STUDIES REGARDING THE MAIN PHYSICAL PROPERTIES OF THE SOILS IN THE SANANDREI COMMUNE, TIMIS COUNTY

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Abstract. *The studies covered by this work were carried out in the commune of Sanandrei, in Timis County. The commune territory is part of the Banat Plain, with an average altitude between 120-140 m. The soils were formed under a moderate continental climate. Groundwater is found at depths varying between 1.5 and 10 m, depending on the land sloping. Most soils are under the influence of the ground water, thus their properties are subject to the depth and extent of mineralization thereof. Similar studies and researches have been made by other authors, such as Nita L., Mihuț Casiana, Rogobete Gh., however on other types of soils occuring in different areas in the western part of the country. The data used in this paper is selected from former studies and books, provided by OSPA Timișoara, as well as our own observations in the field. The main types of soils studied were those displaying a higher natural fertility namely: Chernozems, preluvisoils and eutricambic soils. When analysing these soils, we presented their main physical properties, respectively: soil density, apparent density, total porosity and aeration porosity. The study material refers to the three types of soils and research methods used are the ones specific for the soil Physics laboratories The total porosity and aeration porosity have been determined by calculation. Soil texture is medium calyey-argillaceous, in the case of gleyic chernozem and molic preluvisoil and calyey-argillaceous, towards clayey, in the case of the eutricambi soil. The typical batigleyic Chernozem showed the best physical properties, followed by typical preluvosoil and the worst where displayed by the gleyic eutricambic soil.*

Keywords: *soil physical properties, texture, density, apparent density, porosity, fertility*

INTRODUCTION

The Sanandrei commune is located in the western part of our country, to the south of the Western Plain, also known as the Tisa Plain. It lies at a 12 km distance from the Timis county seat, near National Road 69 linking Timisoara to Arad, at an altitude of 61 meters above sea level. The settlement is located at the boundary between the high foothill plain of the glacial underhills, also called the Vingai Plain, and the lower, divagation plain, also called the Timişului Plain or the Torontalului Plain. The commune of Sinandrei consists of three localities, Sanandrei, Carani and Covaci, with a total area of 9684.25 hectares, of which 444.25 hectares are within the built-up areas and 9.240 hectares outside it.

The commune has got a temperate continental climate. There is a strong influence from the cyclones and warm air masses coming from the Adriatic Sea and the Mediterranean Sea, which generates a complete thaw in winter and stifling heat periods in summer. The average annual temperature is about 10° C, the warmest month is July and the coldest February.

The best physical properties were displayed by the typical batigleyic Chernozem soils and the worst by the gleyic eutricambic soils.

The studies conducted in the Sanandrei commune aim to contribute to the knowledge about the main physical properties of soils, thus analysing the soil fertility status, and in soils

with a natural low fertility, to find techniques and methods leading to an improvement in their fertility, so that these soils can be cultivated with most crop plants.

MATERIAL AND METHOD

This work is based on a selective evaluation of the data in the specialty literature on the fundamental, general and particular aspects on initiation of soil resources in the Sanandrei commune, along with a series of data from the OSPA Timisoara, the municipality Sanandrei and data gathered in the field.

The study material consists of three predominant soil types in the study area, namely: Chernozems, preluvisoils and eutricambic soils.

The main used methods are:

Soil texture – the Cernikova method (principle underlying the pipetting method consists in the veryig speed sedimentation of particles in a liquid, depending on their size, according to Stokes' law).

Soil density (cm3) - using the pycnometer with distilled water;

Soil apparent density (cm3) - using brass cylinders in natural alignment.

The total porosity PT (%) was calculated using the following formula:

$$PT = \left(1 - \frac{DA}{D}\right) x100$$

PA aeration porosity (%). In order to determine this calculation we used the values of hydro and physical indices:

PA = PT - CC x DA

CC - water capacity in the field.

RESULTS AND DISCUSSIONS

The physical properties of the three types of soils from the Sanandrei perimeter are shown in Tables 1, 2 and 3.

In Table 1, we presented the physical properties of typical batigleyic chernozem.

Table 1.

Physical and chemical properties of typical batigleyic chernozem

HORIZONS	**Aţ**	**Amk_1**	**Amk_2**	**A/Ccaac**	**$Ccaac_1g_2$**	**C/Go_3**	**C/Go_4**
Depth (cm)	0-5	5-18	18-50	50-75	75-140	140-165	165-200
Coarse sand (2.0 to 0.2 mm)%	0.3	0.4	0. 3	0. 2	0.3	0. 3	0. 5
Fine sand (from 0.02 to 0.02 mm)%	46. 7	48. 0	45. 8	45. 3	43. 6	48. 6	39. 3
Dust (0.02 to 0.002 mm)%	22. 7	22. 9	23. 8	23. 5	25. 7	26. 2	23. 2
Clay 2 (under 0.002 mm)%	30. 3	28. 7	30. 1	31. 0	30. 4	24. 9	32. 0
Natural clay (less than 0.01 mm)%	40. 4	38. 1	40. 5	40. 7	41. 3	37. 7	46. 5
TEXTURE	**LL**	**LL**	**LL**	**LL**	**LL**	**LL**	**LL**
Density (D g / cm3)	2. 53	2. 55	2. 53				
Apparent density (DA g / cm3)	1. 1	1. 35	1. 24	1. 14			

As one can observe in Table 1, the values of coarse sand ratios are fractionary, oscillating, ranging from 0.2% to horizon / Ccaac and 0.5% in the horizon C/GO4. The fine sand is well represented with high values between 39.3% C/GO4 and 48.6% in the horizon C/GO3. The dust presents values between 22.7% and 26.2% Atk horizon to horizon C/GO3. The clayey fraction present values range between 24.9% in the horizon C/GO3 and 32.0% in the CGo4 horizon. Taking the granulometric composition into account, the soil falls under the "medium textures" class, medium clayey subclass.

The apparent density value (DA) is extremely low in the surface horizon Atk with a very low 1.10 g /cm^3 value in the 18-75 cm interval, and low in the horizon Amk2 with a 1.35 g / cm^3 value.

Table 2 presents the main physical properties of typical preluvisoil from Sanandrei.

Table 2.

Physical and chemical properties of typical preluvisoil

HORIZONS	**Ap**	**Ao**	**AB**	**Bt_1w_1**	**Bt_2w_1**	**BCw_2**	**$Ccaw_1$**
Depth (cm)	*0-10*	*10-25*	*25-40*	*40-75*	*75-135*	*135-145*	*145-180*
Coarse sand (2.0 to 0.2 mm)%	0. 2	0. 3	0. 6	0. 4	0. 9	1. 9	2. 3
Fine sand (from 0.02 to 0.02 mm)%	33. 9	33. 7	31. 8	31. 3	30. 3	30. 9	32. 3
Dust (0.02 to 0.002 mm)%	31. 6	29. 3	28. 8	27. 5	26. 9	24. 9	22. 4
Clay 2 (under 0.002 mm)%	34. 3	36. 7	38. 8	40. 8	41. 9	42. 3	43. 0
TEXTURE	TT	TT	TT	TT	TT	TT	TT
Bulk density (Dg/cm^3)		2. 53	2. 54				

As one can observe in Table 2, the three main granulometric categories, sand, dust, clay, situate the soil in the fine texture class, subclass medium argillaceous clay. The clay fraction values range from 34.3% to 42.3 Ap horizon - 43% in the horizon BCw_2 and $Ccaw_1$ According to the textural differentiation index (Idt = 1.23), the soil is texturally undifferentiated. Dust presents the highest percentages in the Ap horizon - 31.6%, gradually decreasing to towards lower horizons down to a 22.4 value at a depth of over 150 cm. The fine sand is well represented quantitatively 30.3-33.9% with variations from one horizon to another for the entire profile height. Coarse sand, with much smaller quantitative values, presents the same percentage fluctuations as fine sand.

The soil textural class falls under "fine textures" subclass medium argillaceous clay, with a texturally undifferentiated profile.

The specific density increases from 2.53 g / cm^3 in the Ao horizon to 2.54 g/ cm3 in the AB horizon.

Table 3, shows the physical properties of the gleyic eutricambic soil in the Sanandrei perimeter, Timis County.

Table 3.

Physical and chemical properties of gleyic eutricambic soil

HORIZONS	**Ap**	**Ao**	**AByw**	**Btyw**	**Btyw**	**BC**	**Cg**
Depth (cm)	0-13	13-27	27-45	45-77	77-98	98-122	122-160
Coarse sand (2.0 to 0.2 mm)%	2.3	1.1	1.9	1.1	1.1	1.0	1.5
Fine sand (from 0.02 to 0.02 mm)%	33.4	35.8	28.4	28.4	31.4	29.3	29.7
Dust (0.02 to 0.002 mm)%	33.7	34.3	32.5	23.1	20.7	24.7	24.0
Clay 2 (under 0.002 mm)%	30.6	28.8	37.2	47.4	46.8	45.0	44.8
Natural clay (less than 0.01 mm)%	48.0	46.9	52.8	59.5	59.7	59.3	56.5
TEXTURE	**LP**	**T**	**T**	**AL**	**AL**	**AL**	**AL**
Bulk density (D g / cm3)		2.60	2.60	2.12			
Apparent density (DA g / cm3)		1.50	1.59	1.55			
Total porosity (PT%)		42.30	38.84	38.49			
Aeration porosity (PA%)		-1.99	-22.63	-49.90			
Degree of compaction (% GT)		14.86	23.92	26.99			

The data presented in Table 3 leads to the soil taxonomic unit: gleyic eutricambic soil, slightly gleyic, medium stagnogleyic, medium cogged up, on argils, clayey-dusty/argillasceous-clayey (Table 3).

It formed on parental materials with fine granulometric composition (argils or argillaceous fluvial-lacustrine deposits).

The texture is clayey-dusty in the first 7 cm, medium clayey between 7-20 cm, medium clayey-argillaceous between 20 and 35 cm, agrillaceous-clayey up to 84 cm and it becomes medium clayey-argillaceous in depth.

The skeleton content shows low values ranging from 2.60 to 2.12%.

The apparent density is between 1.50 and 1.59 g /cm^3.

The total porosity shows high values, namely 42.30% in the Ao horizon and decreases to 39.49% in the Btyw horizon.

CONCLUSIONS

In terms of the granulometric composition, the chernozem falls under the "medium textures" class, medium clayey subclass.

The typical preluvisoil falls under the textural class "fine textures", medium clayey-argillaceous subclass, undifferentiated in the profile.

The gleyic eutricambic soil formed on parent materials with fine granulometric compositions, respectively argils and argillaceous fluvial-lacustrine deposits.

The texture of the soil is a medium-fine one.

The preluvisoils can be planted with most agricultural crop plants, with a recommendation to use cereal and technical crops on slightly sloping or plain land, and vineyard and orchard plantations on steep versants.

To increase the productive capacity of preluvisoils, we recommend timely and good quality agricultural works, so as to preserve soil humidity and for a better ventilation and permeabilization.

In the case of the eutricambic soil, water maintenance in the first part of the soil profile is due to deficient physical properties of the parent material, but also due to secondary anthropogenic compaction, caused by agro-technical works carried out in improper humidity conditions. Some of these lands are invaded by a hydrophilic vegetation, which hinders soil tillage and favours crop weeding.

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