

Original Article

The Aggregate Structural State Indicators of the Typical Moderated Humiferous Chernozem Depending on Crop Structure

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Abstract

The paper purpose consists in the impact evaluation of cultivated crops on the aggregates state in the agrogen layer of clay loamy typical moderated humiferous chernozem on the same substrate loam clay. The present studies have included two production variants: 1. Wheat crop and 2. Lucerne. From these wheat crop is characterized by three years of vegetation: the numbered profiles one, two and three. Lucerne culture is characterized by four profiles. Conclusions drawn have emphasized that under deficit conditions of organic fertilizers the Lucerne culture is an important element of the agricultural technologies, able to ensure reproduction and optimization of aggregate composition of chernozem.

Keywords: chernozem, crop structure, aggregate structural state, indicators.

1. Introduction

Agricultural interventions involve structural and functional changes of the ecosystem at all levels that leads to the formation of anthropogenic profiles [1, 2, 3]. These in their turn present various models as integration and structural-functional organization of the soil substances, depending on several soils intrinsic features, crop structure and applied work [2].

2. Material and Method

The paper purpose consists in the impact evaluation of cultivated crops on the aggregates state in the agrogen layer of clay loamy typical moderated humiferous chernozem on the same substrate loam clay. Researches were conducted in the northern pedological-climatic Province, Ocnita district, at farming unit "JLC AGRO-MAIAC".

Investigated area belongs to the pedogeographic district No. 1 represented by clay-illuvial chernozems, levigated and typical moderated humiferous. It is characterized by a relatively plain relief. According to A. Ursu (1985) about 55 per cent of the surface district belonging to plain land and other 30 per cent of the total are inclined at 2 - 6 degree [4].

As a result, there is found the most moderated degree of erosion fragmentation.

The slopes are up to 600 m and are limited affected by erosion. Multiannual average amount of precipitation constitute 582 mm. From this during the period with temperature higher than 10°C ranges from 418 to 437 mm. The moistening coefficients constitute 0.76 to 0.84.

The soils from the evaluated area are assessed by typical moderated humiferous chernozems clay loamy on the loamy clay substrate.

Specified conditions favoring cultivation of a wide spectrum of cultures and respectively condition to practice various work methods. The present studies have included two production variants: 1. Wheat crop and 2. Lucerne.

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From these wheat crop is characterized by three years of vegetation: the numbered profiles one, two and three. Lucerne culture is represented by profile four. In the assessment of the physical characteristics have been used the following methods: 1. Particle size analysis – pipetting method, treating soil with pyrophosphate sodium; 2. Determination of aggregate composition – dry fractioning method Savinov; 3. Determination of stability aggregate – water fractioning method Savinov.

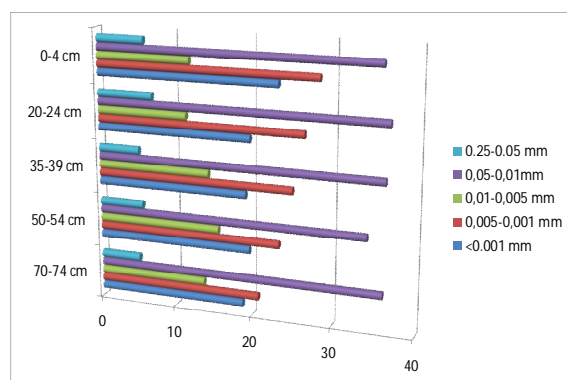
3. Results and Discussions

Soils are characterized by medium fine size composition, in particular, loam clay containing physical clay between 53 – 60 %. All area assessed are characterized by identical particle size composition, which is determined by the low

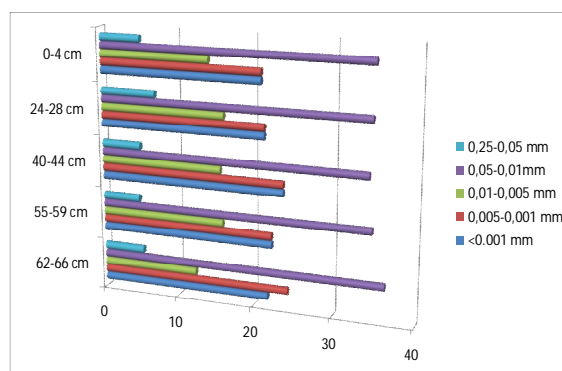
dismemberment degree of the territory erosion. In the particle size fraction dominated the coarse dust (0.05 - 0.01 mm) and its values constituting 30 - 40 %. In the composition of physical clay (< 0.01 mm) predominates two fractions, namely, fine dust (0.05 - 0.001 mm) and fine clay (< 0.001 mm). At the same time the coarse dust presents values greater than 10 % (fig. 1).

Such a composition is characteristic to dusty clays of the North Plateau Moldova. The assessed soils have inherited entirely mineral substrate features without substantial modifications on the profile distribution.

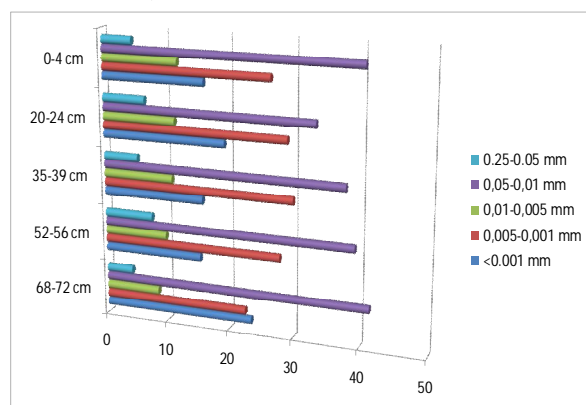
Specified particle size compositions has recognized to assessed soil favorable water relations (water permeability and hydraulic conductivity) and create favorable conditions in favor of the plant root system development.



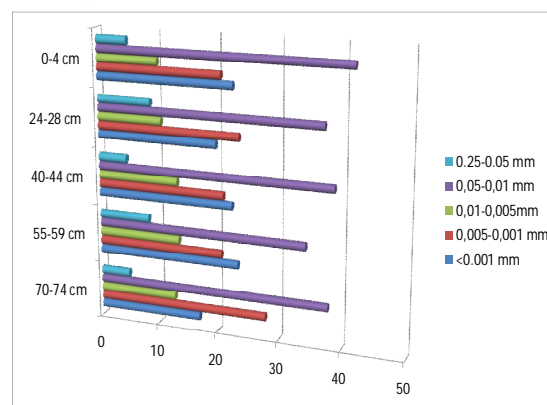
Profile 1



Profile 2



Profile 3



Profile 4

Figure 1. Particle size composition of surveyed soils

Particle size composition of evaluated soils is relatively balanced at all integrations levels, which is one of the leading factors that favoring the practice of conservation agriculture system. At the same time, the specified particle size composition assigned a high structuring potential being favored cubic type structure, especially grains and boulders species.

Evaluation of soil composition structure indicated that this potential is realized in different ways. In the first place the attention is given to the fact that on potential homogeneous background structured on the entire profile, the structural composition presents stratified profiles; on the other

hand the structural potential is achieved in different ways and quantitatively.

In this context, have to be mentioned that in the case of sections 1, 2 and 3 the agro-physical profiles are layered and clearly displayed in three segments.

The first space segment overlaps with arable horizon (Amp), in which the aggregate composition is determined by the pulverization structure.

Evidence of this is clear predominance of aggregates with dimensions from 2 to 0.25 mm and < 0.25 mm in the aggregate composition (fig. 2).

The second segment overlaps with sub-arable horizon hardpanzate (Amph). Within this, its structural aggregates state is determined by the boulders structure. As a result, the structural aggregates composition predominates aggregate > 10 mm, content reaching the 25 %.

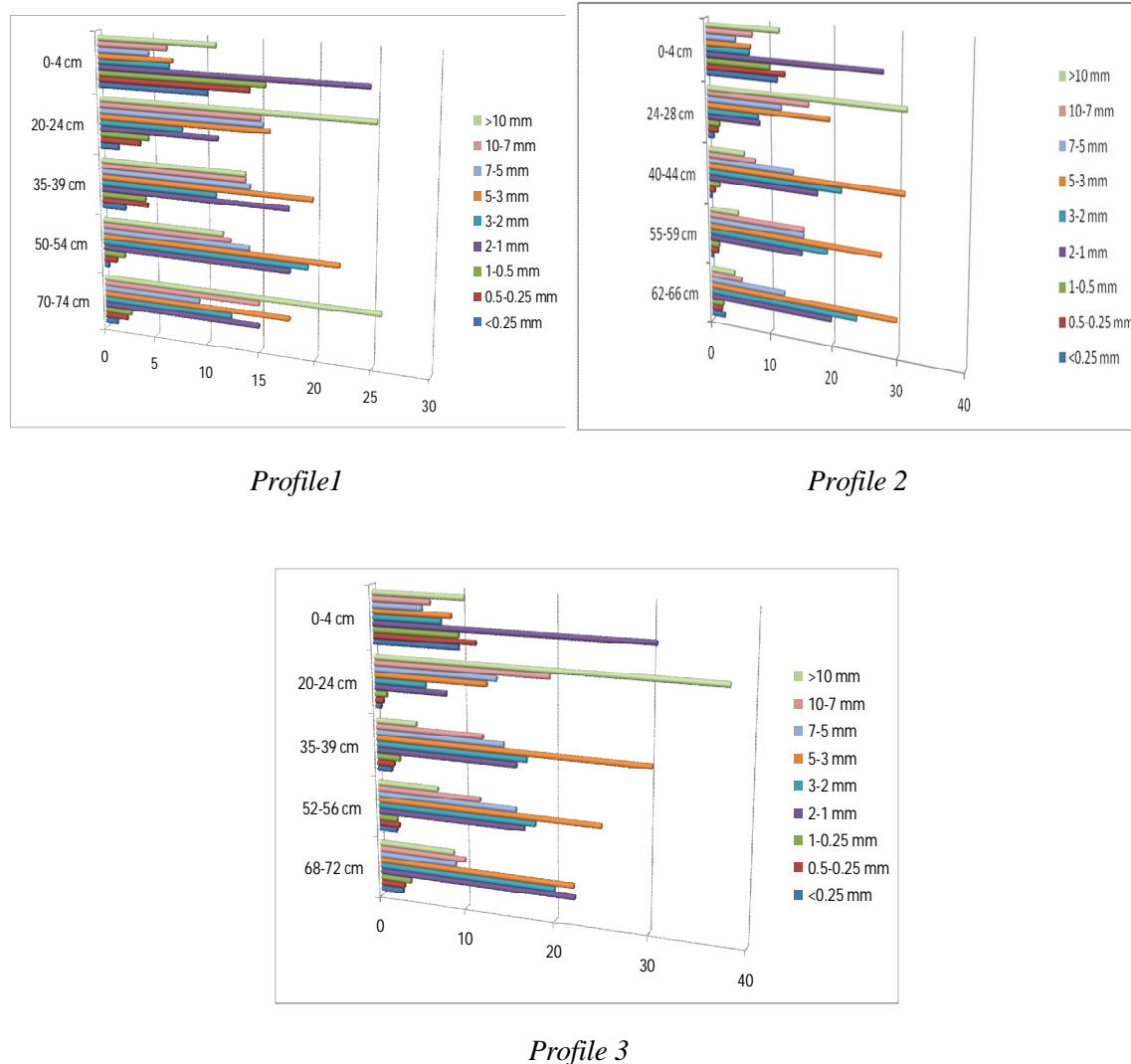


Figure 2. Structural aggregate composition of typical moderated humiferous chernozem under wheat cultivation

As a part of the third segment structural-aggregate state is determined by volumetric modifications driving as result of wetting-drying, blowing - contraction, freeze-thaw, on the one part and the processes of association by through organic polymers of different nature, the origin of which, however, is determinate exclusively by elementary processes of decomposition, transformation and synthesis of organic substances. Specified segment is

characterized by typical aggregates composition of the horizons AmB and B1 of typical moderated humiferous chernozems.

In the case of Lucerne culture, the structured processes are oriented, mainly on boulders and aggregates forming grains (fig. 3). Therefore, the structural profile of the soils in the Lucerne area is distinguished significantly from that of the space where wheat is cultivated.

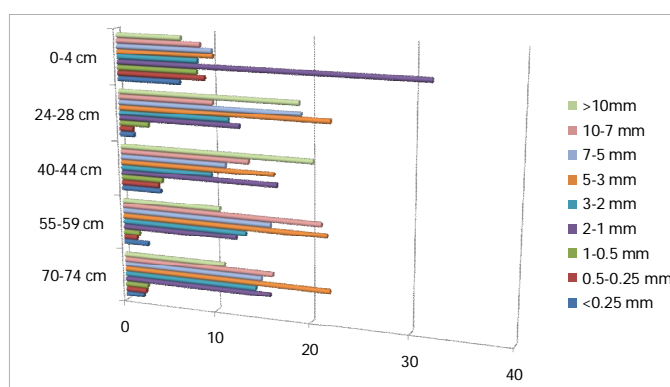


Figure 3. Structural aggregate composition of typical moderated humiferous chernozem under Lucerne cultivation

The superficial segment of these profiles is characterized by the absolute predominance of grain aggregates 2 - 1 mm, due to this fact, the soils have better balance.

In the subsequent horizons, the ratio of aggregates grains and boulders are balanced. Here appears absolute predominance of aggregates 5 - 3 mm that provide pedogenesis regime (air-hydric, oxidation-reduction, biological) that promotes favorable condition for reproduction of humus reserves in the soil.

4. Conclusions

Under deficit condition of organic fertilizer Lucerne culture is an important element of agricultural technologies, able to ensure reproduction

and optimization of aggregate composition of chernozem.

References

- [1] Jigau Gh., 2001, Improvement of soil characteristics. In: Land degradation and desertification, Chisinau
- [2] Jigau Gh., 2009, Genesis and soil physic, CEP USM Chişinau
- [3] Jigau Gh., 2012, Physic basis adaptation and increasing sustainability of the agroecosystems in the Danube region to climate change conditions, Soils of Azerbaijan: genesis, geography, land reclamation, management and ecology, Bacu, 770 - 774
- [4] Ursu, A. F., 1985, Soils from Moldova, Stiinta Chisinau