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NATURAL CONDITIONS FOR SOIL FORMATION AT VOITENI, TIMIS COUNTY, ROMANIA

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Abstract. *The studied territory is at the interference of the low plain (toward Jebel, Ciacova, Ghilad, and Banloc) with the high plain (toward Lieblieng, Folea, and Gătaia). Due to this interference area, the relief is fragmented. It has slopes of 1-5% from east to west, south-west. Altitude ranges between 92 m (south-western extremity) and 108 m (eastern extremity). (4) The low plain is a divagation plain made up of a succession of small hills and fluvial-lacustrine depression areas. This plain is mainly a recent plain, though it appears to have frequent bumps represented mainly by deserted meanders of old watercourses, micro-depressions, and small hills. This is due to the uneven deposit of alluvial material and to subsequent changes.(1) The small hills, whose texture is coarser than that of the surrounding forms of relief, shows manmade influences. In both plain and small hill areas, there are depression-like forms (small depressions, micro-depressions, inter-hill areas, wide depression areas, deserted meanders) where water stagnates for long periods, particularly during abundant rains and snow melting. (6) As for the depth of ground waters in the low plain, it ranges between 0.5 m (in depression areas) and 3-4 m in hill areas). The passage to high plain is after are rather sinuous route marked by more or less remarkable slopes ranging within 5-15%. The high plain area is located in western Voiteni and is a relatively even area interrupted here and there by narrow valleys. On this relatively even valley, there are small depressions with no natural drainage where water from rainfall stagnates during rainy periods (also because of the predominant loamy-clayey soil texture). Therefore, in both low plain and high plain areas we need to develop and improve the existing drainage system. (3)*
To carry out the study, we used both data from our own observations in the field and data from previous research. (5, 9)

Keywords: *natural conditions, soil genesis and evolution, climate conditions, ground water, relief*

INTRODUCTION

Geomorphologically, the studied area is part of the great physical and geographical unit called Tisa Plain, in its eastern part also known as Romanian Western Plain. (2)

Lithologically, the Commune of Voiteni is characterised by a succession of strata of different age, thickness, and granulometric structure depending on meso- and micro-relief conditions. The coarser sand content in these deposits point to a fluvial origin that was later loessofied. (8)

The Commune of Voiteni is 36 m south from Timisoara, Timis County, and 7.5 km north from Deta. It is neighboured by Gataia in the south, Jebel in the north, Folea in the east, Birda in the east, and Ghilad and Ciacova in the west. (7)

The soils evolved differently, depending on area. The soils formed in the low plain on uneven relief with slopes 1-5% are chernozems, and the soils formed in the high plain on loamy-clayey or clayey material are preluvosols. (10)

MATERIAL AND METHOD

To carry out this study, we used both data from literature, observations from our field work, as well as data from the Voiteni Town Hall and from the Weather Station in Timisoara.

RESULTS AND DISCUSSION

The different soil types and sub-types in the studied area are the result of activity of soil genesis factors in time and space; decisive ones are rock, relief, climate, vegetation, hydrography, hydrology, and fauna, plus the manmade factor which, from draining and drainage to intensive agriculture caused the most important changes in the soil.

In the low plain area in the west and south-west of the studied area, in a climate with mean annual rainfall between 600 and 700 mm and at annual mean temperatures of 10-11°C, a wide variety of soil types and sub-types formed as a result of the differentiated action of ground waters along the profile, of the micro-relief and of parental rocks.

In the high plain area, there are frequent narrow or wider valleys that host temporary watercourses during rainy periods or snow melting. There are also numerous deserted meanders and depression areas which, together with small depressions in the high plain collect rainfall water from the positive relief forms around.

Because of the predominant loamy-clayey texture and of low soil permeability, stagnating waters last long periods on agricultural lands.

This is why the current draining canal system needs to be extended and modernised to diminish surface moisture excess successfully. At the same time, the relatively small depth of ground waters in the low plain (0.5- 3 m) correlated with the draining system needs to also aim at the decrease of the ground water below 2-3 m.

As for local climate, the studied area is characterised by a moderate temperate-continental climate with shorter milder winters permanently under the influence of hotter wetter air masses from the Mediterranean and the Adriatic. Mean monthly temperatures have different values, as shown in Table 1.

Table 1.

Mean annual temperatures at the Weather Station in Timisoara

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Temperature (°C)	-1.2	0.4	6.0	11.3	16.4	19.6	21.6	20.8	16.9	11.3	5.7	1.4

Data presented in Table 1 show that the lowest temperatures are in January and February and the hottest in July and August.

As far as the thermal regime of the soil is concerned, it has a slower evolution in February-March, closely following the air temperature evolution.

There is the same evolution in the fall (from the end of September to the first decade of December) with somehow more obvious differences (1-2°C) between the temperature of the ploughed soil and of the air. The multiannual value of soil temperature is constantly above 5°C at the beginning of the second decade of March. In the horizon of 10 cm, temperature is frequently above 10°C in the first decade of April; after about 205 days (October 27-31), it drops again below 10°C.

Depending on granulometric structure, colour, moisture, soil coverage level, etc., these values oscillate within 0.5-1.5°C.

The monthly mean amount of rainfall is as shown in Table 2 below.

Table 2.

Mean annual rainfall amount at the Weather Station in Timisoara

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Rainfall (mm)	40.9	40.2	41.0	50.0	66.7	81.1	59.9	52.3	47.1	54.8	48.6	47.8	630.4

Most rainfall occurs usually in May-July, and the least in January-February.

The first snows occur usually at the end of November and the last ones, at mid-February. Data in the two tables show that both temperatures and rainfalls generally meet crop requirements in the area.

The distribution of mean monthly rainfalls, insufficient in hotter periods to ensure soil moisture proper for crops, asks for supplementary water supply through irrigations.

Wind regime is as follows: the most frequent winds come from the north (16.9%) and east (15%); the most intense come from the south and north, and calm days represent 20.9% of a year.

Mean air relative moisture is about 74%.

The mean number of days with white frost is 47.6.

As for natural vegetation, it differs on the depth of ground water, on its mineralisation level, on land slope, and on soil type, as follows: in close depressions where water stagnates for long periods, there are associations of *Phragmites communis*, *Calamagrostus pseudophragmites*, *Carex spp.*, *Juncus spp.*, and *Tipha latifolia.*

On some soils in the low plain area, the presence of salts in large amounts caused the establishment of halophile vegetation, which has become here and there predominant. It is represented, in general, by a small number of low nutrient value species. Thus, on moderate or strong saline or alkaline soils there are species like *Nardus stricta*, *Puccinelia distans*, *Plantago schwarzenbergiana*, *Statice gmelini*, *Cynodon dactylon*, *Camphorosma ovata*, etc.

As for woody vegetation on these soils there are such species as *Tamarix gallica*, *Crataegus monogina*, *Pirus piraster*, etc.

In the studied area, we identified the following soil types and sub-types: poor, alkaline Gleyey chernozem; loamy, low-levigated chernozem; vertic, stagnogley preluvosol; and mollic, moist phreatic preluvosol.

CONCLUSIONS

In this paper, after a detailed presentation of the natural landscape aimed at explaining phenomena and processes occurring in the soil and the climate conditions in the area, we identified both types and sub-types of soil and natural vegetation (both grassy and woody).

The studied area is part of the Timis River basin, the Birda basin. There are no permanent watercourses within the studied territory.

As far as the thermal regime of the soil is concerned, it has a rather slow evolution in February-March, following closely air temperature regime.

There is the same evolution in the fall 9from the end of September to the first decade of November), with somehow more obvious differences (1-2°C) between the ploughed soil temperature and air temperature. Multiannual soil temperature is constantly above 5°C at the beginning of the second decade of March. In the horizon of 10 cm, temperature is frequently above 10°C in the first decade of April, and after about 205 days (October 27-31) temperature drops again below 10°C.

Depending on granulometric structure, colour, moisture, soil cover level, etc., these values oscillate between 0.5 and 1.5°C.

The distribution of mean monthly rainfalls – not enough during hot months to ensure soil moisture in accordance with crop requirements – ask for supplementary water from irrigations.

In the studied area, we identified the following soil types and sub-types: poor, alkaline Gleyey chernozem; loamy, low-levigated chernozem; vertic, stagnogley preluvosol; and mollic, moist phreatic preluvosol.

To bring soil and other edaphic factors to the most favourable state for crop growth and development, we need to accompany economic evaluation of the soil by technological characterisation of the lands on which to establish measures to be taken.

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