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INFLUENCE OF SOIL WORKS ON THE MAIN HYDRIC FEATURES OF THE CAMBIC CHERNOZEM IN TIMISOARA, ROMANIA

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Abstract. *The goal of this paper is to present the main hydric features of the cambic chernozem in Timisoara, Romania, i.e. hygroscopicity coefficient, field capacity, total water capacity, and useful water capacity. (4,9) The objectives aimed at are characterising the studied area from the perspective of its natural conditions, studying the main soil hydric features, describing and determining the main hydric features of the cambic chernozem at the Didactic Station in Timisoara, Romania – hygroscopicity coefficient, field capacity, total water capacity and useful water capacity, and diversifying and specialising soil research and studies in the field. Soil was sampled in five replicates from 0-20 cm deep in the soil, in three different points: (310) Sample 1 – Ploughed soil; Sample 2 – Ploughed soil + disked and Sample 3 – Uncultivated soil covered by grassy vegetation. Soil sampling was done in two years,2017 and 2018, in April, before sowing maize, in samples 1 and 2 on cultivated land. In general, moisture excess – ground or stagnant – is the amount of water making the soil improper for working or cultivating, it is water above or below the level necessary for plants to grow. Moisture excess is a limiting factor of soil productivity; it damages crops determining a decrease of agricultural production. Sometimes, soil excess water can totally compromise the crop by impeding or even interrupting vegetation; this is why we made measurements of soil water supply.(7,8)*

Key words: *soil works, cambic chernozem, ploughed soil, uncultivated soil covered by grassy vegetation*

INTRODUCTION

The genesis of the studied area is strictly related to an intense fragmentation of the crystal massif into distinct blocks separated by wide depression corridors filled with sedimentary materials. The perimeter is located at the intersection of two such blocks – Seceani – Arad and Timişoara – Arad. (14) These deposits are made of successions of loams, sands and gravel from eastern exondated areas that they continually denuded. (2,11)

Negative relief forms in the area are frequently represented by depression areas made up of fine texture deposits (loamy-clayey, loamy) within 1.0-1.5 m turning into medium-fine texture deposits (clayey-loamy, loamy-clayey-dusty) up to 2 m. in general, both parental materials and subjacent materials have different contents of $CaCO_3$ (from 1-2% to 12-18%).(1)

These materials sometimes contain different amounts of soluble salts (sodium) representing one of the conditions for the formation of salinized and alkalised soils in the area, to which adds the presence of ground waters at low depth (which often affects the soil profile) and their slow drainage, which finally contributes to enriching soil horizons with different amounts of salts (under the influence of evapotranspiration).m (6,12)

MATERIAL AND METHOD

The material studied is represented by a cambic chernozem within the Didactic Station in Timisoara, Romania. Soil was sampled from 0-20 cm in three different points:

Sample 1 – Ploughed soil; Sample 2 – Ploughed soil + disked and Sample 3 – Uncultivated land covered by grassy vegetation.

Soil sampling was done during two years, 2017 and 2018, in April, before sowing maize in the soil samples 1 and 2 – Cultivated soil.

Each soil sample was taken in five replicates and results consisted in the means of the five replicates.

The methods used to determine soil hydric features are specific: determining soil moisture, determining moisture, determining hygroscopicity coefficient, determining field capacity, determining useful soil water capacity, and determining wilting coefficient.

RESULTS AND DISCUSSION

Hygroscopicity coefficient

This coefficient helps characterising soils in general due to its relation with texture, and also calculating wilting coefficient. Data after measuring this indicator are presented in Table 1.

Table 1.

Hygroscopicity coefficient for different uses

Name	2017	2018
Sample 1 – Ploughed soil	8.56	8.55
Sample 1 – Ploughed soil + disked	8.52	8.53
Sample 3 – Uncultivated soil (grassy vegetation)	8.80	8.90

In sample 1, hygroscopicity coefficient ranged between 8.56% in 2017 and 8.55% in 2018, while in the sample ploughed soil + disked, its values ranged between 8.52% in 2017 and 8.53% in 2018, with very small differences. In the uncultivated soil covered by grassy vegetation, this coefficient had values ranging between 8.80% in 2017 and 8.90% in 2018.

Field capacity

Field capacity depends particularly on soil texture and also on apparent density. The values of this indicator are shown in Table 2.

Table 2.

Field capacity values (%) for different uses

Name	2017	2018
Sample 1 – Ploughed soil	22,26	22,24
Sample 1 – Ploughed soil + disked	22,03	22,01
Sample 3 – Uncultivated soil (grassy vegetation)	24,08	24,14

In cultivated soils (after ploughing), this hydro-physic indicator had values ranging between 22.26% in 2017 and 22.24% in 2018, compared to the variant ploughed + disked, where it ranged between 22.03% in 2017 and 22.01% in 2018. On uncultivated soil, where grassy vegetation predominates, its values ranged between 24.08% in 2017 and 24.14% in 2018.

Total soil water capacity

This is an indicator whose values depend on total soil porosity. Results are shown in Table 3.

Table 3.

Total soil water capacity (%) for different uses

Name	2017	2018
Sample 1 – Ploughed soil	31,42	32,28
Sample 1 – Ploughed soil + disked	29,35	29,28
Sample 3 – Uncultivated soil (grassy vegetation)	34,46	34,49

The values of this indicator in Sample 1 ranged between 31.42% in 2017 and de 32.28% in 2018, while in Sample2, these values ranged between 29.35% in 2017 and 29.28% in 2018. On uncultivated soil (Sample 3), its values ranged between 34.46% in 2017 and 34.49% in 2018.

Total soil water capacity

This indicator had different values during the two research years. Its values are shown in Table 4.

Table 4.

Total soil water capacity (%) for different uses

Name	2017	2018
Sample 1 – Ploughed soil	10,21	10,27
Sample 1 – Ploughed soil + disked	9,20	9,25
Sample 3 – Uncultivated soil (grassy vegetation)	10,91	10,94

On the ploughed soil, total soil water capacity had values ranging between 10.21% in 2017 and 10.27% in 2018, while on the soil ploughed + disked, its values ranged between 9.20% in 2017 and 9.25% in 2018. On uncultivated soil, its values ranged between 10.91% in 2017 and 10.94% in 2018.

CONCLUSIONS

Measurements made during the two research years in the three locations where we sampled soil – ploughed soil, ploughed soil + disked and uncultivated soil (covered by grassy vegetation) at the Banat's University of Agricultural Science and Veterinary Medicine "King Michael I of Romania" from Timișoara, followed by measurements conducted in the laboratories of the Soil Science Department (Soil Science and Soil Physics) allow us to claim the following:

- The hygroscopicity coefficient in location 1 – ploughed soil had values ranging between 8.56% in 2017 and 8.55% in 2018, while in location 2 – ploughed soil + disked, its values ranged between 8.52% in 2017 and 8.53% in 2018, with little differences. In location 3 – uncultivated land, its values were higher and they ranged between 8.80% in 2017 and 8.90% in 2018.

- Field capacity in sample 1 – ploughed soil, had values ranging between 22.26% in 2017 and 22.24% in 2018, compared to Sample 2 – ploughed soil + disked, where this indicator had lower values ranging between 22.03% in 2017 and 22.01% in 2018, while in Sample 3 – uncultivated land, its values were higher and ranged between 24.08% in 2017 and 24.14% in 2018.

- Total soil water capacity in Sample 1 had values ranging between 31.42% in 2017 and 32.28% in 2018, while in Sample 2, its values were lower and ranged between 29.35% in 2017 and 29.28% in 2018. On uncultivated soil, its values ranged between 34.46% in 2017 and 34.49% in 2018.

- Total useful water capacity in location 1 – ploughed soil, had values ranging between 10.21% in 2017 and 10.27% in 2018, while in location 2 its values decreased to 9.20% in 2017 and 9.25% in 2018. In location 3, its values were higher and ranged between 10.91% in 2017 and 10.94% in 2018.

Therefore, in all situations, the lowest values were in Sample 2 – ploughed soil + disked and the highest ones were in Sample 3 – uncultivated soil covered by grassy vegetation.

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