UDC 631.417.4

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SOIL ECOLOGICAL QUALITY OF AGROECOSYSTEMS: THEORETICAL, METHODOLOGICAL AND METHODICAL ASPECTS

A new highly informative method for soil organic nitrogen determination was developed. It involves the multi-step alkali hydrolysis of soil organic matter (SOM) with NaOH. We have found that the most informative fraction of SOM and the most active one was obtained after the hydrolysis of soil sample with 8 M NaOH during 144 hours. Content of this fraction reflects quantity and quality of labile (active) organic matter – a heterogeneous mixture of non-humified organic compounds. Quantitative changes of this fraction during the vegetation period show the imbalance of immobilization and mineralization processes in soil. Higher N content indicates the intensification of immobilization process and resynthesis of organic compounds in soil. By contrast, low content of alkali-hydrolysable nitrogen reflects the intensive mineralization of SOM.

We have found that the content of active pool of soil organic matter (APOM) in the cultural pastures without fertilizers reaches 920 $mg \cdot kg^{-1}$ N_{org} or 18 % of N_{total}. That indicates a powerful mechanism of forming of SOM active pool. A similar effect is also found with phosphorus-potassium fertilizer ($P_{90}K_{120}$): in spring content of APOM is over 800 $mg \cdot kg^{-1}$. Prolonged use of nitrogen fertilizers (240 $kg \cdot ha^{-1}$) sharply reduces size of nitrogen stock to 600-700 $mg \cdot kg^{-1}$. These data give reason to assume that prolonged use of nitrogen fertilizers has formed a mechanism of "memory" about the regular flow of exogenous nitrogen in bioavailable form that eliminates the need to deposit it in the soil in the form of labile organic compounds.

To reduce SOM mineralization rates and to increase the N-sequestration in agricultural soils the highly informative indicators of soil's in situ state are needed. In this context we have suggested the new concept of SOM state based on the "*oxidation front*". According to it, when Eh

decrease lower than 350 mV, soil quality worsens dramatically due to anaerobic conditions. The decrease of Eh in agricultural soil is usually caused by high doses of organic fertilizers. We have found that the compatible fertilizing with 20 $t \cdot ha^{-1}$ stall manure and $N_{122}P_{116}K_{135}$ in combination with liming decreases Eh in soil to 310 mV and causes anaerobiosis condition. The main reason for such situation in soil is its overload by organic matter of manure.

We suggested using Eh and EC of soil-water suspensions as rapid and informative indicators of SOM quality and soil quality in general.