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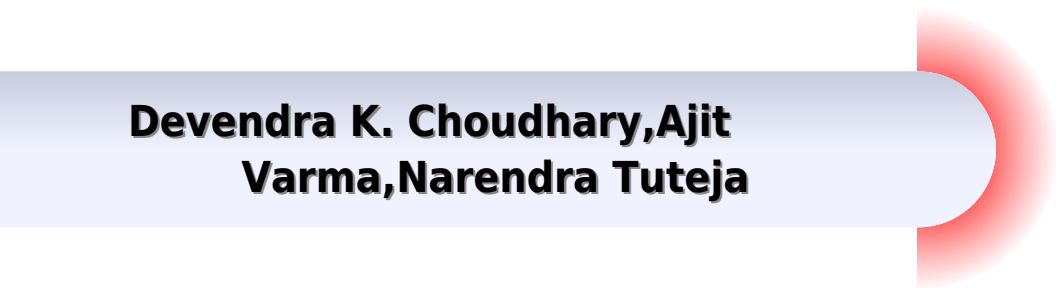
# Principles of Plant-Microbe Interactions

Microbes for Sustainable Agriculture

 Springer

# Principles Of Plant Microbe Interactions Microbes For Sustainable Agriculture

**Devendra K. Choudhary, Ajit  
Varma, Narendra Tuteja**



## **Principles Of Plant Microbe Interactions Microbes For Sustainable Agriculture:**

**Principles of Plant-Microbe Interactions** Ben Lugtenberg, 2014-12-04 The use of microbial plant protection products is growing and their importance will strongly increase due to political and public pressure World population is growing and the amount of food needed by 2050 will be double of what is produced now whereas the area of agricultural land is decreasing We must increase crop yield in a sustainable way Chemical plant growth promoters must be replaced by microbiological products Also here the use of microbial products is growing and their importance will strongly increase A growing area of agricultural land is salinated Global warming will increase this process Plants growth is inhibited by salt or even made impossible and farmers tend to disuse the most salinated lands Microbes have been very successfully used to alleviate salt stress of plants Chemical pollution of land can make plant growth difficult and crops grown are often polluted and not suitable for consumption Microbes have been used to degrade these chemical pollutants **Plant-Microbial**

**Interactions for Sustainable Agriculture** Arvind Kumar Rai, Priyanka Chandra, Nirmalendu Basak, Parul Sundha, Rajender Kumar Yadav, 2024-11-13 Hunger food insecurity and malnutrition are major challenges in many parts of the world Soil degradation and increased water stress worldwide are the major obstacle in the way of the resilient agri food system It has been estimated that across the globe over 800 Mha of land is affected by salts which include both salinity and alkalinity Under stress conditions soil plant and microorganisms form a unique mutualistic relationship in and around the rhizosphere Soil microorganisms inhabiting the rhizosphere called Plant Growth Promoting Rhizobacteria PGPR possesses the potential to enhance plant growth through several mechanisms and also alleviate the effect of abiotic stresses on plants Hence this book aims to bring out a comprehensive collection of scientific research which includes the functions of the rhizosphere to harness plant microbe interactions and PGPR for abiotic stress mitigation and enhancing crop performance

**Plant-Microbe Interaction: An Approach to Sustainable Agriculture** Devendra K. Choudhary, Ajit Varma, Narendra Tuteja, 2017-02-08 The book addresses current public concern about the adverse effect of agrochemicals and their effect on the agro ecosystem This book also aims to satisfy and contribute to the increasing interest in understanding the co operative activities among microbial populations and their interaction with plants It contains chapters on a variety of interrelated aspects of plant microbe interactions with a single theme of stress management and sustainable agriculture The book will be very useful for students academicians researcher working on plant microbe interaction and also for policy makers involved in food security and sustainable agriculture **Microbes for Climate Resilient Agriculture** Prem Lal Kashyap, Alok Kumar

Srivastava, Shree Prakash Tiwari, Sudheer Kumar, 2018-03-07 A comprehensive edited volume pulling together research on manipulation of the crop microbiome for climate resilient agriculture Microbes for Climate Resilient Agriculture provides a unique collection of data and a holistic view of the subject with quantitative assessment of how agricultural systems will be transformed in coming decades using hidden treasure of microbes Authored by leaders in the field and edited to ensure

conciseness and clarity it covers a broad range of agriculturally important crops discusses the impact of climate change on crops and examines biotechnologically and environmentally relevant microbes The book encapsulates the understanding of microbial mediated stress management at field level and will serve as a springboard for novel research findings and new applications in the field Chapter coverage includes the role of the phytomicrobiome in maintaining biofuel crop production in a changing climate the impact of agriculture on soil microbial community composition and diversity in southeast Asia climate change impact on plant diseases microalgae photosynthetic microorganisms and bioenergy prospects amelioration of abiotic stresses in plants through multi faceted beneficial microorganisms role of methylo trophic bacteria in climate change mitigation conservation agriculture for climate change resilience archaeal community structure mycorrhiza helping plants to navigate environmental stresses endophytic microorganisms bacillus thuringiensis and microbial nanotechnology for climate resilient agriculture Clear and succinct chapters contributed and edited by leaders in the field Covers microbes beneficial and detrimental roles in the microbiome as well as the functions they perform under stress Discusses the crop microbiome nutrient cycling microbes endophytes mycorrhizae and various pests and diseases and their roles in sustainable farming Places research in larger context of climate change s effect on global agriculture Microbes for Climate Resilient Agriculture is an important text for scientists and researchers studying microbiology biotechnology environmental biology agronomy plant physiology and plant protection

*Plant-Microbe Interaction and Stress Management* Puneet Singh Chauhan, Shri Krishna Tewari, Sankalp Misra, 2024-08-31 This book provides a comprehensive view for plant microbe interactions towards stress management and microbiome assisted approaches in sustainable agriculture It is divided into four major sections The book gives insights into the increasing threat of abiotic and biotic stresses and the accompanying challenges to modern agriculture Through different chapters the book shows how various microorganisms could ameliorate abiotic and biotic stress and contribute towards food sustainability and restore ecosystem functioning It provides a deep understanding of soil microbiome and its interaction with plants to enhance food security It further talks about metagenomic approaches for methodological tool for studying the soil microbiome Separate sections on stress talk at length about the various abiotic and biotic stresses that plants are faced it The book culminates with an exciting section on microbiome assisted approaches for combating stress It talks about the different microbiomes such as rhizosphere soil phyllosphere and endophytic microbiome The book would be beneficial to students researchers and course instructors in microbiology botany plant pathology and agriculture

**Microbes for Legume Improvement** Almas Zaidi, Mohammad Saghir Khan, Javed Musarrat, 2017-10-09 This book presents in depth insights into strategies involving plant growth promoting rhizobacteria PGPR including symbiotic asymbiotic nitrogen fixers and associative endophyte bacteria phosphate solubilizing microbes as well as arbuscular mycorrhizal fungi and their active biomolecules in legume production It also examines the latest research findings on the taxonomic status of rhizobia and signal molecules affecting rhizobia legume symbiosis to improve readers understanding of

the cultivation of legumes in conventional and derelict soil The agronomically important microflora broadly discussed have offered solutions to some of the problems associated with expensive fertilizers used in many production systems This second edition provides an overview of metal toxicity to legumes and presents strategies for the abatement of metal toxicity to legumes Aimed at professionals practitioners researchers and graduate students in microbiology crop sciences soil microbiology biotechnology and environmental microbiology the book focuses on the basic concepts and practical aspects of useful soil microbiota in legume production

**Agriculturally Important Microbes for Sustainable Agriculture** Vijay Singh Meena, Pankaj Kumar Mishra, Jaideep Kumar Bisht, Arunava Pattanayak, 2017-09-18 This book presents a compilation of case studies from different countries on achieving agricultural sustainability The book stresses that in order to meet the needs of our rapidly growing population it is imperative to increase agricultural productivity If global food production is to keep pace with an increasing population while formulating new food production strategies for developing countries the great challenge for modern societies is to boost agricultural productivity Today the application of chemicals to enhance plant growth or induced resistance in plants is limited due to the negative effects of chemical treatment and the difficulty of determining the optimal concentrations to benefit the plant In the search for alternative means to solve these problems biological applications have been extensively studied Naturally occurring plant microbe environment interactions are utilized in many ways to enhance plant productivity As such a greater understanding of how plants and microbes coexist and benefit one another can yield new strategies to improve plant productivity in the most sustainable way Developing sustainable agricultural practices requires understanding both the basic and applied aspects of agriculturally important microorganisms with a focus on transforming agricultural systems from being nutrient deficient to nutrient rich This work is divided into two volumes the aim being to provide a comprehensive description and to highlight a holistic approach respectively Taken together the two volumes address the fundamentals applications research trends and new prospects of agricultural sustainability Volume one consists of two sections with the first addressing the role of microbes in sustainability and the second exploring beneficial soil microbe interaction in several economically important crops Section I elucidates various mechanisms and beneficial natural processes that enhance soil fertility and create rhizospheric conditions favourable for high fertility and sustainable soil flora It examines the mechanism of action and importance of rhizobacteria and mycorrhizal associations in soil In turn section II presents selected case studies involving economically important crops This section explains how agriculturally beneficial microbes have been utilized in sustainable cultivation with high productivity Sustainable food production without degrading the soil and environmental quality is a major priority throughout the world making this book a timely addition It offers a comprehensive collection of information that will benefit students and researchers working in the field of rhizospheric mechanisms agricultural microbiology biotechnology agronomy and sustainable agriculture as well as policymakers in the area of food security and sustainable agriculture Harnessing Useful

Rhizosphere Microorganisms for Pathogen and Pest Biocontrol Aurelio Ciancio, Corné M.J. Pieterse, Jesús Mercado-Blanco, 2017-01-10 Growing demographic trends require sustainable technologies to improve quality and yield of future food productions. However, there is uncertainty about plant protection strategies in many agro ecosystems. Pests, diseases, and weeds are overwhelmingly controlled by chemicals which pose health risks and cause other undesirable effects. Therefore, an increasing concern on control measures emerged in recent years. Many chemicals became questioned with regard to their sustainability and are or will be banned. Alternative management tools are studied relying on biological and low impact solutions. This Research Topic concerns microbial biocontrol agents, root-associated microbiomes, and rhizosphere networks. Understanding how they interact or respond to biotic environmental cues is instrumental for an effective and sustainable impact. The rhizosphere is in this regard a fundamental object of study because of its role in plant productivity. This e-book provides a polyhedral perspective on many issues in which beneficial microorganisms are involved. Data indeed demonstrate that they represent an as yet poorly explored resource whose exploitation may actively sustain plant protection and crop production. Given the huge number of microbial species present on the planet, the microorganisms studied represent just the tip of an iceberg. Data produced are however informative enough about their genetic and functional biodiversity as well as about the ecosystem services they provide to underpin crop production. Challenges for future research work concern not only the biology of these species but also the practices required to protect their biodiversity and to extend their application in the wide range of agricultural soils and systems present in the world. Agriculture cannot remain successfully and sustainable unless plant germplasm and useful microbial species are integrated as a goal for which new knowledge and information-based approaches are urgently needed. *Microbial BioTechnology for Sustainable Agriculture Volume 1* Naveen Kumar Arora, Brahim Bouizgarne, 2022-05-03 This volume explains the recent findings on the mutualistic plant-microbe interactions and how they can be utilized for sustainable agriculture practices including land reclamation. The book covers mainly plant growth-promoting microorganisms (PGPMs) including both the symbiotic bacteria and fungi and their role in mobilization of nutrients, providing protection to the crops from phytopathogens and abiotic stresses. PGPMs play important roles in survival and health of the plant. These useful microorganisms provide plants with nutrients, protect them from pathogens, and help them combat abiotic stresses. It is important that these mutualistic interactions between plant and soil microbes are well understood so as to develop reliable products in the form of biostimulants and biopesticides as well as managing biotic and abiotic stresses in crops. Apart from enhancing crop productivity, plant-microbe interactions can also perform activities such as reclamation of degraded lands, degradation of pollutants, and remediation of saline or marginal lands. This book is of interest to teachers, researchers, plant scientists, and microbiologists. Also, the book serves as additional reading material for undergraduate and graduate students of agriculture, microbiology, biotechnology, ecology, soil science, and environmental sciences. **Good Microbes in Medicine, Food Production, Biotechnology, Bioremediation, and**

**Agriculture** Frans J. de Bruijn, Hauke Smidt, Luca S. Cocolin, Michael Sauer, David N. Dowling, Linda Thomashow, 2022-09-21  
Discover the positive and helpful contributions made by microorganisms to various areas of human health food preservation and production biotechnology industry environmental clean up and sustainable agriculture In Good Microbes in Medicine Food Production Biotechnology Bioremediation and Agriculture a team of distinguished researchers delivers a comprehensive and eye opening look at the positive side of bacteria and other microbes The book explores the important and positive roles played by microorganisms Divided into five sections Good Microbes examines the use of microorganisms and the microbiome in human health food production industrial use bioremediation and sustainable agriculture Coverage spans from food allergies skin disorders microbial food preservation and fermentation of various beverages and food products also from an ethnical point of view to beneficial use of microbes in biotechnology industry bioeconomy environmental remediation such as resource recovery microbial based environmental clean up plant microbe interactions in biorestauration biological control of plant diseases and biological nitrogen fixation Provides basic knowledge on bacterial biology biochemistry genetics and genomics of beneficial microbes Includes practical discussions of microbial biotechnology including the contribution of microbial biotechnology to sustainable development goals Features a comprehensive introduction and extensive index to facilitate the search for key terms Perfect for scientists researchers and anyone with an interest in beneficial microbes Good Microbes in Medicine Food Production Biotechnology Bioremediation and Agriculture is also an indispensable resource for microbiology graduate students applied microbiologists and policy makers

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