

## PEDOGEOMORFOLOGICAL DATA FROM TITU-DAMBOVITA AREA

Anca-Luiza STĂNILĂ<sup>1</sup>, Mihai PARICHI<sup>1</sup>, Stefan ISPAS<sup>2</sup>, Adrian BASARABĂ<sup>3</sup>

<sup>1</sup>*Spiru Haret* University, Faculty of Geography, Bucharest, 58 Timisoara Blvd., District 6, 061333, Bucharest, Romania, Phone: +40 214442071/104, Fax: + 40 214442071, E-mail: luizastanila2011@yahoo.com

<sup>2</sup>University "Wallachia" Targoviste, Faculty of Humanities, 34-36 Ion Stancu, 130104 Targoviste, Romania, Phone: +40245.2061.05, Fax: +40245.2061.05, E-mail: stispas@yahoo.com

<sup>3</sup>University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăști Blvd., District 1, 011464, Bucharest, Romania, Phone: +4021.318.04.66, Fax: + 4021.318.25.64, E-mail: basaraba\_adrian@yahoo.com

**Corresponding author e-mail:** luizastanila2011@yahoo.com

### Abstract

*As an integrated part of the Titu-Potlogi divagation plain, the territory to which we refer to (created by rivers) slightly descends down from the north to the south in narrow or wide steps (with absolute altitudes between 155 and 220 m), continuing to the Picior de Munte Plain (a subdivision of Târgoviște Plain) to which it is closely attached. In these conditions the soil cover is made out of a multitude of soils that belong to cambisols, luvisols, protisols, cernisols and hidrisols. Most of them have a weak acid reaction, a low content of humus and moderate supplying with nutrients. The main restrictions for agricultural production are caused by the lack of drainage, soil texture and the great variety of soils.*

**Key words:** soils, Titu-Sarata Plain, nutrients, drainage.

### INTRODUCTION

Systematic soil surveys in the Titu-Dâmbovița were held (1978) in order to sustain the project to remove excess moisture from an area of about 3500 ha of the northern Municipality [2].

### MATERIAL AND METHOD

The research comprised two parts: the land, which consisted of mapping and spatial reambulating studied 1:10.000 and 1:25.000 scale, with a collection of numerous soil and groundwater samples, with observations on relief, micro-, parent material, etc. Opened a significant number of soil profiles (150) to depths of 1-2 m, which were collected several samples. He then prepared a summary of samples and analyzes proposals (grain size, humus, reaction pH, exchangeable base saturation level, the physical and hydro, etc.).

Laboratory results were processed and interpreted as indicators of ICPA methodology [5].

Also soil map was completed and all correlative maps (relief, parent material, groundwater) and interpretative (pedoameliorativă clustering) of land. Morphological, physical, hydro and chemical properties of representative profiles are on the forms.

### RESULTS AND DISCUSSIONS

The territory to which we refer is located in the Titu-Sărata Plain and corresponds, in relation to geomorphological space, with an important part of Titu-Potlogi divagation Plain, and slightly to the South, to the Picior de Munte Plain (Fig. 1) [1, 3].

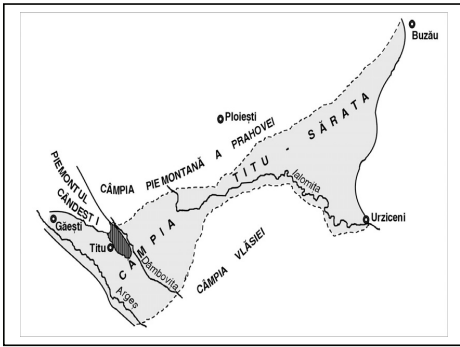


Fig. 1. The geographical position of the Titu-Sărata

The hydrogeological studies and the outcrops in the area show a less complex geological structure: silty clays or loess-like clays of fluvial origin, sand, sand and gravel mixtures with gravel at the base (Fig. 2).

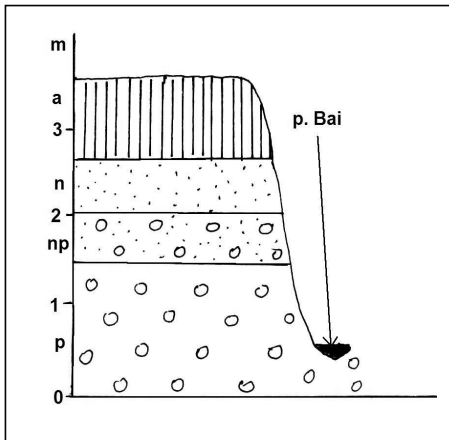


Fig. 2. Geology of the territory at Boteni and Serdanu  
 a- silty clays or loess-like loamy clays  
 n- sands  
 np- sands and gravels  
 p- gravels

The landscape is developed in slightly descending levels of 1.35-2.10 m absolute altitudes, wider or narrower, which constitute a divagation plain, looking like high meadows or fields looking slightly raised (Fig. 3) [2].

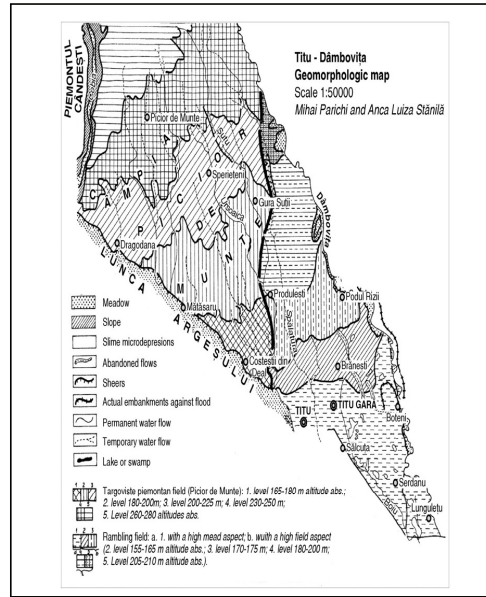


Fig. 3. Geomorphological map of the Titu-Dâmbovița area

The degree of fragmentation and the relief energy have extremely small values. Several shallow (0.3-1 m) creeks (Ursoaia, Șuța, Spălătura etc.) are the only waters crossing the highest parts, as well as Baiul brook, with its numerous meanders visible on high meadows. There are, also, the old riverbeds, oxbows and even small depressions that can be easily observed especially in the actual floodplain (at 135-150 m abs. alt.).

Data available for the investigated territory situates it in the moderate sub-thermal, sub-humid agro climatic area, i.e. the 2<sup>nd</sup> sub zone, characterized by relatively high heat resources (9.0-10.50°C) and water resources that often exceed 750 mm annually. The evapotranspiration slightly exceeds the minimum average rainfall (60-80 mm).

The Dâmbovița River and Baiul brook are the main draining elements of the area. Until recently, Dâmbovița went out of his bed at least once every 2-5 years by several points, starting from downstream the Rizzi bridge, till Serdanu. The above-mentioned streams flood the northern and western margins of the territory; their springs are situated in the Picior de Munte Plain.

Groundwater occurs at depths of 3-5 and 5-10 m, near Dâmbovița course, and at the limits of the upper relief. However, the dominant depths are at ranging from 1 to 3 m (Fig. 4).

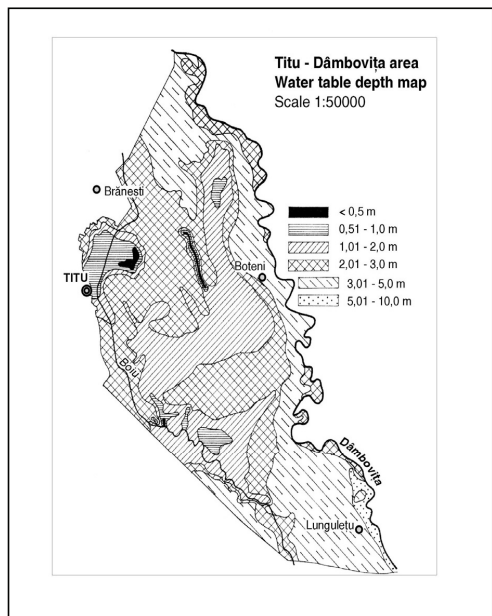


Fig. 4. Map of groundwater depth in Titu-Dâmbovița area

Under the specific of a divagation plain pedogenesis, there has formed a relatively wide range of soils belonging to Protisols, Cernisols, Cambisols, Luvisols, Hidrisols and Anthrisols (Fig. 5) [2, 4].

**Protisols** are represented by eutric and entic aluviosols. Usually, aluviosols characterize youngest relief forms, often subjected to alluviation by Dâmbovița. Most of them have a mollic character, are under the influence of groundwater and even appear as gleyed.

These soils present a moderately developed profile. Most of them have a medium clayey texture, and their granulometry is dominated by fine sand (Table 1, Fig. 4). They have a neutral pH reaction (7.0-7.2), low humus content (2.1-2.2%) and a medium total capacity of exchange (20-22 me/100 g of soil). Their nutrient supply is poor.

Only phreatic cambic chernozems or gleyed subtypes represent **Cernisols**. They appear locally, on higher parts of the floodplains, between Titu and Serdaru, being formed over

loess-like sediments and flat, well-drained surfaces. They have a well-developed profile. Fine sand is also predominant in their composition (40-46%), followed by the clay fraction (under 34%). They have a slightly acid to neutral reaction (6.4-7.2), small to medium humus content (3.0-3.25%) and mid-supply with nutrients (N, 0.15-0.16% P, 16-20 ppm and K between 137 and 175 ppm) (Table 1, 2) [5].

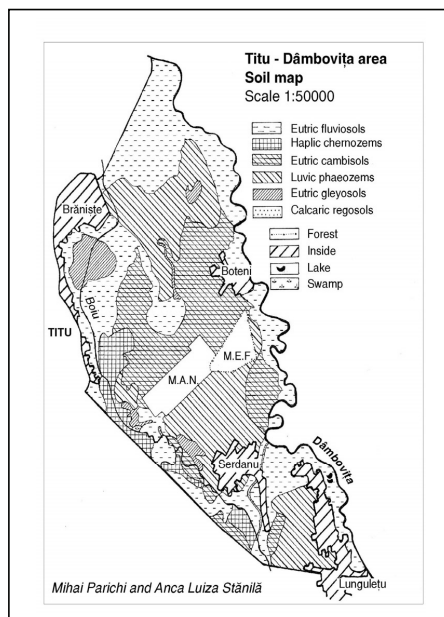


Fig. 5. Soil map of Titu-Dâmbovița area

Table 1. Major physical characteristics of soils in Titu-Dâmbovița area

Horizon	Depth	Granulometry			
		<0.002 mm	0.002-0.02 mm	0.02-0.2 mm	0.2-2.0 mm
<b>Mollic Aluviosol</b>					
Ap	0-16	25.8	24.8	42.5	6.9
Am	16-27	23.2	25.6	44.2	7.0
AC	27-42	22.6	28.1	39.8	9.5
C	65-85	25.7	19.3	46.5	8.5
<b>Typical Cambic Chernozem</b>					
Ap	0-18	28.7	25.7	41.6	4.0
Am	18-39	30.4	26.9	40.5	2.2
AB	40-50	33.2	31.3	34.5	1.0
Bv <sub>1</sub>	50-70	34.0	25.4	39.7	0.9
Bv <sub>2</sub>	80-100	32.1	29.9	37.1	0.9
<b>Gleyic Eutric Cambisol</b>					
Ap	0-20	30.1	24.5	44.5	0.9
Am	24-38	27.7	31.1	40.4	0.9
AB	38-50	24.8	27.2	47.0	1.0
Bv <sub>1</sub>	50-70	27.4	20.4	52.0	0.2
Bv <sub>2</sub>	75-95	23.9	21.1	54.3	0.7
CG	115-135	39.0	29.2	31.1	0.7

Table 2. Major chemical characteristics of soils in Titu-Dâmbovița area

Horizon	Depth	pH	Humus %	T me/100 g sol	Nt %	P mobil ppm	K mobil ppm
<b>Mollic Aluvisol</b>							
Ap	0-16	7.0	2.1	21.6	0.12	13.6	49.7
Am	16-27	7.1	2.0	20.6	0.10	45.5	88.8
AC	27-42	7.9	1.4	20.6	0.08	-	-
C	65-85	8.1	-	18.5	-	-	-
<b>Typical Cambic Chernozem</b>							
Ap	0-18	6.4	3.22	-	0.16	20.2	175.0
Am	18-39	6.9	2.08	-	0.13	16.3	137.1
AB	40-50	7.2	1.48	-	0.08	-	-
Bv <sub>1</sub>	50-70	-	-	-	-	-	-
Bv <sub>2</sub>	80-100	7.4	-	-	-	-	-
<b>Gleyic Eutric Cambosol</b>							
Ap	0-20	6.1	2.3	-	0.14	4.9	111.7
Am	24-38	6.7	2.1	-	0.11	5.10	95.7
AB	38-50	6.9	1.5	-	10.3	-	-
Bv <sub>1</sub>	50-70	7.1	-	-	-	-	-
Bv <sub>2</sub>	75-95	7.5	-	-	-	-	-
CG	115-135	-	-	-	-	-	-

**Cambisols** are spread over a compact central area and are represented by gleyic eutric cambosols. They have formed on aluvio-proluvial materials slightly turned into loess and present a well-developed profile.

Analytical data for these soils show moderate clay content (27-30% in the upper horizon and not more than 39% to the base), but relatively high content of fine sand (40-52%).

They have a slightly acid to neutral pH reaction and the degree of saturation locates them in the category of eubasic soils. As for the humus content, it is below 2.3%. The supply of nutrients in these soils is poor (Fig. 6, 7) [5].

**Luvissols** are also present in the territory, by *mollic-vertic preluvosols*, over compact areas between Braniște and Lungulețu.

They are characterized by a slight texture differentiation and a relatively high content of coarse sand. Their reaction is slightly acid to neutral (6.3-7.0), the humus content is low (2.4-3.2%), mainly concentrated within the upper horizon and a good supply of nutrients.

**Hidrisols** are represented only by *gleiosols*. These soils have a local appearance; their presence is due to some micro-depression areas and the existence of old, abandoned riverbeds near Boteni, Sălcuța and Săvești villages.

They have appeared on fluvial deposits, conditioned by a rich water regime. The hydrostatic level of groundwater is often hovering below 1 m depth.

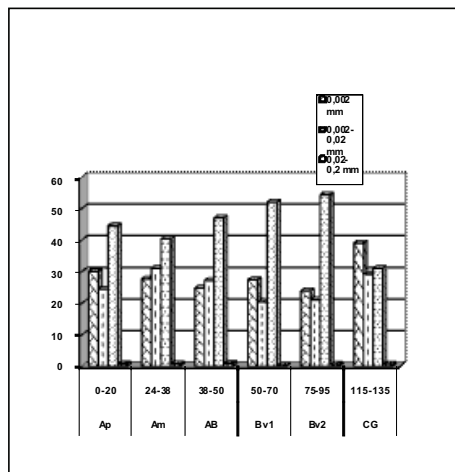


Fig. 6. Size composition of gleyed eutric cambosol

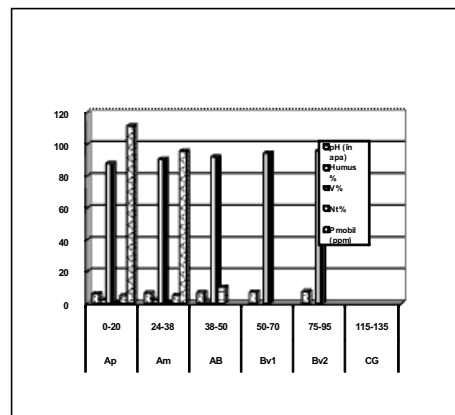


Fig. 7. Chemical properties of gleyed eutric cambosol

The profile of these soils denotes a slight variation of clay content that recalls, of course, some stratification of parent material.

They appear as loose (-42.6... -10%) and have high permeability at the surface and medium along the profile (3.1-96 mm/h).

In all cases, they have medium humus contents (4.3-4.8%), a neutral to slightly alkaline reaction (7.5-8.0) and a good supply of nitrogen nutrient (0.38%), but less adequate in phosphorus (3.6 ppm) and potassium (68.2 ppm) (Table 3, 4, Fig. 8, 9) [5].

Table 3. Physical characteristics of major soils of the Titu- Dambovița

Horizon	Depth	Granulometry			
		<0.002 mm	0.002-0.02 mm	0.02-0.2 mm	0.2-2.0 mm
<b>Mollic-vertic preluvosol</b>					
Ap	0-18	41.8	27.0	23.4	7.8
Amy	18-37	45.0	25.5	22.5	7.0
ABy	37-50	43.4	23.8	23.5	9.3
Bty	60-80	49.3	25.6	18.1	7.0
Bt	120-140	49.5	28.5	15.8	6.2
<b>Eutric-molic gleisol</b>					
Ao	0-8	32.0	24.1	40.7	3.2
AG	10-23	33.3	25.1	37.3	4.3
Gor	23-40	27.3	26.3	42.4	4.0
Gro	40-70	33.7	25.8	36.4	4.1
Gr	80-100	46.6	31.5	20.2	1.7

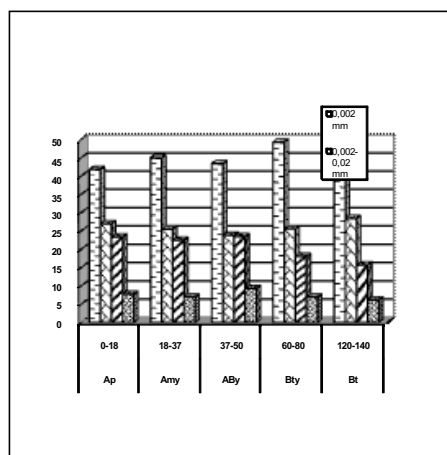


Fig. 8. Size composition of mollic vertic preluvosol

Table 4. Chemical characteristics of major soils of the Titu- Dambovița

Horizon	Depth	pH	Humus %	T me/100 g sol	Nt %	P mobil ppm	K mobil ppm
<b>Mollic-vertic preluvosol</b>							
Ap	0-18	6.7	3.2	94.2	0.18	20.8	188.4
Amy	18-37	6.3	2.4	92.3	0.13	1.8	116.3
ABy	37-50	6.6	1.5	93.2	0.12	-	-
Bty	60-80	7.0	-	96.6	-	-	-
Bt	120-140	7.7	-	-	-	-	-
<b>Eutric-molic gleisol</b>							
Ao	0-8	7.5	4.8	-	0.38	3.6	68.2
AG	10-23	7.6	4.3	-	0.24	10.4	95.7
Gor	23-40	7.7	2.4	-	0.16	4.1	64.8
Gro	40-70	7.8	1.5	-	-	-	-
Gr	80-100	7.6	-	-	-	-	-

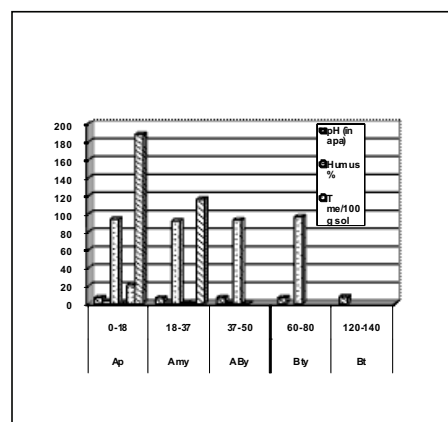


Fig. 9. Chemical proprieties of mollic vertic preluvosol

*Anthrisols* cover an insignificant area and are represented only by calcic erodosols.

They appear only on a former riverbed slope of Dîmbovița, in the Serdanu. They have an incipient *Ap-C* profile, weak loamy texture and are rarely used for pasture.

## CONCLUSIONS

Most of the investigated area is cultivated with cereals, but poor production results. Soils, relief and the drainage are the limiting factors.

The soil refers at texture (predominantly loamy and clayey and concerns the high degree of compaction and small permeability).

The relief imposes by slight alluvial irregularities and abandoned riverbeds and poor drainage occurs over more than two thirds of the territory. Floods add to all of these, even if they occur relatively rarely.

Under these conditions, most of the territory belongs to classes II (2207 ha) and III (673 ha) of land suitability to plowing.

To meet these shortcomings, a series of requirements for agro-pedo-ameliorative measures must be imposed for the impoundment of Dâmbovița between Lungulețu and Nucet localities: regulation of streambed, lavage, the improvement of soil aero-hydric regime and enforcement of agricultural work during the optimum time. A possible development for irrigation must be accompanied by an appropriate drainage system.

## REFERENCES

- [1] Mihăilescu, V., 1957. *On the high division of the Romanian Plain*. Studies and Research, No.3-4, Bucharest.
- [2] Parichi, M., Mircea, I., 1978. *Pedological study phase of the project on disposal of excess moisture from the unit hidroameliorative Titu River*. Archive ICPA, Bucharest.
- [3] Rădulescu, I., 1956. *Geomorphologic observations in Pitești Piedmont Plain*. Annals Univ. , No.10, Bucharest.
- [4] Spirescu, M., Parichi, M., 1970. *Soil Map of Romania, scale 1:200.000*. Sheet Targoviste, Geological Institute.
- [5] \*\*\* 1987. *Methodology development studies soil*, 3 vol, ICPA, Bucharest.