CHARACTERIZATION OF THE STAGNANT ALBIC LUVOSOIL FROM THE PREAJBA-GORJ EXPERIMENTAL CENTER

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RESEARCH ARTICLE

Abstract
The paper presents aspects related to some morphological and agrochemical properties of stagnant albic luvosoil from the Preajba-Gorj experimental center.
Based on the study, restrictive factors of soil fertility were established, ecological and agronomic considerations were issued, as well as agro-pedo-ameliorative measures to increase the productive potential of the soils in the area. Recommended measures: permanent open channels, drainages with high filtering prism for depression areas, deep loosening, scarification, plowing in ridge strips, the application of calcareous amendments and incorporation of manure is recommended to supplement the need for nitrogen, phosphorus and potassium.

Keywords: fertility, nutrient, manure.
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INTRODUCTION

In the current situation, when humanity is affected by more and more disasters, drought, floods, earthquakes, landslides. reactivation of volcanoes, the areas intended for plant cultivation are increasingly limited, which generates problems of food safety and security generated as a result of the increase in food prices (Chiurciu et al., 2022, 2024; Dana et al., 2023, 2024; EEA, 2022; Liu, J. et al., 2024; Selvik et al., 2006).

In the context of a global energy crisis and the increase in energy prices, world food production is decreasing.

The use of solar panels for energy production on fertile land has been changing the way arable land is used more and more in the last decade.

The low production of energy captured in the network from photovoltaic panels and the increasing losses of energy in the atmosphere seem to increasingly accentuate global warming and another resource, water, is becoming insufficient for future agricultural production cycles.

Wind energy, as a source of energy, determines important changes in the water cycle in nature, but also in the circulation of soil colloids in the atmosphere.

As is known, phosphorus is an element very well fixed by the colloidal particle, and through the currents generated by wind installations, they circulate freely in the atmosphere.

Through the currents produced by wind installations, the degree of soil erosion increases.

The P particle plays an important role in the transfer of information and energy to the human species.

But free in the atmosphere charged with energy, it becomes a catalyst in the energy circuit in the atmosphere.

All energy sources used by humanity for development involve biogenic circuits.

When an energy source suddenly disturbs several natural biogenic circuits, extreme phenomena appear.

The price paid by humanity in extreme phenomena are: human lives, the irreversible disappearance of natural resources vital to the human species.

Agriculture is under pressure to respond to energy, food security and reduction of the greenhouse effect.

At the same time, the climate is changing and demand for food is increasing, and the use of less fertile soils in agriculture is becoming a necessity for the survival of humanity. (Balan, 2023; Balan et al., 2024; Bechmann et al., 2005, 2007; Chereji et al, 2022; Chiurciu et al, 2023).

MATERIAL AND METHOD

Physical-geographical conditions

Relief

The Preajba experimental point is located on the highest terrace of Jiu (the 5th terrace), at an altitude of 355 m. It extends over two forms of relief: the platform of the 5th terrace which has a generally flat appearance, slightly inclined towards the W-SW, and a slope of 0-2%; the western slope of the Preajba stream which is a stabilized slope, with a slightly wavy appearance, and a slope from 5 to 45%.

The relief of the area is the result of the action of the Jiu River (the terraces) over time, and within the terraces, the action of the Preajba stream (the stream valley with its slopes).

Geology and lithology

The terrace deposits within the Jiu terraces are fluvial, formed by gravels and boulders of a granitic nature transported from the mountains and belong to the Quaternary.

On the terrace, the soils have as parent materials: clays, clayey clays and clayey loams, and on the slopes clays and clayey loams mixed with gravels. Within the slopes, gravels are found in greater or lesser percentages, over extended areas, even at the surface.

Hydrology

The experimental site's terrain belongs to the Amaradia river basin, which, in turn, belongs to the Jiu river basin, through the Preajba stream.

The groundwater is over 10 m deep and does not influence the soils in their evolution.
Rainwater stagnates on and in the soil, during periods of excess, within the flat terraces, and on the slopes, a large part of the rain water flows to the surface, causing deep erosion phenomena (streams, ravines, gullies and even ravines).

Climate

According to the Târgu-Jiu climate station, the climate is temperate-continental, with obvious Mediterranean influences. The multiannual average temperature is 10.3^{o}C, and the precipitation regime is 753 mm.

The precipitation regime is unevenly distributed percolative, causing a drought period in the months of July-August-September. It is estimated that only in one year out of 10, a normal distribution of precipitation is achieved.

The pedogenetic process that left its mark on the evolution of the soils in the area, under the action of the natural factors presented, is that of - clay alluvial - a process that determined soils from the Luvosols Class (Figure 1).

Figure 1 **Image from the experimental field Preajba - Gorj (PENSOL Project)**

Vegetation

The natural vegetation that characterized the area is still present in extensive areas, is that of oak forests, with numerous species of the genus Quercus.

Currently, on the surface of the experimental point, the natural vegetation is formed by acidophilic meso-xerophyte associations, and the cultivated vegetation is formed by crops of wheat, corn, barley, rye, etc.

RESULTS AND DISCUSSIONS

Morphological characterization

Profile description:

At 0-1 cm; sandy clay; celery; discontinuous horizon; straight transition;

Ao 1-20 cm; sandy clay with skeleton 5 - 10%; brown - dark yellowish brown (10YR 4/3.5) in wet state and pale brown (10YR 6/3)

in dry state; reavn; small-medium grained and small subangular polyhedral; friable in wet state, hard in dry state; weakly plastic; weakly adhesive; weakly compact; small, frequent pores; very thin roots frequent; gradual transition - straight;

El (A) 20-37 cm; clay with skeleton 10%; yellowish brown -dark yellowish brown (10YR 4.5/4) with dark brown - brown spots (7.5YR 4/4.5) when wet and very light brown (10YR 7.5/4) with pink - pinkish white spots (7.5YR 8/3.5) when dry; reavan - wet; subangular polyhedral with a tendency to shale; friable when wet, hard when dry; weakly plastic; weakly adhesive; weakly compact; small, frequent pores; very thin roots frequent; gradual transition;

EBtw 37-46 cm; clay with skeleton 10%; dark brown - brown (7.5YR 4/4) with dark brown - brown spots (5YR 6/7) when wet and reddish yellow - pink (7.5YR 7/5) with reddish yellow spots (5YR 7/8) when dry; wet; polyhedral angular - subangular small-medium; friable when wet, hard when dry; weakly plastic; weakly adhesive; weakly compact; small, frequent pores; very thin roots frequent; clear transition - wavy;

Btw1 46-65 cm; clayey-loamy with 35% skeleton; deep brown (7.5YR 5/6) with yellowish red spots (5YR 5/7) when wet and reddish yellow (7.5YR 7.5/6) with light reddish brown - reddish yellow spots (5YR 7.5/5) when dry; moist - wet; medium subangular polyhedral with a tendency to small - medium prismatic; friable when wet, hard when dry; moderately plastic; moderately adhesive; compact; rare small pores; rare very thin roots; gradual transition;

Btw2 65-90 cm; clayey-loamy with 45% skeleton; intense brown (7.5YR 5/8) with yellowish red spots (5YR 4.5/6) and reddish brown (5YR 5/3) in wet state and reddish yellow - pink (7.5YR 7/5) with reddish yellow spots (5YR 7/8) in dry state; moist; medium angular polyhedral; friable in wet state, hard in dry state; moderately plastic; moderately adhesive; compact; small pores rare; very thin roots rare - very rare; gradual transition;

BC 90-106 cm; clayey clay with skeleton 60%; yellowish red (5YR 5/8) with reddish yellow spots (5YR 6.5/7) in wet state and reddish yellow (5YR 7/6) with reddish yellow spots (7.5YR 7/5) in dry state; moist - moist; small angular polyhedral - medium; friable when wet, hard when dry; moderately plastic; moderately adhesive; compact; small, rare pores; very thin, very rare roots; gradual transition;

CR 106-150 cm; loamy sand with 70 - 80% skeleton; yellowish red (5YR 5/8) with reddish yellow spots (5YR 6.5/7) when wet and reddish yellow (5YR 7/6) with reddish yellow spots (7.5YR 7/5) when dry; moist - wet; structured; friable when wet, hard when dry; moderately plastic; moderately adhesive; compact; small pores rare; very thin roots very rare.

Agrochemical characterization of soil

From the point of view of the soil reaction, the soil is weakly acidic, the values of the degree of saturation with bases place the soil in the oligobasic category, the cation exchange capacity is low and medium (in Btw), the total nitrogen content is medium, the contents of mobile phosphorus and potassium are extremely low. Regarding the content of microelements, this is above the susceptibility limit (Table 1)

Agronomic and ecological considerations

The physical properties are unfavorable for stagnant albic luvosoil in the relationship of these soils with water, respectively they become more compacted and less permeable. Thus the apparent density becomes high, the total porosity is medium at the surface and low on the profile, the aeration porosity is low at the surface and very low on the profile, the shrinkage index is high and very high in the control section. The wilting coefficient is high-very high, the field capacity is high and the usable water capacity is medium. The permeability of these soils is low and very low.

This explains the pseudo-gleyzation phenomenon which, depending on local conditions, can be from weak-moderate to excessive, and the aero-hydric regime is deficient.

They are less favorable soils, their fertility decreasing with increasing eluviation. Agricultural crops suffer greatly from lack of water in summer and excess humidity in spring and autumn. To regulate the aero-hydric regime, it is planned to carry out hydro- and pedoamelioration works such as: permanent open channels, drainages with high filtering prism for depression areas, deep loosening, scarification, plowing in ridge strips.

The ecological characteristics of the soil profile, especially of the active soil layer (for plant roots), highlighted by the pH values and

Table 1

The main agrochemical properties of the stagnant albic luvosoil
Source: own determination, PENSOL Project

Horizon	pH	Nt (%)	P ppm	K ppm	Humus (%)	SB me/ 100 g soil	Ah me/ 100 g soil	T me/ 100 g soil	VAh %	Cu ppm	Zn ppm	Fe ppm	Mn ppm
Aţ/Ao 0-20 cm	5.46	0.17	1.40	51.66	4.25	8.14	4.38	12.52	65.0	0.86	0.69	38.97	40.96
El 20-37 cm	5.29	0.14	0.35	35.00	1.25	4.26	4.22	8.49	50.3	0.53	0.60	25.31	29.15
EB 37-46 cm	5.25	0.12	0.35	46.66	0.41	4.07	3.63	7.70	52.8	0.55	0.38	22.98	31.23
Bt1 46-65 cm	5.28	0.11	0.35	41.66	0.89	6.51	3.84	10.35	62.9	0.59	0.77	22.66	33.68
Bt 2 65-90 cm	5.41	0.11	0.35	54.16	0.29	7.73	3.63	11.36	68.0	0.51	0.71	17.42	23.86
BC 90-106 cm	5,50	0.08	0.35	55.83	0.41	11.60	3.17	14.77	78.5	0.32	0.32	11.26	5.89
C 106-150 cm	5.52	0.14	1.40	50.00	-	11.60	2.88	14.48	80.1	0.33	0.27	9.22	8.18

the exchange properties of the soil (cation exchange capacity and degree of base saturation) show more moderate conditions for the development of crop plants. Soil acidity also contributes to these. In extreme conditions that could lead to a drastic decrease in the soil reaction, these ecological characteristics could be associated with the presence of mobile aluminum, an element often harmful to plant growth, a high deficit of calcium and magnesium, which ultimately leads to less favorable conditions for plant development.

As a result of these physical and chemical characteristics of the soil, the fertility of this type of soil (Luvosoil) is low.

For these reasons, the application of calcareous amendments and incorporation of manure is recommended to supplement the need for nitrogen, phosphorus and potassium.

CONCLUSIONS

The studied soil has a profile of the type: At-Ao-El-EBtw-Btw1-Btw2-BC-CR.

The pseudo-gleyzation phenomenon is generated by local conditions and can be from weak-moderate to excessive.

The aero-hydric regime is deficient, and agricultural crops suffer greatly from lack of water in summer and excess humidity in spring and autumn.

The fertility of this type of soil is low and it is recommended to apply lime amendments, incorporate manure and apply mineral fertilizers with nitrogen, phosphorus and potassium.

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