



“PHOSPHATE-SOLUBILIZING ENDOPHYTIC BACTERIA ISOLATED FROM TOMATO PLANTS AND THEIR INFLUENCE ON PLANT NUTRITION”

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Abstract: *Phosphorus (P) is a vital macronutrient required for plant growth and development, playing an essential role in energy metabolism, photosynthesis, nucleic acid synthesis, and root architecture formation. Despite its importance, phosphorus availability in agricultural soils is often limited due to its fixation in insoluble forms, restricting plant uptake and reducing crop productivity. This challenge necessitates sustainable strategies to improve phosphorus use efficiency in crop production systems.*

Keywords: *Phosphate-solubilizing bacteria, plant growth promotion, phosphorus bioavailability, biofertilizer, sustainable agriculture, root development, nutrient uptake, tomato, Pikovskaya's medium.*

Endophytic bacteria, which reside within plant tissues without causing harm, have gained increasing attention as effective plant growth-promoting microorganisms. Unlike rhizospheric bacteria, endophytes establish intimate associations with their host plants and can directly influence plant nutrition and metabolism. Endophytic phosphate-solubilizing bacteria (PSB) isolated from tomato (*Solanum lycopersicum* L.) plants represent a promising biological approach for enhancing phosphorus availability within plant tissues.

In this study, endophytic bacteria were isolated from healthy tomato plants and screened for their ability to solubilize inorganic phosphate. The isolates were evaluated using qualitative and quantitative assays to determine phosphate solubilization efficiency. In addition to phosphorus solubilization, selected strains were assessed for other plant growth-promoting traits, including indole-3-acetic acid (IAA) production and siderophore synthesis, which are known to enhance root development and micronutrient acquisition.

The results indicated that several endophytic bacterial isolates exhibited strong phosphate-solubilizing activity along with multiple growth-promoting characteristics. The inoculation of selected endophytic PSB strains significantly improved plant nutritional status by enhancing phosphorus uptake and promoting better root and shoot growth under controlled and greenhouse conditions. These findings suggest that tomato-derived endophytic bacteria play an important role in improving plant phosphorus nutrition through both direct solubilization mechanisms and indirect growth stimulation.

Overall, the use of native phosphate-solubilizing endophytic bacteria offers a sustainable and eco-friendly alternative to chemical phosphorus fertilizers. Their application can improve nutrient use efficiency, support healthy plant development, and contribute to environmentally responsible tomato production systems.

Conclusion

Endophytic bacteria isolated from tomato plants demonstrated significant potential for phosphate solubilization and enhancement of plant nutrition. Their ability to increase phosphorus availability, combined with additional plant growth-promoting traits,



highlights their suitability as bioinoculants for sustainable agriculture. The integration of tomato-derived endophytic PSB into nutrient management strategies may reduce reliance on chemical fertilizers and improve crop productivity. Further molecular identification and field-based evaluations are recommended to validate their effectiveness under diverse agricultural conditions.

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