THE VARIATION OF CHEMICAL PROPERTIES OF EUTRICAMBOSOILS AND PRELUVOSOILS IN THE FORESTRY SITES IN THE BARAOLT AND BODOC MOUNTAINS

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Abstract:

Based on laboratory analyses carried out on 45 soil samples, the present paper aims to present the chemical properties of eutricambosoils and preluvosoils in the Baraolt and Bodoc Mountains, as well as the statistical indexes of their variation (the arithmetic mean, the amplitude, the standard deviation, the variation coefficient). The variation interval of chemical properties provides information about the two most important soils in the Baraolt and Bodoc Mountains from the point of view of their trophicity for the mountainous and pre - mountainous beechwood sites.

Key words beechwood, trophicity, chemical properties, forestry sites.

INTRODUCTION

The chemical properties of soils are a reliable indicator of the trophic potential of the soil, therefore the present paper establishes the variation interval of these properties for eutricambosoil and preluvosoil.

It is well – known that chemical properties of the soil are influenced by the type of parent material and by other soilification conditions and they are well reflected in the production class of the stand. Some of the soil properties represent criteria for systematic framing of soils (diagnosis elements). In the present paper 25 soil profiles were analysed for eutricambosoils and 20 profiles for preluvosoils.

The following properties were determined in the 45 soil samples: the humus content (H – the Scholenberg-Jackson direct oxidation method), the C: N ratio, the Nitrogen content (N – the Kjeldahl method), the soil reaction (the pH in water), the base exchange capacity (Sb – the HCl 0,1 N Kappen method), the Hydrogen exchange capacity (Sh – the Kappen method using calcium acetate), the cation exchange capacity (T=Sb+Sh), the degree of base saturation (V=Sb/T*100), the structure percentage, the unstable phosphorus (P_2O_5 in lactate acetate using the AA200 PerkinElmer device).

MATERIAL AND METHOD

The aim of this paper is to prove the close connection between the chemical properties of the soil seen as part of the forestry site and the productivity potential of the beechwoods in the Baraolt and Bodoc Mountains.

In order to accomplish the intended purpose, we have established the following objectives:

- Defining the pedogenetical processes which are specific to the two soils and

their influence on forest vegetation;

- Laboratory determination of chemical and physical properties of soils;
- Study of the variation of chemical properties of eutricambosoils and luvosoils;
- Emphasizing the variation interval of chemical properties for the researched types of soil;

The researches were carried out in the Barolt and Bodoc Mountains forest site.

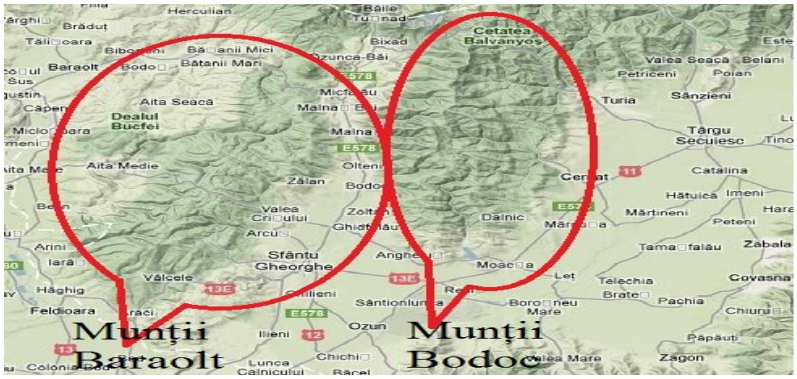

Fig. no.1 Research location
http://www.wunderground.com/auto/wxmap/global/stations/15215.html

1. Research methods

The research was carried out on beech stands in the area of Baraolt, Targu Secuiesc and Talisoara forest districts as part of the Forest Directorate of Covasna and Harghita, on beech mature stands older than 80 years.

The research methods used were the bibliographic research and direct observations, completed with tree - measurements and also soil samples laboratory analyses. By bibliographical research means,a general characterization of the physical geographical environment for the researched area was achieved.

Direct observation was used for rock or parent material determination, and for morphological description of the open soil profiles in order to specify the characteristic types of soil.

Out of the 45 soil profiles, soil samples were cropped which were analyzed in The Laboratory of Pedology from the University of Sylviculture and Forest Engineering of Brasov in order to determine from an quantitative point of view the physical, chemical and hydrophysical properties of soils which represent, in fact, the ecological indices used in the evaluation of forest sites reliability.

RESULTS AND DISCUSSIONS

Geological conditions

The Baraolt and the Bodoc Mountains are framed within the Carpathian Mountain Range, the flysch subunit, and they lay on perishable (on the half south side) and intrusive (not so perishable- on the half north side) rocks. The Baraolt massif is made of formation by marl – chalky flysch of neocomian age, by horizon

marl – sandstone - a formation equivalent with breccias schist and horizon, components layer of Sinaia, with valangian – hauteriviene age, with sandstone – chalky(which both form the Sinaia layer) flysch schist and flysch and with the Sinaia formation, a berriasian – hauterivian superior (sandstone – chalky and breccias formation). (Băcăinţan 1999).

The Bodoc massif is preeminently made of the barremian – aptiene formations of the Bodoc flysch, some lithologyc flysch, schist – sandstone and sandstones. On the east side we can find conglomerate bands, albian – vraconiene sandstone calciphyte, and in the north- west corner between Malnaş and Bodoc, a band of Sinaia layers(marls, sandstones, marl chalky, breccia) intercalated among sandstone chalky formation, scale and marl - chalky. (Kovacs 1977).

The geological sublayer has especially influenced the forming and the evolution of the forest soil, through the coverlet deposits. And so, on the soft perishable layers that are high in calcium minerals and irony- magnesium rocks, eutricambosoils are formed and on the medium ones, luvosoils are formed.

Geomorphologic conditions

Geomorphologically,the researched area is framed within: The Oriental Carpathian ;The Moldo- Transylvanian Carpathians; the Baraolt- Talisoara- Olt - the Brasov Depression area.

The Bodoc masiff surface can be divided into three orographic levels: the upper level is represented by the main chine with an altitude that exceeds 1000 m, the intermediate level that preempts almost all the secondary lateral inter- rivers and a few isolated crests, which has 800- 1000 m altitude and the 600- 800 m altitude level that includes the periferic surfaces. This level range has an obvious influence on thermal characteristics and space- allotment of the atmospheric precipitations, which are important elements in the forestry vegetation distribution.

The Baraolt mountains are divided into two levels: a higher northern level with an altitude of 900 metres and a southern level which is 600 – 700 metres lower.

The northern level is connected to a flattening surface which is well represented in the Curvature Carpathians between 800 and 1200 metres. Because of the rock resistance difference and for a better configuration, the northern higher surface side of the masiff slightly inclines to the north. The lower level includes the flattening surface that frames the 600- 700 m limit of the Brasov Depression. At this erosion level its hills from Dryed Aita (Dryed Aita Hollow) are connected. (Bacanitan, 1999).

Climatic conditions

Thermic Conditions

The characteristic climate of the researched area is in close contact with the perpendicular position up against the displacement direction of the west air mass of the Baraolt and Bodoc crests. Although they have a lower altitude compared to the other crests in the Oriental Carpathians, in their ascension on the

flanks from the Transylvanian Depression, aeration masses form orographic rainfall and in their descendence on the eastern flank, a adiabatic heat takes place while the fumes quantity runs low (from 600mm/year to 500mm/year).

Medium yearly temperature is 7.8^0C, aprox. 23^0 C amplitude that decreses along with the altitude increase.

The maximal monthly averages are in July- August (aprox. 18^0 C), and the minimals are in December- January (-5^0 C).

Wind condition

Wind condition of the Baraolt and Bodoc mountains is divided into two major air masses: dry, warm in summer and cold in winter and a continental flow, watery and breezy in summer and gentle one in winter, that moderates the continental climate of the researched area.

The predominant wind directions are coming from the north- west district (the majority) and from the west district and they react to the aerian mass invasion in the Northen North- West Atlantic that represents a local influence of the cold and dry Crivetz, also known as Nemira.

The medium speed of the wind is 2 - 3 m/s in the lower area and 5 – 6 m/s in the higher area, especially on crests. (Eigel, 1972).

Considering its geographic position and according to „Romanian Geography- Physical Geogrhaphy" – 1983, , the studied district frames itself within the temperate - continental climate :

- Provincial climate district no.I- oceanic influence;
- Lower mountains climate region;
- Climate subregion of the Oriental Carpathians;
- Forestry district and mountain meadows;
- Complex topoclimate of the Harghita- Baraolt Mountains;
- Complex topoclimate of the Brasov Depression.

According to V.Koppen, the studied district is part of D.f.b.x climate region, where:

- D.= boreal climate, fixed snow bedding with cold humid winter;
- f.= adequate rainfall all year long;

b.= the media warmest temperature of the month is

- under 22^0C, but at least 4 months a year is over 10^0C;
- x.= the maximum pluviometric is at the begining of summer and the mininum is at the end of winter.

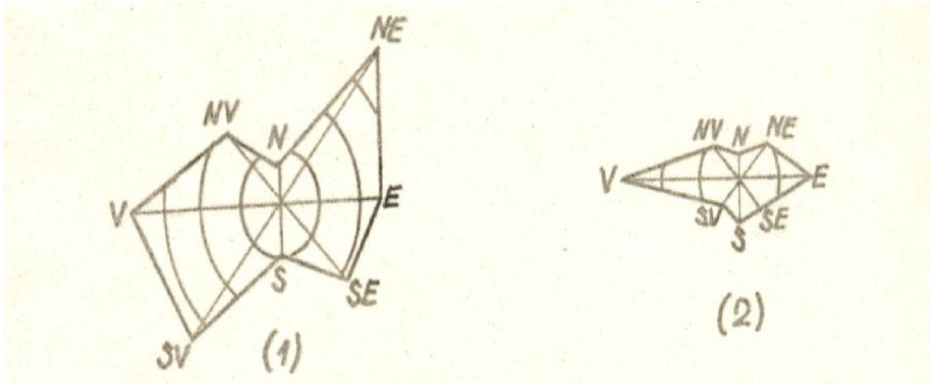

Fig. no. 2: Wind frequent direction:
1 – Bod weather station;
2- Baraolt weather station.

Hydrological conditions

The studied district taken to study is part of the hydrographyc pond of the Olt river, medium superior area. The principal affluents are: the Iarăş brook, Hăghig, Araci,Vârghiş, Cormoş, Baraolt, Aita, Ilieni, Jambor and the Black river that has two affluents :the Beldii brook and the Lisnăului Valley.

Water filling is permanent for the Olt river and its main affluents, alternating with the secondary valleys. The water discharge grows especially in spring when there is plenty of rainfall mixed with the snow melting season, but the discharge is minimal in winter. Its density is 0,8- 1,0 km/km^2 in the mountainous area and 0,5- 0,6 km/km^2 in the hill area.

Edaphic conditions

Based on forest planning in the forest districts situated in the researched area and on personal observations which resulted in the morphologic description and the explanantion of analytical data from the 45 soil profiles, figure 2 shows the spreading of soil classes and soil types as part of the mountainous and pre - mountainous beechwood sites. Thus, it is obvious that the most common soil class are cambisoils (54%), out of which eutricambosoils are the most common, covering almost 30% of the researched area.

Eutricambosoils are formed at low altitudes in the mountainous area, on parent materials which are rich in calcic elements such as marl – sandstone flysch and chalky microconglomerates.

The pedogenetical conditions in the forest site characteristicto the Baraolt and Bodoc Mountains, favoured the eluviation-illuviation process which consists in the debasification of the adsorbtion complex, clay dispersion and its migration to crop rotation in an inferior B_t horizon (argic). If we cannot notice an E_l horizon over the B_t horizon, then preluvosoil is formed.

The pH value for eutricambosoils is a moderate – acid and low – acid reaction (A_0 - 5,15; B_y - 5,85). (Table 1)

In the case of preluvosoils (table 2) the value of the pH is decreasing in the E_l horizon (5,09), followed by a slight increase in the inferior B_t horizon (5,23). The colloidal complex is poorly represented in the E_l horizon, due to a acid reaction which leads to the recording of minimum values for each profile for the sum of exchangeable bases (Sb), the cation exchange capacity (T) and the the degree of base saturation.

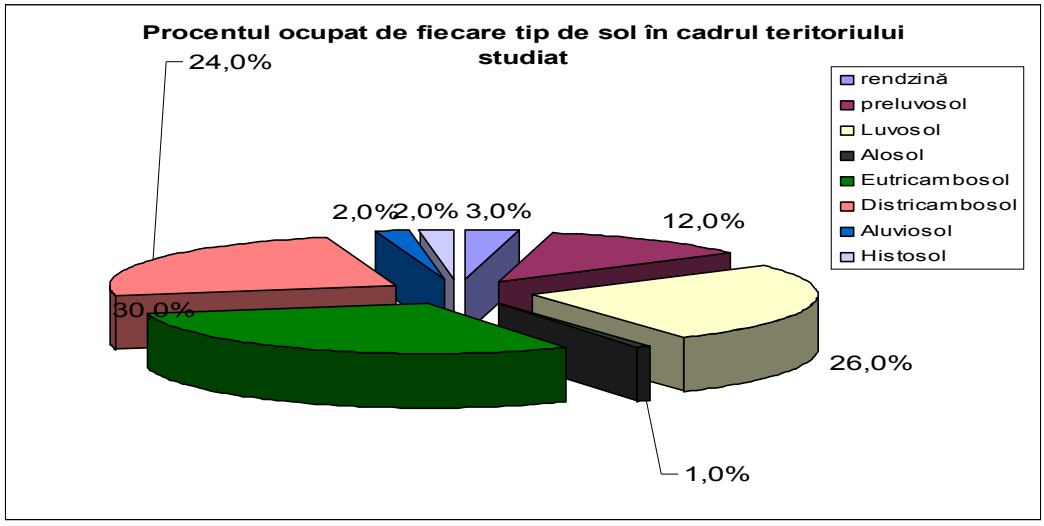

Fig.no 3: Soil distribution on the researched district

Table 1

The main statistical indicators for Eutricambisoils from Forest Sites with Beech

Crt.no	Chemical Properties	Pedogenetical Horizon	Number of values analyzed	Statistical Indicators			
				Medium Value $\overline{X}$	Variation Amplitude X_{max}-X_{min}	Standard Deviation(S)	Variation Coefficient (S%)
1	pH	Ao	15	5,15	3,48	1,35	16,30
		Bv	15	5,85	4,15	1,55	17,45
2	Sb me/100g sol	Ao	15	18,21	45,60	13,64	69,50
		Bv	15	13,59	33,10	10,50	59,35
3	Sh me/100g sol	Ao	15	11,88	15,35	5,33	45,20
		Bv	15	8,11	12,44	3,45	46,55
4	T me/100g sol	Ao	15	33,55	91,50	18,15	60,18
		Bv	15	35,83	93,44	29,55	75,43
5	V %	Ao	15	57,29	86,39	26,45	50,15
		Bv	15	64,78	92,50	22,33	33,25
6	H %	Ao	15	6,80	12,68	3,25	50,15
		Bv	15	1,21	2,18	0,85	70,80
7	C/N	Ao	15	14,77	13,61	4,55	31,20

Table 2

The main statistical indicators for Preluvosoils from Forest Sites with Beech

Crt. no	Chemical Properties	Pedogenetical Horizon	Number of values analyzed	Statistical Indicators			
				Medium Value $\overline{X}$	Variation Amplitude X_{max}-X_{min}	Standard Deviation(S)	Variation Coefficient (S%)
1	pH	Ao	15	5,85	3,41	1,25	13,88
		A/B	15	5,09	3,25	1,33	15,41
		Bt	15	5,23	4,11	2,78	20,20
2	Sb me/100g sol	Ao	15	20,45	29,25	15,42	58,66
		A/B	15	10,85	7,15	5,32	51,43
		Bt	15	10,26	15,24	4,89	38,12
3	Sh me/100g sol	Ao	15	8,98	12,45	4,75	53,47
		A/B	15	14,63	2,39	15,12	91,75
		Bt	15	8,25	8,47	3,15	32,48
4	T me/100g sol	Ao	15	24,24	39,82	13,77	58,41
		A/B	15	18,36	15,41	6,46	35,69
		Bt	15	21,58	20,25	6,38	33,72
5	V %	Ao	15	70,45	58,44	4,17	30,48
		A/B	15	59,83	69,69	21,20	35,47
		Bt	15	59,44	22,36	7,15	15,86
6	H %	Ao	15	8,45	9,80	3,45	38,64
		A/B	15	3,45	4,15	2,14	58,48
		Bt	15	1,12	2,15	1,69	65,38
7	C/N	Ao	15	15,48	11,45	5,48	30,45

CONCLUSIONS

- The soilification conditions which are characteristic to the forestry site in the Baraolt and Bodoc Mountains favoured the formation of eutricambosoils and preluvosoils.
- The forest vegetation which consists of beechwoods caused a slight debasification of soils in the case of eutricambosoils, so that the medium value of the pH in the Ao horizon is 5,15 and in the Bv horizon is 5,85. The degree of base saturation varies between 57, 29 in the Ao and 64, 78 in the Bv horizon, in which case soils are being mezobasic soils.
- In the case of preluvosoils the reaction is moderate acid in the El and Bt horizons, and according to the degree of base saturation the soil is oligo-mezo-basic in the El horizon and mezobasic in the Ao and Bt horizons.
- The variation coefficient varies between 13, 88 and 20, 20% in the case of pH. For the degree of base saturation the variation coefficient has the smallest value in the Bt horizon.

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