ENHANCING STRAWBERRY (FRAGARIA SPP) CULTIVATION THROUGH POLYFUNCTIONAL BIOPREPARATIONS DERIVED FROM ENDOPHYTIC MICROORGANISMS OF XEROPHYTIC PLANTS: IMPLICATIONS FOR FOOD SECURITY

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Abstract

This study investigates the efficacy of polyfunctional biopreparations, formulated from consortia of endophytic microorganisms (Bacillus, Pseudomonas, Priestia, and Brevibacillus) isolated from xerophytic plants, in promoting the growth and resilience of local strawberry (Fragaria spp.) cultivars. These biopreparations were applied to strawberry seedlings via root inoculation to assess their impact on vegetative and generative traits, including root architecture, stem elongation, flowering intensity, and fruit yield. Experimental results demonstrated that treated plants exhibited significantly enhanced root development, increased stem vigor, and improved flowering and fruiting compared to untreated controls. Furthermore, the biopreparations conferred heightened tolerance to abiotic stresses, such as drought, suggesting their potential as sustainable agro-biotechnological tools. By leveraging the unique adaptive traits of endophytic microorganisms from drought-resistant plants, this research highlights a novel approach to improving strawberry productivity and resilience. These findings contribute to sustainable agricultural practices, supporting food security by reducing reliance on chemical inputs and enhancing crop performance under environmental stress.

Keywords: Polyfunctional biopreparations, endophytic microorganisms, xerophytic plants, strawberry cultivation, abiotic stress tolerance, sustainable agriculture, food security.

Introduction

Climate change and increasing drought conditions pose serious challenges to agriculture in arid and semi-arid regions, including Uzbekistan. Strawberry (Fragaria spp.) is a high-value crop, but its productivity is often limited by water scarcity and poor soil conditions. Heavy use of chemical fertilizers and pesticides leads to environmental degradation and reduces long-term soil fertility. Therefore, sustainable alternatives are urgently needed.Endophytic microorganisms living inside drought-resistant xerophytic plants possess unique adaptive traits that help their host plants survive harsh conditions. These microbes can promote plant growth and enhance stress tolerance through natural mechanisms. The aim of this study is to evaluate the effectiveness of polyfunctional biopreparations prepared from consortia of endophytic bacteria (Bacillus, Pseudomonas, Priestia, and Brevibacillus) isolated from xerophytic plants for improving local strawberry cultivation under normal and stress conditions.

Materials and Methods

The study used local strawberry (Fragaria spp.) cultivars as the experimental object. Endophytic microorganisms (Bacillus, Pseudomonas, Priestia, and Brevibacillus) were isolated from xerophytic plants collected in the Samarkand region. These strains were formulated into polyfunctional biopreparations as microbial consortia.The biopreparations were applied to strawberry seedlings by root inoculation. Untreated seedlings served as the control group. The effects on vegetative traits (root architecture and stem elongation) and generative traits (flowering intensity and fruit yield) were

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evaluated. Additionally, the ability of the biopreparations to improve tolerance to abiotic stress, particularly drought, was assessed through controlled experiments.

Conclusion

In conclusion, the polyfunctional biopreparations derived from endophytic microorganisms of xerophytic plants effectively enhanced the growth and resilience of strawberry plants. Treated plants showed significantly better root development, stronger stems, increased flowering, and higher fruit yield compared to untreated controls. The biopreparations also improved the plants' tolerance to drought stress.

This approach utilizes the natural adaptive properties of endophytes from drought-resistant plants, offering a sustainable biotechnological solution for strawberry cultivation. The results support reduced dependence on chemical inputs, preservation of soil health, and increased crop performance under environmental stress. Such biopreparations can contribute to food security in arid regions by promoting climate-resilient and environmentally friendly agriculture.

Future work should focus on field-scale trials and optimization of application methods to facilitate practical use by farmers in Uzbekistan and similar regions.

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