THE INFLUENCE OF SYSTEMATIC FERTILIZATION ON SOIL FERTILITY WHEN GROWING WINTER WHEAT

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The article presents the results of studies of the systematic use of organic and mineral fertilizers on the parameters of fertility of gray forest soil and the formation of productivity of winter wheat. It was found that in a five-saw field crop rotation, the formation of ground backgrounds with different physical and chemical properties is observed. The application of bedding manure at a dose of 60 t/ha and against the background of moderate fertilization rates ($N_{50-100}P_{30-60}K_{50-100}$) contributed to the neutralization of the soil solution to values of slightly acidic reaction (pH – 5,1), while in the absence of manure (mineral system fertilizers) pH continued to remain within the acidic reaction.

The organic-mineral fertilization system (12 t / ha of manure + N100P60K100) and organic (12 t/ha of manure per 1 ha) turned out to be effective in terms of the humus of the soil regime, in accordance with the total humus content was 1,30 % and 1,32 % which in percentage terms is 18 % and 20 % higher compared to the option without fertilization – 1,10 %.

Optimization of the parameters of the nutrient regime (mobile forms of phosphorus and potassium) of the soil at the end of the rotation was provided by the organo-mineral fertilization system ($N_{100}P_{60}$ K_{100} against the background of 60 t/ha of manure). A clear tendency to an increase (by 27 mg/kg) of the content of mobile

potassium was determined, compensating for its constant deficiency in the soil, and by an increase of 38 % in mobile phosphorus.

The highest productivity of winter wheat (5,45 t/ha) was provided by the organo-mineral fertilization system (60 t/ha of manure + $N_{100}P_{60}K_{100}$), which is 78 % higher than the control (without fertilizers), under these conditions the greatest increase in protein was obtained – 0,63 t/ha.

The research was conducted during 2016-2018 in a stationary experiment of the department of agrochemicals in the experimental farm of DPDG "Chabany" NSC "Institute of Agriculture NAAS" on gray forest coarse-grained loamy soil in a five-field field crop rotation, grain, corn, corn, corn winter wheat. The use of fertilizers in a stationary experiment on gray forest soil helped to increase soil fertility. The results of the research showed that the application of litter manure at a dose of 60 t/ha and against the background of moderate fertilizer rates ($N_{50-100}P_{30-60}K_{50-100}$) contributed to the neutralization of the soil solution to the values of weak acid reaction (pH sol. – 5.1), while lack of manure (mineral fertilizer system) pH index of salts, ccontinued to remain within the acid reaction. The results of the research showed that the hydrolytic acidity in the arable (0-20 cm) layer approached 1,94 mg-eq. per 100 g of soil, which indicates the need for its liming, except for fertilizer systems with the use of organic fertilizers both separately (60 t/ha) and against the background of mineral applied in moderate norms ($N_{50}R_{30}K_{50}$). Over the years of research there is a tendency to reproduce the content of total humus in the arable layer (0-20 cm) of the soil, so in the organic fertilizer system the content of this indicator exceeded the initial percentage by 10 %, at baseline it was in absolute units – 1,20 %. The most effective were both organo-mineral fertilizer system (12 t/ha of manure + $N_{100}P_{60}K_{100}$) and organic (12 t/ha of manure per 1 ha of crop rotation area), respectively, the content of total humus was – 1,30 and 1,32 % or as a percentage 18 and 20 % higher compared to the control (without fertilizers) - 1.10 t / ha. With the use of purely mineral fertilizers, the humus content in the arable layer was 1,24 t / ha or 12% higher than the control variant. In all variants with the application of

fertilizers there was an increase in the content of hydrolyzed nitrogen from 52,8 to 65,2 mg/kg of soil, but within the limits of gradation, which corresponds to the low supply of soil with this form of nitrogen. The most active processes of accumulation of hydrolyzed nitrogen up to 67,9 and 65,2 mg/kg in the layer of 0-20 cm occurred, respectively, with the application of organic fertilizers 60 t / ha and (N100P60K100) on the background of the aftereffect of 60 t/ha of manure, fertilizer 44,1 mg/kg. In the other variants, its content was only 8,7-13,5 mg/kg higher than the control, which corresponds to the gradation of very low soil supply with this form of nitrogen. It was found that taking into account the increased level of mobile phosphorus in the soil before the experiment, during its systematic conduct there was an accumulation of this element in direct proportion to the amount of phosphorus introduced in the composition of organic and mineral fertilizers. By the content in the arable (0-20 cm) layer of mobile phosphorus soil in the control version in 150,0 mg / kg of soil, the largest increase was in the organo-mineral fertilizer system (60 t/ha of manure + $N_{100}P_{60}K_{100}$) – 263,0 mg/kg of soil, and purely mineral in the application of a similar rate of fertilizers. It should be noted that the content of mobile phosphorus fluctuated within the limits corresponding to the gradation of a very high level of provision of this element. The results of the research give grounds to believe that with the systematic application of fertilizers the intensity of the increase in the content of mobile phosphorus in the root layer of the soil will gradually increase. The application of organic fertilizers to crops helped to increase the content of exchangeable potassium in the soil on average from 95 to 127 mg of K_2O per 1 kg of soil, leaving its content within the limits of high soil security. With the content of K_2O in the control without fertilizers 95,8 mg/kg of soil, its increase (by 28.4 and 31.2 mg/kg of soil) occurred, respectively, with the introduction of an increased dose of NPK, both individually and against the background of 60 t/ha of manure. The results of research have shown that the accumulation of mobile potassium in the soil is slower, which can be explained by its transition to non-exchangeable forms and removal of crops. Thus, the content of hydrolyzed nitrogen in both controls and fertilizers at the end

of rotation corresponded to the gradation of low supply, and the content of mobile phosphorus - high supply, with a 38 % increase in organo-mineral fertilizer system N100P60K100 against 60 t/ha of manure. With the systematic application of organic and mineral fertilizers for growing winter wheat, a clear tendency to increase (by 27 mg/kg of soil) the content of mobile potassium, which compensates for its constant deficiency in the soil, on average, its content ranged from 117-127 mg /kg of soil. Creating appropriate levels of fertility provides conditions for sustainable yields of winter wheat with appropriate quality indicators of basic products. With a yield in 2016-2018 hh., on the control without fertilizers of 3,06 t/ha, the highest increase in grain after the impact of 60 t/ha of manure and direct action of double the rate of mineral fertilizers ($N_{100}P_{60}K_{100}$), which is 78 % higher than the yield on control without fertilizers and 10% efficiency of single doses and NPK on the background of the aftereffect of manure. Characteristically, under the organic fertilization system, the increase in the yield of winter wheat grain at a single rate of manure (60 t/ha of crop rotation area) was 1,47 t/ha or higher by 48 % compared to the control without fertilizers. One of the most important indicators of grain quality of winter wheat is the protein content. The quality of winter wheat grain tends to improve in terms of such indicators as protein. The main role in the accumulation of protein belongs to nitrogen. Stable indicators of nitrogen-containing compounds (protein) were obtained by applying organic and mineral fertilizers to winter wheat. The highest protein content was obtained using an organo-mineral fertilizer system at a rate of 60 t/ha of manure + $N_{100}P_{60}K_{100}$ and was 11,6, against the control variant, respectively – 9,1 %. In the variant with the introduction of a single rate of organic fertilizers, the figure was at the level of 11,4 %. The collection of protein from 1 ha was consistent with the patterns established by its content and yield. For crop rotation without fertilizer it is necessary to expect to obtain indicators at the level of 0,28 t/ha, while for systematic fertilization it is possible to obtain protein collection at the level of 0,43-0,63 t/ha.

Conclusions and prospects. It is established that during the systematic application of fertilizers in five-field field crop rotation under the influence of different systems there is the formation of soil backgrounds with different physical and chemical properties, the reaction of soil solution with litter manure at a dose of 60 t/ha and moderate fertilizer rates (N50- 100P30-60K50-100) contributed to the neutralization of the soil solution to the values of weakly acid reaction (pH sol. – 5,1), while in the absence of manure (mineral fertilizer system) the pH of the salt, continued to remain within the acidic reaction, the hydrolytic acidity approached 1,94 mg-eq. per 100 g of soil, which indicates the need for liming under such conditions. It is proved that in its arable layer (0-20 cm) there is a tendency to increase the reserves of humus. The most effective were both organo-mineral fertilizer system (12 t/ha of manure + N100P60K100) and organic (12 t/ha of manure per 1 ha of crop rotation area), respectively, the content of total humus was – 1,30 and 1,32 % or as a percentage 18 and 20 % higher compared to the control (without fertilizers) – 1,10 %. It was found that the content of hydrolyzed nitrogen in both controls and fertilizers at the end of rotation corresponded to the gradation of low supply, and the content of mobile phosphorus – high supply, with a 38 % increase in organo-mineral fertilizer system N100P60K100 against 60 t/ha of manure. With the systematic application of organic and mineral fertilizers for growing winter wheat, a clear tendency to increase (by 27 mg/kg of soil) the content of mobile potassium, which compensates for its constant deficiency in the soil, on average, its content ranged from 117-127 mg/kg of soil. It is proved that the creation of appropriate levels of fertility provides conditions for obtaining stable yields of winter wheat with appropriate indicators of the quality of basic products. The highest yield levels were formed with the use of organo-mineral fertilizer system (60 t/ha of manure + N100P60K100) – 5,45 t/ha, which is 78 % higher than the control (without fertilizers), under these conditions the largest increase in protein was obtained – 0,63 t/ha.