World Academy of Science, Engineering and Technology
International Journal of Agricultural and Biosystems Engineering
Vol:18, No:05, 2024

Application of Free Living Nitrogen Fixing Bacteria to Increase Productivity of Potato in Field

Authors : Govinda Pathak

Abstract : In modern agriculture, the sustainable enhancement of crop productivity while minimizing environmental impacts remains a paramount challenge. Plant Growth Promoting Rhizobacteria (PGPR) have emerged as a promising solution to address this challenge. The rhizosphere, the dynamic interface between plant roots and soil, hosts intricate microbial interactions crucial for plant health and nutrient acquisition. PGPR, a subset of rhizospheric microorganisms, exhibit multifaceted beneficial effects on plants. Their abilities to stimulate growth, confer stress tolerance, enhance nutrient availability, and suppress pathogens make them invaluable contributors to sustainable agriculture. This work examines the pivotal role of free living nitrogen fixer in optimizing agricultural practices. We delve into the intricate mechanisms underlying PGPR-mediated plant-microbe interactions, encompassing quorum sensing, root exudate modulation, and signaling molecule exchange. Furthermore, we explore the diverse strategies employed by PGPR to enhance plant resilience against abiotic stresses such as drought, salinity, and metal toxicity. Additionally, we highlight the role of PGPR in augmenting nutrient acquisition and soil fertility through mechanisms such as nitrogen fixation, phosphorus solubilization, and mineral mobilization. Furthermore, we discuss the potential of PGPR in minimizing the reliance on chemical fertilizers and pesticides, thereby contributing to environmentally friendly agriculture. However, harnessing the full potential of PGPR requires a comprehensive understanding of their interactions with host plants and the surrounding microbial community. We also address challenges associated with PGPR application, including formulation, compatibility, and field efficacy. As the quest for sustainable agriculture intensifies, harnessing the remarkable attributes of PGPR offers a holistic approach to propel agricultural productivity while maintaining ecological balance. This work underscores the promising prospect of free living nitrogen fixer as a panacea for addressing critical agricultural challenges regarding chemical urea in an era of sustainable and resilient food production.

Keywords : PGPR, nitrogen fixer, quorum sensing, Rhizobacteria, pesticides
Conference Title : ICAACS 2024 : International Conference on Agriculture, Agronomy and Crop Sciences
Conference Location : Las Vegas, United States
Conference Dates : May 20-21, 2024