

THE SOIL COVERING OUTSIDE THE BUILT-UP AREA OF ZĂBRANI COMMUNE, ARAD COUNTY

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Abstract. *The work aims to present the soil covering outside the built-up area of Zăbrani commune. The studies were carried out over a period of 3 years, respectively the years 2021-2023. The commune of Zăbrani, in Arad County, occupies a total area of 11,778 ha. The soil cover is mostly represented by eutricambosols, luvosols and preluvosols. The largest area is represented by preluvosoil with over 74%, followed by luvosoil. Following the results obtained, it was found that the preluvosoil has a medium fertility, being characterized by the following properties: a fine texture, undifferentiated on the profile, the density has values between 2.67-2.72 g/m³; the apparent density, between 1.36 and 1.52 g/cm³, the total porosity has high values, of 50% and 43% at the level of the Bt layer, CC is between 23.72 and 24.74% and CT between 28.34 and 36.76. The soil has a humus content of 2.33% at the depth of 0-22 cm and decreases to 1.53% at greater depths. The nitrogen index is 2.15% at ad. 0-22 cm (mean values), the mobile K index between 207.5 ppm in the Ap horizon and 182.6 ppm in the Btyw horizon and the mobile P index is high, with values between 63.3 ppm and 117.3 ppm. Luvosoil is characterized by the following properties: the texture presents accentuated differentiations from one horizon to another, from clay-dust in El, medium in Bty and clay-clay in the rest, the reaction is weakly acidic on the surface, neutral in Bt and weakly alkaline in Cyw (5.29-8.09), the humus content is low and very low, 1.61 in El, respectively 0.72 in Bty and the degree of saturation in bases above 77%. Knowing these properties helps us to characterize the soils in general, to establish the crops that are suitable and to take improvement measures, where necessary.*

Keywords: *soil cover, fertility, soil properties, Arad, Chesinț*

INTRODUCTION

One of the most important resources of mankind is soil resources. The existence and development of a prosperous society has always been conditioned by the quantity and quality of the soil, its ability to produce, providing people with food and raw materials for clothing, medicines and other important requirements (BRADY N.C., ET AL., 2003).

By nature and its functions, the soil represents a living natural body governed by a series of natural laws, which are apparently in a certain balance: the law of conservation of matter, energy and entropy (RADULOV ISIDORA, 2007).

The cultivation of the soil over the years has taken the most varied forms. The agricultural models practiced over time have constantly evolved according to scientific and technical advances, as well as changes and changes that have taken place in the agricultural field, depending on the economic and social context (FLOREA N., 1982; MIHUȚ CASIANA, ET AL., 2022).

In the conception of the development of sustainable agriculture, it is unanimously accepted that the protection and conservation of the soil is an essential requirement for a secure and prosperous future (BORLAN Z., ET AL., 1984; DUMITRU R., ET AL., 1983).

In our country, in the last decade, farmers are paying more and more attention to the soil cover, by practicing an environmentally friendly agriculture on an increasing scale (POSEA GH., 2009).

The purpose of the work is to identify and present the soil cover in the perimeter of Zăbrani locality, as well as to present the dominant soil types and the fertility of these soils (URUIOC STELA.2001).

Characteristic of this territory is the oak forest, of the "sleau" type, and in the deforested areas, the sub-humid hay vegetation. These plant formations contribute to the differentiation of the soils on this territory (IANOȘ GH., ET AL., 1994; ȚĂRĂU D., ET AL., 2007).

The complex of pedoclimatic factors specific to this area is also reflected in the floristic structure of the vegetation carpet as a whole (ȚIMBOTA I., 1989). According to the geobotanical map of DONIȚĂ NICOLAE ET AL., 2005, the studied area is located in an area of interference of the forest-steppe, with the forest area. The biggest change was the natural vegetation, which was mostly replaced by certain crops. These anthropogenic interventions have altered the nutrient regime and the water regime of the soil, including soil moisture (IANOȘ GH., ET AL., 1992; RUSU I., ET AL., 1989).

MATERIAL AND METHOD

The purpose of the work is to identify and present the soil cover in Zăbrani, Arad County, respectively to present the properties of these soils and to establish the degree of fertility (BORONEANȚ VASILE, ET AL., 2002).

The methods used are both field methods, as a result of which we used the soil map and made an identification and limitation of each type of soil, as well as laboratory methods, respectively the observation method and individual study, where we studied the specialized literature and documents from the OSPA Arad archive and from the Zăbrani City Hall (FLOREAN., 1964; MUNTEANU I., FLOREAN., 2009; OBREJANU GR. ET AL., 1964).

When describing the locality, we used a series of data and information from the Zăbrani and Lipova City Halls and from the locals, along with the information obtained from the field (FLOREAN., 1985).

The commune of Zăbrani has the following geographical coordinates: 46°04'14" north latitude, 21°33'18" east longitude and is located at an average altitude between 181-217 m. The locality is located in the south-eastern part of Arad County, on the border with Timiș County, in the Lipova plateau, at the intersection of the Arad-Lipova and Timișoara – Lipova county roads, 26 km from the municipality of Arad, 55 km from Timișoara and 12 km from Lipova city.

A part of the territory of the locality is located in the basin of the Mureș River, on the third terrace, a sub-hilly plain, on its hills and depressions and on the valleys of small flowing waters. The commune is composed of the villages Zăbrani (commune capital), Chesinț and Neudorf. To the north, the administrative territory of the commune borders the commune of Păuliș, to the south by the county of Timiș, to the west by the commune of Frumușeni and to the east by the city of Lipova (TODUȚA GHE., ET AL., 2014).

RESULTS AND DISCUSSIONS

Among the soils found within this locality, larger areas are occupied by those of the luvisol class, namely: Preluvosoil and Luvosoil.

The studies carried out during the three years on the personal farm were done on these two types of soil.

The Luvisols class occupies about 74% of the surface of the locality, and over 95% within the farm. It presents soils that are characterized by the presence of a clay-oiluvial (Bt) type B horizon and includes as soil type: preluvosol and luvosol.

Preluvosols are the most widespread on the farm (approx. 70%), the most common subtypes are the vertical and vertical stagnogleized ones, which have a greater spread in the Lipova Plateau, where Chesinț is also located.

Luvosols represent 26% of the territory of the locality and approx. 26% of that of the farm. These soils were formed in higher areas (over 200 m) and have a different evolution, in the sense that they evolved as a result of the influence of large amounts of water, the processes of leaching, debasification and migration of colloids are more intense, which favored the appearance of a Bt horizon, enriched in clay and an E luvic horizon, depleted by clay. There are soils that are poorly supplied with humus and nutrients, as can be seen from the data presented below.

1. Preluvosoil vertic

Taxonomic soil unit: very deep ba.thystragnic vertex preluvoisol, formed on contractile-swelling clays, very fine, medium agile clay/clay clay.

The physical and chemical properties of the Chesinț vertical preluvoisol are presented in tables 1. and 2.

Table 1.

Physical and physical-mechanical properties of the Chesinț preluvoisol vertic

HORIZON	Apw	A/Bw	Btyw ₃	B/Cyw ₄	Cw ₃
<i>Adâncimea (cm)</i>	<i>0-22</i>	<i>22-62</i>	<i>62-87</i>	<i>87-120</i>	<i>120-150</i>
Fine sand (0,2-0,02 mm)%	33.0	28.6.	25.1	29.1	29.1
Coarse sand (2,0-0,2 mm)%	0.6	0.5	1.3	0.9	0.9
Dust (0,02-0,002 mm)%	30.01	27.7	25.4	24.8	24.8
Clay (sub 0,002 mm)%	36.3	432	48.2	45.2	45.2
TEXTURE	TT	TT	AL	AL	AL
Specific density (D g/cm ³)	2.72	2.69	2.72	2.67	
Bulk density (DA g/cm ³)	1.36	1.45	1.49	1.52	
Total porosity (PT%)	50	46	46	43	
Aeration porosity (PA%)	17.58	12.22	9.4	5.57	
Degree of settlement (GT %)	2.36	10.58	18,19	17.83	

The texture is fine, undifferentiated on the profile.

The density has values between 2.67-2.72 g/m³ and the apparent density, between 1.36-1.52 g/cm³. These values made the total porosity at the rice level. B/Cyw to decrease to 43% and the degree of compaction to increase to 17.83% and the aeration porosity to reach 5.57%. Higher values are found on the surface (ad. 0-22 cm), where the total porosity registers 50%, the aeration 17.58% and the degree of compaction is lower (2.36%), which is favorable for the growth of plants in good conditions.

The total porosity has high values between 50 and 43%, higher values are found in the first soil layer and lower values at the level of the Bt layer.

Table 2.

Hydrophysical and chemical properties of the summit preluvoisol from Chesinț

HORIZON	Apw	A/Bw	Btyw ₃	B/Cyw ₄	Cw ₃
<i>Depth (cm)</i>	<i>0-22</i>	<i>22-62</i>	<i>62-87</i>	<i>87-120</i>	<i>120-150</i>
Field Capacity (CC%)	23.84	23.72	24.12	24.74	
Total capacity (CT %)	36.76	31.79	30.88	28.34	
pH (in H ₂ O)	6.00	6.02	6.38	6.10	6.86
Humus (%)	2.33	2.12	1.53		
Whipping Rate (IN)	2.15	2.01			
P mobile (ppm)	90.3	53.3			
K mobile (ppm)	207.5	199.2			
Replacement bases (SB.me /100g soil)	22.38	22.38	28.71	30.30	28.51
Degree of saturation in bases (V%)	80.30	81.13	88.39	89.11	94.74

The soil has CC values between 23.72 and 24.74% and TC between 28.34 and 36.76. Lower CC values are found at a depth of 22-62 cm, where a more compacted horizon is formed due to agricultural works carried out at the same depth and higher values, at a depth of 87-120 cm.

The soil reaction is weakly acidic over the entire profile (pH values are between 6.00 and 6.86). The humus content is 2.33% at ad. 0-22 cm and decreases to 1.53% at greater depths.

The nitrogen index has values of 2.15% at ad. 0-22 cm (mean values), the mobile K index between 207.5 ppm in the Ap horizon and 182.6 ppm in the Btyw horizon and the mobile P index is high, with values between 63.3 ppm and 117.3 ppm.

The fertility of this soil is medium. Among the main causes that reduce the natural fertility of this soil are:

- low permeability at the Bt horizon;
- the quantity and quality of humus, which is much lower;
- the relief that has numerous unevenness, etc.

In rainy years, humidity appears in excess, and in dry years it is deficient.

In order to increase the productions on this soil, a series of works of permeabilization of the Bt horizon are necessary, a moderate fertilization with fertilizers based on nitrogen and phosphorus and at least once every three or four years, the application of manure.

2. Luvisoil

Taxonomic soil unit: weak, salinized, extremely deep stagnoglutated luvisol on medium-fine/fine contractile-swelling clays, medium clay/clay-clay.

The physical, hydrophysical and chemical properties of the weak stagnoglutated luvisol from Chesinț are presented in tables 3 and 4.

Table 3.

Physical properties of the weak tin luvisoil from Chesinț

Horizon	EI	E/B	Bty	Btyw	BCyw	Cyw
Depth (cm)	0-20	20-35	35-58	58-105	105-130	130-145
Fine sand (0.2-0.02 mm)%	37.9	27.1	25.7	29.7	30.7	31.5
Coarse sand (2.0-0.2 mm)%	2.8	2.0	1.3	1.6	1.3	0.5
Dust (0.02-0.002 mm)%	32.0	27.7	23.3	21.6	23.0	22.5
Clay (sub 0.002 mm)%	27.3	43.2	49.7	47.7	45.0	45.5
TEXTURE	LL	TT	AL	AL	TT	AL

As for the texture of this type of soil, it presents marked differentiations from one layer (horizon) to another. If in the first part of the soil profile, the texture is loamy-dusty, in it it is medium and in Bty, it becomes clayey-clayey. This fact reflects the presence of the clay elubering process from the upper to the lower horizons.

Table 4.

Chemical properties of the weak stagnoglycated luvisol from Chesint

Horizon	El	E/B	Bty	Btyw	BCyw	Cyw
<i>Adâncimea (cm)</i>	0-20	20-35	35-58	58-105	105-130	130-145
pH in (H ₂ O)	5.29	5.89	6.97	7.23	7.29	8.09
Humus (%)	1.61	0.82	0.72			
Carbonat (CaCO ₃ %)				0.10	0.16	
Exchange bases (SB me la 100 g/sol)	18.11	84.53	26.03			
Exchangeable hydrogen (SH me)	5.40	3.74	2.03			
Cationic change capacity (T me)	23.51	28.27	28.06			6.52
Degree of saturation. in the bases (V%)	77.03	86.77	92.76			

Through the presence and intensification of the eluviere-flood processes, there was a marked debasification at the level of the higher horizons.

The reaction of this soil is weakly acidic on the neutral surface in Bt and weakly alkaline in Cyw, having values between 5.29-8.09. Carbonates occur at depths of more than 58 cm.

The humus content is low and very low, from 1.61 in El to 0.72 in Bty.

The degree of saturation in the bases has values of over 77%. The highest values (92%) are found at the level of the Bty horizon.

CONCLUSIONS

The studies were carried out in the perimeter of Zăbrani, in Arad County, a locality located in the Lipova Plateau, on the border with Timiș County.

In general, the pedogenesis processes specific to this area have as a final result the evolution and predominant influence of natural bioclimatic factors, along with some particular, local characteristics.

The main types of soils are represented by the Luvisols and Cambisols class, predominantly the luvisols class, namely luvisol and preluvosol.

Luvisols, occupying about 74% of the surface of the locality, are characterized by the presence of a Bt horizon.

Preluvosols is characterized by the following properties:

- ✓ Fine texture, undifferentiated on the profile.
- ✓ Density, with values between 2.67-2.72 g/m³;
- ✓ Bulk density, between 1.36 and 1.52 g/cm³
- ✓ The total porosity has high values, of 50% and 43%, higher values are found in the first layer of soil and lower, at the level of the Bt layer;
- ✓ CC is between 23.72 and 24.74% and CT between 28.34 and 36.76;
- ✓ The soil reaction is weakly acidic throughout the profile;
- ✓ The humus content is 2.33% at ad. 0-22 cm and decreases to 1.53% at greater depths.

✓ The nitrogen index is 2.15% at ad. 0-22 cm (mean values), the mobile K index between 207.5 ppm in the Ap horizon and 182.6 ppm in the Btyw horizon and the mobile P index is high, with values between 63.3 ppm and 117.3 ppm.

The fertility of this soil is medium.

Luvosols is characterized by the following properties:
texture with accentuated differentiations from one horizon to another, from loamy-dusty in El, medium in Bty and clayey-clay in the rest.

The reaction is weakly acidic on the surface, neutral in Bt and weakly alkaline in Cyw (5.29-8.09).

The humus content is low and very low, 1.61 in El and 0.72 in Bty, respectively.

Base saturation degree above 77%.

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