Original Article

The Main Characteristics of Forest Soils from Brașov District

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Abstract

The present article has monitored the main properties of forest soils from Brașov County, covering a period from 1980 until present times. All the analyses were centralized in analysis bulletins and are part of a national data base realized by INCDS „Marin Drăcea" based on forest management plans. Per total, 404 soil profiles and 1083 pedo-genetic horizons were analyzed. The most widespread forest soils in Brașov County are the ones from Cambisol class, holding 70% of total soils, the highest share being obtained by eutric cambisoils. The average pH values are situated in the interval 4-5 in both horizons for dystric cambisol and within 5-6 interval for eutric cambisol. The soils with the highest content of humus, from the ten identified ones, are soils from the Spodisol class -crypto podzol and entic podzol. On the other hand, the haplic podzol, a soil from the same class, registers the smallest value of total cationic exchange capacity. The highest value of this index was obtained for rendzic leptosol, a soil with an alkaline reaction which is not very acid like in the case of haplic podzol.

Keywords: *soil properties, forest soil, Brasov County, Cambisols.*

1. Introduction

The surface of forests from Brașov County represents 200.818 ha in 2015. 20.653 ha are managed by Romsilva National Forest Management (through Brașov Forest District) and 2454 ha by „Marin Drăcea" National Insitute for Research and Development in Forestry (through Săcele Experimental Base).

The largest part is administered by private structures (regime forest districts), namely 177.711 ha according to the National Statistics Institute [13]. The Brașov forest fund composition is represented by common beech (51%), resinous trees (30%), *Quercus* species (9%), diverse types of strong trees (9%) and diverse types of mellow trees (1%) [14]. From these numbers, we can understand the high variability of encountered soil types.

The purpose of this paper is to offer a short presentation of the main soil characteristics encountered in Brașov County forest fund.

2. Material and Method

The present paper has monitored the main properties of forest soils from Brașov County starting with the year 1980 and up to present times. The considered properties were: pH, humus content, carbonates content, basis exchange capacity (Sb), total cationic exchange capacity (T) and the degree of saturation in basis (V). All these analyses were centralized in analysis bulletins and are part of a national data base realized by INCDS „Marin Drăcea", based on forest management plans. The methods used in the analysis of soil samples are national and international accredited methods [4]. The laboratory work was realized in the Soil Laboratory from ICAS București (up to 1999) and in the Soil Analysis Laboratory from INCDS „Marin Drăcea" Brașov (after 1999).

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The results of laboratory analyses were organized in a data base, processed and then interpreted from a pedologic and statistic point of view. As a total, 401 soil profiles and 1083 pedogenetic horizons were analyzed.

3. Results and Discussions

First and foremost, a chard was realized in order to emphasize the identified types of soils and their percentage within the forest fund (Figure 1). From this figure it can be observed that 10 types of soils were identified from 5 classes (based on the Romanian Soil Taxonomy System, SRTS 2003, [8]), namely Cambisols, Cernisols, Hidrisols, Luvisols and Spodisols. The Cambisol class has the largest percentage, namely 70% of total classes, while the soils with the largest prevalence are eutric cambisol (48%), followed by dystric cambisol (22%). At the country's level, the most widespread type of forest soil is dystric cambisol, with 2.292.385 ha, while the eutric cambisol is situated on the 3rd place with a surface of 869.909 ha [5].

In two similar studies realized on forest soils from Maramureș and Cluj Forest Districts, Cambisol is also the most widespread class, covering 79% in Maramureș [2] and 52% in Cluj [10]. The Luvisol class holds 18% in Brașov, being represented by two types of soil – luvisol (12%) and preluvisol (6%).

From the Cernisol class, we also encounter two representatives (phaeozem and rendzic leptosol), with a total percentage of only 7%.

The Spodisol and Hidrisol classes are represented in the smallest measure, namely 4% and 1%. In the lowest part of Brașov basin, gleysoils are present, while, as the altitude increases, haplic phaeozoms are also present, followed by eutric cambisols [1]. Also in Brașov basin, more exactly in Săcele Piedmont, [11] has encountered a soil type also identified in the present study, namely haplic phaeozem.
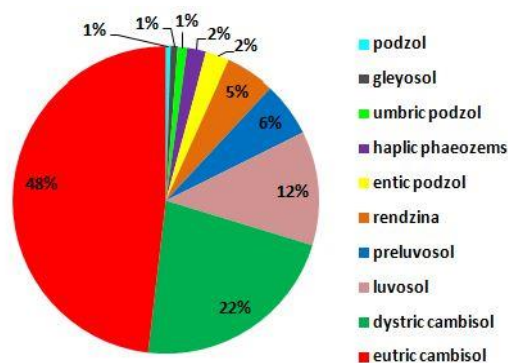

Figure 1. The percentage of soil types identified in Brașov County forest fund

In regard with the soil reaction, a graphic was realized for the most widespread soils (eutric cambisol and dystric cambisol), differentiated on genetic horizons (Figure 2).
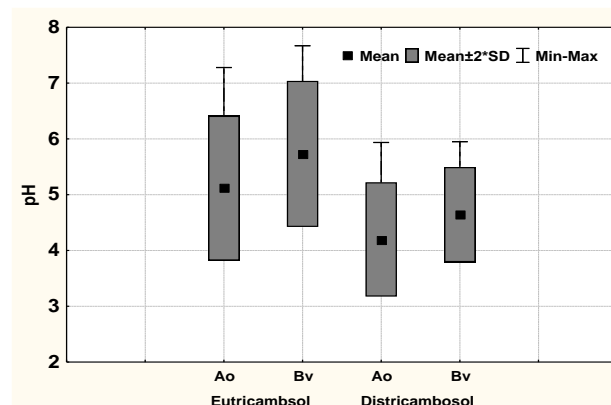

Figure 2. pH variation of genetic horizons for the most widespread forest soils from Brașov County

As for the average pH values, eutric cambisol registers higher values than dystric cambisol, both in the A ocric horizon (Ao), as well as in the B cambic horizon (Bv).

By interpreting the average pH values from a pedologic point of view, eutric cambisol is moderately acid on the entire profile length, while for dystric cambisol the reaction is very acid at the surface and strongly acid in the depth of the Bv horizon. Differences between the two types of soils are also recorded for the minimum pH values.

As such, in the Ao horizon, eutric cambisol registers an average value of 4, while for dystric cambisol the value is more closely to 3.

However, the differences are not so accentuated for the Bv horizon, where the pH has values over 4 for eutric cambisols and under 4 for dystric cambisols. Similar values were recorded for the pH of eutric cambisols in Prahova County and for distric cambisols in Piatra Craiului [7].

Another chemical property that was taken into consideration for describing the forest soils from Brașov County is the humus content. This organic matter from the soil represents „*a constituent of a fundamental ecologic significance*" [12].

As such, the average content of humus from the A horizon was calculated for all the encountered soil types (Table 1).

From the ten types of soils identified in the above mentioned County, seven are situated in the intensely humiferous category (Table 1).

A single soil is moderately humiferous, namely preluvisol. The remaining two types of soils belong to the Spodisol class (crypto podzol and entic podzol) and are excessively humifeours soils, respectively intensely humiferous.

Table 1. Average humus content and total cationic exchange capacity for forest soils from Brașov County

Soil type	Average humus content in horizon A (%)	Average total cationic exchange capacity (me 100 g^{-1} sol)
Crypto podzol	13,06	19,33
Dystric cambisol	6,76	21,61
Eutric cambisol	6,07	24,06
Phaeozem	8,27	42,91
Gleyosol	5,95	35,86
Luvisol	8,5	22,54
Haplic podzol	8,19	17,73
Preluvisol	4,8	21,72
Entic podzol	10,02	24,07
Rendzic leptosol	5,62	44,85

In regard with the total cationic exchange capacity (T), average values per profile were calculated for the ten identified soil types (Table 1). As such, it can be observed that two soils with pH values between 7 or higher (phaeozem and rendzic leptosol) register the highest values for total cationic exchange capacity. All the other types of soils, with the exception of haplic podzol and crypto podzol, are situated in the interval 21-36 me/100 g sol, meaning that they have an average total cationic exchange capacity. The smallest value for this property belongs to haplic podzol. Same values were recorded for luvisols and entic podzols for total cationic exchange capacity of Prahova forest soils [9].

Another index for the soil's assimilating complex used for describing soils is the degree of saturation in basis (V), which shows the percentage in which the soil's colloidal complex is saturated in basic cations. As in the case of pH, the average values per profile were rendered in a graphic form only for the most widespread types of soils (Fig. 3).
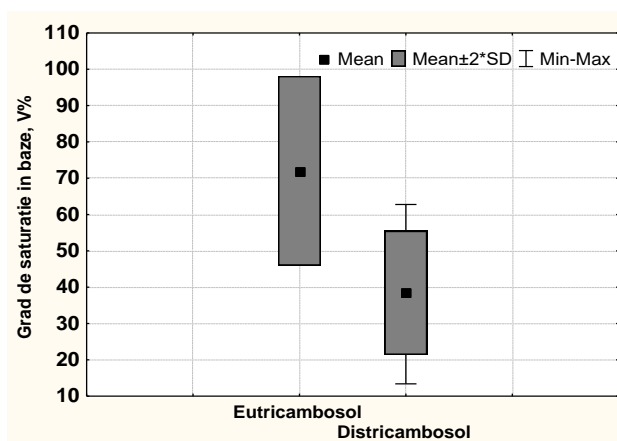

Figure 3. Variation of the degree of saturation in basis for the most widespread forest soils from Brașov County

As such, the two soils present very evident differences. First of all, the average value is over 70% for eutric cambisol, being a mesobasic soil, while for dystric cambisol the average saturation degree is situated under 40%, being an oligomesobasic soil.

Secondly, the minimal values of eutric cambisols are very close to 100%, which shows that these soils are very rich in bases, while the lowest values for dystric cambisol are closer to 10%, being oligobasic. In Timis County, the base saturation degree for eutric cambisols are 60.5% in Ao horizon and 65.2 in Bv horizon [3].

4. Conclusions

In Brașov County, the most widespread type of soils are those from Cambisol class, registering 70% of the total number, while the largest percentage is obtained by eutric cambisol.

The average pH values are situated in the 4 – 5 interval for both horizons for dystric cambisol and in the 5 – 6 interval for eutric cambisol. As such, the dystric cambisol's reaction is more acid than eutric cambisol, regardless of the horizon.

Amongst the ten identified soils, the ones with the highest content of humus are those from Spodisol class – crypto podzol and entic podzol. On the other hand, a soil from the same class, haplic podzol, registers the lowest value for the total cationic exchange capacity. The highest value of this index was obtained for rendzic leptosol, a soil with an alkaline reaction, which is not strongly acid like in the case of haplic podzol.

Eutric cambisols are rich soils in basic cations, mesobasic up to eubasic, while dystric cambisols are oligobasic - oligomesobasic soils.

As such, the forest soils from Brașov County are generally favorable to forest vegetation, the acid ones from higher altitudes (haplic podzol, entic podzol, dystric cambisol) for spruce, fir and other resinous species, while the ones from the hill area (eutric cambisoil, luvisol etc.) for common beech, oak, or mixture forests.

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