

**RESEARCH REGARDING THE DISTRIBUTION OF MACRO AND MICRO ELEMENTS
IN FOREST SOILS FROM DAMBOVITA COUNTY**

Ciulei Constantin Sorin
Valahia University of Targoviste
E-mail: sorin0200@yahoo.com

Abstract

Actual research has been made in forest ecosystems from Dambovita's River Middle Valley, at Manesti - Ungureni village. These researches are part of a research project that follows among other things, accumulation level of some chemical elements in fungal-soil system. There were taken samples for establishing the potassium, magnesium and iron level, the soil reaction and the soil humidity. So, in different humidity conditions, soil reaction and soil exposure have been recorded values of potassium concentration between 0.7 and 2.83%, calcium concentration between 0.92 and 3.22%, iron concentration between 2.28 and 4.82% and a value of magnesium concentration between 0.32 and 0.94%. There have been found lower values for calcium concentration and magnesium concentration in areas with northern exposure and reduced declivity, and there have been found higher values of potassium concentration on the hillside with south - south east exposure (2.83%). Higher values for the calcium concentration have been recorded on probation areas (3.22%). Regarding the iron concentration, the highest values were found at luvisol (4.58%) on the north side of the studied territory. The ph values oscillates between 5 and 5.5 at luvisols and 6.2 - 6.6 at phaeozem soil. This fact settles the high mobility for the studied elements in soil.

Keywords: soil, concentration, pH, calcium, ecosystem

1. INTRODUCTION

These studies were performed within forest ecosystems from Dambovita's middle basin of the valley, on the territory of Manesti-Ungureni. These researches are part of a research project which aims, among others, the accumulation of chemical elements in the soil-fungal.

In the studied ecosystem, which is an oak forest, due to the interaction of pedogenetical factors (climate, rock, relief, vegetation) were formed different soil types: phaeozem and luvisol classified Chernisols and Luvisols classes as Soil Taxonomy System (2003).

Before 1989 and soon after, other areas than the arable use of the land, generally located in the hills and mountains, have not received much attention from the authorities in the field, there are not achieved pedological and agrochemical research, and also no mapping.

We conducted a comprehensive characterization of the soil cover, both in terms of its formation and in terms of chemical composition, in the course of a large project aimed at fungal behaviour as bioaccumulative and biomarkers for certain chemical elements.

So it has been tried and achieved a complete characterization of forest soil around Targoviste in terms of their level of fertility and its interaction with other components of the environment. The area of the study referred to in this paper, namely Mănești Ungureni, is located at the contact between the Dambovita valley terraces and areas with older relief belonging to Subcarpathic hills.

We can say that the soils in the area have been formed on a relief plateau represented by the silt carried by the older model and rivers, especially the Dambovita River, and subsequently subjected to strong erosion on medium and fine textured deposits, at variable depths

appear discontinuous layers of gravel. For climatic point of view, soil formation and evolution is influenced by the average of annual temperature of 9.90 C and rainfall of 560-600 mm annually.

The vegetation is represented by quercinee forests (*Quercus robur*, *Quercus cerris*, *Quercus frainetto*) and through water meadows in Dambovita meadow (*Populus alba*, *Salix alba*).

In these circumstances, were formed in the area soils with medium-fine texture, slightly acidic pH-moderately acid phaeozem and luvisol.

2. MATERIALS AND METHODS

In order to obtain meaningful results on the ground reality we considered necessary to choose a regular sampling networks with equidistance of 500 m between points from which samples were taken. We have carried out a total of six main sections of the ground and 20 surveys.

Soil samples were collected at two depths (0-20, 20-40 cm) according to the soil sampling by the methods described in the literature. [Borlan and Rauta 1981, Florea 1986, ICPA].

Two grams of each sample was rolled by hand, without chemical treatment, in a plastic container with Mylar at the bottom.

Samples were shaken for 300s and characteristic X-rays were detected using a multichannel spectrometer based on X-ray detector Si-pin-diode with 140µm Be by window and an energy resolution of 5.9 keV 200ev.

Accuracy and precision of the results was assessed by measurement of certified reference samples NISTSRM 1571 - leaves in the orchard.

We have conducted the following analysis:

- Soil reaction – potentiometric method in aqueous solution;
- humus content – Tiurin titration method;
- exchange capacity for H (SH) – Method for leaching four successive extractions;
- sum of exchangeable bases (SB) - Method Kappen;
- granulometric analysis - Kacinski.

3. RESULTS AND DISCUSSION

Soil types that have formed as a result of the combined action of factors pedogenetical in the middle basin of the Dâmbovița River, in the village Ungureni-Manesti are assigned to Phaeozems and Luvisols classes, eventually occupying approx. 70% of the study area. These soils presenting Ao horizon with an humus content frequently richer than 2.5%, in fulvic acids, mainly from decomposing woody vegetation, often resulting the formation of an organic horizon at the surface of the soil. Regarding the texture of these soils we may say that it is middle-fine textural poorly differentiated on phaeozems and highly differentiated in some cases of Luvisols levels, and the clay content of the Bt horizon in some cases is up to 53%. Due to the intensive leaching processes, decreases the soil pH, frequently below 5.5 to luvisols, and increases soil aluminium ions and metal ions mobility.



Fig. 1. Luvisol Phaeozems profile in the Manesti area

Table 1. Analytical data specify to physical and chemical characteristics of the Luvisol Phaeozems

Horizon	Depth of sample (cm)	pH	Humus	IN	P ₂ O ₅ mg /100 ppm	K ₂ O mg /100 ppm	V%
Ap	0-25	6.76	2.78	2.32	31.0	325.9	80.5
Am	25-45	6.80	2.05	2.08	27.3	193.7	82.0
A/B	45-63	6.86	1.41	2.01	-	-	85.1
Bt1	63-95	6.96	1.05	1.49	-	-	89.5
Bt2	95-150	7.34	0.46	-	-	-	95.7
C	150-180	8.22	-	-	-	-	100

Stagnic Luvisols (without E horizon) have been formed under excess moisture from precipitation, expressed in terms of relief with a flat surface in the studied territory often being encountered on valley bottoms.

Stagnogleyization intensive processes are favoured by low permeability horizons, parent materials are represented by clays.

Stagnic Luvisols has the following sequence of horizons Ao-ABW - Btw - C. The morphological characteristics are presented as follows:

Ao : 0-24cm, brown - yellowish grain sandyclay, thin dense roots, quartz grains colloidal film strip, normal porosity, low compactness, damp, crossing net.

A/Bw : 24-50cm, yellowish brown with small black spots 5% and 8% ash, weak polyhedral, dustyclay, roots thick and thin quartz grains without colloidal film porosity medium, weak compactness, damp, clear passage.

Bt_{1w2} : 50-75cm, dark brown (7.5 Y/R) rust spots oxides and hydroxides of Fe 10%, prismatic, clayish, tamping, damp, clear passage.

Bt_{2w2} : 75-105cm, dark reddish brown (7.5 Y/R) 25% black rust spots, prismatic, clayish, damp, clear passage.

Bt_{3w3} : 105-140cm, dark reddish brown (7.5 Y/R 2/3) rust and black spots 40-50%, prismatic clayish, damp.



Fig. 2. Stagnic Luvisols (without E horizon) in the Ungureni area

Haplic Luvisols are characterized by the succession of horizons:

Ao – El – Bt – C and the following morphological characteristics:

Ao : 0-28 cm, yellowish brown, no structure, sandy clay, rare roots, medium porosity, higher compactness (Tapped) moist, clear passage.

El : 28-48 cm, yellowish brown, polyhedral structure underdeveloped, dustyclay, quartz sand grains present roots rare, medium porosity, compactness moderate wet clear passage.

Bt₁ : 48-67cm, faint yellowish brown rust, prismatic, clayish, roots very rare, clay films on faces of the structural aggregates, porous medium, moderate compactness, damp, clear passage.

Bt₂ : 67-110 cm, bluish rusty brown, prismatic, clayish, damp.

Table 2. Analytical data specify to physical and chemical characteristics of the Stagnic Luvisols(without E horizon)

Horizon	Depth of sample (cm)	pH	Humus	IN	P ₂ O ₅ mg /100 ppm	K ₂ O mg /100 ppm	V%
Ao	0-24	6.20	2.4	1.94	7.9	174.3	70.1
A/B	24-40	6.55	1.7	1.74	2.2	95.5	70.3
B ₁ W ₂	40-53	6.75	-	1.23	0.9	88.8	74.8
B ₂ W ₂	53-83	6.40	-	-	-	-	77.0
B ₃ W ₃	83-103	6.30	-	-	-	-	80.3
B/Cw ₃	103-124	6.35	-	-	-	-	83.8

Stagnic luvisols (with E horizon) are characterized by yellowish brown Bt horizons (10YR hues and chroma values > 3.5 wet material) reached in migrated clay from the upper portion and the horizon El intensive processes which occur the stagnogleyization, which causes a marbling of these horizons. It shows the sequence of horizons *Ao – Elw – Btw – C*.

In the study area are encountered in areas with plan relief or on the bottoms of the valley.

Under different conditions of humidity, exhibition and soil reaction occurred potassium values between 0.71 and 2.83%, 3.22% calcium and 0.92, between 2.28 and 4.52 Iron % and magnesium from 0.32 to 0.94%.

There were recorded lower values of calcium and magnesium in the areas with north exhibition and low slope, and higher values of potassium on the slopes with an south southeast exhibition.

Were recorded higher values of calcium content in sampling areas located in the eastern part of the studied territory, on the right side of Dambovita River (3.22%). Regarding iron concentrations, highest values were found in Luvisols (4.58%) in the north of the studied territory, on flat surfaces sometimes affected by stagnogleyization processes, which caused the formation of reduced iron compounds. This reduction led to soil imprimation with green colour, purple alternating with yellow-reddish colour, achieving a mottled specific soil with excess moisture.



Fig. 3. Stagnic Luvisols (with E horizon) profile in the Ungureni area

Table 3. Analytical data characteristic to physico – chemical properties of Stagnic Luvisols(with E horizon)

Horizon	Depth of sample (cm)	pH	Humus	IN	P ₂ O ₅ mg /100 ppm	K ₂ O mg /100 ppm	V%
Ao	0-26	5.23	2.73	2.19	2.8	176.0	80.2
El	26-43	5.55	1.86	1.82	0.9	134.8	82.4
B ₁ W ₂	43 –65	5.70	-	-	-	-	89.3
B ₂ W ₂	65-85	5.80	-	-	-	-	87.4
B ₃ W ₃	85-109	5.95	-	-	-	-	86.6
Cw ₃	109-130	6.15	-	-	-	-	86.6

The values of the pH range between 5.5 and 5, at Luvisols and at 6.2 to 6.6, respectively at phaeozems, which results in a high mobility of the studied elements in soil.

Table 4. Concentrations of Fe, Mg, Ca in the first 25 cm of soil cover in the Ungureni-Mănești zone

Soil type	pH	U%	Fe%	Mg%	Ca%
Luvic Phaeozems	6.76	32.6	2.28	0.94	3.22
Stagnic Luvisols (without E horizon)	6.20	34.8	3.47	0.68	2.23
Stagnic Luvisols (with E horizon)	5.23	40.4	4.58	0.32	0.92

4. CONCLUSIONS

- The soil types that were formed as a result of the combined action of factors pedogenetical in the middle basin of Dambovita River, in the village Ungureni-Manesti were assigned to Phaeozems and Luvisols classes.
- There are types of soil that have a high clay content resulting on the production of the process stagnogleyization with negative repercussions on the condition of the aerohidric soil.
- The humus content, it is commonly more than 2.5%, rich in fulvic acids, mainly from the decomposition of woody vegetation, often resulting on the formation of an organic horizon on the soil surface.
- In different conditions of humidity, exhibition and soil reaction were reported potassium values between 0.71 and 2.83%, Calcium 0.92 3.22% iron between 2.28 and 4.52% and magnesium from 0.32 to 0.94%.
- Distribution of iron, magnesium, potassium and phosphorus are closely related to changes in soil reaction, moisture, slope exhibition and the degree of adsorption of soil colloids (the soil adsorption complex).

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