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# USE OF ASSOCIATED MICROORGANISMS AS POTENTIAL BIOFERTILIZERS FOR SOIL FERTILITY AND LIMITING PLANT PATHOGENS

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***Abstract.*** *Microorganisms present in the plant rhizosphere and tissues absorb atmospheric nitrogen and synthesize various physiologically active substances, regulate the nutrient balance of the plant, and have an antagonistic activity against phytopathogens by positively influencing its growth and development. has Taking into account the fact that our research is carried out depending on the state of the microbe-plant association in limiting phytopathogens, bacteria belonging to the genera Azotobacter and Bacillus were isolated and identified.*

***Keywords:*** *Azotobacter, Bacillus, rhizobacteria, phytopathogen, antagonist, morphology, physiology, mineral fertilizer.*

In agriculture, the use of plant growth-promoting rhizobacteria (PGPR) is gaining attention, because it reduces the use of chemical fertilizers, pesticides and other harmful substances, and allows these microorganisms to produce environmentally friendly products. is incommensurable [3,6]. Substances controlling growth and development are produced in large quantities by the action of these rhizosphere microorganisms, which directly or indirectly affect the general morphology and physiology of crops. Recent advances in the field of sustainable development rely on the availability and diversity of PGPR, their colonization capacity, and a mechanism of action that can be used to facilitate their use as a reliable element in the management of sustainable agricultural systems[2,5].

In the unique climatic and ecological conditions of our republic, most local rhizobacteria are found in the regions and rhizospheres [2,8]. The use of local strains as biological fertilizers shows that it is important to study the effects of salinity, various pesticides and heavy metals on a scientific basis.

As the plant develops in a certain ecological environment, interaction-symbiosis processes occur between it and the microorganism populations in that environment [1.7]. In general, it is difficult to imagine the growth and development of a plant without microorganisms associated with it [4,6,3].

Microorganisms present in plant rhizosphere and tissues - free-living and endosymbiont microbial populations play an important role in physiological and biological processes of plants. In particular, they normalize the nutrient balance of the plant by assimilating atmospheric nitrogen [6,7] and synthesizing various physiologically active substances, enhancing its growth and development.

Recently, special attention has been paid to the use of rhizobacteria, representatives of the Azotobacter, Azospirillum and Rhizobium families and their secondary metabolites, for the purpose of increasing the productivity of agricultural crops and soil bioremediation [1, 4]. Because, compared to other rhizobacteria, representatives of these genera synthesize nitrogen and a number

of physiologically active substances in optimal amounts for plants, including phytohormones - auxins, gibberellin-type substances, and can transfer hardly soluble phosphates in the soil to mobile forms.

Based on the above ideas, bacteria belonging to the genera Azotobacter and Bacillus were isolated from the rhizosphere of wheat growing in the soil regions of Uzbekistan, including Namangan, Khorazm, Syrdarya, Bukhara and Andijan regions. To isolate and identify these bacteria, 10 g samples of rhizosphere and root parts were mixed in 90 ml of nitrogen-free liquid Ashby's nutrient medium and bulk cultures were obtained. Then, knowing the characteristics of the bacteria from the bulk cultures, they were planted in different solid nutrient media without nitrogen. For growing strains of bacteria belonging to the genus Bacillus (g/l): peptone - 10; yeast extract - 1; NaCl - 0.2; MgSO4•7H2O – 0.2. nutrient medium was used.

Two types of morphologically different colonies were isolated in Ashby nutrient medium. Morphological-physiological, biochemical (cell shape, formation of capsule mucus, staining according to Gram's reaction, catalase indicator) characteristics of the colonies showed that they belong to the genus Azotobacter.

The phylogenetic analysis of the Bacillus sp.2011 strain based on the 16 S rRNA gene sequence showed that it belongs to the Bacillus subtilis species (Fig. 1).

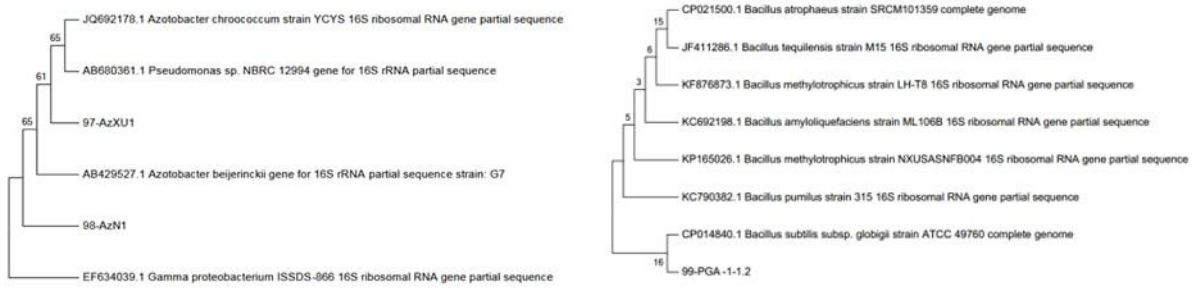


**Figure 1. Phylogenetic tree of strains of Bacillus sp, Azotobacter sp.**

As a result of the research, a total of 15 strains, 9 strains belonging to the genus Azotobacter and 7 strains belonging to the Bacillus subtilis species, were isolated from the wheat rhizosphere.

It can be concluded from these experiments that plant-microbe association with the help of bacteria isolated from the rhizosphere of wheat can be used to create a unique natural ecological adaptation, to increase the productivity of irrigated land areas, and to increase the productivity of plants.

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