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Towards A Better Greener Future- An Alternative Strategy Using Biofertilizers I: Plant Growth Promoting Bacteria

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Abstract

In recent years, an unprecedented change in the environmental conditions has substantially affected the ability of plants to adapt to changing climactic conditions. These changes are primarily the result of population explosion, increased air and soil pollution, heavy metals contamination of the ecosystem, degradation of soil quality, and global climate change among others. Hence, there is a need to develop a sustainable agriculture system focused on yield increase and remediation of dwindling soil nutrients. Enhancing the natural roles of plant growth-promoting bacteria (PGB) that are beneficial in improving soil health and plant productivity is gaining importance. In the symbiotic associations of PGBs with plants, the microbes help to increase the bioavailability of phosphorus (P) and nitrogen (N) and other soil trace elements essential to plant growth. Moreover, the presence of the symbiotic association also helps to increase the water uptake of plants, induces systemic resistance and encompasses the adverse effects of phytopathogens, modulates the production of plant growth hormones and diminishes the effects of abiotic stresses like drought, salinity, heavy metal toxicity. Establishment of the symbiotic association is a well-orchestrated process at both physiological and molecular levels that requires a continuous communication between the two participating partners. Research studies carried out over the years have identified some candidate genes, and putative signal transduction cascades necessary for the symbiotic association, but a complete understanding of the PGB molecular interaction is still very limited. This review focuses on the recent development of knowledge in the PGB symbiosis, molecular mechanisms involved in the nutrient exchange, and improvement in plant growth and development.

Key words

Plant growth-promoting bacteria, phosphorus, quorum sensing, siderophores, stress,

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