

“Atlas of Soil Microorganisms” – Citizen Science Education Program for School Teachers

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Every year, citizen science's contribution to obtaining scientifically significant results grows. The search for new formats for teaching schoolchildren and improving school teachers' skills is an essential task of modern biological education. Research-oriented teaching projects allow students to research without listening to obligatory lectures and consolidate knowledge in exams.

In 2022, due to the “Atlas of Soil Microorganisms” research project implementation, teachers and their students from 62 regions collected more than 3,000 soil samples. They initially screened plant growth-promoting bacteria, primarily which fix nitrogen and solubilize phosphates. Another promising direction is the construction of consortiums of soil bacteria with different properties promoting the plants' growth. Due to close interaction with the rhizosphere of cultivated plants, bacterial consortia can simultaneously provide several biological activities beneficial for plants: fixation of atmospheric nitrogen, solubilization of inorganic and organic phosphates, synthesis of siderophores, heteroauxin, and other organic compounds. The combination of several activities in one microbial consortium has a productive effect on the growth and development of plants.

With the participation of schoolchildren, during the 24-day techno-scientific educational project, an analysis was made of the effect of 20 consortia inoculated into germinating seeds on the *Triticum aestivum* L. A comparative analysis of the copy number content of three genes important in plant growth in wheat rhizosphere samples was carried out. The best results show consortia containing *Bacillus*, *Enterobacter* и *Pseudomonas* strains: copy number of Nifh (nitrogenase) gene increased in 424 times, of ALPL (alkaline phosphatase) increased in 74 times, and copy number of beta-propeller phytase gene did not change.

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