DATA REGARDING FOREST SOILS FROM OLT COUNTY

DELEANU Elena (1), IONESCU Monica (1), LUCACI Dora (2)
(1) National Institute for Research and Development in Forestry (INCDS) „Marin Dracea", 128 Eroilor bld, BUCUREŞTI, cod 077190, Tel/fax: 0213503238/0213503245, mdeleanuelena@gmail.com
(2) National Institute for Research and Development in Forestry (INCDS) „Marin Dracea", 13 Closca street, BRAŞOV, cod 500040, Tel/fax: 0268419936/026841533

Key words: luvisol, preluvisol, pH, humus, nitrogen.

ABSTRACT

The purpose of this paper is to offer a description of the forestry soil types from Olt County, based on the chemical and physical analyzes performed. The database of chemical analyzes carried out refers to the period 1988-2015. As such, a total of 1516 soil profiles and 4050 pedo-genetic horizons have been analyzed. The main types of forest soils in this area are luvisols, preluvisols and fluvisols. Luvisols are moderately acidic soils with a high total cationic exchange capacity, mesobasic in Ao and Bt, well supplied with nitrogen and intensely humiferous. Preluvisol is a moderately acidic soil, with a large cationic exchange capacity, very well supplied with nitrogen, and intensely humiferous. Fluvisol is a moderately acidic mezobase soil, with a large cationic exchange capacity, very well supplied with nitrogen, highly humiferous, with a relatively high carbonate content.

INTRODUCTION

Romania is confronting with a degradation degree of soil's quality through processes such as erosion, acidification, alkalization, humidity or drought excesses, salinization or densification. The main factors that have a role in soil degradation are the periodic humidity excess and frequent drought excess, which are also affecting forest soils.

Forests contribute to the conservation of relief forms and ambiance environment, being an obstacle that prevents erosions and landslides, while at the same time modifying favorably the climate from within and its proximity and exercising an important influence in the genesis and evolution of forest soils.

Within Olt County, the forest surface represents 58.824 ha, namely approximately 10% from the county's surface. This number situates the county on the 22nd place in Romania. By reporting the forest surface to the number of inhabitants, an average of 0,13 ha/inhabitant results for the year 2014, in comparison with the national level of 0,26 ha/inhabitant, respectively 1,4 ha/inhabitant at an European level (http://apmot.anpm.ro-Raport privind starea mediului anul 2014-judetul Olt.pdf). Olt County Forest Administration presently manages an area of 30871 ha public state property allocated in the field area. The management is realized through 6 forest districts (Balş, Caracal, Corabia, Draganeşti, Slatina and Vultureşti), 21 districts and 119 forest ranges (www.rosilva.ro).

Forest soils are an essential component of silvic ecosystems (Târziu *et al.,* 2004, Dincă L. *et al.,* 2006, Spârchez *et al.,* 2011). The purpose of the present paper is to describe the chemical characteristics of soils from Olt County's forest fund.

MATERIAL AND METHOD

"*Marin Dracea*" National Institute for Research and Development in Forestry holds an important database regarding soil analysis realized over time within forest management activities. At an interval of 10 years, soil samples are harvested from representative forest areas for each forest district. The physical-chemical properties of the samples are then analyzed, namely: pH, humus content, carbonates content, basis exchange capacity (Sb),

hydrogen exchange capacity (Sh), total cationic exchange capacity (T), base saturation degree (V), texture, total nitrogen. Accredited national and international methods are applied for analyzing soil samples (Dincă L. *et al.,* 2012).

The methods that were used in order to determine the laboratory analyses realized for the soil samples were as follows (Obrejeanu, 1964; Edu *et al.,* 2013a, 2013b; Rusu *et al.,* 2005):

- the soil's pH was electrochemically determined in water. The results were rendered with a pH-meter.
- the carbonates were gazovolumetrically determined with the Scheibler calcimeter.
- the soil humus was determined through the humid oxidation method and titrimetric dosage - Walkley Black method in the Gogoaşă modification.
- determining the organic carbon and total nitrogen was realized through the dry combustion method (Dumas method), by using the TruSpec CN analyzer.
- determining the exchangeable hydrogen through percolation after Cernescu (SH)
- determining the cationic exchange capacity and exchange basis by extracting with pH 7 ammonium acetate solution, after Cernescu, (SB). The readings were realized with flame spectophotometer.
- V = SH+SB saturation degree is determined through calculus.

The present paper analyzes the soil samples harvested in the period 1988-2015, from 6 forest districts from Olt County Forest Administration. As a total, 252 soil profiles and 797 pedo-genetic horizons were analyzed.

RESULTS AND DISCUSSIONS

Types of soils from Olt County Forest Administration

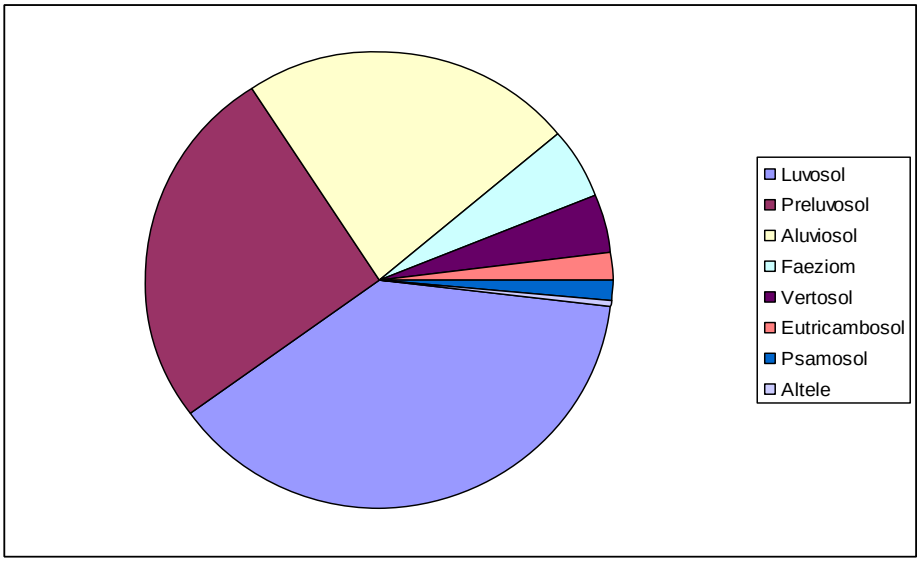


Figure 1. The percentage of forest soils identified in Olt County

The most widespread types of soils are the ones from the Luvisols class, which amount to 65% from all the county's soils. As type of soil, the most widespread is luvisol (38%), followed by preluvisol (26%), fluvisol (23%), phaeozem (5%), vertisol (4%), eutric cambisol (2%) and arenosol 1.5% (figure 1). Other type of soils (gleysol and regosol) represent only 0.5% of the total number of forest soils from this area.

At the country's level, luvisol occupied the 2nd place as spreading in forest soils (1.440.052 ha, meaning 22%), eutric cambisol occupies the 3^{d} place (with a total surface of 869.909 ha, meaning 13%), preluvisol the 5th place (335.050 ha, meaning 5%), and fluvisol the 6th place with 330.564 ha. (Dincă L. *et al*., 2014).

The variation of the main chemical indexes with soil types from Olt County

The situation for the main types of soils encountered in the analyzed County, on pedogenetic horizons from which soil samples were gathered is as follows:

1) The lowest **pH** values are recorded for luvisoils (acid soils), while the highest (alkaline soils) are for preluvosoils and fluvisols (figure 2)

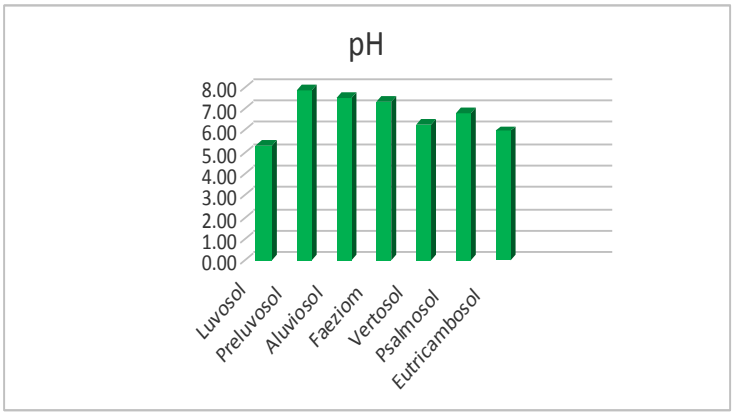
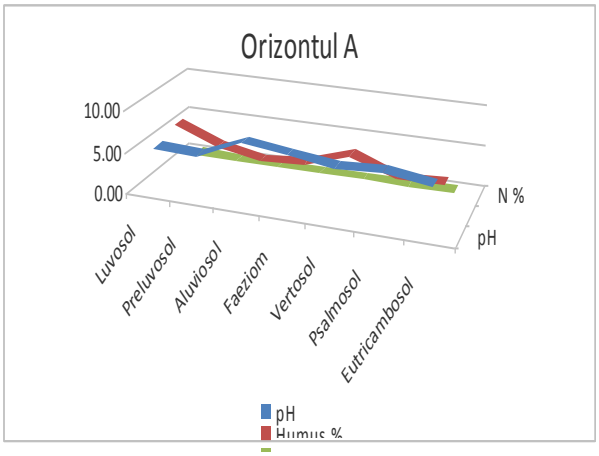


Figure 2. pH variation for the most widespread forest soils from Olt County

In field units, the relief homogeneity and superficial coarse deposits are favors the formation of a well-developed soil cover with a zonal character (the characteristic types of cernisois and locally for luvisols).

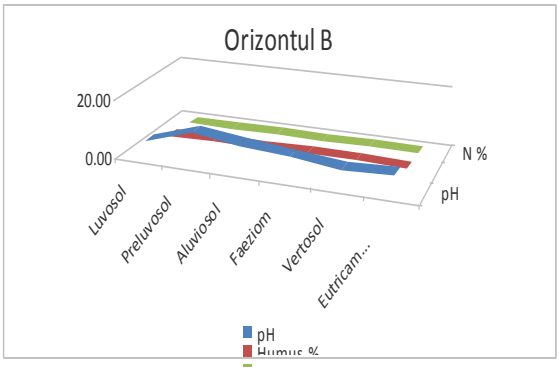
In regard with the pH for the first *A genetic horizon*, the largest values are recorded for fluvisol, while the smallest belong to preluvisol (figure 3).



	pH	Humus %	N %
Luvisol	5.27	6.17	0.356
Preluvisol	5.09	4.20	0.237
Fluvisol	7.37	3.05	0.157
Phaeozem	6.79	3.54	0.183
Vertisol	6.07	5.29	0.271
Arenosol	6.26	3.29	0.168
Eutricambisol	5.65	3.44	0.179

Figure 3. The variation of pH, humus and nitrogen (average values) in the A horizon

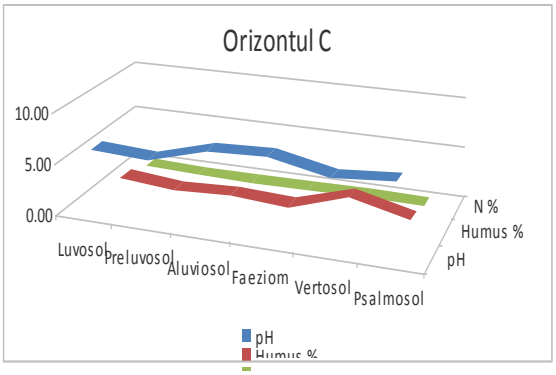
In regard with the *B horizon*, the highest values are for preluvisol and the lowest for vertisol (figure 4). All the other soils are moderately acid.



	pH	Humus %	N %
Luvisol	5.46	1.13	0.185
Preluvisol	5,39	1.34	0.083
Fluvisol	8.17	1.52	0.078
Phaeozem	6.76	1.72	0.089
Vertisol	4.89	1.85	0.096
Eutricambisol	5.89	1.10	0.058

Figure 4. Variation of pH, humus and nitrogen (average values) in the B horizon

Non the less, for the *C horizon*, the values are increasing for fluvisol and are decreasing for preluvisol (figure 5).



	pH	Humus %	N %
Luvisol	6.20	1.09	0.203
Preluvisol	5.82	0.66	0.041
Fluvisol	7.54	0.91	0.048
Phaeozem	7.75	0.62	0.032
Vertisol	6.53	2.41	0.148
Arenosol	7.05	1.07	0.054

Figure 5. Variation of pH, humus and nitrogen (average values) in the C horizon

Similar pH soil values (5.2) were also obtained by Tuti and Țărău (2013) for the Deveselu area in the same County (Olt). In the case of forest soils from another county situated in the country's field area (Giurgiu County), Crisan *et al.,* 2017, have identified similar values for luvisoils (5.53 in the A ocric horizon, 5.33 in the E luvic horizon and 5.68 in B argic) and preluvisoils (5.62 in Ao and 5.85 in Bt).

2) Humus is one of the most important chemical parameters of forest soils (Dincă L., 2015).

Generally speaking, the soils from Olt County have a lower towards average humus content. In this regard, higher values for the humus content are registered for luvisol and vertisol, while lower values can be found for fluvisol and arenosol (figure 6).

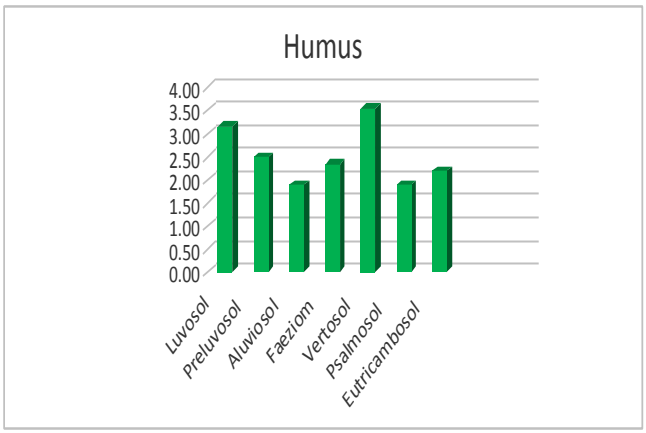


Figure 6. Humus variation for the most widespread forest soils from Olt County

The humus content (average values) on genetic horizons (figures 3, 4 and 5) varies of the *A horizon*, from higher values for luvisol (6,17%), towards relatively smaller values for fluvisol (3,05%). For the *B horizon*, the values are relatively similar (1,10 – 1,85%), while for the *C horizon,* the values are higher for vertisol (2,41%) and lower for phaeozem (0,62%).

The average values of humus content obtained for the Olt County are situated within the national deviation established for the respective soil types (Dincă *et al.,* 2012). In the case of forest soils from Cluj County, humus values for the first horizon were of 4.1% for preluvisol, 4.3% for luvisol and 4.56% for eutric cambisol (Enescu *et al.,* 2017).

3) Unlike the other essential elements for vegetal nutrition, **soil nitrogen**, does not originate from mineral rocks or minerals, its accumulation in soil being conditioned by a series of biologically processes. Nitrogen can be found in soils mainly as organic combinations that ensure, besides other nutritive substances, a good percentage of nitrogen necessary for plants, under the form of ammoniac and nitric nitrogen.

The nitrogen content of the analyzed soils from Olt county varies between 0.10 and 0.18 %, thus being averagely nitrogen supplied soils (Figure 7).

The following aspects were observed for the studied types of soils in regard with the supply of nitrogen on genetic horizons (average values): for the *A horizon,* the highest values are for luvisol (0.356%) and the lowest are for fluviso (0.157%), for the *B horizon,* higher values are recorded for luvisol and lowest for eutric cambisol, while for the *C horizon,* higher values are for luvisol and lowest for preluvisol (figures 3, 4, 5).

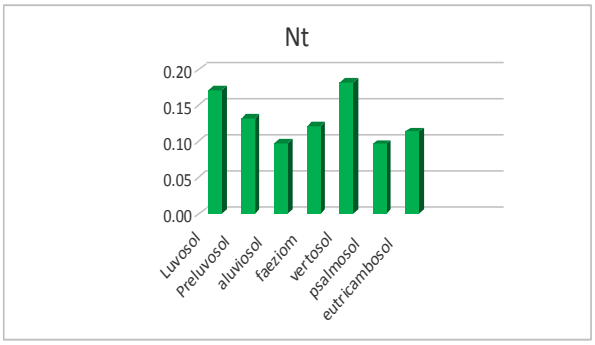


Figure 7. Nitrogen variation for the most widespread forest soils from Olt County

4) Base saturation degree

For the **base saturation degree (V%)** which represents the percentage in which the soil's colloidal complex is saturated in basic cations, it can be observed a close variation of average values for the forest soils analyzed in Olt County (figure 8). The variation of this parameter is higher for all soils, being situated in the interval 60 – 86% for all soils, with lower values for luvisol (67%) and higher ones for fluvisol (87%).

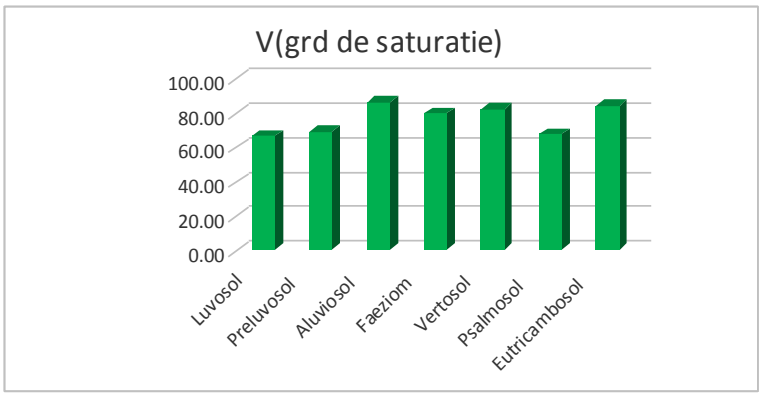


Figure 8. The base stauration degree variation (V%) for the most widespread forest soils from Olt County

For the hill-field transition area between Olt and Cotmeana, Parichi M. *et al.,* 2008, have obtained comparable values for the pH (6.4-6.7), humus (2-4%), base saturation degree (89-95%) and nitrogen (0.218-0.246%).

CONCLUSIONS

The types of forest soils from Olt County have a distribution characteristic to the field areas. The most widespread type of soil from the County is luvisol (38% of the surface), followed by preluvisol (26%) and fluvisol (23%).

Luvisol is a moderately acid soil, with a high total cationic exchange capacity, well supplied with nitrogen and intensely humiferous. Preluvisol is a moderately acid soil, with a high total exchange capacity, well supplied with nitrogen and intensely humiferous. Fluvisol is a moderately acid soil, with a very high total exchange capacity, well towards very well supplied with nitrogen, intensely humiferous and with a relatively high content of carbonates (the highest content of carbonates from the analyzed types of soils).

70% of Olt County's forest fund is artificially afforested through natural regenerations, while approximately 1506 ha of degraded lands were afforested (with approximately 20 forest species, namely oak, elm, ash and poplar species) thanks to the afforestation project through the transaction of reducing CO_2 emissions (based on the Kyoto Protocol).

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