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THE IMPACT OF ORGANIC FARMING IN GROWING MAIZE ON THE FEATURES OF FORMATION OF STRUCTURAL-AGGREGATE COMPOSITION OF SOIL IN THE CONDITIONS OF THE DANUBE STEPPE OF UKRAINE

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Annotation: *The study was conducted in a fixed three-factor experiment with ordinary chernozem (black soil). The positive impact of the improved system of pre-sowing soil preparation and care of maize crops, as well as the introduction of biodestructors Ecostern 1.5 l/ha and Cellulad 2.0 l/ha in the formation and increase in the content of agronomically valuable fraction of 0.25 - 10 mm on the formation of structural and aggregate soil composition. Minimization of the main tillage for maize by carrying out flat-cut tillage to a depth of 14-16 cm or disking for 10-12 cm had no advantage over plowing. The highest coefficient of soil structure was obtained in the experiment for turning the chips and wrapping postharvest residues and by-products of the predecessor with the introduction of biodestructor Cellulad 2.0 l/ha on the background of improved system of pre-sowing soil preparation and care of maize plants and was - 4.97 for soil layer 10 -20 cm.*

Key words: *maize, structural and aggregate composition of soil, basic tillage, pre-sowing tillage and crop care systems, biodestructors, organic farming.*

Maize is considered one of the most productive cereals in the world. This crop has a universal purpose and is grown for both food

and feed and technical purposes. In the southern regions of Ukraine, maize is given a fairly high share in the total volume of grain production. However, changes in weather conditions over the past five years, aimed at establishing abnormally high air temperatures and soil droughts, have caused significant losses in maize productivity, especially in the Danube Steppe zone of Ukraine. And this has led to the fact that the current level of maize grain crop production in this area has recently exceeded significantly by the biologically possible potential of this crop.

Scientifically based agricultural system involves the choice of tillage systems, which are important components not only to preserve and restore their fertility, but also to protect against erosion and also increase crop productivity, which occurs due to changes in terrestrial factors of plant life. However, research and practical experience have shown that the effect of this element can be quite different: from the highest efficiency to zero estimate, or even negative. This is influenced by many factors: the soil moisture availability, its agrophysical properties, humus content, precursors, presence and quantity and quality of post-harvest residues, applied tillage equipment, etc.

An important feature and property of the soil is its structure, as it has a significant impact on the fertility and productivity of crops, as confirmed by numerous studies [1-8]. It is established that cloddy and granular macrostructure with particle size from 1 to 5 mm has the utmost agronomic significance. However, for wet soils, this figure can reach up to 10 mm, and for arid soils - up to 2 mm [9].

Researchers and farmers who are supporters of shelf plowing [10-13], believe that such cultivation is able to provide optimal structure parameters during the movement of soil layers. They emphasize that this provides the best conditions for the growth and development of crops, which is due to improved water and physical properties, as well as controlling weeds growth and plants protection against diseases and pests.

However, according to the data gained from the vast majority of researchers [14-20], the best structural condition of the soil can be ensured, on the contrary, only by shelfless different depth tillage.

It has also been established that the wrapping of straw, manure and green manures during tillage has a significant influence on the processes of structure formation [21-25]

The research was carried out in a grain-cultivating short-rotation 4-field crop on the ordinary chernozem (black soil) with the following alternation of crops: peas – winter wheat – winter barley - ½ sunflower fields + ½ maize fields.

Location of research: Ivaniv district of Odesa region, Gudevichevo village, farm "Bereginya-Lada".

Scheme of the experiment: three-factor experiment:

Factor A - methods of basic tillage:

a1 - plowing at 25-27 cm - (control);

a2 - shelfless (flat-cut) cultivation on 14-16 cm;

a3 - shelfless (disking) treatment for 10-12 cm.

Factor B - the use of biodestructors of by-products

b1 - without destructors;

B2 - Ecostern 1.5 l / ha;

b3 - Cellulad 2.0 l / ha.

Factor C - system of pre-sowing tillage and crop care:

c1 - traditional;

c2 - improved.

Variants of the experiment are placed in 3 replicates, by randomization. The total square of the experiment is 300 m^2, accounting – 100 m^2. The structural and aggregate composition of the soil was determined by the sieve method in the modification of N.I. Savvinova (DSTU 4744: 2007) in the phase of ejection of maize panicles. During the experiment zonal maize hybrid Kobza MV was being sawn.

Studies have shown that the methods and depth of basic tillage, the use of biodestructors to improve the decomposition of by-products of the predecessor, as well as an improved system of pre-sowing tillage and maize care in the experiment, in some way influenced the formation of structural and aggregate soil composition. The positive effect of the use of biodestructors Ecostern 1.5 l/ha and Cellulad 2.0 l/ha in the creation of structural aggregates and the increase in the

content of agronomically valuable fraction of 0.25-10 mm has been established. Thus, in the variant with plowing the application of the biodestructor Ecostern 1.5 l/ha contributed to the increase in the structural composition of the soil fraction of 0.25 mm by 1.13%, and in option with the application of Cellulad 2.0 l / ha, respectively by 2.09%. The application of the improved system of pre-sowing tillage provided in the experiment a slight improvement of the structural and aggregate composition of the soil precisely by reducing the content of fractions larger than 10 mm and less than 0.25 mm. Minimization of the main cultivation for maize in organic agriculture by carrying out flat-cut tillage on the soil by 14-16 cm, or disking on 10-12 cm, did not give the expected positive results. Under these treatments, the most structured was the soil layer of 0-10 cm introducing biodestructor Cellulad 2.0 l/ha on the background of an improved system of pre-sowing soil preparation and maize plants care with a coefficient of structure (K), respectively - 4.03 - 4.77, but the largest coefficient of soil structure was obtained in the experiment by turning the chips and wrapping postharvest residues and by-products of the predecessor with the introduction of biodestructor Cellulad 2.0 l/ha on the background of improved system of pre-sowing soil preparation and maize plants care. Mainly this variant has a layer of soil of 10-20 cm at level - 4,97.

The best indicator of the structural and aggregate composition of the arable (0-30 cm) layer of soil in the experiment in terms of structural coefficient (K) was obtained by plowing with the introduction of biodestructor Cellulad 2.0 l/ha on an improved system of pre-sowing tillage and plant care - 4.41 . Replacement of shelf plowing with shallow tillage (flat cutting) tillage or disking of the soil led to a deterioration of the structural coefficient, which was only - 3.16-3.26.

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