

# PGPR: Biocontrol and Biofertilization

*Edited by*  
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 Springer

# Pgpr Biocontrol And Biofertilization

**P. Narayanasamy**



## **Pgpr Biocontrol And Biofertilization:**

**PGPR: Biocontrol and Biofertilization** Zaki Anwar Siddiqui, 2006-01-19 PGPR have gained world wide importance and acceptance for agricultural benefits These microorganisms are the potential tools for sustainable agriculture and the trend for the future Scientific researches involve multidisciplinary approaches to understand adaptation of PGPR to the rhizosphere mechanisms of root colonization effects on plant physiology and growth biofertilization induced systemic resistance biocontrol of plant pathogens production of determinants etc Biodiversity of PGPR and mechanisms of action for the different groups diazotrophs bacilli pseudomonads and rhizobia are shown Effects of physical chemical and biological factors on root colonization and the proteomics perspective on biocontrol and plant defence mechanism is discussed Visualization of interactions of pathogens and biocontrol agents on plant roots using autofluorescent protein markers has provided more understanding of biocontrol process Commercial formulations and field applications of PGPR are detailed

**Plant-Growth-Promoting Rhizobacteria (PGPR) and Medicinal Plants** Dilfuza Egamberdieva, Smriti Shrivastava, Ajit Varma, 2015-02-07 This book describes the various applications of microorganisms in improving plant growth health and the efficiency of phytochemical production The chapters trace topics such as the role of PGPRs in improving salt stress and heavy metal tolerance in plants the prevention and control of plant diseases boosting soil fertility and agriculture productivity the induction of secondary metabolite biosynthesis in medicinal and aromatic plants the enhancement of phytochemical levels and the action mechanisms diversity and characterization of PGPRs The reviews will be of interest for scientists in the fields of agriculture microbiology soil biology plant breeding and herbal medicinal products *Microbiota and Biofertilizers* Khalid Rehman Hakeem, Gowhar Hamid Dar, Mohammad Aneesul Mehmood, Rouf Ahmad Bhat, 2020-12-07 An increasing population has put tremendous pressure on agricultural productivity to fulfill the demands of human consumption Numerous agricultural activities and techniques have been developed to raise annual crop production globally While agriculture has succeeded in enhancing the yearly crop productivity this achievement is at the cost of environmental degradation by applying synthetic persistent substances such as industrial fertilizers pesticides herbicides etc Chemical fertilizers are nearly as destructive as they are productive causing monocultures and consequences associated with elimination of diversity nutrient pollution as evidenced by algae blooms eutrophication water quality issues lower oxygen levels and dangers to fish stocks Therefore the scientific approach to maintain sustainable fertility in soil and plants is to switch over to biofertilisers Biofertilisers are compounds of organic matter that are applied to crops for growth and health Their constituent micro organisms interact in an ecofriendly manner with the soil root and seeds of plants promoting the growth of micro flora that enhances soil fertility They are known to play a number of vital roles in soil fertility crop productivity and production in agriculture Application of biofertilisers results in increased mineral and water uptake root development vegetative growth and nitrogen fixation They liberate growth promoting substances and vitamins and help to maintain soil fertility They act as

antagonists and play a pivotal role in neutralising the soil borne plant pathogens thereby assisting in the bio control of diseases Application of biofertilisers in lieu of synthetic fertilizers could be the promising technique to raise agricultural productivity without degrading the environmental quality The present book focuses on the latest research approaches and updates from the microbiota ecosystem and their applications in agriculture industry It also highlights the great potential and possible future of action of microbiota in the development of sustainable agricultural systems **Plant Growth**

**Promoting Rhizobacteria for Agricultural Sustainability** Ashok Kumar,Vijay Singh Meena,2019-06-28 To meet the food security needs of the 21st century this book focuses on ecofriendly and sustainable production technologies based on plant growth promoting rhizobacteria PGPR It is estimated that the global population could increase to 9 billion by 2050 Further the amount of land devoted to farming has decreased Soil is a living entity and is not only a valuable natural resource for agricultural and food security but also for the preservation of all life processes Agricultural productivity rests on the foundation of microbial diversity in the soil and in recent years PGPR have emerged as an important and promising tool for sustainable agriculture The injudicious use of agrochemicals by farmers has created a range of negative impacts not only threatening the environment but also destroying useful microorganisms in the soil The efficient use of PGPR reduces the need for these chemicals while simultaneously lowering production costs In turn increased yields could provide a more favourable environment and encourage sustainability This book assesses the impacts of PGPR on crops environmental and socio economic sustainability and demonstrates these ecofriendly technologies three critical advantages namely a enhanced crop productivity b reduced application of agrochemicals and c increased incomes for farmers Besides offering an economically attractive and ecologically sound means of augmenting the nutrient supply and combatting soil borne pathogens PGPR play an important part in boosting soil fertility bioremediation and stress management for the development of ecofriendly and sustainable agriculture **Plant Growth Promoting Rhizobacteria for Horticultural Crop**

**Protection** P. Parvatha Reddy,2014-09-19 The use of synthetic pesticides has undoubtedly resulted in the achievement of increased crop production However in recent times there has been a considerable pressure on consumers and farmers to reduce or eliminate the use of synthetic pesticides in horticulture since fruits and vegetables are consumed afresh This concern has encouraged looking for better alternatives which are cheaper and eco friendly than synthetic pesticides It is well known that plant growth promoting rhizobacteria PGPR play an important role in maintaining crop and soil health through versatile mechanisms There are two main outcomes or effects from beneficial microorganisms enhanced plant growth and crop protection both of which represent the two main constraints to agriculture The information on biomanagement of pests insect and nematode pests fungal bacterial and viral phytoplasma diseases of horticultural crops fruits vegetables plantation spice tuber ornamental medicinal and aromatic crops using PGPR is very much scattered There is no book at present which comprehensively and exclusively deals with the above aspects on horticultural crops The present book deals with

biomanagement of pests in horticultural crops in detail using PGPR The present book deals with biomanagement of pests in horticultural crops in detail using PGPR The present book is divided into six sections The first section deals with the importance of PGPR including introduction potential role of PGPR in agriculture genera of PGPR disease management nematode management insect pest management integrated pest management mechanism of biocontrol mass production formulation delivery and commercialization Pest management in tropical sub tropical and temperate fruit crops is dealt in Section II The third section deals with pest management in Solanaceous bulbous Malvaceous Cruciferous Leguminous Cucurbitaceous leafy and root and tuber vegetable crops Pest management in plantation and spice crops is in Section IV Section V deals with pest management in ornamental medicinal and aromatic crops The last section deals with a road map ahead including challenges future prospective and conclusions The book is extensively illustrated with excellent quality photographs enhancing the quality of publication The book is written in lucid style easy to understand language along with adoptable recommendations involving eco friendly components of IPM

**Plant Growth Promoting Rhizobacteria for Sustainable Stress Management** R. Z. Sayyed, 2019-10-11 Attaining sustainable agricultural production while preserving environmental quality agro ecosystem functions and biodiversity represents a major challenge for current agricultural practices further the traditional use of chemical inputs fertilizers pesticides nutrients etc poses serious threats to crop productivity soil fertility and the nutritional value of farm produce Given these risks managing pests and diseases maintaining agro ecosystem health and avoiding health issues for humans and animals have now become key priorities The use of PGPR as biofertilizers plant growth promoters biopesticides and soil and plant health managers has attracted considerable attention among researchers agriculturists farmers policymakers and consumers alike Using PGPR as bioinoculants can help meet the expected demand for global agricultural productivity to feed the world's booming population which is predicted to reach roughly 9 billion by 2050 However to provide effective bioinoculants PGPR strains must be safe for the environment offer considerable plant growth promotion and biocontrol potential be compatible with useful soil rhizobacteria and be able to withstand various biotic and abiotic stresses Accordingly the book also highlights the need for better strains of PGPR to complement increasing agro productivity

**Biofertilizers and Biopesticides in Sustainable Agriculture** B. D. Kaushik, Deepak Kumar, Md. Shamim, 2019-10-23 This new volume Biofertilizers and Biopesticides in Sustainable Agriculture presents strategies for the management of soil and crop diseases Microbes have attracted worldwide attention due to their role in disease management and remediation of polluted soils Taking a sustainable approach this book explores the means of integrating various microbial management approaches to achieve the desired levels of crop yield under both conventional soils and neglected soils through the use of biopesticides and other botanicals as well as biomolecules This book also presents a broad and updated view of molecular nitrogen fixation and phosphate solubilizing and sulfur transforming microbes for nutrition of crops in relation to the role of metal tolerant microbes in providing protection to

plants grown in metal contaminated soils The preparation and application of biofertilizers utilization of household waste materials and use of genetically modified microorganisms GMOs in plant growth and development are also well discussed in the volume     **Biofertilizers** Amitava Rakshit,Vijay Singh Meena,Manoj Parihar,H.B. Singh,A.K. Singh,2021-03-24

Biofertilizers Volume One Advances in Bio inoculants provides state of the art descriptions of various approaches techniques and basic fundamentals of BI used in crop fertilization practices The book presents research within a relevant theoretical framework to improve our understanding of core issues as applied to natural resource management Authored by renowned scientists actively working on bio inoculant biofertilizer and bio stimulant sciences the book addresses the scope of inexpensive and energy neutral bio inoculant technologies and the impact regulation has on biofertilizer utilization This book is a valuable reference for agricultural environmental scientists in academic and corporate environments graduate and post graduate students regulators and policymakers Informs researchers on how to develop innovative products and technologies that increase crop yields and quality while decreasing agricultural carbon footprints Focuses on production protocols and developments in the processing of bio inoculants bio stimulants and bio fertilizers Summarizes the biologically active compounds and examines current research areas     Biocontrol Agents of Phytonematodes Tarique Hassan Askary,P R P Martinelli,2015-06-29 Highlighting the use of biocontrol agents as an alternative to chemical pesticides in the management of plant parasitic nematodes this book reviews the current progress and developments in the field Tactful and successful exploitation of each biocontrol agent i e nematophagous fungi parasitic bacteria predaceous mites rhizobacteria mycorrhiza and predaceous nematodes has been described separately The contributors are 23 eminent nematologists and their information has been compiled in 19 chapters     Microbial Biocontrol: Sustainable Agriculture and Phytopathogen Management Ajay Kumar,2022-05-04 This first volume of a two volume work presents the manifold applications of beneficial microbes and microbiomes in plant growth promotion in enhancing crop resilience and in control of phytopathogens through microbial antagonists In depth insights into latest technologies such as biopriming of seeds and soil inoculation of rhizosphere microorganisms are provided The two volume work Microbial Biocontrol introduces mechanisms of plant microbe interactions and explores latest strategies of how microbes can be applied in biocontrol and management of plant pathogens replacing chemical fertilizers and pesticides The book covers different groups of microorganisms such as bacteria fungi but also the interplay of entire microbiomes and reviews their specific benefits in crop growth promotion in enhancing the plants tolerance against biotic and abiotic stress as well as in post harvest management of various plant diseases Novel tools such as CRISPR Cas9 and microbe derived nanoparticles are also addressed besides the legal aspects of biocontrol applications Today rising global population and changing climatic conditions emerge as a major challenge for agronomist farmers and researchers in fulfilling the requirements of global food production The conventional agricultural practices utilize undistributed use of chemical fertilizers and pesticides to enhance growth and yield of agricultural products and fresh

foods but their extensive and continuous use have led to a range of negative consequences on the food quality and safety to environment as well as to human and animal health Microbial biocontrol applications are presented as a solution paving the way to a sustainable agriculture in compliance with the UN Sustainable Development Goals SDG The book addresses researchers in academia and agriculture *Plant Growth Promoting Rhizobacteria (PGPR): Prospects for Sustainable Agriculture* R. Z. Sayyed, M. S. Reddy, Sarjiya Antonius, 2019-06-27 Sustainable increase in agricultural production while keeping the environmental quality agro ecosystem function and biodiversity is a real challenge in current agricultural practices Application of PGPR can help in meeting the expected demand for increasing agricultural productivity to feed the world's booming population Global concern over the demerits of chemicals in agriculture has diverted the attention of researchers towards sustainable agriculture by utilizing the potential of Plant Growth Promoting Rhizobacteria PGPR Use of PGPR as biofertilizers biopesticides soil and plant health managers has gained considerable agricultural and commercial significance The book *Plant Growth Promoting Rhizobacteria PGPR Prospects for Sustainable Agriculture* has contributions in the form of book chapter from 25 eminent global researchers that discusses about the PGPRs and their role in growth promotion of various crop plants suppression of wide range of phytopathogens their formulation effect of various factors on growth and performance of PGPR assessment of diversity of PGPR through microsatellites and role of PGPR in mitigating biotic and abiotic stress This book will be helpful for students teachers researchers and entrepreneurs involved in PGPR and allied fields The book will be highly useful to researchers teachers students entrepreneurs and policymakers

Biofertilizers Inamuddin, Mohd Imran Ahamed, Rajender Boddula, Mashallah Rezakazemi, 2021-08-03 Great attention has been paid to reduce the use of conventional chemical fertilizers harming living beings through food chain supplements from the soil environment Therefore it is necessary to develop alternative sustainable fertilizers to enhance soil sustainability and agriculture productivity Biofertilizers are the substance that contains microorganisms bacteria algae and fungi living or latent cells that can enrich the soil quality with nitrogen phosphorous potassium organic matter etc They are a cost effective biodegradable and renewable source of plant nutrients supplements to improve the soil health properties Biofertilizers emerge as an attractive alternative to chemical fertilizers and as a promising cost effective technology for eco friendly agriculture and a sustainable environment that holds microorganisms which enhance the soil nutrients solubility leading a raise in its fertility stimulates crop growth and healthy food safety This book provides in depth knowledge about history and fundamentals to advances biofertilizers including latest reviews challenges and future perspectives It covers fabrication approaches and various types of biofertilizers and their applications in agriculture environment forestry and industrial sectors Also organic farming quality control quality assurance food safety and case studies of biofertilizers are briefly discussed Biofertilizers physical properties affecting factors impact and industry profiles in the market are well addressed This book is an essential guide for farmers agrochemists environmental engineers scientists students and faculty who would

like to understand the science behind the sustainable fertilizers soil chemistry and agroecology      *PGPR Amelioration in Sustainable Agriculture* Amit Kishore Singh, Pawan Kumar Singh, Ajay Kumar, 2018-09-14 *PGPR Amelioration in Sustainable Agriculture* Food Security and Environmental Management explores the growth promoting rhizobacteria PGPR that are indigenous to soil and plant rhizosphere These microorganisms have significant potential as important tools for sustainable agriculture PGPR enhance the growth of root systems and often control certain plant pathogens As PGPR amelioration is a fascinating subject is multidisciplinary in nature and concerns scientists involved in plant health and plant protection this book is an ideal resource that emphasizes the current trends of and probable future of PGPR developments Chapters incorporate both theoretical and practical aspects and may serve as baseline information for future research This book will be useful to students teachers and researchers both in universities and research institutes especially working in areas of agricultural microbiology plant pathology and agronomy Presents new concepts and current development in PGPR research and evaluates the implications for sustainable productivity Describes the role of multi omics approaches in establishing an understanding of plant microbe interactions that help plants optimize abiotic stresses Incorporates both theoretical and practical aspects and will serve as a baseline for future research      *Biological Management of Diseases of Crops* P. Narayanasamy, 2013-06-28 Biological disease management tactics have emerged as potential alternative to chemical application for containing crop diseases Biotic and abiotic biological control agents BCAs have been demonstrated to be effective against diseases caused by microbial plant pathogens Combination of biotic and abiotic agents leads to synergism and consequent improvement in the effectiveness of disease control It is essential to assay the biocontrol potential of all isolates species of fungal bacterial and viral biocontrol agents by different techniques in vitro and under greenhouse and field conditions and to precisely identify and differentiate the most effective isolates from less effective ones by employing biological immunological and nucleic acid based assays      **Microbial Diversity and Biotechnology in Food Security** R.N. Kharwar, R.S. Upadhyay, N.K. Dubey, Richa Raghuwanshi, 2014-06-11 The roles of microbes in agriculture industry and environment have been the point of interest since long time for their potential exploitation Although only a fraction of microbial diversity was accessed by microbiologists earlier for harnessing them owing to limited techniques available The molecular techniques have opened new vistas to access the wide field of the unexplored microbes and their exploitation for useful genes and novel metabolites Sincere efforts have been made in biotechnology using microbes leading to improve our life with respect to agriculture and people health This comprehensive volume covers different aspects of microbial biotechnology and its management in sustainable agriculture for food security and improved human health The book comprises four sections Endophytes and Mycorrhizae Microbial Diversity and Plant Protection Microbial Functions and Biotechnology and Microbes and the Environment which contain 53 chapters The book examines the aspects on endophytes and mycorrhizae bioactive compounds growth promoting microorganisms disease management with emphasis on biocontrol



genetics of disease resistance microbial enzymes advances in potential of microbes and their industrial as well as pharmaceutical applications In addition the use of botanicals and the etiology and management of medicinal and aromatic plants in the post harvest management have been reviewed in greater depth for the benefit of teaching and research community The biotechnological developments using microbe potential have enabled us combat the environment and human health problems worldwide in ecofriendly manner We are sure that this volume will be highly useful to all those concerned with fungi bacteria viruses and their biology including environmental and public health officers and professionals in the field of interest The volume is an exhaustive coverage of almost all the aspects of microbial biology and biotechnology

*Biofilms in Plant and Soil Health* Iqbal Ahmad,Fohad Mabood Husain,2017-07-24 Biofilms are predominant mode of life for microbes under natural conditions The three dimensional structure of the biofilm provides enhanced protection from physical chemical and biological stress conditions to associated microbial communities These complex and highly structured microbial communities play a vital role in maintaining the health of plants soils and waters Biofilm associated with plants may be pathogenic or beneficial based on the nature of their interactions Pathogenic or undesirable biofilm requires control in many situations including soil plants food and water Written by leading experts from around the world Biofilms in Plant and Soil Health provides an up to date review on various aspects of microbial biofilms and suggests future and emerging trends in biofilms in plant and soil health Issues are addressed in four sub areas I The fundamentals and significance of biofilm in plant and soil health and the concept of mono and mixed biofilms by PGPR and fungal biofilms II Biochemical and molecular mechanisms in biofilm studies in plant associated bacteria and techniques in studying biofilms and their characterization gene expression and enhanced antimicrobial resistance in biofilms as well as biotic and biotic factors affecting biofilm in vitro III The ecological significance of soil associated biofilms and stress management and bioremediation of contaminated soils and degraded ecosystems IV Pathogenic biofilm associated with plant and food and its control measures This book is recommended for students and researchers working in agricultural and environmental microbiology biotechnology soil sciences soil and plant health and plant protection Researchers working in the area of quorum sensing biofilm applications and understanding microbiome of soil and plants will also find it useful

**Biomass, Biofuels, Biochemicals** Sunita Varjani,Ashok Pandey,Thallada Bhaskar,S.Venkata Mohan,Daniel C.W. Tsang,2021-12-04 Biomass Biofuels Biochemicals Circular Bioeconomy Technologies for Biofuels and Biochemicals provides comprehensive information on strategies and approaches that facilitate the integration of technologies for the production of bio based fuels chemicals and other value added products from wastes with waste biorefinery concepts and green strategies The book also covers lifecycle assessment and techno economic analyses of integrated biorefineries within a circular bioeconomy framework As there has been continual research on new designs in production and consumerist approaches as we move towards sustainable development by scientists of various disciplines law makers environmental activists and industrialists this book provides the latest details

Resources consumption and environment degradation necessitates a transition of our linear economy towards sustainable social and technical systems As fossil resources are only projected to fulfill the needs of the population for the next couple of centuries new tactics and standards must be created to ensure future success Covers recent developments and perspectives on biofuels and chemicals production Provides the latest on the integration of technologies and processes for biofuels and chemicals production Paves a way forward roadmap to achieve Sustainable Development Goals Covers recent developments in lifecycle assessment and techno economic analysis using a waste biorefinery approach

#### **Advances in PGPR Research**

Harikesh Bahadur Singh,Birinchi K Sarma,Chetan Keswani,2017-11-24 Rhizosphere biology is approaching a century of investigations wherein growth promoting rhizomicroorganisms PGPR have attracted special attention for their ability to enhance productivity profitability and sustainability at a time when food security and rural livelihood are a key priority Bio inputs either directly in the form of microbes or their by products are gaining tremendous momentum and harnessing the potential of agriculturally important microorganisms could help in providing low cost and environmentally safe technologies to farmers One approach to such biologically based strategies is the use of naturally occurring products such as PGPR Written by an international team of experts this book considers new concepts and global issues in biopesticide research and evaluates the implications for sustainable productivity It is an invaluable resource for researchers in applied agricultural biotechnology microbiology and soil science and also for industry personnel in these areas

#### *Plant Microbe Symbiosis:*

*Fundamentals and Advances* Naveen Kumar Arora,2013-08-15 Plant microbe interaction is a complex relationship that can have various beneficial impacts on both the communities An urgent need of today s world is to get high crop yields in an ecofriendly manner Utilization of beneficial and multifaceted plant growth promoting PGP microorganisms can solve the problem of getting enhanced yields without disturbing the ecosystem thus leading to sustainability For this to achieve understanding of the intricate details of how the beneficial microbes form associations with the host plant and sustain that for millions of years must be known A holistic approach is required wherein the diversity of microbes associated with plant and the network of mechanisms by which they benefit the host must be studied and utilized Plant Microbe Symbiosis Fundamentals and Advances provides a comprehensive understanding of positive interactions that occur between plant and microorganisms and their utilization in the fields The book reviews the enormous diversity of plant associated microbes the dialog between plant microbes microbes and mechanisms of action of PGP microbes Utilization of PGPRs as nutrient providers in combating phytopathogens and ameliorating the stressed and polluted soils is also explained Importantly the book also throws light on the unanswered questions and future direction of research in the field It illustrates how the basic knowledge can be amalgamated with advanced technology to design the future bioformulations

#### **Plant Growth**

**Promoting Microorganisms of Arid Region** Ritu Mawar,R Z Sayyed,Sushil K Sharma,Krishna Sundari

Sattiraju,2023-03-01 This edited book aims to focus on microbial diversity in arid lands and deserts versus specific microbial

assemblages associated with plants The book explains ecological drivers that shape this diversity how plant associated microbiomes are selected and their biotechnological potential are discussed Diversity and functional redundancy of these associated PGPM make them very active in supporting plant improvement health and resistance to drought salt and other stresses and these dimensions will be explored in this book Implementing proper biotechnological applications of the arid and desert adapted PGPM constitutes a sizeable challenge and the book attempts to take up that challenge and help researchers in this field to gain a detailed understanding of PGPM from arid ecosystems This book serves as a handbook for research workers teachers postgraduate students and extension personnel other development workers and policy planners engaged in arid zone development

## **Pgpr Biocontrol And Biofertilization** Book Review: Unveiling the Power of Words

In some sort of driven by information and connectivity, the power of words has become more evident than ever. They have the capability to inspire, provoke, and ignite change. Such could be the essence of the book **Pgpr Biocontrol And Biofertilization**, a literary masterpiece that delves deep into the significance of words and their effect on our lives. Compiled by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we shall explore the book is key themes, examine its writing style, and analyze its overall affect readers.

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### **Pgpr Biocontrol And Biofertilization Introduction**

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