THE INFLUENCE OF *BRADYRHIZOBIUM JAPONICUM* AND *AZOSPIRILLUM BRASILENSE* ON THE VERTICAL MIGRATION OF NUTRIENTS AT SOYBEAN CULTIVATION

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Nitrogen-fixing bacteria developing in plants root area are able to improve their nutrition and boost the growth and development of crops. Particularly effective are nodule bacteria that form symbiotic systems with various legumes, including soy [1]. The maximum realization of rhizobia-plant systems potential can be achieved by the incorporation of all abiotic and biotic environmental factors effect, one of which is the impact on symbiotic diazotrophs of associative or nonsymbiotic nitrogen-fixing bacteria.

There are some author's research results that indicate the possibility of root growth and nodulation stimulation in soybean plants by the use of azospirils in conjunction with the inoculation with different strains of rhizobia [2-4]. It was shown that microorganisms introduced in agrocenosis can help increase the length and dry mass of roots and growth of root hairs. The enhanced root development after the application of mixed culture of microorganisms, in our view, should provide a reduction of nutrients losses with vertical water flow by the soil profile observed in the conditions of flushing regime.

The objective of our work was to study the effect of soybean pre-seed bacterization with diazotrophs *Bradyrhizobium japonicum* and *Azospirillum brasilense* on the intensity of vertical migration of nutrients beyond the root layer of soil.

Materials and methods. The effect of soybean pre-seed bacterization on vertical migration of compounds of nutrients was studied in the terms of lysimeter installation of the Institute of Agricultural Microbiology and Agroindustrial Manufacture of NAAS, containing 48 sections-lysimeters placed in two parallel rows of 24 lysimeters each. Vessels-receivers for infiltration collection are placed beneath. By construction the lysimeters are made of concrete, bulk type. Lysimeter cells are filled with soil sequentially, beginning with the parent rock, taking into account the power of genetic horizon. Lysimeter cell cultivated area is 3.8 m², soil layer - 155 cm, its weight - 10.5

tons. Soil in lysimeters - sod-podzolic sabulous with such agrochemical characteristics of arable layer (0-23 cm): humus content by Tiurin - 1.1%; salt extraction pH - 5.5; hydrolytic acidity (by Kappen) - 2.5 mg eq. Per 100 g; P₂O₅ content (by Kirsanov) - 170.0 mg; K₂O (by Maslova) - 62.0 mg per 1 kg of soil. Experiment with soy of Lehenda variety was performed in 2014. The repetition in the experiment is quadruple. The scheme of the experiment is shown in the tables.

Nitrate content was determined by phenoldisulfonic method, ammonium content - with Nesler reagent, water-soluble P₂O₅ - by Kirsanov, K₂O - by flame photometric method, CaO and MgO - by complexometric method, water soluble humus - by Tiurin [5].

Harvest collection and records were performed by direct method. Statistical analysis of the results was performed by Dospiekhov [6]. The content of chlorophylls a and b was determined spectrophotometric method [7].

Bacterial strains *B. japonicum* M-8 [8] and *A. brasilense* 410 were used in the experiment [9]. The microorganisms were obtained from the National Collection of useful soil microorganisms of the Institute of Agricultural Microbiology and Agroindustrial Manufacture of NAAS.

The studied microorganisms were grown in the conditions of periodic cultivation on microbiological rocking at 220 rev/min and 28°C. Seeding culture of *A. brasilense* was grown in liquid culture medium of such composition (g/dm³): maize extract - 30.0; molasses - 30.0; (NH₄)₂SO₄ - 0.10; KH₂PO₄ - 0.25; K₂HPO₄*3H₂O - 0.25; MgSO₄*7H₂O - 0.20; CaCO₃ - 0.30. Seeding culture *B. japonicum* was grown in liquid culture medium of such composition (g/dm³): peas seed broth - 100; glucose - 10; sucrose - 5; (NH₄)₂SO₄ - 1.0; KN₂RO₄ - 0.5; K₂NRO₄*3N₂O - 0.5; MgSO₄*7H₂O - 0.2; CaCO₃ - 0.3. Co-culturing of *A. brasilense* and *B. japonicum* bacteria was performed using a mixed culture medium for culturing rhizobia and azospiryls [10].

We express our sincere gratitude to the

authors for kindly furnished strains, and the staff of Agricultural Chemistry and Soil Fertility laboratory of the Institute of Agricultural Microbiology and Agroindustrial Manufacture of NAAS for assistance in the study.

The records of soybean yields showed that pre-plant inoculation of seeds with nodule bacteria helped increase the culture productivity. There was no significant effect of *A. brasilense* 410 on productivity. The highest increase in soybean harvest against control was observed in the variant with common use of *B. japonicum* M-8 and *A. brasilense* 410 (Table.

2). While combined application of rhizobia and azospiryls helped increase the yields by 19.2% compared with the use of pure *B. japonicum* culture.

Thus, the use of *B. japonicum* and *A. brasilense* in soybean growing technology there is a significant decrease in the loss of moisture, water soluble humus compounds and nutrients, and increase in the content of chlorophyll a and b in leaves of soybean plants. At combined use of rhizobia and azospiryls the synergistic effect as for the increase of yields of this legume is observed.