# MAIN HYDRIC FEATURES OF A CAMBIC CHERNOZEM IN TIMISOARA, ROMANIA

**S.MERTICARIU, Nicoleta Florina BOJINESCU, C. PAȘCALĂU, Casiana MIHUȚ, A.OKROS**

***University of Agricultural Sciences Banat Veterninară „King Michael I of Romania"***

***Timisoara, Arad Way, no. 119, Romania, Phone: +4025627475, Fax: +40256200296,***

*Corresponding author: casiana_mihut@usab-tm.ro*

***Abstract.*** *The goal of this paper was to determine and know the main hydric features of the studied soil: hygroscopicity coefficient, field capacity, total water capacity, and useful water capacity. (5) The objectives aimed at were: characterising the studied area from the perspective of its natural conditions; studying the main hydric features of the soils; describing and determining the main hydric features of the cambic chernozem in Timisoara, Romania – hygroscopicity coefficient, field capacity, total water capacity, and useful water capacity; and diversifying and specialising soil researches and studies in the field.(2) What influences negatively the soil yielding potential in the area are mainly rain water stagnating, which delays certain works, particularly during rainy periods. (1,3) In Romania, the area affected by moisture excess measures about 3 million ha (from 6,300 ha in the Dobrogei Plateau to 882,900 ha in the Danube flooding area), i.e. about 13% of the total area of the country and over 20% of its agricultural lands. Knowing these features can help us take all necessary measures to increase the yielding capacity of these soils and get higher better-quality yields even on soils with moisture excess. (4)*

***Key words*****:** *soil, cambic chernozem hygroscopicity coefficient, field capacity, total water capacity, and useful water capacity*

## INTRODUCTION

Research was carried out on a cambic chernozem at the Didactic Station in Timisoara, Romania. The area under study measures 268 ha and it is located within the Banat's University of agricultural Science and Veterinary Medicine "King Michael I off Romania" from Timisoara, Romania, between NR 69 Timisoara-Arad (in the east) and CR Timisoara-Sannicolau Mare (in the west), starting with urban Timisoara (in the south) and ending on the left bank of the Niarad rivulet (in the north). (7)

Geologically, the area is part of the great eastern Pannonia Depression that took shape by the gradual clogging of the lake during the Pleistocene and the Quaternary. (6)

Lithologically, it is characterised by a succession of layers of different age, thickness and granulometric composition depending on meso- and micro-relief forms. Thus, the hills are made up of deposits of even texture, medium to 1.0-1.5 m, followed by coarse texture.(9)

The area is part of the group of the south-western hydrographic systems, the Bega-Beregsau river basin (N. ONU, 1972).

As for the level of ground waters, it depends directly on the meso- and micro-relief forms, on the nature and depth of hydro-geo-pedologic horizons, on season, on precipitations, and on hydro-ameliorative works. (10)

Ground water is 1.1-1.2 m deep in the soil, overlaying poorly sinuous contact areas between negative (meanders and small falls) and positive (hills, mounds, and plateaus) forms. The current level of these waters is not the natural one. The major network of canals from the second half of the 19$^{th}$ century was overlain by a relatively recent network of canals which, associated with the drain network, aimed at overtaking the moisture excess from the surface and the ground and at maintaining the level of ground water below critical levels.(8)

## MATERIAL AND METHOD

The material studied was a type of cambic chernozem within the Didactic station of the B.U.A.S.V.M. from Timisoara, Romania.

Soil was sampled from the horizon 0-20 cm, from three different locations: Sample 1, from the park of the University, where the main vegetation is forestry; Sample 2, from cultivated soil; and Sample 3, uncultivated soil covered by grassy vegetation.

Soil was sampled in 2017 and 2018, in April, before sowing maize (Sample 2, cultivated soil).

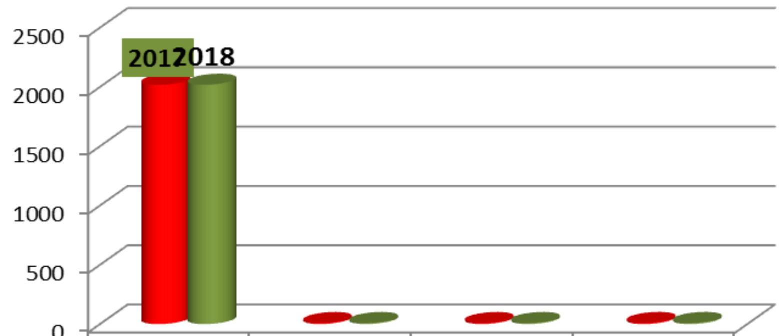
Each soil was sampled five times and results were obtained from the calculus of the mean of the five replicates.

The methods used in determining soil hydric features were specific.

## RESULTS AND DISCUSSION

Measurements in the field and in the laboratory supplied the following results:

**1.** The **hygroscopicity coefficient** serves characterising soils due to its relation with texture, and obtaining wilting coefficient through calculus. Data are shown in Figure 1.




| | Denumirea | Parc | Sol cultivat | Sol necultivat |
|---|---|---|---|---|
| Series1 | 2017 | 8,58 | 8,57 | 8,9 |
| Series2 | 2018 | 8,57 | 8,59 | 8,87 |

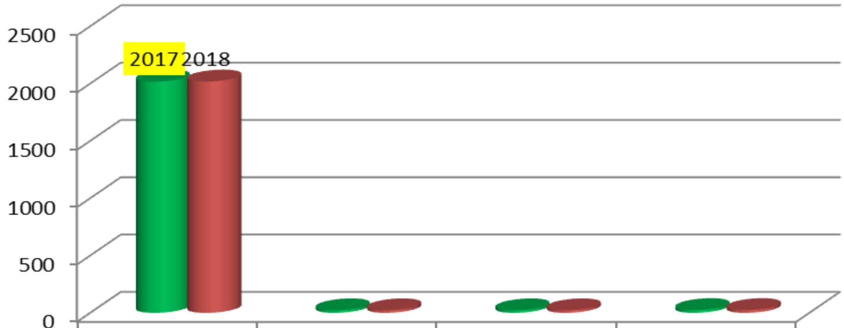
Figure 1. Hygroscopicity coefficient (HC %) 0-20 cm deep in the soil

Hygroscopicity coefficient (HC %) in the Park was 8.58% in 2017 and 8.57% in 2018.

In the cultivated soil, this coefficient was 8.57% in 2017 and 8.59% in 201; in uncultivated soil, it was 8.90% in 2017 and 8.87% in 2018.

This means that hygroscopicity coefficient in 2017 was **higher** than in 2018 in all three locations. The cultivated soil has a **lower** coefficient in 2017 than in 2018. As for the uncultivated soil, it had a **higher** hygroscopicity coefficient in 2017 than in 2018.

**2. Soil field capacity** is the upper limit of the moisture range significant for plant growth because, above this level, water is no longer retained in the soil. Apparent density has a particular influence on field capacity. Results are shown in Figure 2.




| | Denumirea | Parc | Sol cultivat | Sol necultivat |
|---|---|---|---|---|
| Series1 | 2017 | 22,15 | 22,07 | 24,03 |
| Series2 | 2018 | 22,21 | 22,09 | 24,12 |

Figure 2. Soil field capacity (FC %)

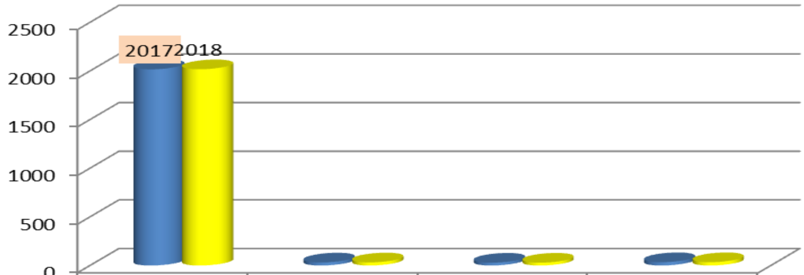
In the Park, field capacity ranged between 22.15% in 2017 and 22.21% in 2018.

In the cultivated soil, values ranged between 22.07%) in 2017 and 22.09% in 2018.

In uncultivated soil, values ranged between 24.03% in 2017 and 24.12%) in 2018.

As a conclusion, field capacity had a **medium** value in the Park. Cultivated and uncultivated soils ranged between **21-25% g/g** in both 2017 and 2018.

**3. Total soil water capacity** is the hydro physical indicator corresponding to water saturated soil, i.e. the maximum amount of water in the soil, when all the soil pores are filled with water. The value of this indicator depends mainly on total soil porosity. The values obtained are shown in Figure 3.




| | Denumirea | Parc | Sol cultivat | Sol necultivat |
|---|---|---|---|---|
| Series1 | 2017 | 31,45 | 29,37 | 34,35 |
| Series2 | 2018 | 32,24 | 29,39 | 34,42 |

Figure 3. Total soil water capacity (TC %)

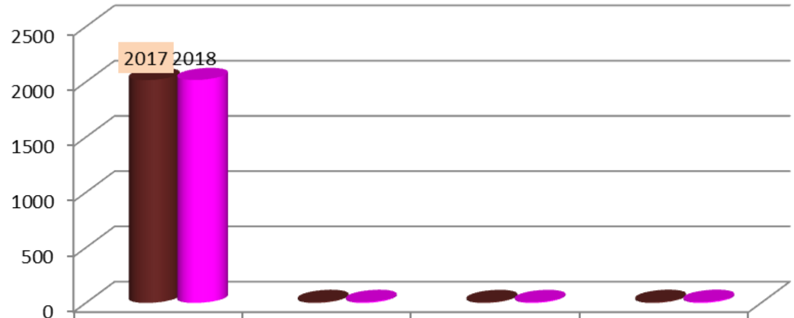
Total soil water capacity in the Park was 31.4% in 2017 and 32.24% in 2018.

In the cultivated soil, the values were 29.37% in 2017 and 29.39% in 2018.

In the uncultivated soil, total soil water capacity ranged between 34.35% in 2017 and 34.42% in 2018.

In conclusion, we can say that total soil water capacity in the Park and in both cultivated and uncultivated soils was **lower** in 2017 than in 2018.

**4. Soil useful water capacity** represents the interval between wilting coefficient and soil field capacity, more precisely, the amount of water the soil can retain and supply to the plants (Figure 4).




| | Denumirea | Parc | Sol cultivat | Sol necultivat |
|---|---|---|---|---|
| Series1 | 2017 | 10,18 | 9,37 | 10,85 |
| Series2 | 2018 | 10,32 | 9,41 | 10,92 |

Figure 4. Soil useful water capacity (UC %)

Soil useful water capacity in the Pak was 10.18% in 2017 and 10.32% in 2018.

In the cultivated soil, it ranged between 9.37% in 2017 and 9.41% in 2018.

In uncultivated soil, its values ranged between 10.85% in 2017 and 10.92% in 2018.

In conclusion, according to the ICPA Bucharest, useful water capacity (UC %) in the Park and cultivated soil had **low** values in both 2017 and 2018, ranging between **8-10% g/g**. As for the uncultivated soil, the value of soil useful water capacity was **medium**, i.e. about **11% g/g**.

## CONCLUSIONS

Soil sampled from 0-20 cm deep in the three locations (Park, cultivated soil and uncultivated soil) within the precincts of the B.U.A.S.V.M. in Timisoara, and analysed in the laboratories of the Soil Science discipline in 2017 and 2018 allow us to draw the following conclusions:

- *Hygroscopicity coefficient* had higher values in 2017 than in 2018 in all three locations. Cultivated soil had a higher value in 2017 than in 2018. In exchange, uncultivated soil had a higher value in 2017 than in 2018.
- *Field water capacity* had values ranging between 22.15% in 2017 and 22.21% in 2018 in the Park; between 22.07% in 2017 and 22.09% in 2018 in the cultivated soil; and between 24.03% in 2017 and 24.12% in 2018 in the uncultivated soil;
- *Total soil water capacity* was between 31.4% in 2017 and 32.24% in 2018 in the Park; between 29.37% in 2017 and 29.39% in 2018 in the cultivated soil; and between 34.35% in 2017 and 34.42% in 2018 in the uncultivated soil.
- *Useful soil water capacity* was 10.18% in 2017 and 10.32% in 2018 in the park; 9.37% in 2017 and 9.41% in 2018 in the cultivated soil; and 10.85% in 2017 and 10.92% in 2018 in the uncultivated soil.

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