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**HUMUS CONTENT AND SUPPLY CHANGES AT CHERNOZEM TYPICAL
UNDER DIFFERENT FERTILIZATION AND CULTIVATION SYSTEMS**

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Soil organic matter is an integral parameter of potential soil fertility level. It plays an important role in regulating physical-chemical and biological soil processes, providing plants with nutrients and forming optimal soil conditions [1]. The organic matter of Chernozem is represented mainly by humus. Balance between humification and mineralization under different soil tillage types is determined humus content and supply. The biggest impact on this ratio cause organic fertilizers and plant residues, which are presented in the soil and intensity of its tillage [2]. An important condition for increasing humification process is mineral fertilizer application, especially Nitrogen. Crucial to keep C:N rate between 25-30:1.

Humus mineralization takes place under crop cultivation process. Its' intensity will be depended on plant biological particularity and tillage/fertilizer systems. The key factors of organic matter conservation and restoration are soil tillage minimization and fertility plan biologization systems. That is why the study of changes in the organic matter of soil is important in the modern agriculture.

The purpose of our research is to determine the influence of different soil tillage practices on humus content and reserves, main physical and chemical properties of Chernozem Typical under short term crop rotation.

Objectives and methods. Studies were conducted at long-term field research of the Department of Soil Science and Soil Conservation named after professor N. Shykula, National University of Life and Environmental Sciences of Ukraine. The soil of tested plots - Chernozem Typical medium-loamy low-humified on loess. Humus content at plow layer is $3,57 \pm 0,13\%$, at subsurface layer – $3,52 \pm 0,14\%$. The soil

active pH - 6.7-6.9 in the upper horizons. Following tillage practices were studied: 1. Plowing to the depth of 25-27 cm; 2. Conservation unconventional cultivation to the depth of 25-27 cm; 3. Shallow conservation cultivation to the depth of 10-12 cm. Studies on soil fertilization under crop rotation were conducted in next variants: 1. Without fertilizer (control); 2. Straw 1.2 t/ha + N₁₂ + N₇₈P₆₈K₆₈; 3. Straw 1.2 t/ha + N₁₂ + green manure + N₇₈P₆₈K₆₈. Soil studies were carried out during the active growing season (3rd decade of May during 2010-2012 yrs.) in soil layers of 0-50. Soil sampling, and preparation was done according DSTU 4289:2004, GOST 26212-91, 27821-88.

Results and analysis. The results of soil organic matter measurements (Table 1) shows that soil fertilization cause significant humus content increase in top 0-30 cm of soil layer under all tillage types. The higher difference of organic matter in 0-10 cm layer and control was recorded for the use of straw, green and mineral fertilizer for the shallow soil cultivation (0,52 %), then 0,50% for the usage of different depth cultivation. Minimal difference was observed in the soil plowing test plot.

The soil humus content at plots without fertilizing was lowest with slight difference between tillage types. In the upper 0-10 cm layer, the highest values were noted in the shallow soil cultivation -3,46%. At plots with fertilizing was observed soil humus accumulation at top layer under conservational tillage. Humus content growth at top 0-10 cm layer was 0,50-0,54% under conservation tillage and 0,42% under plowing.

Table 2 shows the results of determining the stock of humus in Chernozem Typical under different soil and fertilizer systems. Without fertilization, the content and reserves of humus decreased. That was noted for all tillage types. For plowing there was a uniform humus distribution in 0-30 cm soil layer. Under conservational tillage accumulation took place in upper layers (0-10 and 10-20 cm). For shallow conservation tillage more intensive humus level was decreasing in 20-50 cm layer compare to the upper ones. Fertilizer application promoted to humus accumulation in 0-50 cm layer for all tillage systems. In the case with plowing and deep conservational tillage humus stocks were larger by 17.7-21.7 t / ha, and shallow soil cultivation by 13.0-15.6 t / ha compared to those without fertilizers. At cultivated layer 0-30 cm an

advantage had multi-depth conservational tillage, with reserves of 142.3-144.5 t / ha. Shallow conservational tillage had low humus at lower layers compare to plowing tillage.

At plots where mineral fertilizers were applied we pointed increase of SAC and hydrolytic acidity which had influence on Chernozem Typical fertility. The amounts increased by 1.4-2.0 meq / 100 g of soil and correlated with humus content for experimental variants and soil layers. It highest values were observed in the layer 0-10 cm for conservation tillage - 28,0-28,8 meq / 100 g of soil, and in the variant with plowing 27,4-27,8 meq / 100 g of soil.

In the layer 0-30 cm, the best parameters were at deep plow and multi-depth conservational tillage. In the variant with plowing were 27.3 meq / 100 g of soil, and 27.6 meq / 100 g of soil on multi-depth conservational tillage. Hydrolytic acidity was highest in the variant with plowing and in the 0-20 cm layer of soil and reached 3.0 meq / 100 g of soil. This parameter was not characterized by critical values for chernozem soils, but in the variant with a plow the tendency of its increase was observed with straw, siderates and mineral fertilizers application. The lowest values of hydrolytic acidity in the layer 0-30 cm were noted for shallow conservation tillage. Although in the upper layer, under the influence of fertilization, an increase in hydrolytic acidity was observed.

Soil physical and chemical properties of Chernozem Typical are improving under the influence of fertilization, although straw, siderates and mineral fertilizers application did not contribute to the critical increase in hydrolytic acidity.

Conclusions

Systematic application of plant residues and mineral fertilizers under short crop rotation system has positive effect on humus content, physical and chemical properties of Chernozem Typical. The humus content increase from the comparative usage of straw, siderates and mineral fertilizers by 14 years compared to control and was 0.42% in the layer 0-10 cm under plowing, 0.50 under multi-depth conservational tillage and 0.52% under shallow conservation tillage. Different soil tillage systems have influenced the differentiation of humus content and stocks. For plowing there was a

uniform humus distribution inside layer (0-30 cm). For the conservation tillage it was accumulated in the upper layers of 0-10 and 10-20 cm. Under shallow conservation tillage more intensive reduction of humus stock in the lower layers of 20-50 cm compared to the upper ones was recorded. Multi-depth conservational tillage contributed to the restoration of humus reserves, stabilization of the SAC and reproduction of Chernozem Typical fertility.