

BIOTECHNOLOGY OF THE USE OF MICROBIOLOGICAL PREPARATIONS IN INCREASING THE YIELD OF PLANTS GROWING IN CLOSED CONDITIONS.

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Annotation: This article discusses the importance of microbiological preparations in agriculture, their effect on plant growth and development, their role in increasing soil fertility, and modern biotechnological methods of their application. The advantages of biological preparations over traditional agrotechnical methods are also analyzed.

Key words: microbiological preparations, productivity, nutrition improvement, phytohormones increase.

Introduction: Nowadays, the need for environmentally friendly and sustainable agriculture is increasing. Excessive use of chemical fertilizers and pesticides leads to soil degradation, disruption of the ecological balance and negative effects on human health. In this regard, microbiological preparations are gaining increasing importance as an environmentally safe and effective alternative. General information about microbiological preparations

Microbiological preparations are biological agents based on beneficial microorganisms (bacteria, fungi, actinomycetes, etc.) that improve plant nutrition, stimulate growth and increase disease resistance.

Main types:

- Nitrogen-fixing bacteria (e.g. *Rhizobium*, *Azotobacter*)
- Phosphorus-solubilizing microorganisms (e.g. *Bacillus megaterium*)
- Phytohormone-producing microorganisms
- Biocontrol agents (e.g. *Trichoderma*, *Pseudomonas fluorescens*)

Effect of microbial preparations on plants

Microorganisms increase plant productivity through the following mechanisms:

1. Improving nutrition - by facilitating nitrogen fixation and phosphorus assimilation.
2. Synthesis of phytohormones - growth hormones such as auxin, gibberellin, cytokinins are produced.
3. Increasing stress resistance - becoming more resistant to factors such as drought, salinity.
4. Combating phytopathogens - protecting plants by producing antibacterial and antifungal substances.

Microbiological preparations are produced in the following stages:

1. Selection and identification of microorganisms
2. Reproduction in laboratory conditions (fermentation)
3. Formulation - preparation in the form of liquid, powder, granules
4. Storage and application technology - special conditions to preserve biological activity

Practical application

- Cereal crops - for example, wheat, corn, rice
- Vegetable and melon crops - tomatoes, cucumbers, pumpkin
- Fruit trees and vineyards
- In greenhouse conditions

Chemicals	Microbiological agents
Expensive and import-dependent	Made from local raw materials
Causes resistance	Biologically compatible
Not suitable for organic farming	Compatible with certified organic systems
Chemicals	Microbiological agents
Damage to the ecosystem	Eco-friendly

Conclusion: Microbiological preparations are environmentally friendly, economically efficient and one of the innovative tools that play an important role in the agricultural system. Their production based on modern biotechnology and widespread implementation in practice can achieve sustainable development in agriculture. In the future, it will be important to further deepen scientific research in this area and form a bank of microorganisms suitable for local climatic conditions.

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