+\cos\beta_3\frac{x}{a}\right)-k_3\left(\sinh\beta_3\frac{x}{a}+\sin\beta_3\frac{x}{a}\right)\right]\cdot$$

$$\left[\left(\cosh\beta_1\cdot\frac{y}{b}-\cos\beta_1\frac{y}{b}\right)-k_1\left(\sinh\beta_1\frac{y}{b}-\sin\beta_1\frac{y}{b}\right)\right]\Bigg\}\cdot\Psi_{31}$$

$$M_{33}^{y}(x,y)=-D\cdot\left\{\left(\frac{\beta_3}{b}\right)^2\left[\left(\cosh\beta_3\cdot\frac{y}{b}+\cos\beta_3\frac{y}{b}\right)-k_3\left(\sinh\beta_3\frac{y}{b}+\sin\beta_3\frac{y}{b}\right)\right]\cdot\right.$$

$$\cdot\left[\left(\cosh\beta_3\cdot\frac{x}{a}-\cos\beta_3\frac{x}{a}\right)-k_3\left(\sinh\beta_3\frac{x}{a}-\sin\beta_3\frac{x}{a}\right)\right]-$$

$$-\nu\cdot\left(\frac{\beta_3}{a}\right)^2\cdot\left[\left(\cosh\beta_3\cdot\frac{x}{a}+\cos\beta_3\frac{x}{a}\right)-k_3\left(\sinh\beta_3\frac{x}{a}+\sin\beta_3\frac{x}{a}\right)\right]\cdot$$

$$\left.\left[\left(\cosh\beta_3\cdot\frac{y}{b}-\cos\beta_3\frac{y}{b}\right)-k_3\left(\sinh\beta_3\frac{y}{b}-\sin\beta_3\frac{y}{b}\right)\right]\right\}\cdot\Psi_{33} \quad (13)$$

RESULTS AND DISSCUSIONS

Modal displacements values are given in tables 2 to 5. The total displacements (table 6). Bending moments for the modal resposes to the axis x and y, are given (tables7,8,9,10,11,12,13,14), and total bending moments (tables 15, 16).

Displacements mode (1,3) Table 3. w_{13}

b/a	*0*	*1*	*2*	*3*
0	*0*	*0*	*0*	*0*
1	*0*	*0,0019*	*0,0005*	*-0,0019*
2	*0*	*0,0035*	*0,0010*	*-0,0035*

Displacements mode (3,1) Table 4. w_{31}

ba	*0*	*1*	*2*	*3*
0	*0*	*0*	*0*	*0*
1	*0*	*0,0058*	*0,0155*	*0,0200*
2	*0*	*-0,0060*	*-0,0159*	*-0,0205*

Displacements mode (3,3). Table 5 w_{33}

b/a	*0*	*1*	*2*	*3*
0	*0*	*0*	*0*	*0*
1	*0*	*0,001*	*0,0003*	*-0,0010*
2	*0*	*-0,001*	*-0,0003*	*0,0011*

Total Displacements) Table 6 w_{tot}

b/a	*0*	*1*	*2*	*3*
0	*0*	*0*	*0*	*0*
1	*0*	*0,0118*	*0,0247*	*0,0278*
2	*0*	*0,0022*	*0,0001*	*-0,0032*

Bending moments mode (1,1) Table 7 M_{11}^{x}

b/a	0	1	2	3
0	0	-0,010	-0,027	-0,034
1	-0,0017	0,0006	0,0033	0,0045
2	-0,0031	0,0054	0,0176	0,0230

Bending moments mode (1,3) Table 8 M_{13}^{x}

b/a	0	1	2	3
0	0	0,0061	-0,0017	0,0062
1	-0,0018	0,0016	0,0005	0,0019
2	-0,0034	0,0055	0,0016	0,0062

Bending moments mode (31) Table 9 M_{31}^{x}

b/a	0	1	2	3
0	0	-0,0640	-0,1740	-0,2203
1	-0,0106	0,0454	0,1083	0,1293
2	-0,0196	-0,0351	-0,1186	-0,1706

Bending moments mode(3,3) Table 10 M_{33}^{x}

b/a	0	1	2	3
0	0	-0,0113	-0,0032	0,0115
1	-0,0010	0,0075	0,0022	-0,0078
2	0,0010	-0,0086	-0,0024	0,0089

Total bending moments Table 11 M_{tot}^{x}

b/a	0	1	2	3
0	0	-0,0916	-0,2034	-0,2374
1	-0,0152	0,0552	0,1142	0,1240
2	-0,0250	-0,0328	-0,1018	-0,1449

Bending moments mode(1,1)Table12 M_{11}^{y}

b/a	0	1	2	3
0	0	-0,0020	-0,0054	-0,0070
1	-0,0084	-0,0018	0,0036	0,0058
2	-0,0155	-0,0025	0,0090	0,0136

Bending noments mode (1,3)Table 13 M_{13}^{y}

b/a	0	1	2	3
0	0	0,0012	-0,0003	0,0012
1	0,0092	0,0050	0,0016	0,0067
2	0,0169	0,0097	0,0031	-0,0128

Bending moments mode (31) Table 14 M_{31}^{y}

b/a	*0*	*1*	*2*	*3*
0	*0*	*-0,0128*	*-0,0343*	*-0,0441*
1	*-0,0156*	*0,0042*	*0,0271*	*0,0369*
2	*0,0160*	*-0,0053*	*-0,0303*	*-0,0411*

Bending moments mode (3,3) Table 15 M_{33}^{y}

b/a	*0*	*1*	*2*	*3*
0	*0*	*-0,0023*	*-0,0006*	*0,0023*
1	*-0,0050*	*0,0040*	*0,0012*	*-0,0050*
2	*0,0051*	*-0,0043*	*-0,0013*	*0,0053*

Total bending moments.Table16 M_{tot}^{y}

b/a	*0*	*1*	*2*	*3*
0	*0*	*-0,0183*	*-0,0407*	*-0,0475*
1	*-0,0382*	*0,0115*	*0,0336*	*0,0310*
2	*-0,0112*	*-0,0023*	*-0,0195*	*-0,0350*

Watching these modal displacements is observed that it obtain the maximum modal displacement corresponding to vibration mode (3.1). The maximum total displacements is obtained into the node (1,3).Regarding modal bending moments relative to the axis x is established that the maximum value is recorded in the node (0,3) for mode vibration (3.1).The maximum value of total bending moment relative to x axes is recorded in node (0,3) $|M_x| = 0{,}2374$.For modal bending moments relative to the axis y is established that the maximum value is recorded in the node (1,3) for mode vibration (3.1).The maximum value of total bending moment relative to y axes is recorded in node (0,3) $|M_y| = 0{,}0475$ It is observed that the value of bending moment in the x axis is 80 % higher than the bending moment in relation to the y axis.Following the modal efforts values relative to the x and y axes it can be draw the conclusions: For mode (1,1); $|M_{11}^{x}| = 0{,}034$, node (0,3); $|M_{11}^{y}| = 0{,}0155$, node (2,0)

Bending moment in the x axis is 55 % higher than the bending moment in relation to the y axis.. For mode (1,3); $|M_{13}^{x}| = 0{,}0062$, node (0,3); $|M_{13}^{y}| = 0{,}0169$,node (2,0). Bending moment in the y axis is ~ 64 % higher than the bending moment in relation to the x axis. For node (3,1),; $|M_{31}^{x}| = 0{,}2203$,node (0,3) ; $|M_{31}^{y}| = 0{,}0441$,node (0,3). Bending moment in

the x axis is ~ 80 % higher than the bending moment in relation to the y axis.Fornode (3,3),;$\left|M_{33}^{x}\right| = 0{,}0115$,node (0,3) ;$\left|M_{33}^{y}\right| = 0{,}0053$,node (2,3). Bending moment in the x axis is ~ 54 % higher than the bending moment in relation to the y axis.

CONCLUSIONS

This paper presents the modal analysis that determines the total and modal dynamical responses in displacements and bending moments for rectangular plate loaded with a uniformly distributed forces over the entire surface. Using the multiplier dynamic function is simplifies the dynamic methodology calculation of plates.The method considered the shapes functions of plates vibrations as the product of bars shape functions having the same limits conditions. For symmetric normal modes was considered as known the own pulsations. By applying the superposition principle is determined the total dynamic responses in displacements and efforts.Also the paper presents the sectional efforts modal percentage deviations values between relative x and y axes.The results obtained in this paper reveal the most dangerous sections of the structure relative to the x and y axes. Having the necessary data will be able to perform the correct strength calculation.

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THE VEGETATION OF THE SPRUCE FOREST IN THE WESTERN CARPATHIANS, SOMEȘUL CLAD - SOMEȘUL RECE INTERSTREAM AREA. PHYTOCENOSES OF THE HIERACIOTRANSYLVANICI - PICEETUM ASSOCIATION.

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Abstract

Phytocenoses dominated by Piceaabies and Hieraciumtransylvanicum from the Western Carpathians grow in a cool humid climate, at altitudes ranging between 1103 m and 1535 m. They develop on predominantly northern and north-western-facing slopes of 6° - 28°, on acid brown earth soils, poor in nutrients, with humus of fine mull and moder type, of moderately to medium-deep, deeply skeletal, permanently moist and well drained soil. The floristic summary of the association Hieraciumtransylvanicum -Piceetum encloses 47 cormophytes and five bryophytes subordinated to the Soldanellomajorii-Piceetum alliance: Luyula sylvatica, Homogynealpina, Gymnocarpiumdryopteris, Calamagrostis villosa, orderPiceetaliaexcelsae: Dechamsiaflexuosa, Luzulaluzuloides, Dryopteris austriacaand the classVaccinio-Piceetea: Vaccinium myrtillus, Oxalis acetosella, Sorbus aucuparia, Campanula abietina, Lamiumgaleobdolon, Dryopteris cristata, Sphagnum girgenshonii. The layer of trees with a consistency ranging between 0.6 - 0.8 is populated by the dominating species, specific for the associationaforementioned i.e.Piceaabies, with coverage of 48.21%. As regards this associationbioforms, hemicryptophytes (51.06%) are dominant, followed by megaphanerophytes (14.89%) and chamaephytes(10.63%). In the spectrum of phytogeographic elements, we note the circumpolar species (31.91%) followed by the European ones (21.27%) and the Eurasian species (19.14%). Concerning the ecological factors i.e.moisture (M), temperature (T) and the chemical reaction of the soil (R), the mesophilsare dominant (63.82%) followed by the meso-hygrophila (21.27%) and eurihydrousspecies (8.51%), microtherms (46.80%) followed by micro-mesotherms (31.9%) and eurytherms (19.14%), acid-neutrophils (34.04%), and by acidophilic and euryionicspecies (25.53% each). The karyotype analysis reflects the share of polyploid species (53.09%), which adapted to the pedoclimatic conditions, followed by the diploid ones (40.42%), which forms the genetic reserve for species evolution.

Key words:phytocenoses, bioforms, floristic elements, ecological indices, karyotype.

INTRODUCTION

The montane forests populated with *Piceaabies* and *Hieraciumtransylvanicum* grow on skeletal, acid brown earthsoils, poor in

nutrients, with humus of fine mull and moder type, moderately to medium deep, permanently moist and well drained soils.

The relief consists of mountain with a gentle to strong slopes ranging 6° - 28°, and altitudes ranging from 1103 m - 1535 m. From the literature it results that there have been sporadic, non-exhaustive research works on the forest vegetation in the Western Carpathians, SomeşulCald-SomeşulRece interstream area. Paper works on the study of spruce forest are few and were carried out on small areas, not covering much of the territory subjected to our study, of which we recall: Pop et al., 1984; Pop and Hodişan, 1962;Togor, 2016;Burescu and Togor, 2010;, Burescu and Togor, 2012); Pop and Hodişan, 1981.

MATERIAL AND METHOD

The material of our research consists of the natural forest ecosystems dominated by the species *Piceaabies* and *Hieraciumtransylvanicum* from the Western Carpathians' SomeşulCald - SomeşulRece interstream area. We carried out 14 surveys, phytocenologicalrelevés for the most representative phytocenoses. In the Association table (see Table 1 below), we recorded all the species of plants we found with the assessment of abundance and dominance (AD) for each species according to the Braun-Blanquet and Pavillard scale, 1928. The population of boreal forests of *Piceaabies* with *Hieraciumtransylvanicum* was ecologically, phytocenologically and cytogenetically analyzed and characterized based on the association table and histograms with reference to the distribution of bioforms, floristic elements, ecological indices and genetic karyotypes.

Classification and description of the associations were made on the basis of the floristic criterion, with the help of characteristic, dominant anddifferential species. The name of the association is given in accordance with the provisions established by the International Code of Phytosociological Nomenclature developed by Weber et al., 2000.

Classification of species according to the corresponding cenotaxonomic units (sub-alliance, alliance, order, class) was carried out by observing the requirements of the eco-floristic systems developed by Tüxen, 1955;, Braun-Blanquet, 1964; and based on the information provided in the most recent papers of Coldea et al., 1997 and Sanda et al., 2008.

The ecological and phytocenological characterization of the species within the surveyed area was done according to Sanda et al. (2003), Ciocârlan, 2009, and Sârbu et al., 2013.

The information on the level of ecological indices, bioforms, floristic elements, number of chromosomes are presented according to the synthesis

works developed by Ellenberg, 1979; Pop, 1977, 1982; Sanda et al., 1983, 2003, 2008; Cristea et al., 2004;Ciocârlan, 2009;Burescu and Toma, 2005; and Doniţă et al., 2005.

We analysed the phytocenoses in terms of categories of ecoforms, moisture (M), temperature (T) and chemical reaction of the soil (R) according to the works of Sanda et al., 1983, 2003, who adapted the ecological index values for the plants in Central Europe classified on a scale ranging from 1 to 9 according to Ellenberg, 1979, to the specific pedoclimatic conditions of Romania using, this time, a scale ranging between 1 and 6. Classification of species in the corresponding cenotaxa was carried out according to the works of Borza et Boşcaiu, 1968. Cytogenetic analysis of the species by karyotype was done according to the works of Sanda et al., 2003.

RESULTS AND DISCUSSION

Spruce stands dominated by *Piceaabies* and *Hieraciumtransylvanicum* are well represented in the SomeşulRece river basin.

The floristic inventory of the spruce stands aforementioned gathers 52 species (see Table 1), which means a high biodiversity. A number of 23 species belong to the basic cenotaxa of the association, of which eight species belong to *Soldanellomajori-Piceion, Piceionexcelsae (Luyula sylvatica, Homogynealpina, Gymnocarpiumdryopteris, Calamagrostis villosa, Gentianaasclepiadea, Vaccinium vitis-idaea, Melampyrumsylvaticum, Dryopteisdilatata)*, three speciesto *Piceetalia (Dechamsiaflexuosa, Luzulaluzuloides, Dryopteris austriaca)*, 12 species to*Vaccinio- Piceetea (Vaccinium myrtillus, Oxalis acetosella, Sorbus aucuparia, Campanula abietina, Lamiumgaleobdolon, Dryopteris cristata, Sphagnum girgenshonii, Dicranumscoparium, Hypericum maculatum, Lonicera nigra, Daphne mezereum, Lycopodium annotinum)*.

The tree layer has a consistency ranging between 0.6 and 0.8 with diameters between 20 cm and 48 cm and heights from 20 m to 30 m. The herbaceous layer has an overall coverage of 47.85%. The moss layer has an overall coverage of 48.21%.

Table 1

*Hieraciotransylvanici- Piceeteum*Pawlowski et Br. Bl. 1939

Biof.	Floristic elements	M	T	R	K	Survey no	1	2	3	4	5	6	7	8	9	10	11	12	13	14	K	ADm
						Altitude (m)	1291	1194	1517	1496	1497	1535	1242	1522	1103	1178	1176	1299	1388	1167		
						Exposition	SV	N	N	N	N	E	SE	N	NV	NV	NV	N	V	NV		
						Slope (º)	18	28	16	12	10	8	22	6	9	20	10	14	12	26		
						Tree layer consistency	0.7	0.6	0.7	0.7	0.6	0.6	0.6	0.7	0.8	0.8	0.7	0.6	0.7	0.8		
						Tree height (m)	24-26	22-24	26-28	28-30	26-28	24-26	26-28	26-28	20-22	20-22	28	24-26	20-22	22-24		
						Tree diameter (cm)	36-40	26-28	36-38	38-40	34-36	36-38	34-36	36-38	22-24	20-22	46-48	38-40	26-28	24-26		
						Shrub layer coverage (%)	-	-	-	-	-	-	-	-	-	2	2	-	-	2		
						Herbaceous layer coverage (%)	80	20	60	70	60	50	60	70	30	40	40	30	40	20		
						Moss layer coverage (%)	20	60	30	30	40	50	40	30	60	60	60	50	30	15		
						Surface (sq.m.)	400	800	800	400	800	800	800	800	800	800	800	800	800	800		
H	Carp-B	3	0	0	D	*As.Hieraciumtransylvanicum*	+	+	+	+	+	+	+	+	+	+	+	+	+	+	V	0.5
MPh	E	0	0	0	D	*As. Piceaabies*	3	4	4	3	4	3	4	3	4	4	4	3	4	4	V	48.21
						Soldanellomajori-Picenion. Piceionexcelsae																
H	EC	3.5	2.5	2	DP	*Luzula sylvatica*	1	2	+	+	+	.	.	+	+	1	+	+	+	1	V	2.6
H	Alp-E	3.5	2.5	2.5	P	*Homogynealpina*	+	.	+	1	+	+	.	1	.	+	+	1	+	.	IV	1.32
G	Cp	3	2.5	2	P	*Gymnocarpiumdryopteris*	+	+	.	.	.	.	.	+	+	+	+	+	+	+	IV	0.32
H	Eua	4	2.5	1.5	P	*Calamagrostis villosa*	+	1	1	1	2	.	+	+	1	+	.	.	.	+	IV	2.85
H	EC	4	2	4	P	*Gentianaasclepiadea*	.	.	.	.	.	.	.	.	.	+	.	+	.	+	II	0.1
Ch	Cp	3	2	1	D	*Vaccinium vitis-idaea*	.	.	.	.	.	.	+	.	+	+	.	.	.	+	II	0.14
Th	E	3	0	1.5	D	*Melampyrumsylvaticum*	.	.	.	.	.	.	.	.	.	+	+	.	.	.	I	0.07
H	Cp	3.5	0	0	P	*Dryopteris dilatata*	+	.	.	.	.	.	.	.	.	.	.	.	.	.	I	0.03
						Piceetaliaexcelsae																
H	Cp	0	0	1	P	*Deschampsiaflexuosa*	1	+	2	2	+	3	1	1	+	1	2	1	+	.	V	8.35
H	E	2.5	2.5	2	DP	*Luzulaluzuloides*	.	.	.	.	.	.	+	.	+	.	.	+	+	.	II	0.14
H	Cp	3.5	0	0	P	*Dryopteris austriaca*	.	.	.	.	.	.	.	.	+	+	+	.	+	+	II	0.17
						Vaccinio-Piceetea																
Ch-nPh	Cp	0	2	1	D	*Vaccinium myrtillus*	+	+	+	+	.	1	+	1	1	+	1	1	+	+	V	2.07
H-G	Cp	4	3	3	D	*Oxalis acetosella*	+	3	+	+	+	+	+	1	+	+	1	1	3	1	V	7.07
MPh-ml	E	3	2.5	2	D	*Sorbus aucuparia*	+	.	+	1	+	.	+	.	+	+	+	+	+	+	IV	0.35
H	End	3.5	2	2	P	*Campanula abietina*	.	.	.	.	.	+	+	.	+	+	.	+	+	+	III	0.25
H	Ec	3	0	4	D	*Lamiumgaleobdolon*	.	+	.	.	.	.	.	+	+	+	+	+	+	+	III	0.28
H	Cp	3.5	2	3	P	*Dryopteris cristata*	.	1	+	+	+	+	+	+	.	.	.	+	.	.	III	0.6
						Sphagnum girgenshonii	.	.	2	1	1	.	+	.	1	+	.	+	.	.	III	2.42
						Dicranumscoparium	1	2	.	.	.	1	.	.	.	+	1	.	.	.	II	2.35
H	Eua	4	3	2	D	*Hypericum maculatum*	.	.	.	.	.	.	.	.	.	+	.	.	+	+	II	0.1
mPh	EC	3	2	3	D	*Lonicera nigra*	.	.	.	.	.	.	.	.	.	+	+	.	.	+	II	0.1

Biof.	Floristic elements	M	T	R	K	Survey no	1	2	3	4	5	6	7	8	9	10	11	12	13	14	K	ADm
nPh	Eua	3.5	3	3	D	*Daphne mezereum*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	I	0.03
Ch	Cp	4	2.5	2	P	*Lycopodium annotinum*	.	.	.	.	.	.	+	.	.	.	.	.	.	.	I	0.03
						Querco-Fagetea																
nPh	E	3	2.5	3	P	*Rubushirtus*	+	.	.	.	.	.	.	.	.	+	+	+	+	+	III	0.21
H	Cosm	4	2.5	0	P	*Athyrium filix-femina*	.	+	.	.	.	+	.	.	.	.	+	+	+	+	III	0.21
MPh	E	3	3	0	D	*Fagus sylvatica*	+	+	.	.	.	.	.	.	.	.	.	.	.	+	II	0.1
Ch	Eua	2	2	2	DP	*Veronica officinalis*	.	.	.	.	.	+	+	.	.	.	+	.	+	.	II	1.14
MPh	Ec	4	3	0	D	*Abies alba*	.	.	.	.	.	.	.	.	.	.	+	+	+	+	II	1.14
MPh	Ec	3.5	3	3	P	*Acer pseudoplatanus*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	I	0.03
MPh	Eua	3	2	2	P	*Betula pendula*	+	.	.	.	.	.	.	.	.	.	.	.	.	.	I	0.03
H	E	3	3	3	D	*Mycelismuralis*	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I	0.03
H	E	3.5	3.5	3.5	P	*Polystichumaculeatum*	.	.	.	.	.	.	.	.	.	.	+	.	.	.	I	0.03
H	Cp	3.5	3	3	D	*Milliumeffusum*	.	.	.	.	.	.	.	.	.	.	+	.	.	+	I	0.07
mPh	B	3	3	3	D	*Corylus avellana*	.	.	.	.	.	.	.	.	.	.	+	.	.	.	I	0.03
Th	E	3	3	0	P	*Galeopsistetrahit*	.	.	.	.	.	.	.	.	.	.	.	.	+	.	I	0.03
Th	E	3	2	0	D	*Galeopsisspeciosa*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	I	0.03
						Epilobieteaangustifolii																
nPh	Cp	3	3	3	DP	*Rubusidaeus*	.	+	.	.	.	+	.	.	.	.	.	.	.	+	II	0.1
H	Cp	2.5	2	3	D	*Solidagovirgaurea*	.	.	.	.	.	.	.	.	.	+	+	+	+	+	II	0.17
H	Eua	3.5	3	3	P	*Senecio nemorensis*	.	.	.	.	.	.	.	.	.	.	.	.	+	+	I	0.07
H	Cp	3	3	3	P	*Gnaphalium sylvaticum*	.	.	.	.	.	.	.	.	.	.	.	.	+	+	I	0.07
						Variaesyntaxa																
						Polytrichum strictum	1	2	+	1	2	2	1	1	1	+	+	1	1	1	V	4.14
						Ritidiadelfustriqueter	1	1	1	.	.	1	.	1	2	2	1	2	2	.	IV	7.14
						Polytrichum commune	.	.	1	1	1	1	3	2	.	+	1	+	+	1	IV	6.17
H	Cp	4	1.5	0	P	*Epilobiumalpinum*	+	+	.	.	.	+	+	.	.	.	.	.	+	.	II	0.17
G	E	3	2.5	2.5	P	*Polygonatumvetricilatum*	.	.	+	.	.	.	.	+	.	+	+	.	.	+	II	0.17
mPh	Alp-Carp-B	4	2	2	D	*Salix silesiaca*	.	.	.	.	.	+	.	.	.	.	.	.	.	+	I	0.07
H	Eua	0	0	0	P	*Potentilla erecta*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	I	0.03
Ch	Cosm	3	0	0	P	*Cerastiumholeosteoides*	.	.	.	.	.	.	+	.	.	.	.	.	.	.	I	0.03
H	Cp	4	2.5	3	P	*Carexleporina*	.	+	.	.	.	+	.	.	.	.	.	.	.	.	I	0.07
MPh	Eua	3	3	3	P	*Sambucus nigra*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	I	0.03

Place and date of surveys: 1. Făget, 10.08.2018; 2. Lina, 14.09.2018; 3-5. Steaua, 28.07.2019; 6. VârfulLămășoaia, 10.08.2019; 7. ValeaCracilor 11.08.2019; 8. Negru, 11.08.2019; 9. Ghiduri, 11.09.2018; 10-13. Fântânele - CruceaIancului, 11.09.2019; 14. ValeaCălinesei, 12.09.2019.

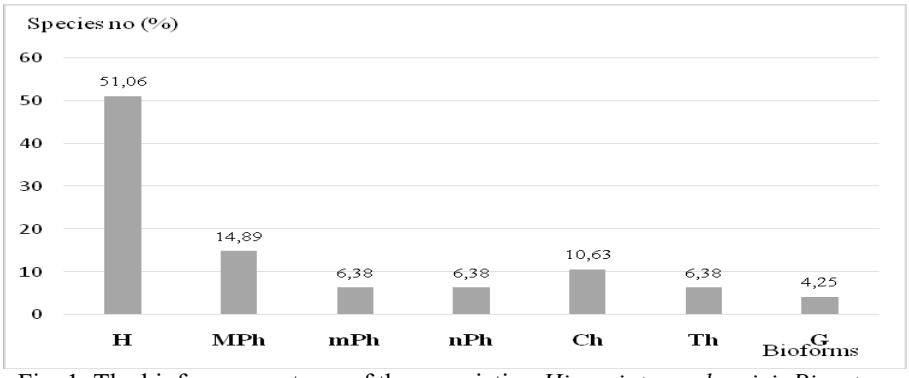

Fig. 1. The bioforms spectrum of the association *Hieraciotransylvanici- Piceetum*
Caption: H = Hemicryptophytes; MPh = Megaphanerophytes; Ch = Chamaephytes; mPh = Mesophanerophytes; nPh = Nanophanerophytes; Th = Therophytes; G = Geophytes.

The bioforms of the association *Hieraciotransylvanici-Piceetum* (see Fig 1 above), are dominated by the hemicryptophytes (51.06%), megaphanerophytes (14.89%) mesophanerophytes (6.38%), nanophanerophytes (6.38%), chamaephytes (10.63%), therophytes (6.38%), and last by geophytes (4.25%).

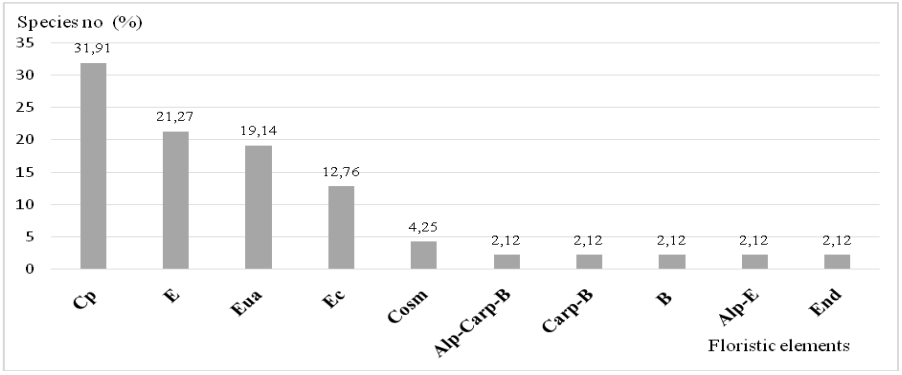

Fig. 2. The floristic elements spectrum of the association *Hieraciotransylvanici-Piceetum*
Caption: Cp = Circumpolar; E = European; Eua = Eurasian; Ec = Central European; Cosm = Cosmopolitan; Alp-Carp-B = Alpine-Carpathian-Balkan; Carp-B = Carpathian-Balkan; B = Balkan; Alp-E = Alpine-European; End = Endemite species

In terms of geographical area and current distribution of the species (see Fig. 2), the phytocenoses of the association *Hieraciotransylvanici - Piceetum* are dominated by the circumpolar (31.91%), European (21.27%), Eurasian (19.14%), Central European (12.76%), cosmopolitan (4.25%) species, followed by Alpine-Carpathian-Balkan, Carpathian-Balkan, Balkan, Alpine-European and endemic species with the lowest percentage (i.e. 2.12% each).

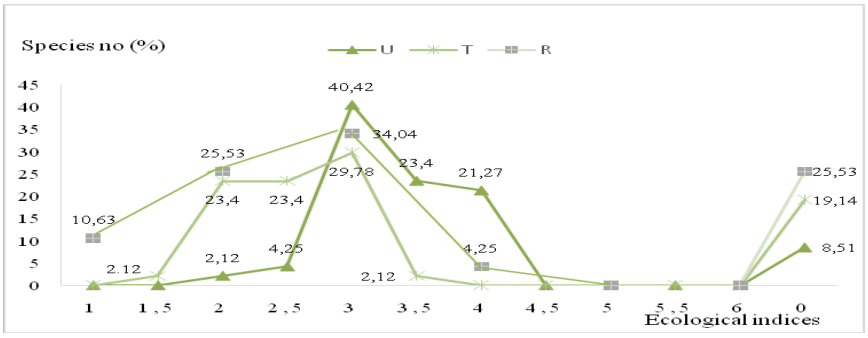

Fig. 3. Diagram of ecological indices of the association *Hieraciotransylvanici–Piceetum*

The analysis of ecoforms (see Fig 3 above) shows that mesophiles (63.82%) are dominant in terms of soil moisture, followed by meso-hygrophila(21.27%), eurihydrous (8.51%), and by xero-mesophiles (6.37%). By temperature, microtherms (46.80%) are dominant, followed by micro-mesotherms (31.9%), eurytherms (19.14%) and by cryophiles (2.12%). In terms of the chemical reaction of the soil, the acidic-neutrophilic species (34.04%) are dominant, followed by the acidophilic and euryionicspecies with the same percentage (25.53%), highly acidophilic species (10.63%), andlast by acidic-neutrophilic species (4.25%).

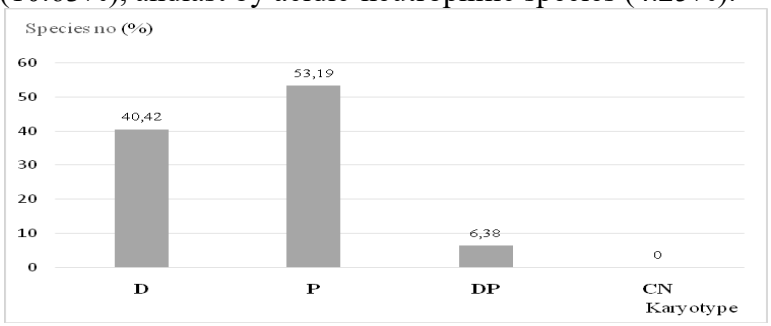

Fig. 4. The karyological spectrum of the association *Hieraciotransylvanici- Piceetum*
Caption: D = Diploid, P = Polyploid, DP = Diplo-Polyploid, UK = Unknown karyotype

From the karyological point of view (See Chart no 4 above), within the *Hieraciotransylvanici-Piceetum* association, polyploid species are dominant (53.19%) since they have adapted to the harsh pedoclimatic environment, followed by the diploids (40.42%) which form the genetic reserve for evolution, and diplo-polyploid species (6.38%).

Phytocenoses dominated by *Piceaabies*with *Hieraciumtransylvanicum* and *Luzula sylvatica*are high conservation value areas (Doniță et al., 2005), sheltering endemic species (*Campanula abietina*), species of very high economic importance in the wood conversion industry (*Piceaabies, Abies alba*), food industry (*Vaccinium myrtillus, Vaccinium vitis-idaea,Corylus avellna*), pharmaceutical industry (*Veronica*

officinalis), ornamental (*Betula pendula, Lonicera nigra*) and honey plant species (*Rubusidaeus, Rubushirtus*).

Priority natural habitat of community interest: NATURA 2000: 9410 the *Picea* acidophilic forests from the mountain to alpine floor (*Vaccinio-Piceetea*), R4208 Southeast Carpathian spruce forests (*Piceaabies*) and fir (*Abies alba*) forests with *Luzulasyilvatica*(Doniță, 2005).

Regarding the floristic composition, following the analysis of the Association table (see Table 1 below) and of histograms, and in comparison with the work of Togor, 2016, one may notice that we found in this association a number of 52 species while Togor, 2016, found 68 species, of which within the alliance and sub-alliance we found eight species while Togor, 2016, found nine species; in our research the order encloses three species while in the case of Togor's work (2016) the order includes four species; our study reveals that the class contains a total number of 12 species and in Togor's research (2016) the class has 18 species.

Comparing the bioforms spectrum, it appears that the hemicryptophytes are dominant with a share of 51.06% and in Togor's study, 2016 with 50%, respectively; the phytogeographic elements are represented by the circumpolar species with 31.91% share while in Togor's case, 2016 with 24.24% share; the ecological index chart shows that mesophilesare dominant with 63.82% percentage and in Togor's study (2016) with a 60.61% percentage; microtherms have a 46.8% share and in Togor's study, 2016, only 45.45%; acid-neutrophils are dominant in our study (34.04%) while in Togor's study (2016) the acidophils are dominant (29.76%). From the cariologic analysis it results that polypoidsreach in our study the highest percentage i.e. 53.19%, almost similar with the one reached in Togor's study (2016) i.e. 54.54%.

From the analysis aforementionedit results that the outputsof the two studies are close because the surveyedareas are adjacent and have the same pedoclimatic conditions.

CONCLUSIONS

1. Phytocenoses of the *Hieraciotransylvanicui - Piceetum* association are dominated by hemicryptophytes (51.06%), followed by megaphanerophytes (14.89%) and chamaephytes (10.63%), which are all adapted to the temperate-continental climate of the Western Carpathians geographical area.
2. Circumpolar (31.91%) and Eurasian (19.14%) species predominate in the geographical area of the association *Hieraciotransylvanici-Piceetum*.
3. Ecological indices show that, in terms of soil moisture, mesophiles are dominant (63.82%), concerning the temperature microtherms

dominate(46.8%), and as far as the chemical reaction of the soil is concerned acid-neutrophils are dominant (34.04%).

4. By karyotype, in the genetic structure of the phytocenoses of the association *Hieraciotransylvanici - Piceetum*, the polyploid species (53.19%) are dominant, followed by the diploids (40.42%) which form the genetic reserve for the evolution of species.

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RESEARCH ON 7135 FOREST ECOSYSTEM TYPE TURKEY OAK WITH *GENISTA - FESTUCA HETEROPHYLLA* (REGIONAL VERSION WITH *COMMON OAK* - SESSIL OAK - HUNGARIAN OAK MIXED STAND) WITHIN THE SEGMENT OF LANDSCAPE SITUATED ON HIGH PLAIN OF TINCA FOREST DISTRICT

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Abstract

The identification and description of types of forest ecosystems on smaller geographical units, at the level of landscapes (lands haft), in order to establish the ecological specificity within a certain territorial unit and the establishment of some sustainable management measures, gives the forest typology a strong regional feature.

Key words: forest ecosystems, management measures, sustainable forestry, forest typology.

INTRODUCTION

The typological research using GIS tools is usefull in practical forestry, being the base for sustainable forestry. The variability of general conditions (climatic, geologic) is very high and this variability induces a high variability of forest types. Each geographical unit, either it is about zones – subzones, levels-sublevels, regions-provinces have distinct features which causes the existence of some inventory of types, with strong regional features.

Forest typology have a strong geographic features because different forest types cannot be determined solely on the large areas where the repetability of some biocoenosys is evident, determined according to some species which occupying a certain ecotop.

The aim of the study was to establish the types of forest ecosystems from the Low Plain of Crisul Negru river and to esteblish the state of these ecosystems in order to fiind the best management solution for a sustainable use but preserving and conservation of the optimum biodiversity of the forest. The aim of the research was also the scientific fundamentation very usefull both in forest management and in applied forestry in order also to fiind the best management solutions for a sustainable use.

STUDY AREA - PHYSICAL AND BIO-GEOGRAPHICAL CONDITIONS

High piemontan plain, situated in the center of the study area, with average altitudes of 100-200 m., with increasing values eastward, is a Pleistocene plain unit, largely folded, resulted from the connection of the alluvial cones of the river flowing from the mountains and hills situated eastward.

The connection between the plain and the hills is marked by a morphological threshold of about 40-60 m.

The provulial deposits from the plain are consisted of clay and silt deposits. On these materials heavy and alternant hydric soils forms.

The relief in dominantly a plateau, slightly folded and fragmented by some shallow, temporary brooks. The climate is warm, less humid as in the low hill unit (mean average temperatures of 10^{o}C, average rainfall quantities of 614.7 mm).

The clays (red clays) are the base of stagnic luvisols on the slopes, planic and whitish soils on the plateau, with a well balanced hydric regime.

Within these natural conditions the plateau ecosystem is consisted of turkey oak, peduncu late oak, sessile oak, hungarian oak, usually the mix of two even three species, with the presence of the common hornbeam along the small brooks. The soil indicators herbaceous and shrub layer is consisted of *Agrostis-Carex brizoides*, *Genista-Festuca heterophylla* on the plateaus, *Glechoma-Geum* and *Arum-Brachypodium* along the brooks.

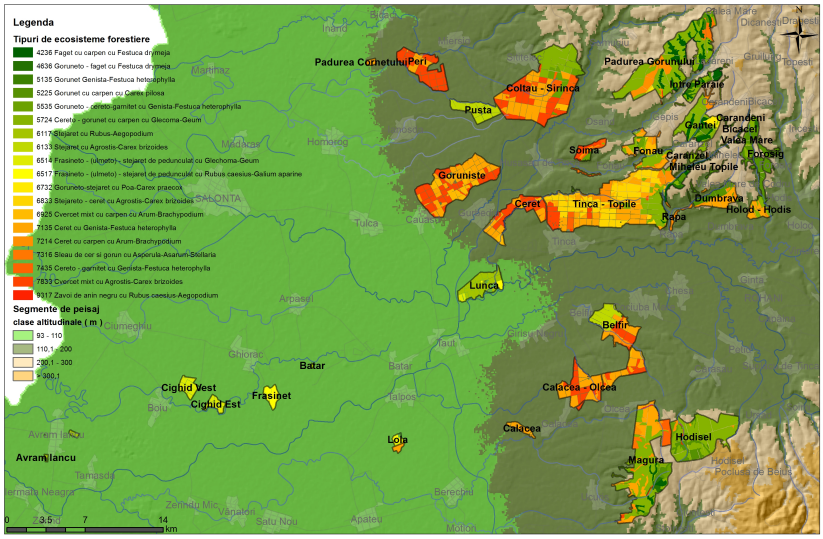


Fig. 1. The territorial repartition of the 7135 forest ecosystem type presenting the percentage within the composition of hornbeam trees

MATERIAL AND METHOD

The locations of the research are the forests administrated by Tinca Forest District; the study has started in 2018 and continued in 2019.

The description of the forest ecosystem was made based on collected field data. In order to analyse the collected data were used different softwares such as Excel, ArcGis.

The use of G.I.S. in the forestry is very important because it could supply a wide range of information upon which a sustainable use of the forest is possible, also offering the possibility of analyze and prognosis of different components of forest ecosystem as a whole. In this study we opted for the development of a geographic concept model.

The forest ecosystems were analysed according to location within the sudy area; the features of the ecosystem type: surface area, geographical paramaters (average altitude, altitude range); relief forms: types, inclination of the slopes, slope expozition, lithology, soil types ans subtypes, ecological limitative factors); the description of the stands, the description of the herbaceous layer; the correspondance with: types of forests, types of stations, plant associations, types of habitat, present state of the stands and management measures (particularities): main features, distribution accordin age classes, the source of main elements, natural regeneration, productivity classes, manegement measures, variability and succession tendency (forms of type, successional tendencies and forest facies).

RESULTS AND DISSCUSIONS

TYPE OF ECOSYSTEM: 7135 Turkey oak stand middle productive, with moder, on brown luvic soils and luvisoils, pseudogleyzation, oligomesobasics, well balanced from hydric point of view and alternating on profile, with *Genista-Festuca heterophylla* (the regional type with *common oak - sessil oak - hungarian oak* mixed stand)

Subtypes: 71351 highly productive subtype;
71352 mid productive subtype.

Spread: this ecosystem type is spread within the high plain and low hill units. Este reprezentat în U.P.I - Trup Ceret, Trup Goruniște, U.P.II - Trup Coltău-Șirinca, Trup Peri, Trup Pădurea Cornetului, U.P.III - Trup Fonău, U.P. IV - Trup Tinca - Topile, Trup Dumbrava, Trup Miheleu - Topile, U.P.V - Trup Măgura, Trup Călacea - Olcea.

The main features of the ecosystem type:

a. Surface: 2631,3 ha.

b. Forest sites:

- the average altitude is 185 m (variation difference 130-240 m);

- relief: by shape – mostly plain, partly slopes; based on inclination – no inclination or smooth and moderate slopes; based on exhibition – flat ground or slopes with different exhibitions, mostly sunny;
- rock: red clays, sand alternations, sandy clays;
- types and subtypes of soil: stagnic luvisols, white stagnic and flat stagnic;
- ecological limiting factors: compact soils on the Btw horizon, causing stagnogleization and reducing edaphic volume, humidity at the limit of the need for plants in the second half of the summer.

c. Compositions of the stands: in the dominant *Quercus cerris* level (in high proportions, sometimes exclusively); spread or to the extent of facies: *Quercus robur, Quercus petraea ssp. dalechampii, Quercus petraea ssp. polycarpa,* rar *Quercus frainetto,* in a few situations it may be encountered *Prunus avium*; on the dominant level may occur *Acer campestre, Acer tataricum, Pyrus piraster, Sorbus torminalis*, rarely *Carpinus betulus*, covering from 5% up to 10% of the surface.

d. Sub-tree compositions: *Crataegus monogyna, C. laevigata, C. pentagina* (rarely)*, Prunus spinosa, Ligustrum vulgare, Rosa canina, Rubus canescens, R. sulcatus;* it may also be encountered on a reduced frequency: *Cornus sanguinea, Sambucus nigra, Rhamus cathartica.*

The layer of shrubs is usually well developed, with a coveragre of 30% - 60% of the surface. In some cases, may be encountered within the sub-tree layer *Acer campestre, Acer tataricum, Carpinus betulus* and *Pyrus pyraster,* from the scattered species covering up to 5%, maximum 10% of the surface.

e. Composition of the herbaceous layer: *Festuca heterophylla, Genista tinctoria, Carex praecox, C. caryophyllea, C. divulsa, C. contigua, Veronica officinalis, Dactylis polygama, Lychnis coronaria, Calamagrostis epigeios, Agrostis stolonifera, Geum urbanum, Hypericum perforatum, H. umbelatum, Poa angustifolia, P. nemoralis, Lysimachia nummularia, Juncus effusus, Polygonum hydropiper, Scrophularia nodosa, Galium aparine, G. Mollugo, Cruciata laevipes, C. glabra, Ajuga reptans, Veronica chamaedrys, Sedum maximum, S. cepaea ș.a.*

Among the sub-shrub species may be also found: *Chamaecytisus hirsutus and Cytisus nigricans* (rarely).

The grass layer is usually well-developed, with a coverage of 30% - 70% of the surface, depending on the illumination degree.

Correspondence with:

- **type of forests**[1]**: 7111** – Normal hills Turkey oak stand (s); **7112** – Hills Turkey oak stand of medium productivity (m); **7121** - Normal plain Turkey oak stand (s); **7123** – Plain Turkey oak stand of medium productivity (m);
- **type of forest sites**[2]**: 7.4.1.1.** - Hilly mixed oak stand with common oak Pm, white and typical **epihipostagnic** – mezzo-stagnic luvisols, cu *Poa pratensis-Carex caryophyllea*;
- **plant associations**[3]**:** *Quercetum cerris* Georgescu '41;
- **type of habitats**[4]**: R4150** – Danubian - Balkan forests of turkey oak (*Quercus cerris*) with *Festuca heterophylla.*

Current status of the trees and management measures (particularities):

f. The structure of the stands: in figure 2 it is presented the distribution of the number of trees by diameter categories, and in figure 2 the vertical and horizontal structure of a representative stand from u.a. 67C, U.P.IV, in which inventories were made. The composition of the stand: 9Ce 1Go disSt, age 100 years, number of trees per hectare: turkey oak - 154, sessile oak - 16, common oak - 4.

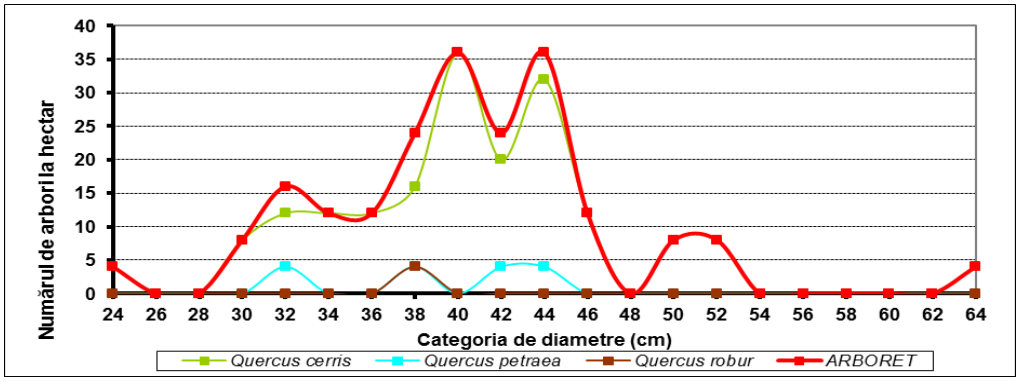
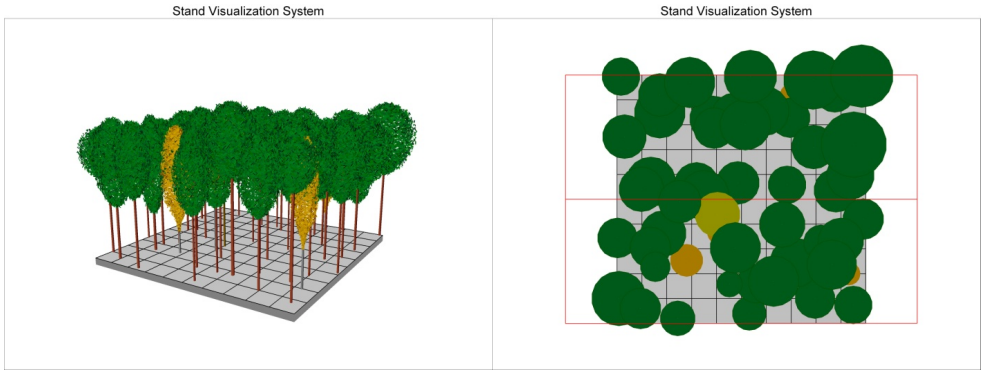


Fig. 2. The distribution of tree numbers per hectare in stand, according to diameter categories and species in u.a. 67C, U.P. IV Topile area

[1] Forest types are defined according to N. Doniță et al., 2005.
[2] Types of stands are defined according to F. Dănescu, C. Costăchescu, Elena Mihăil, 2010.
[3] Plant associations are defined according to N. Doniță et al., 1990, the new types of ecosystems according to V. Sanda, A. Popescu, D. I. Stanciu, 2001.
[4] Types of habitat are defined according to N. Doniță et al., 2005.



Legend:

Quercus cerris *Quercus petraea* *Quercus robur*

Fig. 3: The diagram of vertical structure (left) and plan projection of the canopy (right) for test plot of 2500 sqm, using SVS software, 3.36 version, in u.a. 67C, U.P. IV Topile area

g. Distribution according to age intervals: 6-10 years - 3%; 11-20 years - 6%; 21-40 years - 18%; 41-80 years - 73%.

h. The source of the main elements of the stand: turkey oak – natural seeding 22%, shoots 66%, plantations 12%; sessile oak – natural seeding 6%, shoots 26%, plantations 68%; common oak – natural seeding 13%, shoots 29%, plantations 58%;

i. Production classes of the main species of the stand: turkey oak cl III/II; Sessile oak cl III; Common oak cl III/IV.

j. Natural regeneration through seeding: turkey oak regenerates very well, sessile oak, common oak, hungarian oak, as the other mixed species regenerate less actively, but in more favorable micro-stations, especially in valleys, they regenerate better.

k. Indicated composition: 5Ce 3Go(Gâ,St) 2Ju,Ar,Ulc,Pă,Mă.

Fig. 4: Turkey oak stand with *Genista-Festuca heterophylla,* in u.a. 67C, U.P.IV Topile area, (photo - P.T. Moțiu)

l. Management measures on age intervals: 0-5 years – decomposition of natural regenerations and/or plantations, completions with poorly represented main species (sessile oak, hungarian oak, common oak), as well as with aid species; 6-10 years – promoting the vigorous, well-conformed turkey oak species, the sessile oak, the hungarian oak, the common oak, by applying recesses, and other species where possible. It is compulsory to maintain the mixed species (walnut, field elm, hornbeam, tarred maple and forest pear) to create a sub-layer; 11-20 years – proportioning the mixture according to the determined target composition, by clearing, focusing to the maintenance of mixed oak trees in sustainable proportions, but also of the aid species; 21-40 years – choosing the future trees (from seed) from the main species - turkey oak, but also from the other species (sessile oak, hungarian oak, common oak) and applying combined cutting around these trees; 41-80 years – continuing the promotion of future trees by combined cutting, keeping the rest of the massif closed; over 80 years – applying hygiene cuts; helping natural regeneration by removing the sub-tree and mobilizing the soil.

m. Other management measures: introduction in the composition of the arboretum of some species of aid (preferably the common maple); the trees arising from shoots will be converted gradually, by natural regeneration as far as possible (if the tree is at the age of fructification) or by restoration. In case of crops with ecologically unspecified species (acacia, black pine, wild pine), it is recommended to replace them with native species adapted to local seasonal conditions. The works of helping natural regeneration are mandatory in the years with abundant fructification in case on the mixed species (sessile oak, hungarian oak and common oak).

Recommended forestry measures: it is recommended the promotion of hungarian oak in this type of ecosystem, at the expense of turkey oak. In more favorable seasonal conditions (with partially sunny or shady exposure and higher soil trophicity) it is indicated the introduction of sessile oak in the arboretum composition.

Contraindicated forestry measures: the artificial formation of pure cultures (monocultures) of turkey oak (plantations or artificial seeding) is not recommended. The Oak is contraindicated to be planted under such seasonal conditions (it suffers from the summer drought); it may be introduced, eventually, at the base of the slopes where these conditions improve, being more favorable to its installation and development.

n. Variability and successional trends (forms of type, succesional tendencies and forest facies): This type of forest ecosystem presents a typical slope shape and a typical terrace (plateau) shape. The slope form has the same type of grassy flora as the terrace form, but with abundance – lower dominance, so with less soil cover (up to 30% of the total surface); the terrace shape presents a higher soil cover (up to 50% and even more). On flat places (terraces, plateaus), we find the form with a mixture of mixed oak stand, passing towards the type **7833** - Mixed oak stand with *Agrostis-Carex brizoides* (on the Piedmont plain), the form with sessile (sometimes also oak), passing towards the type **5724** - Turkey oak-sessile oak stand with hornbeam with *Glechoma-Geum* (on the low hills), and the form with hungarian oak (sometimes common oak), passing towards type **7435** - Turkey oak-hungarian oak stand with *Genista-Festuca heterophylla* (on the Piedmont plain). On the slopes we find the form with hornbeam, passing towards type **7214** - Turkey oak stand with hornbeam with *Arum-Brachypodium* (near the valleys).

At the transition to the type of ecosystem **5535** - Sessile oak-turkey oak-hungarian oak stand with *Genista-Festuca heterophylla*, the hornbeam and the hungarian oak perform within this type a transition form with hornbeam and hungarian oak. At the transition to the form with turkey oak within the type of ecosystem **5135** - Sessile oak stand with *Genista-Festuca heterophylla*, the sessile oak realizes within this type a transition form with sessile oak (U.P.III, u.a.62A: 8Ce 2Go). Hungarian oak and the common oak perform within this type of ecosystem a transition form towards the form with oak of the forest ecosystem type **7435** - Turkey oak-hungarian oak stand with *Genista-Festuca heterophylla*.

Within this type, on the plateaus, in some cases, e.g. in U.P.I u.a.89, U.P.II u.a.20, U.P.III u.a.64B, we encounter a form of transition to the type of ecosystem **6833** - Common oak-turkey oak stand with *Agrostis-Carex brizoides*, more precisely towards the middle productive subtype of this type (68332), characterized by the mosaic of the grassy sub-shrub layer.

o. Observations: The composition of the trees is variable on the surface, ranging from pure turkey oak to mixtures with hornbeam, with oak with hungarian oak or with some of these species. There is a tendency to form trees with a majority of turkey oak or with hungarian oak on the plateaus and with the other two mixed oak stand species (sessile oak and common oak) on the slopes. It is remarkable the succession of trends towards the neighboring ecosystem, e.g. towards **7435** - Turkey oak-hungarian oak stand with *Genista-Festuca heterophylla*, **7214** - Turkey oak stand with common hornbeam with *Arum-Brachypodium* (towards the valleys), **6833** - Common oak-turkey oak stand with *Agrostis-Carex brizoides* (on the plateaus).

In more favorable seasonal conditions, the turkey oak and the hungarian oak may achieve the second production class (e.g.: U.P.IV, u.a.5E).

In this type of forest ecosystem, we find trees with a lower productivity (e.g.: U.P.II, u.a.: 25A, 26, 28, 33, 34A, 34C, 39A), although the resort is of medium quality; the cause lies in the origin of these from shoots.

The regional variant is characterized by the presence of mixed common oak, sessile oak and hungarian oak.

CONCLUSIONS

Therefore, it is evident that the regional variants of forest ecosystem types arise due to the influence of reginal variants of climate and soil (pedogenetic sub-layers) - the main forest sites factors.

I tried, within this research, to establish ecosystem-based forest type existing in a territory smaller but representative for the high plain units within Tinca Forest District, to state the current status of types and propose appropriate management measures to bring forest types as close as possible to the natural state.

This priority of this period is to establish types of forests on small geographic units, at the level of landscapes, the typology having thus a strong regional feature.

Forest typology evolved from the necessity of differentiating management measures of the forests according to composition, structure, productivity, features of the stands i.e. after their eco-systemical features.

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RESEARCH ON FOREST SPECIES FOR BLACK TRUFFLE (*TUBER AESTIVUM*) USING G.I.S. TECHNIQUES. CASE STUDY

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Abstract

Black truffle (Tuber aestivum Vitt.) is one of the most important species of ascomycete fungus in Europe due to its growing conditions and high price. As previous studies show, soil conditions are among the main factors which largely influence the spread and development of black truffle. Therefore, the main objectives of this study were to identify soil conditions, climate and forest vegetation which influence both directly and indirectly the distribution of black truffle (Tuber aestivum Vitt.) in Romania, and to identify the areas from the Subcarpathian Hills of Transylvania which support black truffle growth. Geo-informational techniques have been used for this purpose to integrate spatial databases and to identify through spatial analysis the suitability of different areas for the growth of black truffles. The results of land favorability analyses showed the highest favorability level for Quercus robur (91.9%), followed by Carpinus betulus (89.24%) and Fraxinus excelsior (88.4%). The lowest favorability percentage (5.83%) was recorded for Tilia platyphyllos due to climate conditions.

Key words: *Tuber aestivum* Vitt., soil humidity, G.I.S. modelling

INTRODUCTION

According to previous reports (Linderman 1988, Streiblová et al., 2010, Gryndler M. and Hršelová, 2012, Benucci et al., 2012) the spread and development of black truffle species are highly influenced by soil conditions as well as certain invertebrate animal species with direct and indirect influence on soil such as protozoa, worms, and earthworms or other insects whose influence can be felt up to 15 centimeters soil depth. These creatures contribute to the aeration of the soil and increase its fertility by participating directly in the decomposition of organic matter. Earthworms improve soil aggregation and porosity through the channels they leave, thus becoming indirect truffle indicators in the area (acidity level preferred by earthworms is similar to pH range of 5.5-8.5 considered optimal for truffles).

Black truffle (*Tuber aestivum*) grows in symbiosis with forest tree species belonging to the following genera: *Castanea, Citrus, Corylus, Fagus, Ostrya, Tilia, Picea, Carya, Pinus* and Quercus (Wang et al., 2008,

Wedén et al., 2009; Chevalier 2009, Benucci et al., 2012; Stobbe et al., 2013). In Europe 30 tree species were identified as potential hosts for truffle growth (Ceruti et al. 2003).

Further studies were carried out by Moser et al. (2017) regarding vegetation composition in favorable areas for black truffle in the southwestern part of Germany and in the western part of Switzerland, were the identified forest stands suitable for *Tuber aestivum* were consisted of *Fagus sylvatica, Carpinus betulus* and *Ostrya carpinifolia,* as well as a series of grass and shrub species indicating the existence of a warm and dry climate, and an alkaline soil developed on a limestone rock substrate.

Other studies suggest that in the vicinity of the colonized trees there is a low density of herbaceous species induced by the allelopathic compounds released by the mycelium of *Tuber aestivum* in the soil (Streiblova et al., 2012). The knowledge about these dependent relationships and reciprocity are indispensable to determine the existence of these valuable fungi as well as to improve their productivity (De Miguel et al., 2014). In this context, it was found that grassland vegetation was associated with forest tree species such as *Fagus sylvatica, Quercus robur* and *Corylus avellana* being dominant and a very good indicator for estimating the potential existence of *Tuber aestivum* species depending on the season and phenological characteristics of the fungi. The most common host tree species were found to be: *Fagus sylvatica, Carpinus betulus, Quercus sp., Abies alba, Picea abies, Pinus sylvestris, Betula pendula, Ostrya carpinifolia* and *Tillia sp*. (Moser et al., 2017).

Previous reports also show that the presence of termophyte species such as *Cornus sp., Corylus avellana, Crataegus sp., Prunus spinosa*, etc. is a good indicator for the existence of *Tuber aestivum* in any areas (Hall, 1988; Paolocci et al., 1997, Willner, 2002; Baciarelli et al., 2006; Reyna et al., 2009; Murat et al., 2008; Reyna et al., 2014; Berch and Bonito 2016; Bonet et al., 2006; García-Montero et al., 2009; Willner et al., 2017). The occurrence of *Fagus sylvatica* together with termophyte species were also considered reliable indicators of the existence of *Tuber aestivum* species in Italy (Bencivenga et al., 1995b), Southern Germany (Stobbe et al., 2012) and Hungary (Hilszczańska et al., 2014) as well. *Tuber aestivum* can also develop symbiotic relationships with *Picea abies or Abies alba*, indicating thus a high phenotypic plasticity of this fungi. However, it was observed that these territories were previously covered by beech forests with cold climate and limestone soils (Stobbe et al., 2013). According to Gryndler et al. (2014) *Tuber aestivum* can also establish symbiotic relationships with herbaceous species as well such as *Geum urbanum* or *Hedera helix* as non-host species for *Tuber aestivum.*

Taking into consideration black truffle requirements against environmental conditions, the main aim of this research was to identify land favorability induced by forest vegetation for black truffle growth across the Subcarpathian Hills of Transylvania using spatial analysis and quantitative modeling G.I.S techniques.

MATERIAL AND METHOD

Among forest tree species, the most widespread across the studied area were: *Tilia platyphyllos*, *Carpinus betulus*, *Quercus robur*, *Acer pseudoplatanus*, *Fraxinus excelsior*. To determine the favorability of these areas for black truffle growth, land favorability maps were generated based on climatic parameters including annual average temperature, the amount of annual average precipitation, the length of the bioactive period, relative atmospheric humidity and wind regime.

Relief features were also analyzed such as altitude, slope orientation, and soil characteristics: the degree of base saturation (%), soil acidity (pH), type of humus, edaphic volume (m^3/m^2), the degree of soil compaction and soil texture, according to the ecological records (Stănescu, 1987) to determine land favorability levels for *Tuber aestivum* growth.

Regarding climate conditions and their influence on forest tree species favorability for black truffle growth. the annual average temperature of the study area ranged from 5.09 to 10.07 ºC, providing favorable conditions for all the investigated tree species, being divided in three different favorability classes such as low, medium and high (Table 1).

The average amount of rainfall ranged between 640 and 1049 mm /year recorded for the analyzed territories, which offers highly favorable conditions for *Carpinus betulus*, *Quercus robur* and *Fraxinus excelsior* and average favorability for *Tillia platyphyllos* and *Acer pseudoplatanus* found in the most part of the territory (Gilman and Watson, 1993; Taheri et al., 2013; Clinovschi, 2015). Beside temperature and precipitation, soil acidity is a very important growth indicator of truffle species. Across the investigated territories, the pH of the soil varied between 5.48-7.7 in most parts of the Subcarpathian Hills of Transylvania providing thus a high favorability level for the trees analyzed from this point of view.

Table 1

Favorability classes of forest tree species based on climatic conditions across the Subcarpathian Hills of Transylvania

	Favorability classes	*Tilia platyphyllos*	*Carpinus betulus*	*Quercus robur*	*Acer pseudoplatanus*	*Fraxinus excelsior*
Annual average temperature	High	9-11	8-10	8-10	5-8	>8
	Medium	8-9, >11	6-8, >11	7-8, >11	4-5, 8-10	6-8
	Low	<8	<6	<7	<5, >10	<6
Annual average rainfall	High	500-600	600-800	600-800	800-1100	500-700
	Medium	400-500, 600-700	500-600, 800-900	500-600 800-100	700-800, 1100-1300	700-900, 400-500
	Low	<400	<500, >900	<500, >1000	<700, >1300	>900, <400
Length of bioactive period	High	>7	>6	>8	5-7	>7
	Medium	6-7	5-6	5-8	4-5, >7	5-7
	Low	<6	<5	<5	<3	<5

The degree of soil compaction divides soil classes as lightly, moderately and heavily compacted. The Subcarpathian Hills of Transylvania are moderately compacted, while lightly compacted soils have been identified in the valley areas of Bistrița and Homoroadelor hills, which provide a high favorability level for the investigated forest tree species. Moderately compacted soils provide an average favorability especially for lime and ash trees.

Table 2

Forest tree favorability classes based on relief conditions of the Subcarpathian Hills of Transylvania

	Favorability classes	*Tilia platyphyllos*	*Carpinus betulus*	*Quercus robur*	*Acer pseudoplatanus*	*Fraxinus excelsior*
Altitude	High	100-500	300-700	200-600	800-1200	<1100
	Medium	<100, 500-600	700-1000	100-200 600-800	600-800, 1200-1600	1100-1300
	Low	>600	<200 >1000	<100 >800	<600, >1600	>1300
Slope Exposition	High	Sunny Partly sunny	Partly shady Shady	Sunny Partly sunny Depression areas	Partly shady Shady	Partly shady Shady Depression areas
	Medium	Partly shady	Partly sunny Depression areas	Partly shady Shady	Sunny Partly sunny Depression areas	Partly sunny
	Low	Depression areas Shady	Sunny	-	-	Sunny

Due to the clayey texture of the investigated area which represents 22.5% of the territory, these areas proved to be suitable for the growth of ash trees (*Fraxinus excelsior)*. For *Carpinus betulus, Acer pseudoplatanus,*

Quercus robur and *Tillia platyphylos* medium favorability levels were determined due to the clay texture of the soil (Table 3).

Table 3

Forest tree favorability classes based on soil conditions of the Subcarpathian Hills of Transylvania

	Favorability classes	*Tilia platyphyllos*	*Carpinus betulus*	*Quercus robur*	*Acer pseudoplatanus*	*Fraxinus excelsior*
Base saturation	High	>70	>60	>55	>55	>65
	Medium	50-70	40-60	35-55	35-55	45-65
	Low	<50	<40	<35	<35	<45
Acidity	High	6.6-7	>6.3	6.4-6.8	5.8-7	6.6-7
	Medium	4.6-6.6	5.6-6.3	5.2-6.4;>6.8	4.8-5.8;>7	6-6.6;>7
	Low	<4.6	<5.6	<5.2	<4.8	<6
Edaphic volume	High	>0.45	>0.45	>0.60	>0.30	>0.45
	Medium	0.30-0.45	0.15-0.45	0.45-0.60	0.15-0.30	0.15-0.45
	Low	<0.30	<0.15	<0.45	<0.15	<0.15
Compaction	High	Loamy	Sandy-loam	Sandy-loam Loamy	Sandy-loam Loamy	Loamy, Loamy-clay
	Medium	Loose	Loose Moderately compact	Loose Moderately compact compact	Very loose Loosen	Loose, Moderately compact
	Low	Very loose Moderately compact	Very loose	Very loose	Moderately compact	Very loose, compact
Texture	High	Compact, Very compact	Compact, Very compact	Very compact	Very compact, compact	Very compact
	Medium	Loamy	Sandy-loam	Sandy-loam Loamy	Sandy-loam Loamy	Loamy, Loamy-clay
	Low	Sandy-loam, Loamy-sand, Loamy-clay	Loamy-sand, Loamy-clay	Clay-loam Loamy-Clay	Clay-loam	Loamy-clay, Sandy-loam
		Sandy, Clay-loam, Clay	Sandy Loamy-clay Clay	Clay Sandy Loamy-sand	Sandy, Loamy-sand Loamy-clay Clay	Sandy, Loamy-sand Clay

Carpinus betulus L. is considered a forest tree species with low drought resistance (Hamerlynch et al. 2002; Pallardy 2008; Clinovschi 2015). The length of the bioactive period between 3-6 months in these regions represents a limiting factor which ranks the investigated territories in a medium favorability class for *Acer pseudoplatanus* and a low favorability for the rest of the investigated forest tree species.

RESULTS AND DISCUSSION

Our results show that the area of low and medium hills characterized by an altitude of 250-500 m, having a 46% spread across the investigated area offer a high favorability level for the growth of lime, hornbeam and oak, while the areas of high and very high hills (501-1000 m) offer high favorability conditions for the development of sycamore tree and an average favorability for hornbeam trees. In Romania, natural symbiotic relationships

were observed between black truffle and hazelnut (*Corylus avellana*) which led to the establishments of new truffle plantations which success is still uncertain at national level, due to the lack of scientific information regarding the economic efficiency of this type of plantations especially due to the long period until the first harvest (5 to 10 years). High favorability for lime is induced by soils with a clay texture for 7.4% of the territory and for *Carpinus betulus*, *Quercus robur* and *Acer pseudoplatanus* on a clay-sandy texture (for 11.9% of the territory). The results of land favorability analyses revealed a very good favorability level for *Quercus robur* (91.9% of the area), followed by *Carpinus betulus (*89.24%) and *Fraxinus excelsior* (88.4%) as shown in Fig. 1.

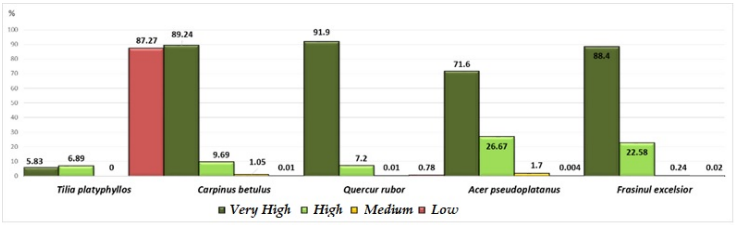

Fig. 1. Distribution pecntage of favorability classes for tree species

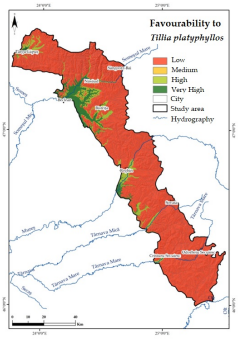

Fig. 2. Map of favorability for *Tilia platyphyllos*

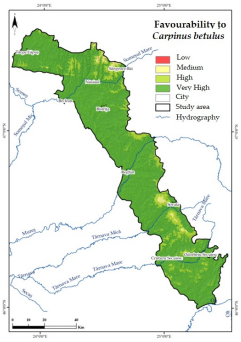

Fig. 3. Map of favorability for *Carpinus betulus*

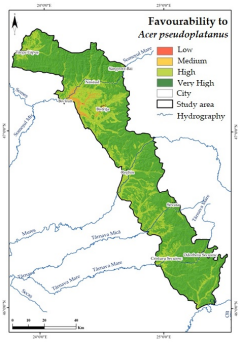

Fig. 4. Map of favorability for *Acer pseudoplatanus*

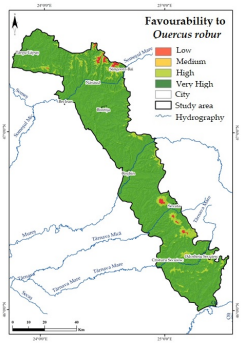

Fig. 5. Map of favorability for *Quercur robur*

The distribution of favorability classes and favorability maps for each tree species are presented in Figures 3-6. The lowest favorability percentage (5.83%) was recorded for *Tilia platyphyllos* due to climate conditions.The importance and usefulness of GIS technologies in the identification of favorability classes and limitations for diverse forest tree species had already been demonstrated in previous studies carried out across the Transylvanian Valley as described by Roșca et al. (2017).

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FACTORS WITH DIFFERENTIATED IMPLICATION IN THE IN VITRO MINITUBERIZATION AT SOME POTATO VARIETIES (*Solanum tuberosum* L)

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Abstract

The factors involved in the in vitro culture of the Solanum tuberosum L variety analyzed in this study are: potato variety, the nature of the explant, the season in which the experiment was initiated, the photoperiod, the dose of additional sugar and the hormone balance. On the Murashige-Skoog-1972(MS) basal medium there were cultivated four potato varieties with good and medium productive value, foreign (Désirée and Ostara) and native (Super and Mureşan), using plants that were formed from the apex, meristem (of 2-4mm) and nodus.

The experiment was conducted at different periods of the year (the 15th of March, the 28th of June, the 25th of September and the 8th of January) on MS medium with the following variants: without hormones (C_o=MS) and with a content of benzyl adenine C_1,C_2 and C_3 (with 1, 2 and 3mg/l+0,5ANA) and of zeatin C_4, C_5 and C_6 (in the same composition and concentration). The applied photoperiod was of 16, and 10 hours light of 24 hours, and the dose of supplemented sucrose of 6, 8 and 10g/l. After three months of in vitro culture and two series of experiments (2 years) there were analyzed the regenerative capacity of the tissues and the in vitro differentiation of the tubers. If at the witness sample (C_o) the regeneration percentage is low and the rooting does not take place, at the variants with a moderate dose of citokinine (2mg/l BA and Z), the regeneration and the rooting exceed 55%, and even 67%. The highest percentage of tubers is obtained in the presence of the zeatin (2mg/l) from the potato apex, in spring (the 15th of March), a different percentage, according to the variety (Désirée – 55%, Ostara- 67%, Super – 18% and Mureşan – 19-20%). The apex of the Désirée and Ostara varieties is rooting in the highest percentage on a medium with 2mg/l zeatin (Z), maximum photoperiod and a surplus of 10g/l sucrose; the other two varieties, Super and Mureşan, have a lower rooting percentage in the same culture conditions.

We conclude that the dose of 2mg/l zeatin (Z) and benzyl adenine (BA) has the best effect in rooting, and among the explants, the apex has proved the highest regeneration capacity, at normal photoperiod and a surplus of 10g/l sucrose, in the conditions in which the experiment was initiated in the spring (the 15th of March). Being a complex experiment, it proves the exact behavior in vitro of the type of explant, the best variety, the most advantageous hormone balance, the dose of sucrose with a stimulatory effect and the favorable photoperiod.

Key words: the nature of the explant (apex, meristem, nodus), mini-rooting, *Solanum tuberosum L,* varieties (*Désirée, Ostara, Mureşan and Super*), photoperiod, season, hormone balance.

INTRODUCTION

Our long time concerns related to the *in vitro* behavior of some varieties of the *Solanum tuberosum* L specie (either foreign or native), lie in the importance of this specie for human nutrition, an aspect for which some improvement problems, the induction of mutations in potato and of *in vitro* reaction of some varieties has represented the theme of a PhD thesis (Agud, 2008).

The present study follows the reaction of the *in vitro* culture of some foreign potato varieties (*Désirée* and *Ostara)* compared with the native ones *Super* and *Mureşan*), establishing the best variety, the balanced hormonal balance, the type of explant, the dose of sucrose and the ideal photoperiod, in order to ensure the *in vitro* rooting of these varieties. Previous research revealed the possibility of *in vitro* potato rooting provided that stakeholders are balanced (Patru, Cachita., 2005). Throughout the experiments undertaken by us (Refs. 1 – 8) the effect of some factors on the potato cultivated *in vitro* could be seen, but the detailed establishment of the *in vitro* rooting protocol related to the involvement of the factors responsible of this phenomenon, was not followed up until now. The response of the potato varieties in the presence of some phytohormones (their nature and concentration) has been watched in order to ensure the *in vitro* rooting (Agud et al., 2008, 2009; Butiuc- Keul et al.,1997), and also the effect of some additional, of the dose of sucrose, correlated with a certain photoperiod (Agud et al., 2010), the evolution of different explants (Agud, 2011), their reaction according to the variety and to the culture medium.

The phenomenon of *in vitro* mini-rooting was followed not only at the *Solanum tuberosum* L specie, but also at some bulb flower species[21]. Potato apex proved good *in vitro* regeneration capacity at some other plant species too (herbs, ornamental plants, etc.) (Zăpârţan et al.,1991; Zăpârţan, 1992), and using a balanced hormonal balance proved its efficiency at the *in vitro* conservation of some rare, endemic and vulnerable plants within the country's flora. Some studies have established another type of *in vitro* behavior of the potato genotypes (Laslo et al., 2011), different according to the variety, nature and concentration of growth substances (Murashige and Skoog 1962,). Noteworthy are the attempts to replace sucrose from the medium with other types of sugars (fructose, honey) with good results, but still unapplied on a large scale in the plant biotechnologies. Due to the economical value of potato, our research was often directed towards the establishment of some technologies of advantageous and economical multiplication, using small doses of phytohormones, (Laslo et al., 2011) culture mediums without hormones, or with some additional natural extracts on the mediums (Cachita-Cosma, Zapartan., 1991).

MATERIAL AND METHOD

There were tested four potato varieties (*Désirée*, *Ostara, Super* and *Mureşan*) with the approximately the same productive value, from which three types of explants were detached, meristem (M), apex (A) and nodus (N) which were cultivated on a basal medium according to Murashige-Skoog, 1962, conceiving six medium variants plus the witness sample

(C_0=MS) and the C_1– C_6 variants with three doses of sucrose (6, 8 and 10g/l), photoperiodic regime of 16 and respectively 10 hours light of 24 hours and the hormonal balance (citokinine and auxine) presented in table 1. The hormonal balance points out the using of two citokinines (BA=benzilaminopurine and Z=zeatin) in three doses (1, 2 and 3mg/l) and a single auxine (ANA= naphthyl acetic acid) in a single concentration (0,5 mg/l), with the presented dose of sucrose and photoperiod (table 1).

Table 1

The composition of the *in vitro* culture mediums and the treatment applied to the potato varieties

Var.	**Basal medium**	**Citokinine** (mg/l)		**Auxine** (mg/l)	**Photoperiod** (hours) light/dark)	**Sugar dose** (g/l)
		BA	**Z**	**ANA**		
C_0	MS	-	-	-	16/24; 10/24	6; 8; 10.
C_1	MS	1	-	0,5	16/24; 10/24;	6; 8; 10.
C_2	MS	2	-	0,5	16/24; 10/24;	6; 8; 10.
C_3	MS	3	-	0,5	16/24; 10/24;	6; 8; 10.
C_4	MS	-	1	0,5	16/24; 10/24;	6; 8; 10.
C_5	MS	-	2	0,5	16/24; 10/24;	6; 8; 10.
C_6	**MS**	-	3	0,5	16/24; 10/24;	6; 8; 10.

(MS = Murashige-Skoog 1972; BA =benzyl adenine; Z=zeatin; ANA= α – naphthyl acetic acid; photoperiod: 8 hours light out of 24; initially 6 days of darkness)

The experiments were initiated within two consecutive years, in two year periods, in March and in June. The value differences of the parameters watched within the two years (*in vitro* regeneration and rooting of the potato varieties), within the same periods and culture conditions, being insignificant, has resorted in calculating the average of the parameters of the best year, percentages presented in tables 2 and 3.

RESULTS AND DISCUSSION

The explants inoculated on the presented variants were analyzed concerning the **percentage of the *in vitro* regeneration**, after 40 days of culture, following the general aspect of the potato neoplantlets and their organization (the number of plantlets and the form of the root system). After 80 days from the incubation of the explants, their *in vitro* mini-rooting was watched (the percentage of explants on variant which induced the formation of tubers), according to the variety, the nature of the explant, the hormonal balance and the photoperiod. The regeneration percentage of the potato varieties on the experimented mediums (after 40 days) is presented in table 2.

Table 2 includes percentage values concerning *in vitro* regeneration at *Désirée* and *Ostara* foreign varieties, on the seven variants. Among these varieties, *Désirée* proved to have the best reaction at the *in vitro* culture,

under all aspects. On the variants with moderate dose of citokinine (2mg/l BA and Z) and 10g/l sucrose, the regeneration percentage was even of 100% in the incubation (initiation), month of the culture – in March.

Table 2

Regeneration percentage of the potato explants according to the variety, the hormonal balance and season (March), after 40 days

Var.	**Désirée(%)**			Ostara(%)			**Super(%)**			Mureşan(%)			Bonus (March)
	M.	**A.**	N.	M.	**A.**	N	**M.**	**A.**	**N.**	**M.**	**A.**	N.	
C_0	8	14	7	8	10	8	8	12	8	5	8	4	x
C_1	50	70	52	30	60	33	48	62	42	40	50	40	xxxx
C_2	75	**100**	76	45	**80**	54	55	**90**	57	40	**65**	42	**xxxxxx**
C_3	32	50	30	15	30	15	20	35	20	14	18	11	xxx
C_4	40	70	50	40	30	30	30	55	28	16	22	17	xxxx
C_5	82	**100**	79	50	**81**	48	60	**90**	55	30	**60**	25	**xxxxxx**
C_6	28	50	30	20	32	28	17	45	18	14	20	13	xxx

(M=meristem; **A=apex**; N=nodus)

Generally this variety responds positively to all variants, but the regeneration percentage is smaller on some variants (about 70% on the mediums with 1 mg/l BA and Z(C_4), and 50% at the concentration of 3 mg/l BA and Z(C_6). It seems that the high dose of citokinine produces a slight inhibition or delay of the *in vitro* regeneration. The differentiated plants are completely conformed as number of sprouts and roots. The regeneration percentage of the apex detached from *Ostara* variety is good, but inferior to *Désirée* variety, of about 80% on C_2 and C_5 (see figure 1 – after 40 days). On the variant without hormones (C_0) the apex of those potato varieties regenerated *in vitro*, but in a lower percentage, between 10 – 14%.

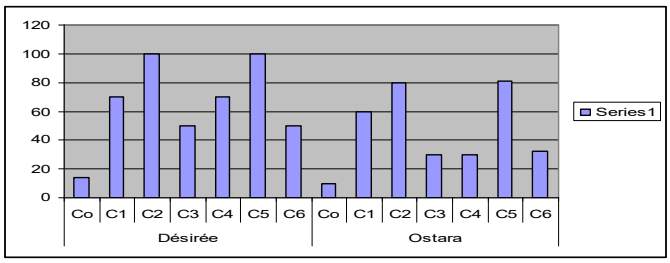

Fig. 1 Apex regeneration of *Désirée* and *Ostara* potato varieties after 40 days of *in vitro* culture (experiment in March)

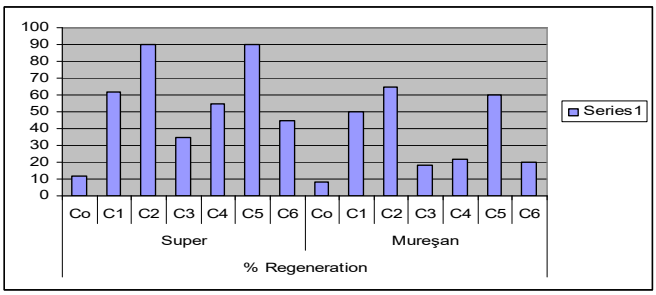

Fig. 2 Apex regeneration of the *Super* and *Mureşan* native potato varieties after 40 days of *in vitro* culture

Among the native varieties (improved at the Stupini Research Station – Brasov) *Super* variety has a regeneration capacity superior (about 80%) to *Mureşan* variety (60%), in the same culture conditions (on C_2 and C_5 mediums). Figure 2 presents the regeneration percentage, the evolution of the two Romanian varieties being similar with the one of the foreign ones, slightly lower, but good. The witness evidence (C_0) with MB (basal medium) only determined the apex regeneration in a low percentage on the mediums with a medium dose of citokinine (2 mg/l), between 8 – 12%.

Table 3.

Mini-rooting capacity (%) of the potato explants according to the variety, to the season and to the hormonal balance, after 80 days

Var.	Désirée				Ostara				Super				Mureşan				Season (March, June)	
	M.	A.	N.	Sugar (g/l)	M.	A.	N	Sugar (g/l)	M.	A.	N.	Sugar (g/l)	M.	A.	N.	Sugar (g/l)		
C_0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	March	
C_1	5	14	3	10	1	4	2	10	3	10	2	10	1	3	1	10	March	
C_2	21	**45**	8	10	4	**15**	3	10	10	**30**	9	10	1	**10**	2	10	March	
C_3	4	18	3	10	2	9	2	10	3	10	3	10	-	8	-	10	March	
C_4	8	20	5	10	2	10	3	10	2	12	2	10	3	4	3	10	March	
C_5	29	**50**	18	10	12	**25**	10	10	10	**40**	12	10	3	**12**	2	10	March	
C_6	-	14	8	10	-	11	7	10	-	12	3	10	-	8	-	10	March	

(M=meristem; A= apex; N=nodus)

The percentage of *in vitro* rooting, an essential aspect followed at the four potato varieties is presented comparatively in table 3. After 80 days of *in vitro* culture the explants differentiated mini-tubers with the diameter of about 2-3 mm, the percentage values depending on the hormonal balance from the medium. Potato apex proved also the highest rooting capacity on the mediums with a medium dose of citokinine (2mg/l BA and Z) and admixture of 10g/l sucrose, culture maintained at a photoperiod of 16 hours light/24 hours and initiated in the spring (in March). Figure 3 presents the percentage of mini-tubers obtained in these conditions at the foreign potato varieties, 45% at *Désirée* on C_2 variant (MS+2mg/lBA+0,5mg/l ANA) and

50% on C_5 (MS+2mg/lZ+0,5mg/l ANA), it seems that zeatin has a better effect on rooting.

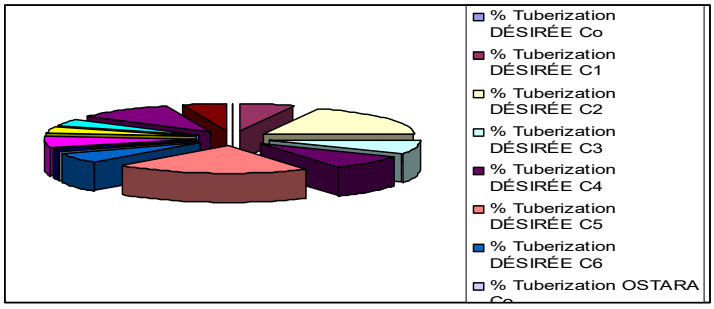

Fig. 3 Number of mini-tubers (%) formed form the potato apex at *Désirée* and Ostara varieties after 80 days of *in vitro* culture

Native potato varieties also form tubers after 80 days of *in vitro* culture in the spring season, but in a lower percentage. *Super* variety is rooting in the highest percentage, meaning 35% on C_2 variant and 40% on C_5, and *Mureşan* variety only about 14 – 15%, an evolution presented in figure 4 for all the variants. The presence of zeatin in the medium (C_5 variant) in this case also stimulates the formation of a great number of *in vitro* tubers.

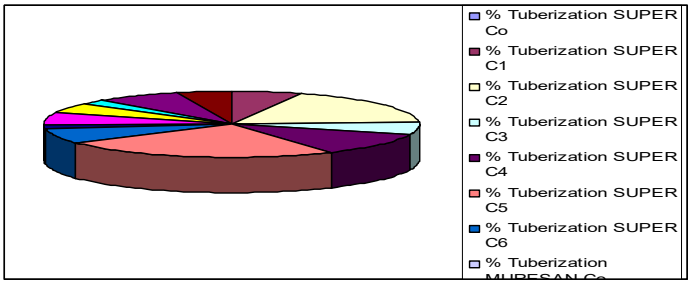

Fig. 4 *In vitro* rooting of the native potato varieties (*Super and Mureşan*) from apex, after 80 days of *in vitro* culture

Following figures 3 and 4 we see that on the witness evidence (C_0), without hormones, but in the same conditions of culture, no explant differentiated any mini-tubers. The high dose of citokinine from the medium, 3mg/l (C_3 and C_6 variants), leads to the formation of a low percentage of *in vitro* tubers of 14-11% at Désirée and Ostara, and of 12-8% at *Super* and Mureşan native varieties, so they present a slight inhibition reaction. Also, the rooting percentage is influenced by the period of the year in which the initiation of the *in vitro* culture is made, the spring season having a positive influence in comparison with the summer one.

The mini-tubers differentiated *in vitro* were perfectly acclimatized at the *ex vitro* culture, without essential loss, acclimatization capacity depending on their size (the greater their diameter, the more successful the acclimatization), this is why the process of taking the tubers out of the bottles was performed after about three months (Photo 1). The mini-tubers were formed on all variants containing citokinine, with differences according to the nature of this phytohormone. Zeatin proved to stimulate the formation of the greatest number of mini-tubers/explant, Photo 1 presents the aspect of the mini-tubers obtained *in vitro* after the acclimatization.

Photo. 1. Mini-tubers obtained *in vitro* from potato apex (*Super* variety) on Murashige - Skoog medium, with addition of phytohormone

CONCLUSIONS

Potato apex manifests a good and very good *in vitro* regenerative capacity, up to 100% at *Désirée* variety, and about 90% at *Super* Romanian variety, on the mediums with a moderate dose of citokinine (BA and Z 2mg/l), in a culture initiated in spring (in March), with 10g/l additional sucrose, and a photoperiod of 16 hours light. On the control medium (C_0), the regeneration percentage of the potato apex takes place, but with an inferior percentage, of only 8-14%. The other experimented tissues (the meristem and the nodus) have a good *in vitro* regeneration, but in a percentage which is inferior to the apex, and only in the spring season (in March).

In vitro rooting capacity of the potato apex is determined in a moderate dose by phytohormones (C_2 and C_5 variants), reaching up to 45-50% at *Désirée*, and respectively up to 30 % at *Ostara* (with 10g/l additional sucrose and a photoperiod of 16 hours light). In the same conditions of culture, the apex detached from the Romanian potato varieties, manifest a rooting percentage of 35-41% at *Super* variety, and of 14-15% at *Mureşan* variety, so these ones could successfully replace the foreign varieties. On the control medium (C_0), rooting was not detected.

For the varieties improved within the country it is important to see their *in vitro* rooting capacity in order to obtain a properly seedling material and also for the establishment of the value of those native varieties in comparison with the foreign ones, and finally, their extension in culture.

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GROUNDWATER 3D MODELLING

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Abstract

Numerical models for determining the level and shape of the groundwater are able to solve large and complex groundwater problems, which vary widely in size, nature and real life. With the appearances of different programs and software any modeling study can be done if some information is known such as: spatial heterogeneities, anisotropy and soil conductivity. However, the success of any modeling study depends to a large extent on the availability and accuracy of the measured / recorded data required for that study. Identifying the data needs of a particular modeling study and collecting / monitoring the necessary data are an integral part of any modeling exercise. This paper presents the process of three-dimensional modeling of groundwater in an experimental field in Ciumeghiu Area, Bihor County.

Key words: software, water drainage, groundwater, numerical model, calibration.

INTRODUCTION

The location, timing, and amplification of the hydrological accountability of natural or man-made events depend on a wide range of factors - for example, nature and weather events impact on groundwater, their properties, and the connections they make with rivers and oceans in which they shed. Groundwater models offer an additional perspective on the complex behavior of irrigation and drainage systems when they are properly designed. (Hanson and Ayars, 2002)

Groundwater management and policy decisions must be based on knowing the past and current behavior of the groundwater system, the likely response to future changes, and understanding the uncertainty in these responses. (Kumar, 2014)

Groundwater systems are affected by natural processes and human activity and require continuous and directed management to maintain the status of groundwater resources within acceptable limits, while providing the desired economic and social benefits. (Merz, 2012)

A groundwater model is any method of calculation that represents an approximation of a groundwater system. (Man et al, 2010) While groundwater models are, by definition, a simplification of a more complex reality, they have proven to be useful tools over several decades for addressing a range of groundwater issues and supporting the process decision. (Sabău et al, 2007)

The model of the groundwater flow in the Ciumeghiu area represents the three hydrogeological layers and the paleontological sediments encountered during the drilling. At the bottom of the channel in the upper layer the horizons were determined: superficial sandy clay and sand, in both the aquifer being present.

MATERIAL AND METHOD

The buried paleontological aquifer is treated as a higher hydraulic conductivity layer embedded in the resistant rock. The resistant rock represents a regional aquifer with a lower conductivity. The filling of the groundwater layer is done through the upper part by infiltration. The basic altitude of this aquifer is set to 120 m and to a thickness of 30 m. The hydraulic conductivities of resistant rock and paleontological aquifers are 0.03 m/day and 0.46 m/day.

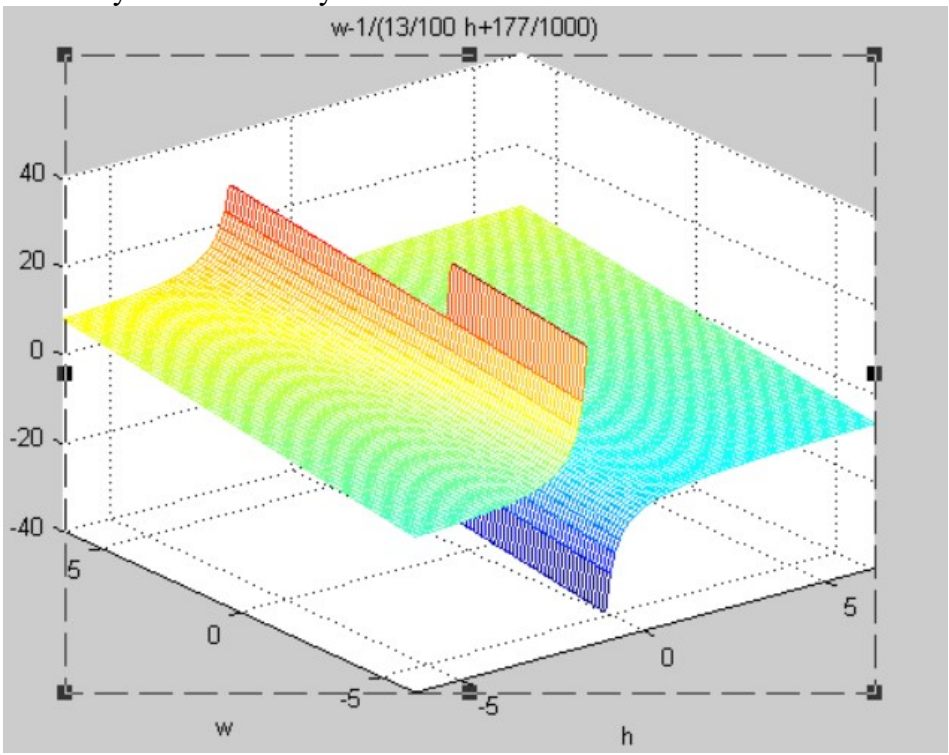

Fig. 1 Tridimensional view of the aquifer in Ciumeghiu area

From the pumping test data it was observed that the aquifer layer separates deep and shallow aquifers with the vertical hydraulic resistance resulting in a semi-restricted condition for the deep aquifer. (Bodog M. et al, 2009) The aquifer has a thickness of 11 m over the entire model range with a hydraulic conductivity of 0.005 m/day.

The model is constructed using the MATLAB program, and the aquifers are treated as extending over the entire domain of the model (Fig. 1). The only boundary imposed on the system is the general one, that is to say, raising groundwater levels (0.8 m below the underground surface) at the discharge point in the northwest corner.

The model uses filling, evapotranspiration and groundwater flow to maintain water balance for inter-aquifer flow. This allows the model to respond appropriately to inter-aquifer demands, such as pumping, imposed by the water balance in the system.

The model covers 5000 m X 6000 m of the Ciumeghiu field. The borehole is located in the middle of the model range, so that the effects of pumping can be detected along the paleontological layer in equal measures. The model domain incorporates all the observation wells on the site. Each cell has 50 m^2, resulting in 120 rows and 100 columns. The topographic data were taken from the digital elevation maps of the basin.

RESULTS AND DISCUSSION

In order to estimate the water filling rates of the groundwater in the Corn Field of Ciumeghiu, different methods were used. The hydrographic analyzes of the last 20 years suggest that the rate of filling of the maize field after cleaning is 5-12% of the annual precipitation, depending on the climate and the location of the river basin.

In this study, recharge rates were calculated using the analysis of trends in the controlled aquifer (non-pumping aquifer), the data being then extrapolated to each soil based on its hydrogeological properties and vegetation cover type.

A recent study by the Bihor Agricultural Directorate indicates that the groundwater level in Ciumeghiu increases by 10 cm per year. The groundwater level observed at 900 m away from the well, increased by 10 cm in 2014-2016 confirming the upward trend. In addition, the drilling carried out by private supply located approximately 2 km to the north, in an experimental field, also registered increases of 10-20 cm per year during the period 2012-2014.

The average annual increase of the groundwater level (15 cm) simply refills the groundwater deposits. Despite the episodic events of winter rainfall in November 2016 and the drought later that year, data from this area indicate that in 2016 only 10 cm were added to the groundwater deposit (Fig. 2). Most of the groundwater recharge was discharged into stream beds as a base stream.

The groundwater filling rate in 2016, estimated in table 1 below, is higher than the average and represents about 31% of the annual rainfall.

Two thirds of this filling was obtained through the event with episodic precipitation and a few other small events between January and February 2016.

Based on the numbers in table 1, a daily transient recharge model was constructed as an input for the MATLAB program and the results were compared with rates from hydrographic analysis from other parts of the maize field. The average recharge calculated from the groundwater represents 12% of the average rainfall in the area - in accordance with the recharge values for other parts of the maize field.

Although there was a significant amount of filling water, only a small volume was added to the underground storage. Between December 2015 and December 2016, so over a period of one year, watering increased only 70 mm - the equivalent of adding 7 mm to the recharge in 2016. In other words, for every mm of recharge added to storage a little over 17 mm they were downloading from the field.

Table 1

Groundwater level recharge in 2016

Filling mode	**Rain fall (mm)**	**Increasing groundwater level (mm)**	**Filling (mm)**	**Filling rate (% rainfall)**	**Decreasing (mm)**	**Final Fill (mm)**
Spring-episodic	156,4	430	35	22	25	10
Autumn-winter	195	850	71	35	61	10
Total (annual)	**351,4**	**1280**	**106**	**30,65**	**86**	**10**

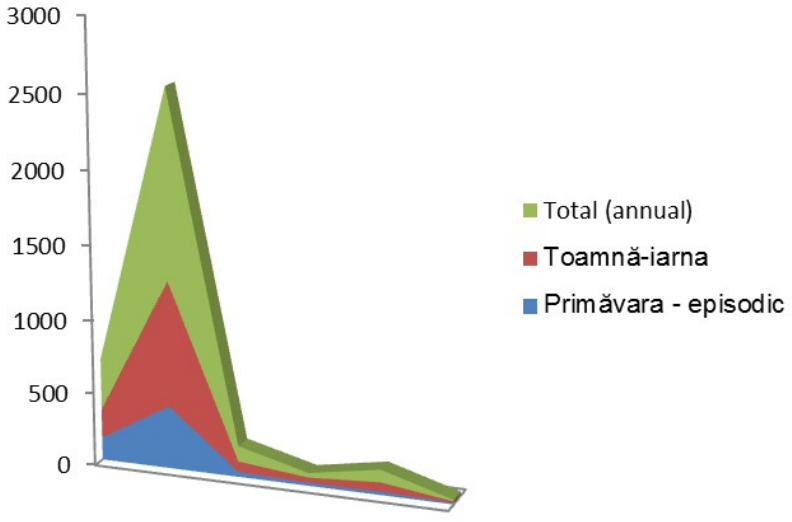

Fig. 2 Representative image of the rainfall

The water levels in the shallow and deep aquifers were mainly calibrated by adjusting the vertical and horizontal hydraulic input conductivities for evapotranspiration and the extinction depth from which evaporation occurs in the surface aquifer. The equilibrium model was calibrated using the ends observed in the observation bores.

The observed depths versus the models up to watering (Fig.3) suggest that the standard error of the estimates is 0.041 m, with a correlation coefficient of 0.962. The maximum and minimum differences of the observed data with respect to the models are 0.2 m and 0.009 m respectively.

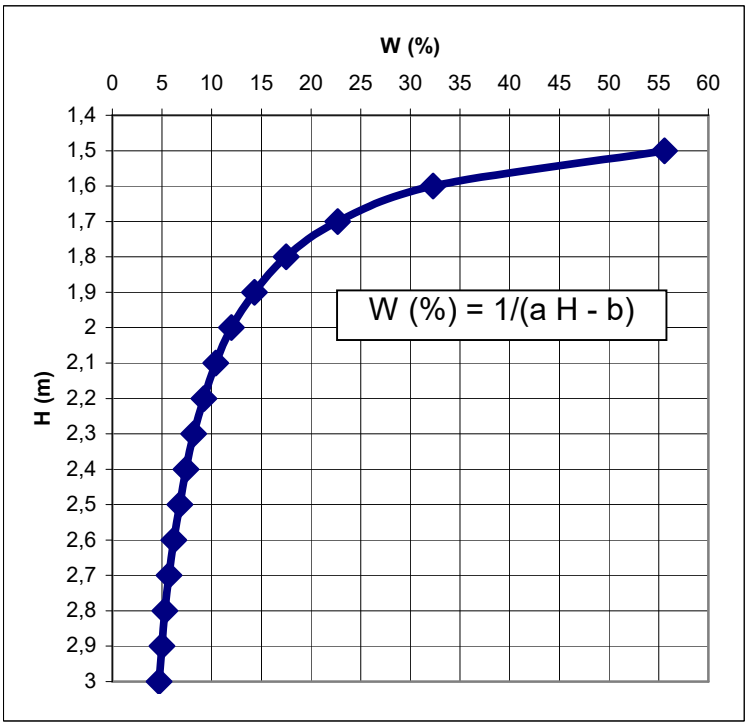

Fig.3 – The correlation between the phreatic level (H) and the medium humidity

The riverbed is about 1.5 m below the main floor of the valley, so the watering is closer to the surface. These results were confirmed by the measured data from the monitoring bore before pumping. The discharge of saline water from the deep and shallow aquifers along the waterway is confirmed by salinity measurements of the surface flow on the experimental field.

CONCLUSIONS

The determined model responds to recharge events faster than those observed on the ground. For example, the calculated aquifer head rises immediately after rain events, while recordings show a delay of approximately two weeks.

The explanation for these differences lies in the fact that the model domain is treated as being uniform in terms of hydraulic properties, that is, a permanent water regime has been considered, and the aquifer layers have identical thicknesses throughout the model domain. Despite these shortcomings, it is remarkable how the model responds accurately to changes in water balance for each stress period, despite the simple conceptualization of the study area.

The transitory model can be run to simulate the impact of different climatic scenarios (such as decreased precipitation and higher episodic recharge), pump capacity, pumping and to estimate the lateral extension / narrowing of the water. In addition, this study has shown that a simple simulation of a large agricultural area can be performed to build numerical models that achieve similar results with long-term field measurements.

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EDIFICATIONS FROM THE LEADER PROGRAM BASED ON THE RESULTS OF A HUNGARIAN MICRO-REGION III. HYPOTHESIS RESULTS

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Abstract

15 years ago Hungary joined the European Union. The first full financial period for the nation as a member of the European Community was 2007-2013. As a full member, Hungary gained access to many financial sources granted by the European Unnion. It is necessary to inspect the efficiency of how the sources have been spent on development, focusing on the LEADER program. The best way to do this is by selecting one of the poorer micro-regions and examining it using different methods. Within my research I used inspected different statistics, I looked into the traditional profession of shepherding which has a long history in the region and I interviewed the citizens of the Sárrét microregion. This multidisciplinary research gave more precise results and conclusions for my research. Suggestions made on the on the conclusions can provide a much more accurate help to decision makers in the periods that are ahead of us.

Keywords: LEADER program, Hungary, Sárrét, development, shepherding

RESULTS AND DISCUSSION

Topic 1

1. Hungary was ready to receive EU funds by the time the accession negotiations were completed, because Community funds had been available even before accession.

No economic concept can be observed for the use of tender funds in the examined areas. Many projects (e.g. church renovation, development of sports grounds, etc.) have been implemented which, although beneficial, would have been better to be performed, in terms of both priority and cost-effectiveness, following the economic recovery investments that would have provided them with funding for implementation and operation. This seems to be a concept-free process. The country was not sufficiently prepared to apply for EU membership.

2. The LEADER program mobilises the rural population and municipalities as it is a bottom-up program.

The conducted interviews show that residents often do not participate in important processes affecting their settlement due to lack of information. This lack of awareness is one of the reasons why the civilian population does not apply for proposals and is not involved in the writing or

implementation of applications. People are more interested in programs and events, which they usually attend, even if as passive visitors.

3. Because of the demand for jobs, I assumed that there would be a higher rate of investment to stimulate the economy.

In terms of the nature of the applications, the ratio of social and economic investment was nearly the same. This is also due to the unfavourable conditions of social institutions, churches and public spaces in the decades preceding EU accession. My assumption was wrong, because there was no greater investment in the LEADER program to stimulate the economy.

Topic 2

1. With the advancement of agriculture, the proportion of people living from agriculture is decreasing because efficiency gains require less labour.

1. According to my model calculations, I found that, in the case of a desirable level of development necessary for competitiveness, the number of people working in the sheep industry or those earning a living in the sector may fall to one-sixth (Nagy andPolai, 2017). Sheep farms need less shepherds, which means they have to retrain themselves, i.e. they need to find occupation in a different area of agriculture or, more likely, in another sector. This is an excellent example for my assumption proving to be true.

2. If people leave farming, fewer people will have the same or higher income, which will increase the income of those in the agricultural sector and improve their quality of life.

Sheep farms operating with the current support can become profitable with optimal development.

Developments in the field of agriculture also mean increased efficiency. This includes mechanisation, increase in livestock per capita, or yield per capita in the case of the same population size. In Hungary, the number of sheep farms and the average number of sheep have changed. As a result, higher revenue is divided among the same workforce or, due to higher efficiency, fewer workers are required for the same farm size. This clearly demonstrates that both income and the quality of life have increased over the last decade among farming families. This assumption proved to be correct.

Topic 3

1. If people wanted to create new jobs, they preferred to invest in the economy or to stimulate the economy through tenders under the LEADER program in the settlements of Sárret.

The obtained results clearly show that economic investments in the five examined settlements in the Püspökladány district of the Sárrét region were significantly lagging behind other developments. My hypothesis was

not confirmed, i.e., the local government, the public and businesses did not prefer economic stimulus investments, as the proportion of such projects did not reach 40% of all projects.

2. The communities of the examined settlements tried to take the lead under the LEADER program. For this reason, the seven LEADER guidelines were applied during the tenders in the settlements of Sárrét (Csurgó and Kovách, 2015).

From the seven principles, the area-based approach, the partnership principle and the integrated approach have been implemented (Póla et al., 2015).

The principles of innovation and networking were not realised.

The principles of specific management and financing methods and area-based approach have been partially implemented.

CONCLUSIONS

Hungary joined the European Union about one and a half decades ago, which happened after several years of preparation.

As the Hungarian political, economic, social and legislative characteristics, as well as the order and operation differed from that of EU countries in almost every aspect, it made the adaptation and harmonisation of the country difficult.

After the first EU cycle, it was a natural task to carry out the Hungarian analyses (2007-2013) and to evaluate the effectiveness of the preparation based on the results of our early years.

I formulated the hypotheses related to my objectives in three areas:

1. economic and village development
2. agricultural and rural development
3. direct impacts of the LEADER program

As stated in the three topics, my conclusions were also drawn in this logical framework.

Concerning the first topic on economic and rural development, I have drawn the following conclusions:

1. Analyses of national databases have shown that they are not accurate enough, the sources used for different purposes are not sufficiently distinguishable and are not completely delineated. Also, overlaps between them make precise and accurate evaluation difficult. I have presented many examples of this phenomenon in my dissertation.

2. It also proved to be false in my assumption that more EU funds will be used to stimulate the economy, with priority being given to job creation and economic entrepreneurship and there would be less investment in infrastructure and welfare. The backwardness of the region in this area

may be one of the reasons (Tóth, 1995). The other reason is that there was a lack of own capital to realise economic development ideas. The desired balance of 60% economic and 40% welfare investments have thus gone in the wrong direction. Accordingly, welfare investments accounted for more than 50%, which increases operating costs in the long run, thereby further deteriorating economic positions.

3. Unfortunately, the greater involvement of the population in decision preparation, decision-making and the implementation of plans has not been sufficiently achieved. The roots of this problem can be explained by the habits arising from the former narrow possibilities of independence. Leadership authoritarianism and centralisation, which is completely alien to the spirit of the European Union, can still be considered unjustifiably high in Hungary. Social consciousness did not develop in proportion to the expansion of population opportunities.

4. The quality of services (school, cultural facilities, infrastructure, job opportunities) improved in the examined micro-region, but its degree was significantly below the desirable level (Harsányi et al., 2007; Vincze, 2012). A particular problem was that the rate of development was extremely polarised even in the five examined villages. The reasons for this anomaly are extremely complex. The size of the village, its characteristics, the values it produced earlier and its leadership all contribute to the development of these differences. All of these factors affect migration, development, the mental state of the population, and even the preservation of values. Where there are more resources and more opportunities, more attention is paid to the needs of the population, to their high standards and to the preservation of the values of the past. People get into focus more.

5. There is a continuous migration of the population, although not all municipalities are affected, but mobility within the region has not changed significantly. The different conditions of employment increased the migration between villages, but only in a few cases did people change their place of residence. Even these cases were related to family changes. The reason for this phenomenon is primarily the lack of financial means needed for a major change.

The results of the evaluation of agriculture and rural development in the second topic have also made it possible to draw many conclusions and suggestions. These are the following:

1. With the development of agriculture, the proportion of people earning a living exclusively from agriculture has decreased significantly, but the proportion of primary producers and those who rely on agricultural income has hardly even changed, as people are dependent on the minimum income from this activity. However, this phenomenon is due to both the region's poor income-generating potential and relative poverty.

It is true that those who live and work in agriculture earn higher incomes, but their numbers have decreased considerably. Those who drop out of agricultural employment tend to re-enter the labour market without qualifications. Since there are few jobs available locally – even though the situation somewhat improved to varying degrees - they either move to work in another village or enter the public employment system. This process results in the poor quality of their lives and their vulnerability. Therefore, their training, further training and preparation for reintegration appears as a task in the activities of local governments.

2. Today, agriculture, with particular emphasis on livestock farming, and, more specifically, sheep breeding, which was significant in the region, can only provide a solution with significant development (productivity improvements, quality improvements, reaching economic size), resulting in the reduction of agricultural employment as mentioned above.

Conclusions and recommendations for the third topic on the impact of the LEADER program are as follows:

1. It is true for the analysed micro-region due to its economic backwardness that resources were not used in the professionally justified proportion of 60% economic and -40% welfare investments. However, the actual rate is slightly better than the national average, but in the present case even exceeding 60% could have been justified, since the maintenance of welfare investments and developments deprive the local government of significant resources at the expense of the subsequent realisation of its tasks.

The evaluated LEADER programs were implemented locally and served the whole population or a specific target group. No irregularities were detected. As much as the inflow of foreign capital is desirable, it can be dangerous that it does not fully serve the purposes of the village. For this reason, the community's decision must remain significant (Kálmán, 2015). That is why it is important that the seven guidelines of the LEADER programs also apply. Unfortunately, the principle of efficiency and the rule of optimal task assignment have not always been fulfilled.

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EDIFICATIONS FROM THE LEADER PROGRAM BASED ON THE RESULTS OF A HUNGARIAN MICRO-REGION IV. NEW SCIENTIFIC FINDINGS

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Abstract

15 years ago Hungary joined the European Union. The first full financial period for the nation as a member of the European Community was 2007-2013. As a full member, Hungary gained access to many financial sources granted by the European Unnion. It is necessary to inspect the efficiency of how the sources have been spent on development, focusing on the LEADER program. The best way to do this is by selecting one of the poorer micro-regions and examining it using different methods. Within my research I used inspected different statistics, I looked into the traditional profession of shepherding which has a long history in the region and I interviewed the citizens of the Sárrét microregion. This multidisciplinary research gave more precise results and conclusions for my research. Suggestions made on the on the conclusions can provide a much more accurate help to decision makers in the periods that are ahead of us.

Keywords: LEADER program, Hungary, Sárrét, development, shepherding

New scientific findings

1. Projects in the area do not reflect the view that economic-type developments are longer-lasting, have a longer effect and serve the development of the area better than social and infrastructural investments in maintaining population (Bonfiglio et al., 2017). However, the gap in infrastructure in the region I performed my investigations is such that it has strongly motivated the population and managers to encourage developments in this area (Baranyi, 2008). Investments of this direction were also encouraged by the fact that neither the population nor the economy had been adequately prepared to exploit the potential of the program more effectively. Therefore, and as a result of the limited financial resources available, these projects as a whole could not bring about profound changes in the quality of life of the examined villages.

2. Since the long preparations for EU accession did not provide the necessary preparation for running projects and receiving resources efficiently, there was no equal opportunity in the "LEADER competition" for the different municipalities (Jávor, 2012). In the cases when there was an appropriate, dynamic entrepreneur in the community, a resident or a family with a willing, creative endeavour or even personal interest, and the management had sufficient agility and ability, then the settlement in

question was more likely to compete for projects and the success of implementation. The leader of the village has a role in shaping the work efficiency and overall experiences of the given settlement, i.e., in improving the selection, implementation and effectiveness of the project (Jávor et al. 2000).

3. As the previous political, economic and social system did not require the active participation of the population in decision-making and it could not go beyond a degree of autonomy, the approach that would have better served the effectiveness of the LEADER programs was missing (Udvardy, 2010a, 2010b). It would have been much more powerful and successful to activate the residents both in the implementation of the programs and in their emotional attachment to them. A new project needs to become more embedded in the life of a village, because success and efficiency increase activity. Effective investments are not just mood boosters that increase the ability and willingness of the population in a spiral manner to play a role in both decision-making and implementation.

4. It takes longer for the deeply embedded habits in these settlements after the political restructuring in 1989 to change in accordance with the position, task and role of each village in the life of the given micro-region. In general, there are communities and villages that play a role in employment, job creation, and the improvement of services, but in the case of other villages, only special and subdued functions develop (Fenyves et al., 2007).

5. The population of the area is clearly aging, with the exception of a village where a significant proportion of the population belongs to a minority ethnic group. This feature in itself gives a different perspective to the problem. In the case of Gypsies, it can be observed at the level of the whole society that there are more children and a higher rate of population growth. Thus, in the villages of the micro-region, it is necessary to prepare for the improvement of services that serve the elderly population, as well as to improve the network of nursery schools and kindergartens along with schools. In their case, it is expected that there will be further position losses in the region's development opportunities (Bakos et al., 2014; Jávor et al., 2017). If the population becomes more active and the appropriate means are found, there will be a greater chance of slowing down or possibly stopping the decline. However, in order to reverse the trend, the resources currently available in the micro-region are not sufficient, therefore, they need to be increased significantly.

6. The degree of cultivation of traditions and folk customs decreases in these settlements, which can further erode communities. Much more activity and intensity is needed to discover and preserve values in education

and in preserving traditions. It was also found that the past, values and thus the chances of the various villages in these areas were not the same.

7. Agricultural production in these areas is likely to remain dominant. At the same time, it can be stated that GDP and income from agriculture is higher, similarly to robotisation and digitalisation, which provides a better quality of life than at present, but this money will be sufficient for much less people due to the improvement in needs concerning the quality of life (Jávor and Jávor, 2018a). There is a need for those who cannot survive in agriculture to find income-generating activities which not only ensure the full livelihood of the micro-region's population, even in other villages, towns, but also constantly improve living conditions and quality of life (Jávor and Jávor 2018b). My findings are also supported by the results of my research in the sheep sector, according to which thousands of jobs could be lost nationwide and tens of jobs in the region (Jávor et al., 2019a; Jávor et al., 2019b). This entails the release of new, unskilled labour force, which is less suitable for retraining due to its age and education. Accordingly, there is a need to further develop rural policy and increase resources in order to prevent further development of the villages in the micro-region(Döbrönte and Vida, 2004; Szávuj, 2013). This is also important because it can have a major drain effect due to competition from prosperous villages and towns. This in itself can be twofold, both positive and negative. The low population growth rate further reinforces this process.

8. The sources and economic conditions of the current system, considering its size, are not suitable for eliminating imbalances and differences. In many cases, given the current circumstances, it may even lead to greater differences between villages. This is underpinned by EU processes, with little change in the position, location and effectiveness of EU regions.

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THE LEVEL OF AIR POLLUTION WITH SEDIMENT PARTICLES IN BIHOR COUNTY BETWEEN 2016 AND 2018

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Abstract

This paper presents the study conducted on pollution with sediment particles in Bihor county over a period of three years (2016 – 2018). The data were obtained from the Bihor County Environmental Protection Agency, the institution which monitors the level of pollution with sediment particles. In the area of Bihor county there are 14 sampling points, which are grouped in three strategic areas. The samples are collected on a monthly basis.

The first area is located in the north – western part of Bihor county and includes the sampling points in Tărian, Biharia, Sălard, Episcopia Bihor.

The second area includes the sampling points in 1st May Spa, at the Oradea Weather Station and at the Oradea Environmental Protection Agency.

The third area consists of the sampling points in Telechiu, Chistag, Peștera, Aleșd, Aștileu, Subpiatră, Țețchea.

These sampling points ensure the monitoring of the areas polluted with sediment particles in Bihor county, and they also take measures to reduce pollution.

The analysis of the level of pollution with sediment particles shows that the maximum permissible concentration of 17 g/m^2/month was not exceeded.

Key words: maximum permissible concentration, monitoring, sampling points, sediment particles

INTRODUCTION

Pollution of the air with sediment particles can be caused by a great number of various sources, such as mechanical processes, road building, road transport, waste and sterile dumps, solid fuel power plants, cement factories, the metallurgical and steel industries, the building materials industry etc. (Măhăra Ghe.,1969, 1976, 2003; Vancea et al, 1992; Mănescu et al ., 1994; Petrea, 2001; Domuța et al., 2010; Moza, 2009, 2010; Pereș, 2011; Köteles, 2010, 2011, 2015); Pârloiu, 2011; Ciulache, 2004; Dumiter., 2005.

MATERIAL AND METHOD

In order to conduct this study, data provided by the Bihor County Environmental Protection Agency, which is the institution that monitors the level of air pollution in Bihor county (www.apmbh.ro), were used. The study covered a period of three years (2016-2018), and the maximum

permissible concentration of sediment particles is 17 g/m^2/month (sampling on a monthly basis) (STAS 12574/1987, Ordinance 592/25.06.2002).

In Bihor county there are 14 sediment particle monitoring points, spread out across three areas:

- First area (the northwest of the county): Tărian, Biharia, Sălard, Ep. Bihor;
- Second area: 1st May Spa, Oradea Weather Station, Oradea Environmental Protection Agency;
- Third area: Telechiu, Chistag, Peştera, Aleşd, Aştileu, Subpiatră, Ţeţchea.

RESULTS AND DISCUSSIONS

Annual evolution of sediment particles

The evolution of the sediment particle concentrations shows that the highest concentration was recorded in 2016, at the Episcopia Bihor sampling point, 8.548 g/m^2. A value close to this was measured in Sălard, 8.295 g/m^2, followed by Biharia with 5.684 g/m^2, which means that the maximum permissible concentration was not exceeded.

In 2017, the highest concentration of sediment particles was recorded in Aștileu, 6.558 g/m^2, followed by 6.121 g/m^2 in Subpiatră and 6.076 g/m^2 in Țețchea. The values recorded at the other sampling points are close, between 5.980 g/m^2 in Telechiu and 4.241 g/m^2 în Peștera. For the year 2018, the highest concentrations were recorded in Subpiatră, 7.347 g/m^2, Episcopia Bihor, 6.770 g/m^2, and Peștera, 5.529 g/m^2 (Fig. 1).

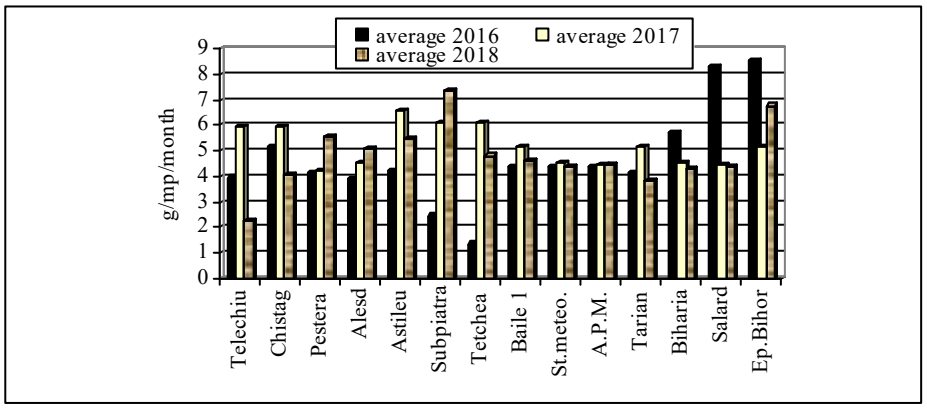

Fig. 1. The evolution of sediment particles average concentrations in Bihor county, 2016 – 2018

The averages of the three years included in the study shows that the highest concentration was recorded in Episcopia Bihor, the value of 7.353

g/m^2, followed by Sălard, 5.598 g/m^2, and then by Aștileu, 5.429 g/m^2. The lowest values were recorded in Telechiu, 4.056 g/m^2, Țețchea, 4.083 g/m^2, and Tărian, 4.191 g/m^2 (Fig. 2).

Looking at the level of pollution with sediment particles between 2016 and 2018, it can be concluded that the 17 g/m^2/month was not exceeded.

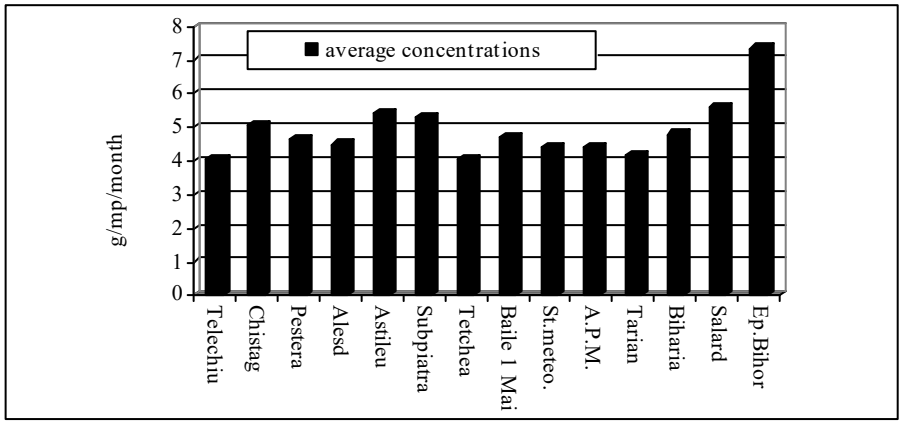

Fig. 2. Evolution of the multiannual average concentrations (2016 – 2018) of sediment particles at the 14 monitoring points in Bihor county

Monthly evolution of sediment particles

The average concentration of the 14 sampling points for the period included in the study (2016 – 2018) shows that the highest value is reached in 2017, in January, 8.004 g/m^2, followed by 7.493 g/m^2 in March 2016 and by 6.933 g/m^2 in August 2018 (Fig. 3).

The lowest concentrations of sediment particles were recorded in February, 2.813 g/m^2, and January, 2.819 g/m^2, 2018, followed by 3.030 g/m^2 in November 2016 (Fig. 3). The values recorded at the 14 sampling points show that the maximum permissible concentration was not reached.

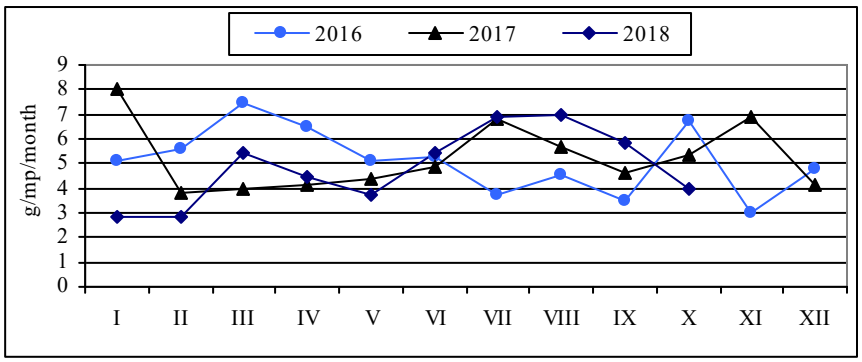

Fig. 3. Monthly pattern of sediment particles in Bihor county (the average of the 14 sampling points)

Looking at the monthly evolution over the three years included in the study, the average for the month of July is 5.808 g/m^2, for August 5.716 g/m^2 and for March 5.628 g/m^2. The lowest concentrations were recorded in February 4.076 g/m^2, followed by May, 4.428 g/m^2, and December, 4.462 g/m^2 (Fig. 4).

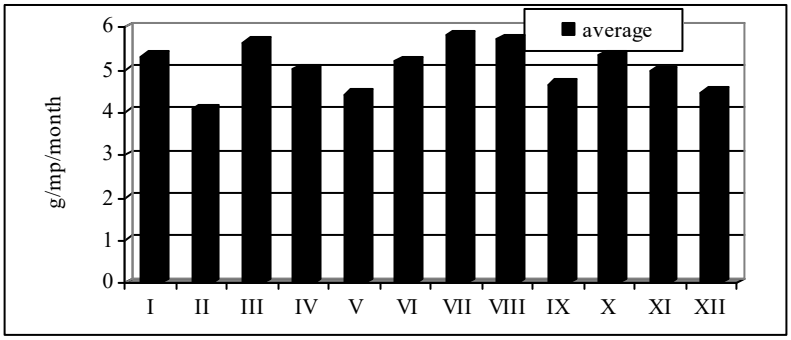

Fig. 4. The evolution of multiannual monthly average concentrations of sediment particles in Bihor (the average of the 14 sampling points)

Evolution of sediment particles by areas

The highest concentrations were recorded in the first area, in 2016, a value of 6.669 g/m^2, followed by the third are in 2017, 5.633 g/m^2, and then the by the third area again in 2018, with a value of 4.938 g/m^2 (Fig. 5).

The lowest concentration was recorded in the third area also, in 2016. In 2017 – 2018 the values in the second and third areas are close, between 5.633 g/m^2 in the third area and 4.480 g/m^2 in the second.

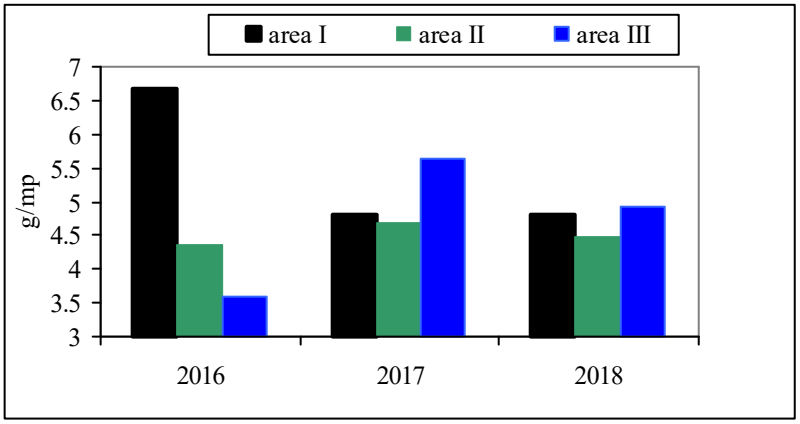

Fig. 5. The evolution of the annual average concentrations of sediment particles in the three areas of Bihor county, 2016 – 2018

The averages of the three years included in the study show that the highest level of sediment particles is recorded in the first area, which is the result of this area being close to the industrial area of Oradea, followed by the third area, where the highest value is 4.726 g/m^2/month and the second one with a concentration of 4.514 g/m^2/month (Fig. 6).

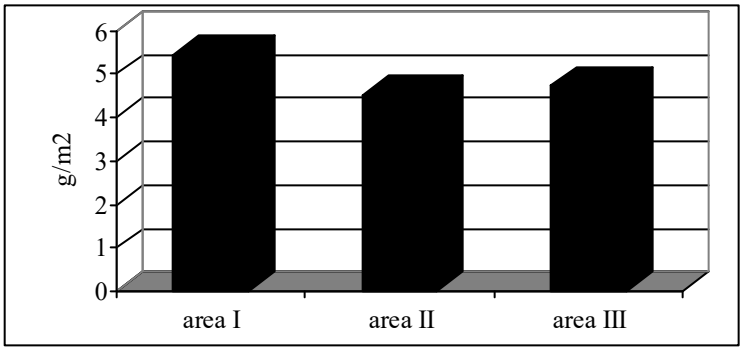

Fig. 6. Distribution of multiannual average concentrations of sediment particles in the three areas of Bihor county, 2016 – 2018

CONCLUSIONS

From the analysis of the average of the 14 sampling points it can be concluded that the level of pollution with sediment particles was the highest in 2016, 8.548 g/m^2, in Episcopia Bihor, followed by 8.295 g/m^2 in Sălard.

The highest concentration of sediment particles was recorded in the first area, where the industrial area of the city is located, but the maximum permissible concentration of 17 g/m^2/month was not exceeded.

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CLIMATE CHANGES IN THE PAST MILLENIUM

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Abstract

The study analyzes the „global modifications" as a result of the interconnected action of phenomena signalled on Earth, such as: global warming, climate modifications; reduction of the ozone layer; deforestation; reduction of resources; reduction of biodiversity; desertification; environmental pollution; demographic changes, as well as other relevant modifications, caused by other factors that render difficult finding solutions. All these being approached from the perspective of their effect on humans.

Key words: ecologic crisis, global modifications, reduction of the Ozone layer, reduction of biodiversity, environment pollution.

INTRODUCTION

At the beginning of the XXI century, we are facing rapid modifications on the globe. Modern technologies of preservation of energy and resources, more rapid circulation at the level of present communications may represent only few of the modifications which changed the world in better, but not all of these are beneficial for the environment (3). The Earth is dominated by human activity, activity which transformed the surface of the planet, appearing new risk factors. Among these, we can mention: approximately 30% increase in the CO_2 concentration from the atmosphere, approximately one quarter of the species of birds from the Earth have disappeared, half of the sweet water being used in human activity; this lead to the so-called „water crisis"(2).

The human activity has affected the planet's climate, modifying the whole biosphere. These modifications without precedent in history affect the heath and future of all alive organisms. Some environmental problems are local, others have global implications, but all of them represent the result of the decisions of millions of people, or the result of the action of a small group of people with decision power in a state, government, industrial corporations, so on. (6).

MATERIAL AND METHOD

The analysis of the „ecological crisis" with possibilities to reduce it, from the IPCC's perspective, as well as the analysis of reasons of optimism in this field (16). The environmental issues and their consequences on alive

organisms have extended, becoming a threat to survival. We are facing a full ecological crisis, crisis which requires an international approach of the environmental issue. The „biocapacity" of the Earth exceeds today with 25% the capacity to support the needs of human kind, thus this crisis is manifested in three directions (8): - in the multiplication 4 times of the globe's population in the XXth century, from 1,6 billions in 1900 to 6,4 billions in 2000; - in the development of dangerous technologies and their export in the 3rd world countries, poor countries, which lead to the deterioration of their environment due to the lack of instruments for the environmental control; - the replacement of natural products with synthetic, toxic ones, which accumulated in the environment's biosystem. The result of the interconnected action of of a few phenomena signalled on Earth are presented in this paper.

Global warming. The phenomenon is signalled starting with the end of the '80s. The green house effect is based on ascertaining the fact that, in time, some gases from the atmosphere absorb the calorific radiation sent out on the surface of the Earth, the gas by interaction with the calorific radiation are heated and resend the heat in all directions. A part of this rows over the atmosphere, contributing to its additional heating. The increase of concentration of these gases determines the heating of the Earth's surface, creating the „green house effect" (Fig. 1).

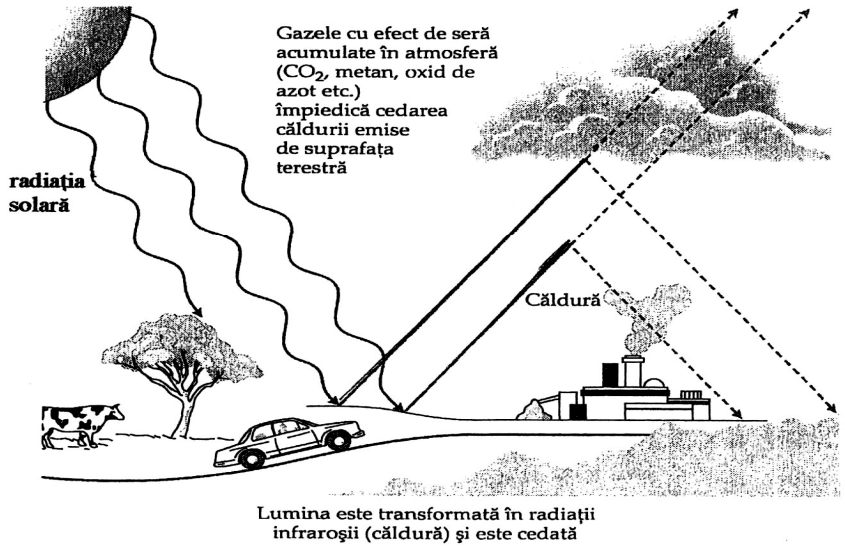

Fig. 1. Green house effect (after *Gates, D.M.,* 1993)

Without the green house effect, the temperature of the surface of the ground would vary from 500^0C in the sunny days to 40^0C during the night and during nebulosity. Today, approximately 6 billion Gt. of CO_2 are annually eliminated into the troposphere, the concentration grew with approximately 1,5 ppm/an (0,4%/an), so a general increase of 25% in the past century. The combustion is responsible of approximately 80%, the rest of the percentage are due to deforestation. The increase of concentration of gas will lead to the increase of average temperature in the first half of the XXth century with approximately $0,5^0$C, and around the year 2100 with 20^0C *(*16*).* The most familiar dates for the average monthly temperatures are those registered by C.E.T. (Central England Temperature) which show that the multiannual average in the past 30 years is higher with approximately $0,5^0$ C than the average of the past 330 years. This warming occurred in the past years is more obvious for the winter than for the summer, and from these dates there is a record year for temperature, the year 1990, when the annual average reached $10,6^0$ C.

The numerical modelling of the global climate is supported by the laws of physics and has as basis the principle of pyramid. The pyramid illustrates the position of various models, position which emphasizes the complexity of the three primary processes and the interaction between them. The modified pyramid has an empty basis, the interaction between the primary processes missing, and, once we approach the top, these processes become more powerful (11), (fig. 2).

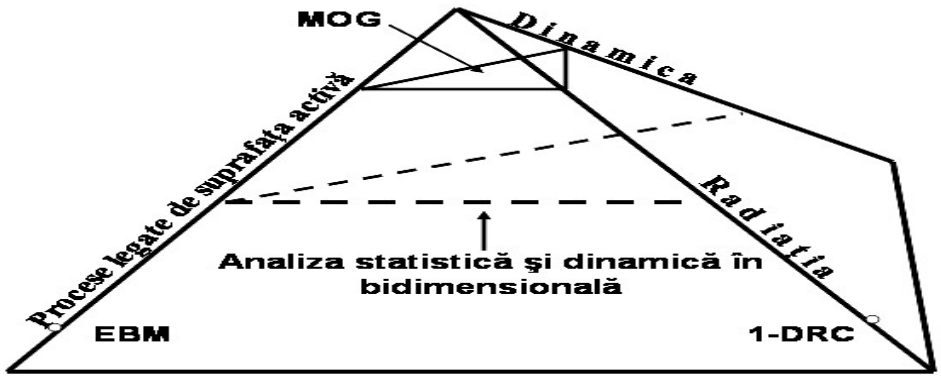

Fig. 2. Pyramid of climate change
(after *Shine, R.P., Henderson – Sellers, A.,* 1983)

Reduction of the Ozone layer. The Ozone is the gas concentrated in the atmosphere at an altitude of 15.000- 45.000 m, with the role of filter and protector of the biosphere to the action of lethal UV radiations. The major

effect of the atmosphere pollution is felt on the modification of the Ozone layer. The Oxygen's photochemistry may represent the cause of formation, but also of the destruction of the Ozone; we have to take into account the implications that the polluting agents and gases with the shape of traces had in the Ozone's survey. During the summer of 1985, in the South Hemisphere a „hole" in the Ozone layer over the Antarctica was noticed. From 1990, the phenomenon was noticed also in the Northern Hemisphere, over Siberia and in the East of North Africa. Until now, the reduction of the Ozone layer is estimated at approximately 3-4% from the atmospherical Ozone and it grows from one year to another (14).

The decrease of content of Ozone in the atmosphere on the global flux of the ultraviolet radiation, as well as on the movements of the spectrum of these waves, to smaller lengths (a reduction of 5 – 10% of the Ozone quantity may lead to an average increase of the ultraviolet radiations with 10 – 20%). If the increase would take place in the field of wave length of 28 – 320 μm, their biological effects would lead to the disorder of the whole planetary ecosystem.

Deforestation. The woods occupied approximately 70% from the surface of the Planet's dry land. Nowadays, we are far from this situation (for example, India lost 2/3 from its woods from 1990 until today, and the USA around 90% starting with the year 1620). With the help of satellites, the annual losses of woods were proved, renouncing to the essential nutrients of the Earth, disturbing water cycles and nourishing elements, impoverishing the soil's fertility reducing agricultural productivity, thus favouring the floods (1).

The wood is the most productive source of oxygen. 1 hectare of wood produces 3 – 10 times more oxygen than 1 hectare of agricultural crop or than 1 hectare of marine phytoplankton. The importance of woods in recycling of oxygen is represented also by the fact that the forest vegetal production, being harvested by humans, this does not decompose, meanwhile the marine ecosystems are consuming in the decomposition process of the organic substance the highest quantity of produced oxygen (4). In the article „*When the wood issues carbon instead of consuming it*" published in *L'Atlas environnement -Analyses et solution,* from Le Monde diplomatique (18), the authors emphasize the fact that the capacity of forest vegetation to absorb carbon will attain the maximum threshold around the year 2050.

The reduction of biodiversity through the disappearance of new species. Nowadays, there are between 3 and 10 million species in the flora and fauna of the Earth, their diversity is an indicator of the ecological health of the Planet. Until the XXth century, few species were destroyed as a consequence of human activity, but, following this period of time, the

number of destroyed species increased significantly. Some researchers from the field say that daily there are 3 species that disappear, the disappearance process being irreversible and compared by some scientists with „burning a library before its books are read".

It was also mentioned that the extensive use of pesticides for herbs and insects harmful to the crops destroy in the same time a large number of useful species (bees), leading to the death or to the interruption of reproductive capacities of several birds. Controversial studies show that the pesticides affect the number of spermatozoids in humans (9),(17).

The reduction of Earth's resources. In order to survive two resources are highly necessary: - water and food. *The water crisis,* in various parts of the world is associated with various conflicts. In the past 50 years, these conflicts also extended to other regions, their caused being represented by the threats to water's security. In various regions from the Middle East, South Africa, Brazil, South-West of the USA, the water crisis will represent one of the factors which limit the increase of the number of population and the economic development of these regions. The countries in progress have a high rate of increase of the population; the water quantity „per capita" available will decrease irrespective of the institution which created the scenery. The battle for water lasts for thousands of years. But the water issues are different, from a historical period to another, from a geographical area to another, the water needs of the humans today being different (8).

The battle for water is given in order to cover the water needs, as well as against water. Each year, millions of people and large surfaces from many countries are threatened in certain seasons by dangers, generated by the great monsoon rains. The water price in the EU reaches an average of 0,32 Euro/m^3 in Sweden, until 1,70 Euro/m^3 in Germany, France and UK have an average of 1,1 Euro/$m^{3.}$ Such differences are explained by the various density of the population, its needs. Germany has 235 inhabitants/km^2, Sweden 10 times less 1,23 locuitori/km^2 have elevated water sale prices, respectively 1,39 and 1,13 Euro/m^3. The world distribution of water from the point of view of the consumption directions is of 70%, in the field of irrigations, 22% in the industry and energy and merely 8% in the domestic field (16), (fig. 3).

In the ecosphere, the sweet water reserve is limited. From the total of water existent on the globe, 97% is to be found in seas and oceans and only 3% in sweet waters. The sweet water from the ecosphere, although in surplus, is distributed in an unequal manner. In table 1, we are mentioning the water reserve of the Earth (12). The underground reserve is important, but it presents the risk to disappear, as well as the fossil fuels. On the surface of the globe, the water is unequally distributed, as well as the population.

But the salty water occupies a percentage of 95,1%, compared with only 4,9% of sweet water. (fig. 4 the ration between sweet and salty water).

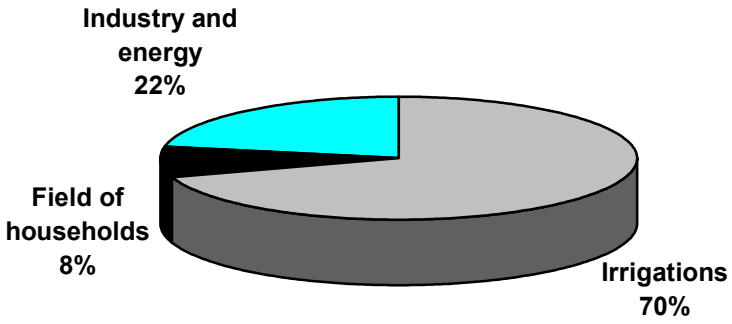

Fig. 3. Worldwide distribution of water in compliance to the consumption directions (after *Lacoste, Y.,* 2003)

Table 1

Water reserve of the Earth (after *Târziu, D.,* 2003)

Reserve from:	Total volume of water in 10^{15}	**%** from total	Resistance in time
Ocean	1.350	97	25.000 years
Glaciers	33	2,4	1.000 10.000 years
Underground waters	8	0,6	1.500 years
Lakes	0,1	< 0,01	17 years
Earth waters	0, 070	< 0,01	1 year
Atmosphere waters	0, 013	< 0,001	8 days
Rivers	0, 0017	0, 0001	16 days
Biomass water	0, 0011	0, 0001	A few hours

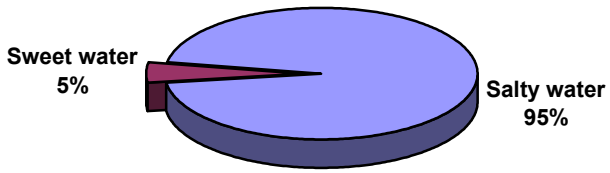

Fig. 4. Renewable water reserves (after *Lacoste, Y.,*2003)

Food crisis. The effects of the El Nino stream (from the end of the ’80s and the beginning of the ’90s) caused the modification of temperature of the oceans, affecting the marine ecology, in several regions, the fish production decreasing, with consequences on the limitation of fish reserves, it insures 20 – 25% from the food needs especially in Asia (15). Another form of reducing the resources is the energy crisis from the industrialized under way countries (China, India), which led to the increase of combustion of inferior coal, to pollution and to an increase of concentration of green house gas, generating variable effects on the health (5).

Desertification. The conversion of agricultural fields into deserts represents a very big issue, the fields for pastures were inadequately used in order to cultivate agricultural species. The tropical forests from Central and South America were eliminated and the clean fields were used as pastures for cows or for the culture of cereals or rice. The cutting of trees in these woods has lead to the interruption of hydrological cycle in the past 10 years the rainfall reduced and the soil’s humidity considerably decreased.

Demographic modifications as well as other relevant modifications cause and other factors make difficult finding a solution. From the demographic point of view, the increase of population and the number of inhabitants on km^2 represents an issue. If at the end of the XIXth century, on the Earth there were 2 billion people, today there are over 6 billion people, and by 2020, it is estimated that 8 billion people will coexist on the Earth. The population is concentrated in the largest cities, for the needs of which the water must be attracted from large distances, existing large consumers of domestic and drinkable water.

Environmental pollution. The pollution has different meanings and can be defined in many ways, a complex definition belonging to the Scientific Committee of the White House, after which the pollution is a defavourable modification of the natural environment, following the

residues coming from human activity and which, through direct or indirect effects alters the life and diversity of alive species (10). The phenomenon is still insufficiently known from the point of view of the capacity to support the ecosystems and the effect of their polluting gas.

The thermal pollution of the atmosphere has an important meteorological meaning, being able to produce severe global climate disturbances if the thermal emissions will exceed 5% from the incidental solar energy to the ground. In agreement with the evolution of world climate and taking into account the violent disturbances in the past years, it is therefore necessary to preserve, by all means possible, the forest ecosystems on the globe, ensuring its necessary viability and stability, reducing its vulnerability by removing the aggressiveness of the polluting agents.

The pollution phenomena are manifesting in two ways. At the beginning, though a green pollution, caused by the invasion of weeds and a brown one, due to the invasion of diseases and pest to sensitive crops, in unfavourable conditions of humidity and heat. The economic loss caused by the brown pollution may sometimes lead to the complete disappearance of crops (during 1991 – 1998, in Romania, due to this, 20.000 ha of trees and 15.000 ha of vine disappeared (2). Another way of manifestation of pollution results from irrational use of pesticides. The pollution affects the vegetation in its vast majority, but the forest is the first component of biosphere affected by atmosphere impurities. In general, the wood species are simultaneously exposed to the mix of polluting agents, their dominant effect being, sometimes, bigger than the individual toxic effect, the mix having synergy effect.

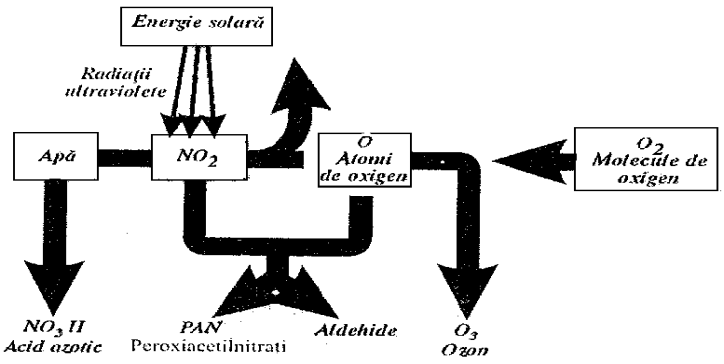

Fig. 5. Formation of photochemical smog (after *Ungureanu I.,* and collaborators, 2003)

Through the interaction of nitrogen oxides (resulting from the use of airplanes) with freons and with other gases which also produce green house effect, the ozone layer is destroyed. Thus, abnormal quantities of ozone

(which exceeds its natural concentration), together with other toxic gases (resulting from burning fuels), determines the formation of photochemical smog (13), (fig. 5).

RESULTS AND DISCUSSION

We may ask if the changes in temperature and rainfall quantity which take place at the global level are due to natural phenomena (such as variability of solar activity or the effects of solar explosions) or are the result of the increase of green house effect. The temperature variations in the atmosphere might modify the structure of the troposphere with consequences in changing regional climate and with the modification of ozone concentration, determining increases in temperature on the Earth's surface, effects comparable to those given by the increases of carbon dioxide.

The deforestation, unavoidable phenomenon due to the fact that 60% from the planet's inhabitants use wood for fire, the industry being also a large consumer of wood. The destruction of woods causes global climate changes, reducing the capacity of the Earth to absorb carbon dioxide from the atmosphere. In parallel to land clearings, the heating reduces the humidity, spreading the fires (the conjunction between El Nino and the increase of forest concessions). The fires from 1997 – 1998 lead to radiations of approximately 2,5 Gt. of carbon in the atmosphere, radiations equal to the annual European emissions (14).

Over the centuries, the water quantities which fell were more or less sufficient to cover the needs of agriculture. In the future, the issue of water will become more serious also due to the fact that in the future decades, the climate conditions risk to be modified (on a large part of the globe) by the increase of values of average temperature of the atmosphere. The destruction of species might have lethal consequences for humans, as well as for the other living beings. The climate changes are linked to a demographic explosion (the middle of the XXth century), which shows that the number of the population of the globe tripled, rising the fear that we will not be able to ensure its needs and that, in the future 30 years, the population of the globe will reach 8 billion inhabitants.

The atmosphere pollution might be regarded under three aspects: the role of meteorological factors on the phenomenon, its effect on the planet's chemism and the effects of pollution on the climate.

The cutting of trees in Sahara, which, 3000 years ago, was, at least in part covered with woods, lead rapidly to the conversion into desert. Similar processes took place in other regions on the globe, which has as

consequence the reduction of potential to produce nourishment. A deserted field may become again rich, after several hundreds or thousands of years.

For our temperate climate, flighty and full of unwanted phenomena, we have to practice a forestry and an adequate agriculture, the corresponding means for existent technologies, in order to reduce unfavourable, biological and climate effects of the CO_2 from the atmosphere, possible through some drastic measures, out of which we mention here: the termination of land clearings from forest ecosystems, rational cultivation of all fields (agricultural, forest etc.) and conservation of forest fund still existent on Terra, measures mainly connected to the antropic factor.

CONCLUSIONS

The direct and indirect effects of global warming will be manifested, thus, in several general directions: - *modifications of vegetation,* the appearance of weeds which may become fatal for the ecosystem, in time; - *the increase of the level of seas and oceans* with approximately 50 cm in the year 2050, which might put in danger lots of ecosystems, especially by an increase of salinity; - *weather abnormalities* manifested though tropical rains, storms, tornados, waves of heat, etc. With an impact on the entire biosystem and on all alive mechanisms; - *the appearance of diseases transmitted through vectors,* in some regions of the globe this phenomenon may lead to incidence, prevalence and, possibly, mortality; - *the food safety is threatened*, high temperatures will affect crops in some regions of the world, especially due to modifications of the rainfall regime and the soil's humidity; - *emphasis on the desertification,* due to the „green revolution" which lead to a dramatic increase of the agricultural production, especially in the past 40 years after the second world war; - *withdrawal of alpine glaciers* has as main cause the increase of green house gas concentration, phenomenon noticed for the first time in the XIXth century, leading to the withdrawal of river flows (used in irrigations and as drinkable water), which generated a real "water crisis" with consequences in the limitation of population increase in many regions from the globe.

Our society must adopt a practical attitude in solving the *environmental issues*, instead of the one adopted until now, a reactive attitude, taken each time when a crisis appears. An optimism reason might be the fact that the great majority of alive organisms from Terra are robust, powerful, which many times demonstrated the ability to adapt to a large scale of precarious weather conditions. Mankind enters

into the largest crisis ever encountered, but the man is full of resources and in the best shape, even in crisis moments.

IPCC, in its report from 1995, approached *several options to diminish* these global modifications: non-polluting methods of transportation, reduction of gas emissions of human establishments, preservation of agricultural fields, policies and strategies of management of woods from the Earth, an efficient industry, so on.

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ABSOLUTE EXTREME AIR TEMPERATURES IN THE VAD-BOROD DEPRESSION

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Abstract

The study of extreme air temperatures in the Vad-Borod depression is based on data recorded at the weather station within the depression, in Borod. The data were extracted from the archives of the National Meteorological Administration (ANM). The analysis of the thermal regime in the Vad-Borod depression covered a period of 48 years.

The analysis of the air temperature regime was based on the extraction of extreme values (absolute minimums and maximums), which represent the possible variation limits of the element.

The multiannual mean of air temperature in the Vad-Borod depression is 9.5ºC.

The absolute maximum temperature at the Borod weather station was 38.1ºC, recorded on 20th July 2007. The annual absolute maximum occurs mainly in August, with a frequency of 54.2%.

The absolute minimum air temperature was -22.3ºC, recorded on 23rd February 1983. The annual absolute minimum is recorded in most cases in January, with a frequency of 39.6%.

Key words: air temperature, absolute maximum, absolute minimum

INTRODUCTION

The Vad-Borod depression is an intermontane depression in the north-west of the Apuseni Mountains, along the upper course of the Crişul Repede river. In the north-east the depression is surrounded by the Plopişului Mountains (Şes), in the south-east the Pădurea Craiului Mountains can be found, while in the west it opens wide towards the Western Plains.

MATERIAL AND METHOD

The analysis of the extreme temperatures in the Vad-Borod depression was conducted using the air temperature data recorded at the Borod weather station over a period of 48 years, between 1970 and 2017.

The Borod weather station was established on 1st December 1967 and it is located on a terrace of the Crişul Repede river in the Vad-Borod depression, at an altitude of 333 m, having the following geographical coordinates: north latitude 46º 59’ and east longitude 22º 36’.

RESULTS AND DISCUSSION

The thermal regime of air in the Vad-Borod depression is determined by the particularities of air circulation, of the radiative factors and of the subjacent surface (Pereş, Köteles, 2011, 2013).

The multiannual mean temperature for the period 1970-2017 in Borod has a value of 9.5ºC. The highest annual mean value was recorded in 2014, 11.3ºC. The lowest annual mean temperature was 8.1ºC and it was recorded in 1985. The monthly minimum air temperature in Borod is recorded in January, with a mean value of -1.1ºC, and the maximum in July, when it reaches 19.6ºC, which gives a monthly amplitude of 20.7ºC.

Absolute extreme air temperatures

Althoug they occur randomly, extreme temperatures have a significant practical and theoretical importance, as they show the possible limits within which temperatures can vary from the warm season of the year to the cold one (Costea M., 2014). These temperatures have a relative character, that is, they depend on the length of the monitoring interval and they are determined by the circulation of air masses, as well as the local conditions: landforms with their altitude and morphology, the presence of valleys etc. (Dragotă, Gaceu, 2002; Cristea, 2003; Köteles, Pereş, 2010)

Absolute maximum temperature

It represents the maximum value recorded during the entire monitoring period, at a certain moment. Just like the minimum temperature, it occurs randomly, showing the air temperature value which can be reached or even exceeded. The absolute maximum temperature at the Borod weather station was recorded on 20th July 2007, the value of 38.1ºC (Table 1).

Table 1

Variation of monthly and annual absolute maximum temperatures in Borod, 1970 – 2017

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
tºC	17.9	20.6	26.0	30.3	30.8	35.2	38.1	38.0	34.2	30.5	25.0	19.4	38.1
Date	07.01	25.77	23.74	30.13	18.94	23.00	20.07	23.07	01.12	01.12	08.97	09.06	20.07.2007

Source: data provided for processing by the A.N.M archives

At the Borod weather station the annual absolute maximum temperature is recorded primarily in August, which means 54.2% of the years. In July, the absolute maximum temperature is recorded in 39,6% of the years, and in June in 6.2% of the years (Table 2).

In the case of winter months, the absolute maximum temperatures are positive in each year. Thus, the absolute maximum value for the cold season was recorded on 25th February 1977, when the air temperature in Borod went up to 20.6ºC. As a matter of fact, February is the winter month with the highest frequency of highest air temperature, 52.1% of the years. The figures for December and January are 29.2% and 18.7% respectively.

In spring, the absolute maximum seasonal temperatures are recorded in most cases in May, in 91.6% of the years. The highest air temperatures can be recorded in April and May as well, but their frequency is much lower, only 4.2%. The highest air temperature recorded in the spring months was 30.8ºC, on 18th May 1994.

Table 2

Absolute maximum values and the dates they were recorded on in Borod, 1970 – 2017

Month	June	July	August
Annual absolute maximum (ºC)	35.2	38.1	38.0
Day / Year	23.2000	20.2007	23.2007
Frequency (%)	6.2%	39.6%	54.2%

Source: data provided for processing by the A.N.M archives

In autumn, the highest air temperatures are recorded in September, with a frequency of 89.6% of the years, the absolute maximum value being 34,2ºC, recorded on 1st September 2012. Maxim values occur in October too, but their frequency is much lower, only 10.4% of the years.

A comparative analysis of the monthly absolute maximum air temperature values and of the monthly mean values shows that there are big differences between them, which means that the absolute maximum values occur randomly. A good example is July 2007, when the absolute maximum reached 38.1ºC, while the thermal mean of the same month was 21.9ºC.

The highest air temperature values were determined by the random invasion of the dry hot continental tropical air carried here as a result of the extension of the North African Anticlyone or that of the Arabian Penisula (Ciulache, 2002; Moza, 2009).

Absolute minimum temperature

It represenst the lowest air temperature value recorded during the monitoring period of the weather station. At the Borod weather station the absolute minimum air temperature value was -22.3ºC, recorded on 23rd February 1983 (Table 3).

Table 3

Variation of monthly and annual absolute minimum temperatures in Borod, 1970 – 2017

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
tºC	-22.1	-22.3	-17.0	-6.0	-3.6	0.8	5.2	3.6	-2.4	-10.5	-15.2	-19.0	-22.3
Date	13.87	23.83	04.87	09.03	02.07	02.77	09.93	31.08	29.70	29.97	24.88	25.01	23.02.1983

Source: data provided for processing by the A.N.M archives

The absolute minimum temperatures show negative values in the cold season, while in the summer and in the transitional seasons these values are positive. The values vary between -22.3ºC, recorded on 23rd February 1983, and 5.2ºC, value recorded on 9th July 1993. In the summer, the absolute minimum value over the 48 years included in the study was recorded in June, that is, 2nd June 1977, 0.8ºC. The highest value of the summer absolute minimum occurred in July, that is, 9th July 1993, 5.2ºC. In the

winter, the absolute minimum occurred on 23rd February 1983, -22.3ºC, and the highest value was recorded in December, -19.0ºC, on 25th December 2001 (Table 3).

At the Borod weather station the annual absolute minimum was recorded primarily in January, which means 39.6% of the years. In December, the absolute minimum temperature is recorded in 31,2% of the years, and in February the frequency is 29.2% (Table 4).

Table 4

Absolute minimum values and the dates they were recorded on in Borod, 1970 – 2017

Month	December	January	February
Annual absolute minimum (ºC)	-19.0	-22.1	-22.3
Day / Year	25.2001	13.1987	23.1983
Frequency (%)	31.2%	39.6%	29.2%

Source: data provided for processing by the A.N.M archives

The lowest thermal values occur due to the invasion of the cold Arctic air, carried by anticyclones: the East-European or the Scandinavian Anticyclone, synoptic situations during which the sky clears up, which favours nocturnal radiation, helped to a great extent by the snow (Măhăra, 2001; Gaceu, 2005; Pereş., 2012).

CONCLUSIONS

The absolue maximum temperature was recorded on 20th July 2007, tha value of 38.1ºC, and the absolute minimum air temperature value was -22.3ºC, recorded on 23rd February 1983.

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PHOTOGRAMMETRIC PROCESSING APPLIED TO WATER MANAGEMENT FOR NH TOPOLOVĂȚU MIC, TIMIȘ COUNTY

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Abstract

Using aerial vehicles without pilot (UAV-unmanned aerial vehicle) or Drone has seen a rapid development, over the last decade, in order to obtain spatial information of the Earth's surface. This scientific paper was realized for the Hydrotechnical Node of Topolovățu Mic, from Timis County and has as purpose the processing of aerial images, obtained from a Phantom4 Pro device, which is capable to capture video at 4K resolution at 30 frames per second and Full HD 1080p at 120 frames per second for a slow motion with a Sony EXMOR camera that can take photos at 20 megapixel, with a maximum flight speed of 20m/s.

The device is equipped with positioning equipment, which connects to both GPS and GLONASS, allowing it to connect faster to satellites and position itself with high accuracy in the air. Phantom 4 automatically records the details of each flight made, so you can check your previous flights.In order to achieve the 3D model, were used oblique and vertical images with the highest accuracy. Nadir imaging was performed at an average height above ground (AGL–Above Ground Level) of approx. 113m. The imaging data was processed with the AgiSoft PhotoScan program using a number of 273 aerial images (total 287 aerial images). For image processing, the sotware proposes for each processing stage, different parameters that determine the precision and time of the final processing of the Topolovățu Mic Hydrotechnical Node.

The images were georeferenced using the control points from the ground. In the present paper, in order to achieve georeference, with very high precision, we have use of 18 control points (total 26 GCP) situated on the ground (GCP-Ground Control Points), which were determined in the field using a GNSS receiver in RTK mode (Leica GS08), obtaining coordinates in the Stereographic Projection System 1970. So, data exported from PhotoScan have provided textures, clouds of points, orthomosaics in red, green and blue spectral bands, obtaining a final precision of georeference by milliseconds order. The RMS error values being 0,029480 m on X; 0,041659 m on Y and 0,042573 m on Z, a resolution of 8,28 cm/pixel. From the 273 aerial images georeferenced on 18 GCP control points, were obtained 32.119.272 points.

The final stage of the data processing work includes the generation of orthophotomaps, mosaics, and raster images, in TIN and DEM formats as well as the generation of clouds of point (Point Cloud). Combining 2D and 3D, which allow classifying points and filter them for accurate objects modeling. At the end of aerial data post-processing UAV, were generated topographic models, was made data export in various formats, including Google Earth and LIDAR files (LAS), which then could be processed and viewed with other special programs such as: Global Mapper, Google Earth, Surfer, AutoCad, CloudCompare.

Key words: UAV, point cloud, ortofotoplan, AgiSoft PhotoScan, GCP, GNSS

INTRODUCTION

Use of UAVs is ideal to purchase research data at resolutions ranging from 0.5 to 2 cm. The programs used to process monitoring and reconstruction data may vary, as price, from the most expensive to the ones obtained as Open Source, obtaining data at high resolution (Rusnák, Miloš et al., 2017). Although UAVs have their origins in military contexts, they have also become valuable for scientific and commercial applications, especially during the previous decade (Nex and Remondino, 2014). The use field of UAVs is multiple, in civil applications, the reconstruction of high resolution surfaces (Anders. et al., 2013), the realization of cultural heritage and archeology sites, hydrology (Șmuleac, et al., 2017), in agriculture for monitoring the crops (Zhang. and Kovacs, 2012), in order to manage natural disasters, in topography (Șmuleac. et al., 2016) and mapping (Herbei. et al., 2016) and mapping (Barnes,. and Volkmann, 2015) and wildlife observation (Koh, and Wich, 2012), in engineering (Uysal, Toprak, 2015). In this context, Pajares offers a detailed review of the wide range of applications of remote sensing based on UAV (Pajares, 2015).

Turner and his colleagues in 2015 highlighted the fact that it is the latest technology to realize digital photogrammetry in real time, as well as to obtain a land elevation model (DEM), but with the inconvenience of not realizing images under dense vegetation (Turner et al., 2015). UAV photogrammetry generates high resolution topographic data essential for 3D terrain modeling. Operations approached for UAV imaging and data processing consist of several essential steps: preparation of UAV equipment, calibration, establishing control points (GCP), point cloud processing and analysis as well as obtaining orthophotomaps. Indeed, remote sensing methodologies and techniques for 3D modeling of a cultural patrimony allow the generation of very realistic 3D results that can be used for a variety of purposes, such as the development of historical documentation (El-Hakim et al., 2007), and the realization of digital preservation, monitoring in time of objectives with UAV technologies (Bruno et al., 2010) and viewing 3D data.

With regard to photogrammetric data analysis, software programs uses different approaches, both with commercial solutions and with open source solutions (Remondino F. et al., 2014; Agisoft PhotoScan, 2014).

MATERIAL AND METHOD

In order to obtain the aerial data required for this study, the research was divided into 4 stages, namely: stage 1 refers to the preliminary study, stage 2 to the positioning of the GCP control points, stage 3 to obtaining the aerial data, stage 4 refers to processing of aerial data. At the same time for

the acquisition of data for mapping with UAV equipment, the following steps will be taken: land recognition and identification of possible hazards in order to make the flights, identification of take-off and landing points, placement of control points at the ground (GCP), aerial imaging of the area of study, quality assurance and data processing, data precision assessment, image processing with **Agisoft PhotoScan Professional Version**: 1.4.0 build 5650 (64 bit), 3D mapping and 3D extraction operations, cloud point grading and orthophotomaps.

RESULTS AND DISCUSSION

This research was carried out on the Topolovățu Mic Hydrotechnical Node, located in Timis County at approx. 60 km from the city of Timisoara and approx. 10 km from the city of Lugoj, which is located strategically at the Timis-Bega discharge channel on the Timis River. The purpose of this Hydrotechnical Node, built in 1758 by engineer Maximilian Fremaut (an engineer who carried out essential water management works in the 18th century in Banat) being one of the oldest arrangements from Romania, is to deviate in drought weather the waters of the Timiş River in the Bega Channel, in order to balance the flow or otherwise to divert the water from the Timis River to the Bega River.

Land Recognition and setting **Ground Control Point (GCP)** was **the first step** in the aerial image collection process. In order to complete the data processing operations including georeferencing, a number of **18** control points (**GCP**) were used, points that were determined with the **Leica GPS** model, **GS08**, using the **RTK** method (Table 1, Figure 2). Managing control points (GCP) and the correction of those locations are particularly important for carrying out accurate mapping with UAVs. Three or more control points (GCPs) are required in order to achieve the georeferencing of the obtained orthophotoplane, but the more the number of them will increase, the better the precision and the quality of the data acquisition will be of high precision. After the AgiSoft PhotoScan user manual, at least 10 control points (GCPs) are required to referencing the model, and they will need to be distributed in lines or create regular patterns, such as equilateral triangles. Another relevant condition for distributing control points is their arrangement at different vertical heights (at different altitudes, if this is possible), including their positioning on riverside, canals, terraces, as well as the parameters for making the flight plan.

To achieve the 3D model and get the point cloud (**Point Cloud)**, were used oblique and vertical images for the best accuracy. Nadir imaging was performed with an AGL (**AGL** Above Ground Level) of 13. The aerial

images were processed with the AgiSoft PhotoScan program using for processing **273 aerial images**.

The set of 273 images from the shooting flights were uploaded to **AgiSoft PhotoScan**, and the control points from the ground determined with the **GPS** equipment were identified and positioned manually (Figure 3). In PhotoScan, the tagging algorithm is a priority and requires considerable verification and adjustment by the human operator for placement of the marker point. Marking centers have been carefully checked and manually adjusted where it was necessary. Coordinates for those **18 GCP** points were loaded and an initial alignment was performed (Table 2)

Table 1

Presentation of coordinates of GCP soil control points in Stereographic 1970 Projection System, NH Topolovățu mic

GPS point No.	**X (m)**	**Y (m)**	**Z (m)**	**GPS point No.**	**X (m)**	**Y (m)**	**Z (m)**
GPS1	478944,7491	238505,967	102,9181	GPS14	478846,8925	238491,049	102,3714
GPS2	478891,8496	238420,72	102,3054	GPS15	478825,2726	238443,122	102,2533
GPS3	478897,9112	238467,129	102,0203	GPS16	478823,3087	238490,39	105,3035
GPS4	478892,0439	238387,666	105,7409	GPS17	478990,9908	238574,92	102,8973
GPS5	478947,873	238529,907	99,9782	GPS19	478998,4071	238599,865	102,8633
GPS6	478902,9092	238498,192	99,9478	*TMIC9*	*478872,351*	*238506,115*	*102,6415*
GPS7	478906,4634	238517,078	98,1452	*INT7*	*478935,2289*	*238565,648*	*101,1011*
GPS8	478914,5456	238545,496	98,1054	*INT6*	*478902,5447*	*238516,549*	*98,053*
GPS9	478893,0948	238551,349	100,0047	*INT5*	*478975,67*	*238530,71*	*106,7927*
GPS10	478882,4946	238505,563	99,9654	*INT4*	*479049,0716*	*238483,42*	*103,3759*
GPS11	478923,0232	238604,629	101,7695	*TMIC1*	*479067,2863*	*238501,567*	*102,1107*
GPS12	478924,383	238634,051	102,7919	*TMIC2*	*479124,9429*	*238508,712*	*102,6469*
GPS13	478869,8698	238549,083	102,8562	*TMIC3*	*479069,033*	*238586,241*	*105,0858*

The steps involved in generating a cloud of points **3D-Point Cloud** along with the estimated position and the position of the camera stations and a solution for camera model parameters are similar regardless of the SfM/MVS software used. To accomplish this study, the main purpose was to ensure that all scenarios were based on the same **PhotoScan** project, resulting minimal differences in processing stages. This study, which contained 273 images of high quality, high resolution, from both nadir and oblique flights, has an overlap of 80% -90%. Any gloss of water (reflector) was masked from each image. The GPS navigation data on the UAV equipment was used to geocode the images, so an initial alignment was made based on these approximate positions.

Fig. 1. The type of target use in field

Fig. 2. Leica equipment GPS Leica GS08 use to determinated the target

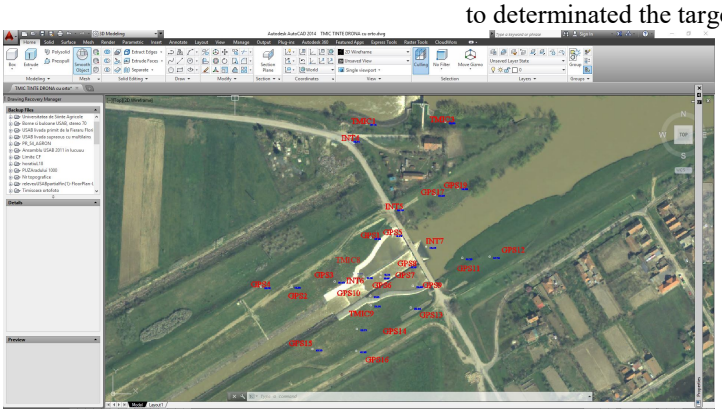


Fig. 3 – Identifying markers at the ground (GCP)

The 19 GCPs were loaded into the project, and primary alignment based on image coordinates helped identify the markers from each image. Each marker has been reviewed and edited when it is necessary, in order to ensure that it has been located and centered in as many images as possible. Once these markers were placed (Figure 4), the baseline project was used to: analyze and change the coordinate system for the drones images (Figure 4).

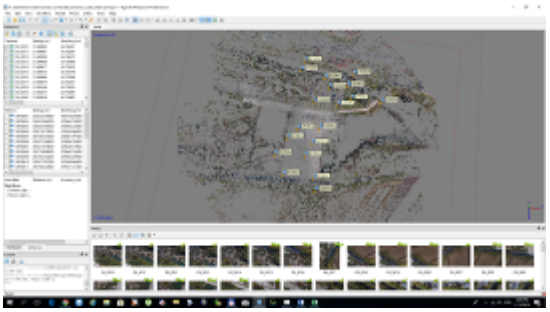


Fig. 4 – Presentation of GCP ground points

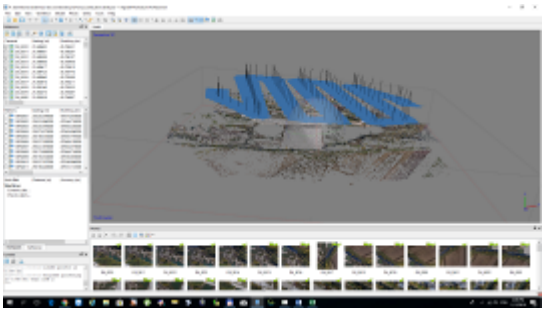


Fig. 5 First alignment of aerial images

The steps taken to process the data were as follows

1. Importing photos and viewing the WGS1984 coordinates obtained - 273 images were imported (Figure 6).**Calibrarea imaginilor cu AgiSoft Lens**.

2. Gross data processing and **image alignment with Agisoft PhotoScan Professional** Version: 1.4.0 build 5650 (64 bit). It was found that from each image was extracted 40000 points

3. View the **errors of the ground markers** at the time of their completion and their positioning on land marks from the ground (Table 2).

4. Obtaining dense point clouds (**Build Dense point Cloud**) - For a results near reality with high resolution, we will go on representing the cloud points by opting for Hight and an aggressive filtering (Figure 6).

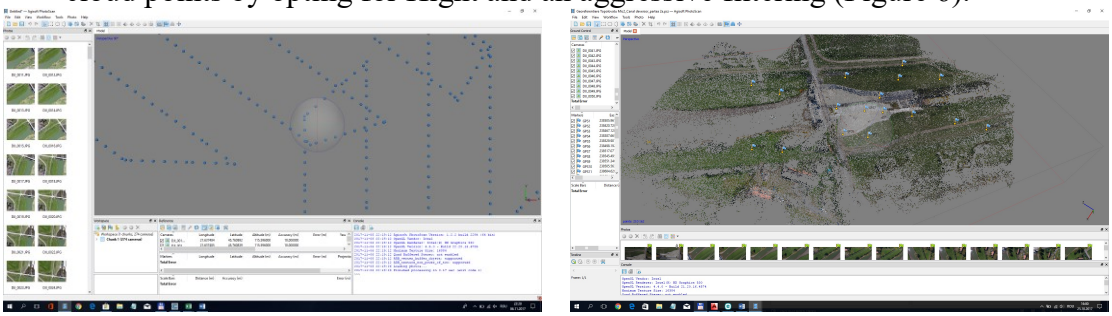


Fig. 5 – Importing the aerial images in WGS 1984 coordinates

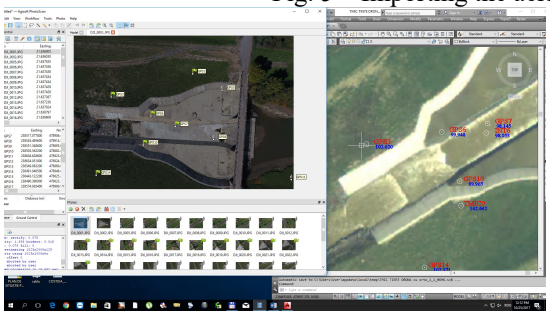


Fig. 4 – Control ground point presentation

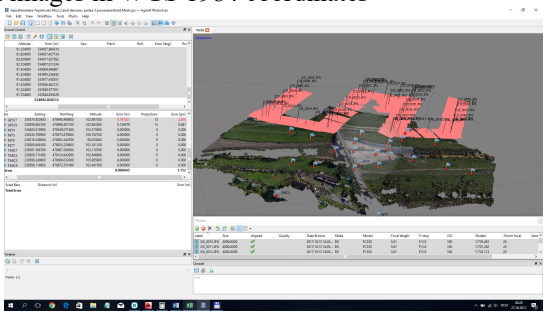


Fig. 6 – Presentation of the point clouds

5. Mesh Representation (**Construction Mesh**) - PhotoScan reconstruction parameters support several reconstruction methods, which ultimately help to achieve optimal reconstruction for a particular set of data. **The polygon contour (Polygon Count)** specifies the maximum number of faces formed in the mesh. Additionally, the following advanced parameters can be adjusted: polygon type, namely high (**Height**) in our case we have a number of 32.119.727 points. If we had opted for a poorer generation of point clouds we would have: for the Medium module **(Medium)** a number of 16.119.058 points, for the low module (**Low)** a number of 2.832.594 points or it can opt for a custom module **(Custom)**. The result of Mesh generation can be seen in Figure 7.

6. Creation of 3D model's texture (**Building model texture**) - texture mapping mode determines how the texture of the object will be wrapped in the texture atlas. The correct selection of the texture mapping mode helps to achieve an optimal texture packaging, in consequence, a better visual quality of the final pattern obtained. Textures mapping methods (**Mapping mode**) shall be taken into account, by texture generation parameters (**Blending mode**) and the text dimension and number size (**Texture size/count**). In addition, other parameters can be adjusted **Advanced Parameters**. In Figure 8 is presented the result obtained.

7. Building the faience pattern (**Building Tiled Model**) - Data hierarchy format is a good solution for urban scale modeling. Enables fast 3D viewing of high resolution of 3D models, an open sandstone model with Agisoft Viewer - a complementary tool included in the PhotoScan installation package. Data processing lasted 7 hours and 12 minutes.

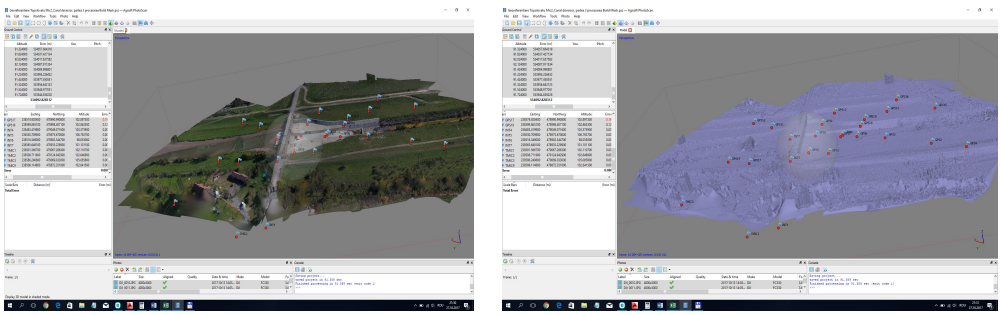


Fig. 7 – Obtain Mesh (Shaded to the Left and Solid to Right)

8. Making the Digital Elevation Model (**DEM**).

9. Obtaining Orthophotlan (**Build Orthomosaic**) based on aerial images and alignment of images on control points from the ground. In the continuation of the study, the newly obtained georeferenced Orthophotoplan (in 2018) was inserted in the **AutoCad** program where we compared the GPS data taken with the GSP Leica GS08 equipment (table 3), and then compared the new orthofotoplan with another older orthophotoplan from 2010, the results can be seen in Figure 9. Both Orthophotoplans are georeferenced in the Stereographic Projection System 1970 and superimposed over the **GCP** points taken from the **GPS.**

10. Final report of the paper covering all steps taken, the precisions, the images used, the number of control points, DEM, Mesh and the realization of the georeferencing.

Table 2

Presenting the coordinates of GCP control points and their errors in AgiSoft PhotoScan for NH Topolovățu Mic

The pictures	X error	Y error	Z error	Error (m)	Error (pix)
GPS1	-0,00082	-0,05338	-0,05578	0,086585	0,865
GPS2	0	0	0	0	0
GPS3	0,036718	-0,01016	-0,05006	0,066342	0,682
GPS4	0	0	0	0	0
GPS5	0,111514	-0,10573	-0,03657	0,166920	0,852
GPS6	-0,01769	-0,05901	-0,04148	0,051342	0,498
GPS7	-0,02703	-0,05565	0,044331	0,089025	0,628
GPS8	0,098082	0,206393	0,100105	0,294918	1,039
GPS9	0	0	0	0	0
GPS10	0,240903	-0,05648	-0,04699	0,284375	1,445
GPS11	-0,12949	-0,1157	-0,01983	0,143166	1,055
GPS12	-0,1046	-0,04651	-0,03665	0,101849	0,237
GPS13	-0,13328	-0,11733	-0,08312	0,169012	0,653
GPS14	-0,06569	-0,00166	0,01723	0,057242	1,115
GPS15	0,099543	0,055981	0,252045	0,529738	0,052
GPS16	-0,02441	0,050251	-0,02056	0,048090	1,217
GPS17	0,028593	0,170319	0,071616	0,197021	2,616
GPS19	-0,04183	0,071089	0,079123	0,12679	0,861
Total erori	**0,041659**	**0,029480**	**0,042573**	**0,066461**	**0,607**

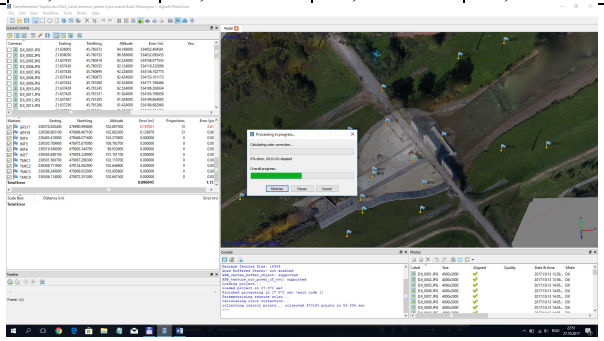
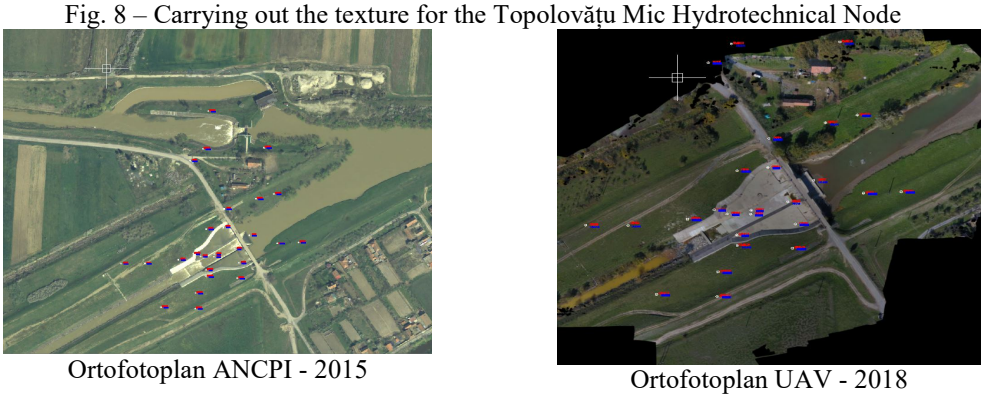


Fig. 8 – Carrying out the texture for the Topolovățu Mic Hydrotechnical Node



Ortofotoplan ANCPI - 2015

Ortofotoplan UAV - 2018

Fig. 9. Presentation of Orthophotlan obtained (right 2018, left 2010), NH Topolovățu Mic, Timiș County

CONCLUSIONS

In this study, photogrammetry data (273 images) were processed using AgiSoft PhotoScan making the georeferencing on the 19 GCP. The image analysis process for image generation includes image alignment, texture, geometry, Dense Point Cloud generation, construction and georeferencing. In addition, this can be done with Open Source programs, namely: Bundler, PMVS, Pix4D Mapper, AgiSoft PhotoScan, Photosyntch or ARC3D. It is very essential to make an assessment of the accuracy and accuracy of the acquired data and as a result the final 3D model and geometry calculation.

This is particularly important for topographic models in which they successfully undergo modeling, carrying out volumetric calculations based on daytime sky clouds obtained from air flights. The total number of points- **Points** being 32.119.727, resulting a DEM of 8,196x5,180, and 8,28cm /pix.

The purpose of this work is to create a 3D database on the current state of the Hydrotechnical Node and on time monitoring, the realization of orthophotoplanes necessary for the realization of the heritage documentation as well as the realization of the situational plans based on the ground and air elevations for the design and renovation of the node.

This material presents the current presentation of the hydrotechnical node through the creation of geo-referenced orthophotoplanes and the point clouds can be used in conjunction with terrestrial laser scanning to complete the top of the constructions and to visualize in time the riverbeds.

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