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THE VARIATION OF THE CHEMICAL PROPERTIES OF EUTRICAMBOSILS AND LUVOSOILS OF THE FORESTY LAND FROM THE IALOMIȚA SUBCARPATHIANS

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Abstract: *In the present paper on the basis of the laboratory analysis done on 111 soil samples we present the chemical properties of Eutricambosoils and Luvosoils from the Ialomița SubCarpathians, as well as the statistical indicators of their variability (arithmetical average, amplitude, standard deviation, variation coefficient). The interval of the variation of chemical properties provides information about the most important two soil types occuring in the center of the catchment area of the Ialomița River regarding the troficity of beech, sessile oak and beech-sessile oak sites (FD_3).*

Key words: *beech, sessile oak, trophicity, chemical properties.*

1. Introduction

As well known the chemical properties of the analyzed soil samples represent a sure indicator of the trophic potential, the present paper determines the variation interval of these properties for Eutricambosoils and Luvosoils.

The chemical properties of the soil are influenced to a great extent by the nature of the parental material, as well as the other solification conditions and are reflected very well in the production class of the tree. Some of the properties belonging to the soils are also considered criteria for the systhematic framing of these soils (diagnostic elements). In this paper there have been 21 soil profile samples analyzed for Eutricambosoils and 23 soil profile samples for Luvosoils.

For the 111 soil samples there have been identified the following properties: humus content (*H* - the direct Scholenberg-Jackson oxidation method), the *C/N* raport, the Nitrogen content (*N* - the Kjeldahl method), the soil reaction (the *pH* - in water), the exchange capacity for bases (*Sb* - Kappen method with HCl 0.1 N), the exchange capacity for Hidrogen (*Sh* - the Kappen method with calcium lactat), the total cationic exchange capacity ($T = Sb + Sh$), the saturation degree in bases ($V = Sb/T \cdot 100$), the skeleton procentage, the mobile phosphorum (P_2O_5 in the lactate acetat with the PerkinElmer AA200 aparatum) and the mobile potasium (K_2O in lactate acetat with the PerkinElmer AA200 aparatum) [5].

The aim of the present paper is to demonstrate the strong link between the soil's chemical properties, as a site component and the productive potential of

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the beech and sessil oak found in the Ialomiţa SubCarpatians. In order to reach this aim we have established the following objectives:

- to define the specific pedogenetical procesess for the two soils analyzed and the implications on the forest vegetation;
- to determine within the laboratory of the chemical and pshysical properties of the soils;
- to study the variation of chemical properties for Eutricambosoils and Luvosoils;
- to outline the variation interval of the chemical properties for the types of soil samples analyzed.

The location of the research is represented by the Ialomiţa SubCarpathians which are part of Central Muntenia, limited on the North side by the Românescu and Leaota Mountains; on the South side by the high plain of Târgovişte between the Dambovița and Cricov Rivers; on the West side by the Cracul Bercii Heights and Cărbunarului Hill and on the East side by the Hills of Provița, Priboiului and Rudei.

2. Materials and Research Methods

The research has taken place on the stands of beech, sessil oak and beech and sessil mixture oak from the hills on the radius of the Forest Department of Pucioasa, Moreni and Târgovişte which are part of the Târgovişte Forest District and has focused on the mature stands with the age of over 80 years old.

The research methods used have been: the bibliographical research and the direct observation completed with measurements and laboratory analyzes. Through the bibliographical research the overall characterization of the pshysico-geographical conditions has been realized.

The direct observation method has been used to determine the type of rock and parental material, for the morphological characterization of the soil [6].

Out of the 44 soil profiles there have been samples which were digged and analyzed by the Forest Soil and Site Laboratory of the Faculty of Silviculture and Forest Engineering of Braşov, in order to quantify the physical, chemical and hidropshysical properties of these soils which were actually used for the ecological indicators in the site evaluation.

3. Results and Discussions

3.1. Geographical conditions

Based on the existent geological maps and after field observation, it was found that in the Ialomiţa River watershed, the geological formations that form the lithological substratum (Figure 1) are represented by the

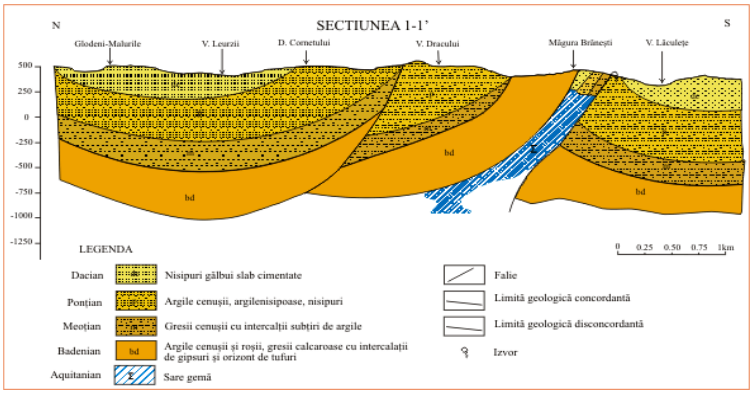

Fig. 1. *Geological section in the direction N-S in the Ialomiţa SubCarpathians* [11]

crystallin schists, which are covered discordantly with Jurasic and Cretacic sedimentary deposits (gray calcareous sandstones, limestones, breccia and conglomerates), neogen deposits, sandy clay, quaternary deposits, cretacious flysh siliceous gravel, sedimentary deposits belonging to the Meotian-Dacian type of clay, sanstones and argillaceous marl, association which are proper to the hill area [3].

At lower altitudes at the interference of the Piedmontan Plain with the Târgovişte Hills, we also find loess deposits over the Pliocene clay which are hardly permeable, fine sands, gray clay-marls, ash-grey sands and ash-grey clay-marls [7].

At the contact between the mountain area and the subcarpathian area we also find marl-clay and sandy substratum.

3.2. Climatic conditions

The climatic data (Table 1) were taken from pubilshed tables reffering to the period 1930-1960 for the climatic stations in Câmpina and Târgovişte [4].

From the presented data we conclude that in the central part of the Ialomița River watershed the climate is favorable for the growth of beech and sessil oak in the Southern part.

The Main Characteristics of the Climate in the Researched Territory Table 1

Nr. crt.	Weather Characteristics	Weather Station	
		Târgovişte	Câmpina
1	Average annual temperature	+9.9 °C;	9.1 °C
2	Average temperature for January	–2.3 °C;	–1.5 °C
3	Average temperature in July	+21.0 °C	20.5 °C
4	The period of vegetation	184 days in the Southern part; 140 days in the Northern part	180 days in the Southern part; 143 days in the Northern part
5	Date for the first frost	17. X	14. X
6	Date for the last frost	17.IV	15IV
7	Average annual amount of rain	774 mm	700
8	The rainiest month	June (188 mm)	June (180 mm)

3.3. Hydrological and hydrographical conditions

The hydrological network was developed around the Western Ialomicioara River, also known as Negrita or Runcu, thus we can say that the entire hidrographical network is well developed, resulting a typical relief, with hillslopes alternating with flat areas [2]. All the rivers have a greater flow in the spring as a result of the simultaneous action of the melting of snow and in the fall season the flow drecreases gradually until August, when we have the lowest flow. Still, after heavy rain floods can occur.

3.4. Pedogenetic processes

Due to the warm and relative wet climate, the main pedogenetic procesees that occur within the researched teritory are the bioaccumulation, clay formation and eluviation-illuviation. The bioaccumulation is specific to both soils analyzed and is reduced in the organic *O* horizon, due to the fact that the humification is intense and results in just a thin *Ol* horizon; the intensity of the bioaccumulation increases the inferior horizon because of the accumulation of humus from the decomposition of the organic horizon.

The clay formation is specific to

Eutricambosils which present a *Bv* horizon where this process takes place *in situ* with the accumulation of clay and free oxides.

The process of elluviation-illuviation is characteristic to Luvosoils and in this case it consists of the migration of salts, clay and colloids from the *El/Ea* horizon which becomes poor. After this process the resulting *Bt* horizon is enriched in clay and salts that leads to compaction and degradation of the aerohidric properties of the soil.

3.5. Edaphic conditions

Based on the management plans provided by the Forestry District from the study area [8-10] and our own observations that were materialized in the morphologic description and interpretation of analytic data from 54 soil profiles in Figure 2 is presented the extent of soil classes and types from the beech, sessil oak and beech-sessil oak sites (FD_3). As we can see, the most common soil class is the Cambisoils (70%) from which the most representative is the Eutricambisoil with almost 60% of the entire study area [1].

The Luvisoils and Eutricambisoils of the Ialomița SubCarpathians were formed on the basis of disintegration of rocks such as loess, marl, conglomerates and calcarous sandstone which in hillslope conditions with moderate slopes are capable of mentaining forest stands of middle and superior production classes. The *pH* value in the case of Eutricambisoils (Table 2) is

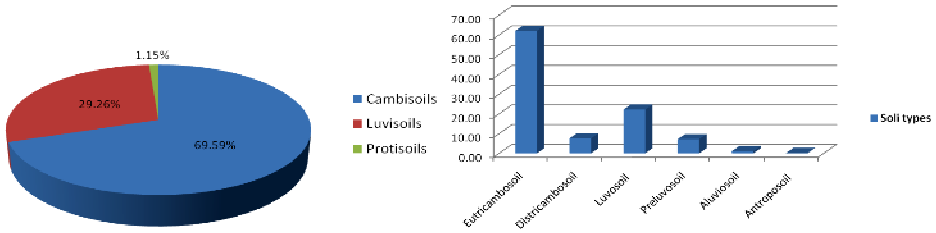

Fig. 2. *The distribution of forest stands from the Ialomița SubCarpathians of classes and types of soil* [1]

The Main Statistical Indicators for Eutricambisoils Table 2

Nr. crt.	Chemical properties	Pedogenetical horizon	Number of values analysed	Statistical indicators			
				Medium value $\overline{X}$	Variable amplitude $X_{max} - X_{min}$	Standard deviation [S]	Variation coefficient [S%]
1	pH	Ao	21	5.62	3.17	0.87	15.55
		Bv	21	5.97	3.98	1.13	18.92
2	Sb me/100 g sol	Ao	21	17,62	44.80	12.43	70.55
		Bv	21	14.66	32.00	9.45	64.46
3	Sh me/100 g sol	Ao	21	10.57	16.08	4.53	42.88
		Bv	21	7.22	11.43	3.31	45.83
4	T me/100 g sol	Ao	21	32.30	90.40	19.10	59.12
		Bv	21	34.20	92.40	28.88	84.46
5	V %	Ao	21	58.51	87.69	25.17	43.01
		Bv	21	65.89	91.28	23.08	35.04
6	H %	Ao	21	6.30	13.35	3.09	49.12
		Bv	21	0.76	1.59	0.53	69.38
7	C/N	Ao	21	13.71	12.21	3.61	26.32

moderatly acid until it reaches low acidity (*Ao*-5.62, *Bv*-5.97); the increase of *pH* in the inferior horizon is caused by the litholigical substratum that contains bases.

In the case of luvisoils (Table 3) these present an increase of *pH* in the *El* horizon (5.21) followed by a weak recover in the *Bt* horizon (5.39) and the colloidal complex is less represented in the *El* horizon, where the more intense acid reactionleads to the occurence of minimum profile values for the sum of exchangeable base (*Sb*), the total capacity of cationic exchange (*T*) and the degree of saturation in bases (*V*).

The humification is active due to the warm and relative humid climate, thus the *C/N* ratio for both soils is between 10-15 which together with the *pH* indicates humous of forest mull capable of providing very well for the forest stand with Nitrogen.

The Main Statistical Indicators for Luvosoils Table 3

Nr. crt.	Chemical properties	Pedogenetical horizon	Number of values analysed	Statistical indicators			
				Medium value $\overline{X}$	Variable amplitude $X_{max} - X_{min}$	Standard deviation [S]	Variation coefficient [S%]
1	pH	Ao	23	5.92	2.24	0.71	12.07
		El	23	5.21	2.26	0.75	14.34
		Bt	23	5.39	3.24	0.99	18.30
2	Sb me/100 g sol	Ao	23	19.13	30.80	11.08	57.88
		El	23	8.06	6.7	3,94	48.87
		Bt	23	11.01	13.20	4.18	37.93
3	Sh me/100 g sol	Ao	23	6.97	11.76	3.66	52.46
		El	23	16.13	3.44	14.35	88.89
		Bt	23	7.29	7.12	2.12	29.16
4	T me/100 g sol	Ao	23	22.35	37.44	12.36	55.29
		El	23	17.17	13.34	5.89	34.31
		Bt	23	18.33	18.12	5.84	31.84
5	V %	Ao	23	68.67	57.19	19.52	28.43
		El	23	56.13	70.41	19.57	34.87
		Bt	23	58.96	20.37	6.90	11.71
6	H %	Ao	23	7.71	8.96	2.92	37.86
		El	23	2.69	3.79	1.55	57.71
		Bt	23	0.71	1.21	0.46	64.92
7	C/N	Ao	23	14.47	9.34	4.13	28.53

4. Conclusions

The soil formation conditions characteristic of the Ialomița SubCarpathians has favoured the predominant formation of Eutricambisoils and Luvosoils.

The forest vegetation, represented by beech, beech-sessil oak and sessil-oak stands has generated a slight loss in the base content of the soils in the case of Eutricambisoils, thus the average value of the *pH* horizon *Ao* is 5.62 and in the *Bv* horizon is 5.97. The degree of saturation in the bases varies between 58.51% in *Ao* and 61.89% in the *Bv* horizon, the soils being mesobasic.

In the case of Luvisoils the reaction is mildly acid at the *El* and *Bt* horizon levels and in relation to the degree of base saturation, the soil has poor to medium bases content at the *El* horizon and medium bases content within the *Ao* and *Bt* horizons.

The variation coefficient has values between 12.7 and 14.34% in the case of *pH*. For the saturation degree in bases the variation coefficient has lowest value in the *Bt* horizon (11.71).

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