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DETERMINATION OF THE PHYSICAL PROPERTIES OF THE SOILS IN THE MUNICIPALITY OF TORMAC, TIMIȘ COUNTY

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Abstract: The paper presents a case study carried out on a farm in the town of Tormac, Timiș county, on an area of 48 ha during 2021 and 2022. A series of researches were carried out on the physical properties of the three types of soil identified: eutricambosol, preluvosol and gleosol. Texture, density, apparent density, total porosity and aeration porosity were thus determined. Each soil type occupies different areas and are cultivated with grain corn, sunflowers, winter wheat, oats, red clover and alfalfa. Thus, the results obtained showed that, during the two years, another area was cultivated with each plant, namely: 3 ha with sunflowers in 2021, respectively 6 ha, in 2022, in rotation with autumn wheat and red clover on eutricambosol; 12 ha of grain corn in 2021, respectively 14 ha in 2022 in rotation of winter wheat and alfalfa on preluvosol; 3 ha with maize for grain in 2021, respectively 4 ha in 2022 in rotation with oats, on gleosol.

Regarding the results of physical properties, it was found that: eutricambosol and preluvosol have a medium clay loam texture, while in gleiosol the texture is dusty loam; soil density has lower values on Preluvosol and higher on Gleiosol, with an average between 2.62-2.67 g/cm³. The apparent density has lower values on the preluvosol (1.43-1.45 g/cm³) and higher on the gleiosol (1.46-1.48 g/cm³); total porosity has values between 43.38% on gleosol and 48.12% on preluvosol, with an average of 44.8%, and aeration porosity had the lowest values on gleosols and the highest on preluvosols, with an average between 8.45% and 16.45%.

• Introduction

Agriculture is the basic branch of society, carried out in order to ensure food resources and other resources needed in different economic sectors. It contributes to the sustainable development of the economy both for the current generation and for future generations, provided that it is practiced on the basis of sustainable, sustainable principles (POPESCU, C.A., HERBEI, M.V., SALA, F., 2020).

Thus, agriculture has a decisive impact on man due to the fact that it is the main source that provides food for mankind. At the same time, by providing food, the main responsibility assigned to agriculture is also that of protecting the soil and the environment in general. Food production depends on many factors, but the quality of the land and implicitly the soil has a decisive role (MIHUȚ CASIANA, L. NIȚĂ, 2018).

Numerous regional or extensive statistics show that the population of the globe is continuously increasing, and on the opposite side, arable land is present, which from one year to the next is continuously decreasing as an average area per inhabitant (DUMA COPCEA ANISOARA, ET AL., 2016; MIHUȚ CASIANA, ET AL., 2019).

A series of recent information shows that due to various forms of degradation, it is estimated that approximately 1 ha of arable land is lost every six seconds, with many countries already reaching the limit value of arable land area. Consequently, due to these changes, man must place a major interest on the sustainable use of agricultural land, through innovative technologies, for systems of sustainable use of agricultural land, which prevent or minimize soil degradation, restore the productive capacity and vital processes of degraded soils (ȚĂRĂU D., BORZA I., DUMITRU M., CIOBANU C., 2007).

• Material and method

The material used is represented by the three soils identified within the studied perimeter from the locality of Tormac, Timiș county, respectively: Eutricambosol, strongly leached typical; Typical Preluvosol and Weak Carbonate Gleiosol. Each soil occupies different surfaces and are cultivated with grain corn, sunflower, winter wheat, oats, red clover and alfalfa (OSPA TIMIȘOARA, 2020-2022).

In the paper, we determined the properties of the three soils from the point of view of its physical properties.

The collection of soil samples was carried out on genetic horizons, in modified layout and in natural layout, in metal cylinders of known volume, at the optimal soil humidity and in specially made cardboard boxes.

The preparation of the samples for the laboratory determinations consisted of the removal of organic remains and some accidental skeleton traces, then they were mortared and sieved (with the exception of the soil samples collected in natural setting).

The following methods were used to perform the physical determinations:

- Granulometric analysis – by the Cernikova method.
- Density (D, in g/cm³): by the pycnometer method and by estimation depending on the amount of humified organic matter and the percentage of granulometric fractions.
- Apparent density (DA, in g/cm³): by the method of metallic cylinders with known volume.
- Total porosity (Pt, in %): by calculation $Pt = (1 - DA / D) \cdot 100$.
- Aeration porosity (Pa, in %): by calculation $Pa = Pt - CC \cdot DA$.

Tormac commune is located in the southeast of Timiș county. It is bordered to the north by the communes of Nițchidorf and Sacoșul Turcesc, to the south by the commune of Gătaia, to the west by the communes of Voiteg and Liebling, and to the east by the county of Caraș Severin.

• Results and discussions

Within the studied perimeter, three types of soils belonging to three different classes were identified, namely:

- ◊ Class Cambisols, Eutricambosol;
- ◊ Class Luvisols, Preluvosol;
- ◊ Class Hydrosols, Gleiosol.

The total area studied was 48 ha, distributed as follows:

- ◊ 10 Ha, respectively 20.83% is occupied by Eutricambosols;
- ◊ 29 Ha, respectively 60.42% being occupied with Preluvosols;
- ◊ 9 Ha, respectively 18.75%, with Gleiosols.

As can be seen from the data presented above, the largest area is the Preluvosol, with 29 ha of the 48 hectares studied, followed closely by the Eutricambosol, with 20.83%, respectively 10 ha and the Gleiosol with 18.75%, 9 ha.

On the three types of soils identified within the 40 hectares studied, we determined a series of physical (texture, density, apparent density, total and air porosity) and chemical (pH, N content, N index) properties and humus content and am stability which are the factors that limit the fertility of these soils.

All determinations were made during 2021 and 2022, the soils were cultivated with a series of plants, namely: grain corn, sunflower, winter wheat, oats, red clover and alfalfa, making a rotation of crops, as can be seen from table 2.

The three locations were cultivated as follows (table 2.):

- Sunflower was cultivated on 3 ha, respectively 6 ha, in rotation with autumn wheat, on 6, respectively 3 ha and red clover, year 1, on 1 ha in the case of eutricambosol type soil;
- On Preluvosol: grain maize 12 ha, in 2021, respectively 14 ha in 2022 in rotation with winter wheat and alfalfa, year 3 on the 3 Ha;
- On Gleiosol: grain corn on reduced areas, respectively 3 ha in 2021 and 4 in 2022, out of the 9 ha, in rotation with oats. The red clover occupies 2 ha and is in its 2nd year, the crop being established in April 2021.

The texture of Eutricambosol is medium clay loam.

The clay content is 33.0% in the two years of the study and the dust content is 30.1% in 2022 and 30.4% in 2021. Fine sand had values between 36.2% in 2021, respectively 36.5% in 2022, a fact that can also be seen from the data presented in table 3.3. and figure 3.5. with very small differences, texture being the most stable soil property.

The texture of Gleiosol is dusty loam.

In the following tables and figures we presented the density, apparent density and porosity values of the three studied soils.

Soil density has lower values on the Preluvosol in the two years and higher on the Gleiosol, with an average of 2.62 g/cm³ to 2.67 g/cm³.

And regarding the apparent density values, the lowest were recorded on the preluvosol from 1.43-1.45 g/cm³, with an average of 1.44 g/cm³ and the highest on the gleiosol of 1.46 -1.48 g/cm³, with an average of 1.47 g/cm³.

The total porosity of the soil has low values of 43.38% in 2021 e gleiosol and 48.12% on the preluvosol, the eutricambosol having values between 44.7-44.9%, with an average of 44.8%.

And in the case of aeration porosity values, the lowest were found on gleosols and the highest on preluvosols, eutricambosols having values appropriate to preluvosols, the averages of these values were 8.45% on gleosols, 14.95% on eutricambosols and 16.45% on preluvosols.

Conclusions:

Following this study carried out in the town of Tormac in Timiș county, a study that was carried out both in the field and in the laboratory, we can formulate the following:

Three types of soils were identified on the land, namely:

- ◊ Eutricambosol;
- ◊ Preluvosol;
- ◊ Gleiosol.

The surface taken in the studio is 48 ha, with an uneven distribution, namely:

- ◊ 10 Ha, 20.83% occupied by Eutricambosols;
- ◊ 29 Ha, 60.42% occupied with Preluvosols;
- ◊ 9 Ha, 18.75%, with Gleiosols.

The determinations were made during 2021 and 2022, the soils were cultivated with: grain corn, sunflower, winter wheat, oats, red clover and alfalfa, making a crop rotation, namely:

- Sunflower was cultivated on 3 ha, respectively 6 ha, in rotation with autumn wheat, on 6, respectively 3 ha and red clover, year 1, on 1 ha in the case of eutricambosol type soil;
- On Preluvosol: grain maize 12 ha, in 2021, respectively 14 ha in 2022 in rotation with winter wheat and lucerne, year 3 on the 3 Ha;
- On Gleiosol: grain corn on reduced areas, respectively 3 ha in 2021 and 4 in 2022, out of the 9 ha, in rotation with oats. The red clover occupies 2 ha and is in its 2nd year, the crop being established in April 2021.

After determining the soil texture, it was: o Medium clay loam to eutricambosol and preluvosol; a dusty clay loam.

Soil density has lower values on the Preluvosol and higher on the Gleiosol, with an average of 2.62 g/cm³ to 2.67 g/cm³.

The apparent density of the soil, recorded the lowest values on the preluvosol between 1.43-1.45 g/cm³, with an average of 1.44 g/cm³ and the highest on the gleiosol of 1.46-1.48 g/cm³, with an average of 1.47 g/cm³.

Total soil porosity has low values of 43.38% in 2021 on Gleiosol and 48.12% on Preluvosol, Eutricambosol having values between 44.7-44.9%, with an average of 44.8%.

Aeration porosity had the lowest values on gleosols and the highest on preluvosols, with an average of 8.45% on gleosols, 14.95% on eutricambosols and 16.45% on preluvosols.