



## Theoretical Principles of Increasing Plant Productivity and Soil Fertility Based on the Complex of Rhizosphere Microorganisms

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**Abstract:** In the article, two-, three-, and four-component microbial preparations are currently considered promising, and it is known that they contain biologically active substances, along with fungal bacteria, rhizobacteria, and mycorrhizal fungi.

For seed inoculation, treatment with a mixture of microorganisms selected for high nitrogen accumulation, resistance to external environmental factors and competition with other types of microflora increases nitrogen availability in the rhizosphere and phyllosphere of plants compared to single cultures. It is mentioned in the literature analysis that it enables mastering.

**Keywords:** bacterial preparation, microorganism, salinity, tomato, tomato crops, inoculation, productive productivity, complex biopreparations, rhizobacteria, microflora, substrate carrier, inoculation.

**INTRODUCTION.** A group of representatives of several groups of rhizosphere microorganisms - free-living and associative microorganisms (microorganisms belonging to the genera *Azotobacter*, *Bacillus*, *Klebsiella*, *Azospirillum*) is used to form the composition of complex bacterial preparations. Currently, two-, three-, and four-component microbial preparations are considered promising, and it is known that they contain biologically active substances, along with fungi, rhizobacteria, and mycorrhizal fungi.

For seed inoculation, treatment with a mixture of microorganisms selected for high nitrogen accumulation, resistance to external environmental factors and competition with other types of microflora increases nitrogen availability in the rhizosphere and phyllosphere of plants compared to single cultures allows to master.

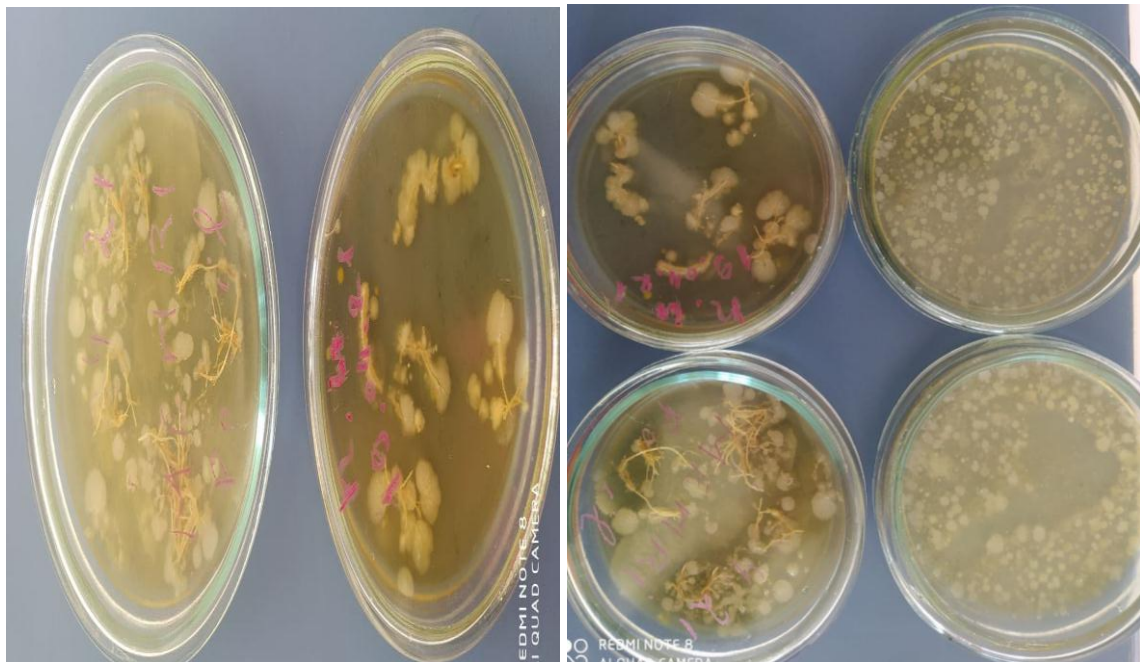
When the composition of polyvalent microbiological preparations based on ecologically and physiologically compatible composition of microorganisms and their biologically active substances is correctly selected, they have a high level of stability and are highly effective in different agro-climatic conditions.

Microorganisms with a complex effect, types with biofertilizer, fungicidal and insecticidal effects, solve a number of problems, i.e. biological protection of plants, harvested crops (fruits and vegetables, fodder, technical crops and etc.) allows to positively solve problems such as increasing the volume and quality, improving the condition of soils, and increasing productivity. This, in turn, leads to reducing or completely abandoning the use of chemical plant protection agents.



## RESEARCH METHODS.

Bacteria were grown in a Petri in an agar medium. (10 ml) of nutrient medium was supplemented with 1-8% NaCl, and 150  $\mu$ l of actively growing PGRR were added to test tubes on a rotary shaker at 37°C. The growth intensity of bacteria in NaCl was determined by optical density index 03540. All isolates were selected on the basis of one-step mutation for resistance to 100  $\mu$ g/ml rifampicin. Rifampicin-resistant PGPR was grown in NaCl-free media. Actively grown bacteria were adapted for resistance to 6% NaCl.



**Figure 1. Rhizobacteria isolated from tomato plant**

For mono- and multi-component composite preparations, a complex of microorganism strains with the characteristics of production of biologically active substances, phosphatase enzyme activity, assimilation of atmospheric nitrogen, fight against phytopathogens, and acceleration of plant growth and development are used.

Also, an example of a complex biofertilizer, consisting of a suspension of pistia and khara algae in a ratio of 12-14:4-1:1-3, in addition to green algae intended for agricultural crops - chlorella and xenodesmus can be brought. According to the authors who recommended it, the used biofertilizer saves a certain amount of mineral fertilizers and has high ecological and economic efficiency.

## RESEARCH RESULTS AND THEIR ANALYSIS.

As a result, the excessive load on the soil, including the effect of harmful chemicals on the useful active agroflore, is achieved, and the biological activity of the soil increases and its productivity increases. These tools are environmentally safe as they are extracted from living nature.

It is known from the scientific literature that bacterial preparations with complex effects obtained on the basis of useful microorganisms, which are typical representatives of the rhizosphere of plants, allow to change the traditional approaches in plant science to a certain extent. Such preparations help to improve the health of the root layer of the soil, reduce the amount of phytopathogens in it, and regulate the organo-mineral balance of the soil.

Taking into account the unique soil and climate conditions of Uzbekistan, the use of active microbial collections (populations) to increase soil fertility and plant productivity, to improve the phytosanitary condition of agroecosystems, and to use scientifically based and economically



effective biotechnologies are among the urgent problems in the cultivation of agricultural crops. is considered to be Finding its solution requires biotic (biotic factors related to living organisms and abiotic factors, taking into account the quantitative and qualitative composition of microbial senoses, which requires methodological approaches adapted to the conditions. For this, microorganisms with high polyfunctional activity and strong viability in natural conditions and it is recommended to use antagonists with competitive properties or their associations in a complex manner.

**CONCLUSION.** In our country, considerable work is being done on the use of microorganisms with complex effects in agricultural practice. However, the research conducted in this regard is not sufficient, taking into account different soil and climate conditions, it is necessary to systematically expand the production of polyfunctional biopreparations.

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