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STUDY OF PHYTOGEOGRAPHIC AND PHYSICAL CONDITIONS FROM THE BARAOLT AND BODOC MOUNTAINS

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Abstract: *The aim of this paper is to contribute to the detailed knowledge of the phytogeografic environment of the Baraolt a Bodoc Mountains in order to study the forest sites from this area, as well as for their evaluation. Thus, this paper tries to support the site evaluation for the beech stand by means of the ecological indicators.*

Key words: *beech, site evaluation, soil, site quality.*

1. Introduction

The determination of the forest resort components requires general knowledge of the specific physical-geographical framework to be taken into study. Based on bibliographic research and personal observations upon the studied framework, this paperwork accomplishes the detailed study regarding the proper physical and physical-geographical environment for the Baraolt and Bodoc mountains. This study is very important in carrying out researches regarding the types of forest sites and finally, in establishing the variation of the ecological indices used in the evaluation of forest sites.

As a polydisperse, structured, leachy and hydrophilic system, made of mineral and organic components, the soil represents the rooting and nutrition support for trees and other forest plant formations.

Trees are perennial and big sized wooden plants that use water and nutritional soil substances for the development of physiologic processes in the wooden production. It is very important for the biomass production to know the structure and the formation of the soil, its chemical, physical, hydro-physical, thermic and aeration properties.

2. The Purpose, Objectives and Place of Research

The main purpose of this research is represented by the detailed knowledge of the phytogeographic specific environment of the Baraolt and Bodoc mountains in order to study forestry sites in the area and so to determine the quantitative variation of ecological indices used in forest site quality assessment (Figure 1).

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

- Knowledge of geological and geo-morphological, climatic and vegetation conditions which represents important solification factors in soil evolution;
- Establishment of detailed morphological and physical-chemical soil proprieties;

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Fig. 1. *Research location* [17]

- Establishment of forest sites and forest types distribution from the researched territory.

Our research was conducted in the area of the Baraolt and Bodoc mountains and in the Baraolt, Şugas and Talişoara forest districts, on beech mature stands older than 80 years [17].

3. Material and Research Methods

The used methods used were the bibliographic research and direct observations completed with tree - measurements and also soil samples laboratory analyses, cropped out of the open soil profile.

By bibliographical research means,a precise characterization of the physical and phytogeographical environment for the researched area was achieved. Direct observation was used for morphological description of the open soil profiles and for rock and parental material determination.

The biometric measurements of tree growth allowed the determination of the medium diameter, of the medium height, of age and quality class, elements used in the production class establishment of the stands. To determine physical and chemical soil proprieties, acknowledged methods were used. The analyses were made in The Laboratory of Pedology from the Faculty of Sylviculture and Forest Engineering of Braşov.

4. Research Results

4.1. 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) [1].

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 [5].

4.2. Geomorphologic conditions

Geomorphologically, the researched area is framed within: The Oriental Carpathian; The Moldo - Transylvanian Carpathians; the Baraolt - Talişoara - Olt - the Braşov Depression area [13].

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 [8].

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. Due to the rock resistance difference and to 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 metres limit of the Braşov Depression. At this erosion level its hills from Dryed Aita (Dryed Aita Hollow) are connected [9].

4.3. Climatic conditions

4.3.1. 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 600 mm/year to 500 mm/year).

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

The maximal monthly averages are in July-August (aprox. 18 ^{o}C), and the minimals are in December-January (–5 ^{o}C) [6].

4.3.2. 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 [4]. Considering its geographic position and according to „Romanian Geography - Physical Geogrhaphy" - 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 Braşov Depression.

According to 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 ^{o}C, but at least 4 months a year is over 10 ^{o}C; *x* - the maximum pluviometric is at the begining of summer and the mininum is at the end of winter [7].

4.4. 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 [10].

4.5. Edaphic conditions

In Figure 2 is presented the soil types distribution in the researched district after studying the management plan for the forest district situated in the target district and taking into consideration my own observations [11].

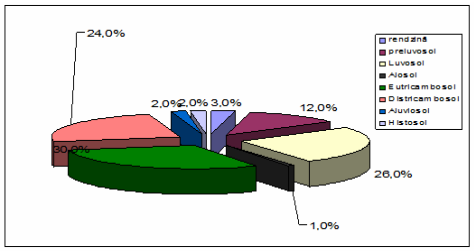

Fig. 2. *Soil distribution on the researched district*

As observed, the most representative soil type is euricambisoil (30%) closely followed by luvosoil (26%), districambosoil (24%), preluvosoil (12%), rendzina (3%) aluviosoil and histosoil (2%) and alosoil (under 1%).

In Table 1 is presented the soil samples tests report from the Baraolt and Bodoc Mountains.

Soil samples tests report from the Baraolt and Bodoc Mountains Table 1

Compartment, Production Unit, soil type, soil subtype, Forestry district	Horizon	Level (cm)	pH	Humus %	C/N	Bases exchange %	Hydrogen exchange %	Total exchange capacity (V) %	Degree of base saturation %	Total N g %	Texture
31 A, UP I Vâlcele, Preluvosoils, Şugaş	Ao	0-20	5.18	2.4	10.69	7.2	9.2	16.4	43.90	0.13	
	A/B	20-35	5.46	1.2	5.31	8.0	7.8	15.2	52.63	01.3	LP
	Bt	35-70	5.63			10.0	6.8	16.8	59.52		AP
35 G, UP II Sfântu Gheorghe, Luvosoils, Şugaş	Ao	0-20	5.12	3.6	20.9	5.2	8.4	13.6	38.23	0.10	
	El	20-35	5.54			13.6	8.0	21.6	62.96		LAP
	Bt	35-90	5.66			18.8	7.2	26.0	72.31		AP
73 B, UP I Vâlcele, Districambosoils, Şugaş	Ao	0-20	4.99	3.84	18.5	3.6	8.0	11.6	31.03	0.12	
	Bv_1	20-45	5.35			4.4	6.0	10.4	42.31		LP LP
	Bv_2	45-100	5.62			12.0	5.6	17.6	68.18		

1. Compartment unit 31 A lies at 650 m north-west altitude with an average slope of 28^0. The determined soil type is typical prelovosoil. Tested soil is formed on flysch marl sandstone, it has a silty loam texture in the A/B horizon and silty clay in the Bt horizon, granular structure in the Ao horizon and prismatic in the Bt horizon. It has a moderate-acid reaction and a base saturation higher than 53% in the Bt horizon. The soil is poor in humus and nitrogen. The soil has a medium trophicity so the existent 100 years beechwood represents the 3rd production class.

2. Compartment unit 35 G lies at 560 m altitude, north-east exposion with an average slope of 35^0. The determined soil type is typical luvosoil. The researched soil is formed of sandstone chalky, it presents a silty clayey loam texture in the El horizon and silty clay texture in the Bt horizon. It has a crumbly structure in the Ao horizon, granular structure in El horizon and angular blocky structure in Bt horizon. It has a moderate - acid reaction in all the profiles. Due to the large edaphic volume, the moderate - acide reaction and the medium - nitrogen content, it is very fertile for the beechwoods, in fact the stands in this experimental holding is 48 cm in medium diameter, 34 cm medium hight and it can be framed within the production class no 2 (Table 1).

3. Compartment unit 73B lies at 720 m altitude, north-west exposion with an average slpoe of 25^0.

The determined soil type is typical districambosoil. The reasearched soil is formed on flysch marl, it presents a silty loam horizon in A/B and Bv, a granular structure in Ao and angular blocky structure in Bv horizon. It has a moderate-acid reaction in all the profiles and a base saturation lower than 53% in the Bv_1 horizon. The soil content is low in humus and very low in nitrogen and it has a medium trophicity so that the existent beechwood can be framed within the production class no 3.

4.6. Forest-site types

The vegetation distribution in the Baraolt and Bodoc Mountains is:

- FM3 - Norway spruce forest mountain sites - 2%
- FM2 - Mixed forest mountainous sites - 10%
- FM1 + FM4 - Beech mountain and piedmont sites - 48%
- FD3 - European beech and sessile oak forest hill sites - 40% [11].

The researches was made in the premountain and mountain beechwoods, premountain and mountain that which represents 48% of the Baraolt and Bodoc mountainous area.

1. FM - FD4 - Beech mountain and piedmont sites: this vegetation floor is the best represented one with a widespread area over 48%. The lythologic sublayer is diverse and it covers the majority of the formation met on the researched area; in this sublayer eutricambosoils and districambosoils are usually formed and rarely luvosoils. The relief is scrapped, it has a moderate relief energy and with a preponderant average slope of 16^0-30^0. The flanks are sunny and partly sunny (at higher altitude) and rarely shadowed. The climatic conditions of this floor are lightly favourable for the blended floor, it has higher air temperatures (around 1-3 ^{0}C) and lower but sufficient rainfall**.** The forestry vegetation is particularly made of beech stand. Here and there we can see the hornbeam, particulary the black alder in areas with phenomena of gleyzation and pseudogleyzation. The productivity of the stands is preponderant medium, but in the deep rock free content soil the beech productivity is high [11].

5. Conclusions

The research emphasizes the close correlation between the solification factors and the studied soil types inside the researched sites as well as between these factors and their morphological characteristics and physical and chemical properties of the soil.

The chemical characteristics that the studied soil has in the surface horizon are influenced by vegetation and by the nature of the parent material in the secondary horizon.

The fertility level of the studied soil diversifies from medium to inferior,

depending on deepness, deep rock content, reaction, nutrient element content.

The component elements of soil and climate have a mixed activity and they influence both the mountain and the premountain site quality beech stands forest resort.

We observe a close correlation between the edaphic volume of the soil, its trophicity and the beech stands productivity level.

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