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## **Influence of anthropogenous factors on humus state and content of nutrients in typical black earth**

**Goal.** To determine the influence of organic and organo-mineral systems of fertilization and soil cultivation on the transformation of the humus state and the agrochemical properties of typical black soil. **Methods.** Field, laboratory. **Results** It has been established that prolonged application of different fertilizer systems for combined and shallow soil treatments causes differentiation of the upper layer of soil by the level of humus, qualitative changes of organic matter and the agrochemical properties of typical black soil. **Conclusions** The use of fertilizers contributed to the increase of mobility of the whole system of humus substances, which is confirmed by the growth of the content of moving fractions and the decrease in the content of fractions that are tightly bound to the mineral part of the soil. Organic and organo-mineral fertilizer systems for combined and shallow soil treatments have positively influenced the nutrient content.

*Key words: fertilizer systems, soil cultivation, typical black currant, humus, nutrients.*

One of the most significant diagnostic signs of soil degradation is the decrease in the content of organic matter and its composition - humus. According to the results of the last round of agrochemical certification of land, agricultural soils Polissya is characterized by a predominantly low (1.1-2.0%) and middle (2.1-3.0%) content of humus, forest-steppe and steppe - elevated (3.1 - 4.0%) and average (2.1 - 3.0%).

Reduction of humus content and deterioration of its qualitative characteristics is caused by the lack of permanent compensation of plant residues and organic fertilizers the current consumption of organic matter due to its biological mineralization and the change in the correlation between mineralization of fresh organic matter, the formation and stabilization of new humus substances in the soil [4].

The soil tillage system involves the methods of wrapping organic and mineral fertilizers that determine the activity and orientation of soil processes [5, 12]. Therefore, it is relevant to study and choose the most promising for a specific soil and Only the results of stationary field experiments can have an objective assessment of the changes in soil fertility.

The purpose of the research is to determine the influence of organic and organo-mineral systems of soil fertilization and cultivation on the transformation of the humus state and the agrochemical properties of typical black soil. climatic zone of combinations of different objects in the system of accepted crop rotation. Realistic theoretical and practical significance.

**Research methodology.** The research was carried out in a stationary field experiment (the year of laying in 1984, a research farm of the Poltava MIA Vavilov AAP). The soil is a typical black-and-so-called heavy-loamy loam.

Soil treatment - combined and small non-leaching (KPG-2.2 for 0 - 12 cm). Agricultural crops are grown with intensive technologies. Experiments are conducted with 7-way alternating crops: corn silage, winter wheat, sugar beet, barley, peas, winter wheat, corn for grain. Sown area - 175 m<sup>2</sup>, accounting - 100 m<sup>2</sup>.

Samples of soil are selected from layers 0 - 20 and 20 - 40 cm in accordance with DSTU 4287: 2004 [8].

Analytical work on soil samples was carried out in a certified laboratory (certificate No. 100-154 / 2014) according to generally accepted methods [1, 2, 6, 7, 9, 10]. The assessment of the humus state of the soil was carried out according to the system of indicators proposed by D.S. Orlov and others. [3]. The index of the mobility of the whole system of humus substances was determined by the ratio of the content of moving

fractions (ГК-1 + + ФК (1а + 1) to the content of fractions firmly connected with the mineral part of the soil ГК (2 + 3) + + ФК 2 + 3).

Research results. It has been established that prolonged application of manure separately and in combination with mineral fertilizers, salt with the addition of nitrogen and complete fertilizers affects the level of soil humic and the quality of the humus substances in combination and shallow soil leakage.

The use of combined soil treatments against the backdrop of 20 years of manure application results in an increase in organocarbon content of 5.4% compared to control. The most effective (16.9%) turned out to be the use of straw with the addition of nitrogen fertilizers, which was introduced in the crop rotation for sugar beets and corn for grain.

At the same time, the removal of straw with the full amount of mineral fertilizers and the application of salts with the addition of nitrogen to all crops of crop rotation did not ensure an increase in the total content of organic carbon in the soil layer of 20 cm.

In the case of the use of shallow non-crop cultivation, an increase in the total content of organic carbon by 7.4% was observed in variants with organic and organo-mineral fertilizer systems. The removal of straw with a full dose of NPK mineral fertilizers contributed to an increase in the total organic carbon content compared to a control of 5.3% (Table 1).

1. Influence of different systems of fertilizer for shallow cultivation on general content and quality of humus (0-20 cm)

The application of various fertilizer systems causes changes in the quality composition of the whole system of humus substances for combined and small soil treatments. The degree of humification of organic matter in variants with the removal of manure and by-products of crop production for combined soil cultivation is very high. In the case of the application of shallow soil treatment, a very high degree of humification was observed in the control and in variants with an organo-mineral fertilizer system and the introduction of straw with a full dose of mineral fertilizers under sugar beets and maize for grain. For the introduction of organic fertilizers and straw with the addition of nitrogen (for beets of sugar and corn for grain) for combined soil cultivation, the type of humus is humate, on the control and in variants with the use of organo-mineral fertilizer system - fulvato-hutumny. For shallow soil cultivation for organic and organo-mineral fertilizer systems and in the case with the removal of straw with a full dose of mineral fertilizers under sugar beets and corn for humus type humus, in the case of use of straw with a full dose of mineral fertilizers for all crops of crop rotation - humate-fulvatus (control - fulvata-humate).

The removal of by-products under sugar beets and corn and all crops of crop rotation during combined and shallow soil treatments contributed to increasing the mobility of the whole system of humus substances. The removal of straw with a full dose of mineral fertilizers for all crops of crop rotation has increased the degree of mobility of the system of humus substances in half compared with the control. In the version with the removal of straw with a full dose of mineral fertilizers under sugar beet and maize for grain with combined soil treatment, the reduction of the content of the fraction of "free" humic acids (ГК-1) was doubled compared with the control with simultaneous increase (twice) of humic acid content, firmly bound to the mineral part of the soil (ГК -3). The straw content of all crop rotation crops increased by 2.5 times compared to control. In all varieties, the organic matter of the soil was enriched with nitrogen.

In the course of shallow soil cultivation, the maximum accumulation of the "free" fraction of humic acids was observed in the case with the removal of straw with a full dose of NPK mineral fertilizers for all crops of crop rotation. At the same time, due to the organic fertilizer system, the amount of fractions of ГК-1 has decreased twice. In the course of shallow soil cultivation, in almost all variants, there was no accumulation of the fraction of ГК-3. Different systems of use for combined and shallow soil treatments almost did not affect the transformation of the fraction of humic acids bound to calcium (ГК-2). The increase in total humus for organic and organo-mineral fertilizer systems is confirmed by the data of Table. 2 and 3.

Organic and organo-mineral fertilizers did not show an increase in humus mobility, the removal of straw together with a complete mineral fertilizer for combined soil cultivation, the content of labile organic matter in the soil layer of 0 - 40 cm increased by more than twice compared with the control. During shallow soil cultivation, the increase in the content of labile humus was noted only in the upper layer of soil (0-20 cm).

2. Influence of various fertilizer systems on the agrochemical properties of black earth of typical heavy-grained (combined soil cultivation)

3. Influence of various fertilizer systems on the agrochemical properties of chernozem typical heavy-grained (shallow, non-polar soil tillage)

In all variants of experiment for combined cultivation a high concentration of mineral nitrogen in soil was found [11]. Significant increase in mineral nitrogen in the soil layer of 0-20 cm (26%) compared with the control was observed only with the introduction of complete mineral fertilizers against the background of manure. Despite the optimum C: N (25: 1) ratio in straw removal, a decrease in mineral nitrogen in the soil layer of 0-40 cm was observed, indicating the mobilization of mobile nitrogen, which leads to its loss. According to the organic fertilizer system, there was no accumulation of mobile phosphorus in the soil, but with the removal of manure in combination with mineral fertilizers, its content increased by 1.6 times as compared with the control in the upper layer of soil (0-20 cm). Similarly, the introduction of straw for this cultivation contributed to the accumulation of mobile phosphorus. Significant influence on the content of mobile potassium in the studied treatment systems was not revealed. In general, the soil content of this element is high and elevated.

In case of shallow cultivation in all variants of the study, except for the removal of straw with the addition of nitrogen to sugar beet and maize on grain, mineral fertilization nitrogen was very high. An increase in the content of mobile forms of phosphorus and potassium in the background of this cultivation occurred in the upper layer of soil.

### Conclusions

Prolonged use of organic and organo-mineral fertilizer systems in the Black earth with a typical heavy-bulky soil caused an increase in the level of humus, the degree of humification of organic matter and the change in its composition. The use of fertilizers helped to increase the mobility of the whole system of humus substances, which is confirmed by the growth of the content of moving fractions and the decrease in the content of fractions that are firmly linked to the mineral part of the soil. Different fertilizer systems contributed to the enrichment of the organic matter of the soil with nitrogen during combined soil cultivation, which does not occur during small cultivation.

Combined tillage compared to the shallow deeply affected the transformation processes in the organic substance of the typical black soil.

Organic and organo-mineral fertilizer systems for combined and shallow soil protections positively influenced the nutrient content of the upper soil layer.

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