NUMBER OF PHOSPHATE-MOBILIZING BACTERIA AND PHOSPHATASE ACTIVITY OF SPRING BARLEY PLANTS RHIZOSPHERIC SOIL UNDER THE ACTION OF FERTILIZERS AND MIKROHUMIN

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The realization of agricultural crops productivity is possible only in conditions of optimal plants nutrition depending on the availability of nutrients in soil and the degree of their accessibility. Important here is the formation of specific bacterial groups in plants root zone. Soil microorganisms convert unavailable for plants compounds into forms optimal for their metabolism [1], so their study is necessary to assess the possibility of intensifying of crops root nutrition.

A kind of reflection of the number of microorganisms of separate eco-trophic groups in soil and their functional activity is biological activity and, in particular, enzyme one as a sensitive indicator of the most important biochemical processes [2-4].

Excretion of enzymes into soil by microorganisms and plant roots is usually of an adaptive nature in the form of reaction-response to the presence or absence of a substrate for the enzyme action or reaction product, which is especially clearly manifested with phosphatase. Due to the lack of movable compounds of phosphorus in the environment microorganisms and plants dramatically increase the excretion of enzymes. The application of soil phosphatase activity index is based on such a relationship to diagnose the nutrition of plants with available phosphorus [5]. Therefore, the study of soil phosphatase activity enables you to evaluate the prospects of organic and mineral fertilizers use and the effectiveness of new technologies of growing crops, etc.

In this context, the objective of our study was to determine the number of bacteria that dissolve soil organophosphates and and the levels of phosphatase activity in rhisospheric soil of spring barley plants under the action of fertilizers and Mikrohumin.

Materials and methods. The study was conducted during 2011-2015 in the stationary field experiment of the Institute of Agricultural Microbiology and Agroindustrial Manufacture of NAAS with short-rotation crop succession (potato – spring barley – peas – winter wheat) on black leached soil with humus content – 2.12%, slightly-hydrolized nitrogen – 95.2 mg/kg, phosphorus mobile forms (P_2O_5) – 226 mg/kg (by Chyrikov), exchangeable potassium (K_2O) – 108 mg/kg (according to Kirsanov), rH_{sol} – 5.30.

Fertilization scheme for spring barley of Hosia variety included the following options:

Background I – without bacterization:

1. Without fertilizer (control);
2. First year aftereffect of 40 t/ha of manure;
3. $N_{30}P_{30}K_{30}$;
4. $N_{60}P_{60}K_{60}$;
5. $N_{90}P_{90}K_{90}$;
6. First year aftereffect of 40 t/ha of manure + $N_{60}P_{60}K_{60}$.

Background II – preplant bacterization of seeds with Mikrohumin:

7-12 – the same options of fertilization.

Research plot area – 86.4 m^2 (7.2 x 12.0), repetition of the experiment is quadriple. Plots location – randomized. Farming technique for the cultivation of spring barley is generally recognized. Bacterization of seeds with Mikrohumin (TU U-24.1-00497360-007:2008) was conducted according to SUC 01.11-37-782 [6].

Samples of rhisospheric soil for analysis were taken in the following phases of barley plant development: stem elongation, flowering and milky ripeness.

The number of phosphate-mobilising bacteria in plants root zone was determined by cup method on a nutrient Muromtsev medium adding $C_3H_5(OH)_2PO_4Ca$ – 6.0 g/l (203 mg of P_2O_5/ 100 ml) [7]. Total phosphatase activity of rhisospheric ground of barley plants was determined by I. T. Heller and K. E. Ginzburg [7].

The conduct of stationary field experiment and statistical processing of results were performed according to conventional methods [8].

Thus, when growing spring barley on black leached soil the number of bacteria that dissolve organic ground phosphates, and phosphatase activity in plants root zone is positively affected by fertilization in the norms, not exceeding N60P60K60. Effective by the action on the studied parameters is also the first year aftereffect of 40 t/ha of manure. The application of Mikrohumin enables the increase of phosphate-mobilizing bacteria and phosphatase soil activity. Focusing on the performance of enzymatic activity the mentioned aricultural backgrounds and Mikrohumin can be considered favourable for the manifestation of the highest biological activity in agrocoenosis with spring barley when growing the crop on black leached soil.

This is confirmed by crop yield account (Table 1).

The highest effect of interaction with Mikrohumin was observed at the introduction of by making $N_{30}P_{30}K_{30,}$ $N_{60}P_{60}K_{60}$ and aftereffect of 40 t/ha of manure. Thus, the biological activity of barley rhisospheric soil is the highest in case of appropriate agricultural backgrounds. In their interaction with microbial agent the greatest influence on the formation of crop productivity is observed.

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