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Microbial Strategies for Crop Improvement

 Springer

Microbial Strategies For Crop Improvement

S Ashworth



Microbial Strategies For Crop Improvement:

Microbial Strategies for Crop Improvement Mohammad Saghir Khan, Almas Zaidi, Javed Musarrat, 2009-08-25 With an ever increasing human population the demand placed upon the agriculture sector to supply more food is one of the greatest challenges for the agrarian community In order to meet this challenge environmentally unfriendly agrochemicals have played a key role in the green revolution and are even today commonly recommended to circumvent nutrient deficiencies of the soils The use of agrochemicals is though a major factor for improvement of plant production it causes a profound deteriorating effect on soil health soil fertility and in turn negatively affects the productivity and sustainability of crops Concern over disturbance to the microbial diversity and consequently soil fertility as these microbes are involved in biogeochemical processes as well as economic constraints have prompted fundamental and applied research to look for new agro biotechnologies that can ensure competitive yields by providing sufficiently not only essential nutrients to the plants but also help to protect the health of soils by mitigating the toxic effects of certain pollutants In this regard the role of naturally abundant yet functionally fully unexplored microorganisms such as biofertilizers assume a special significance in the context of supplementing plant nutrients cost and environmental impact under both conventional practices and derelict environments Therefore current developments in sustainability involve a rational exploitation of soil microbial communities and the use of inexpensive though less bioavailable sources of plant nutrients which may be made available to plants by microbially mediated processes

Rhizosphere Revelations: Microbial Strategies for Sustainable Agriculture, 2025-08-01 Rhizosphere Revelations Microbial Strategies for Sustainable Agriculture Volume 116 in the Advances in Botanical Research series highlights new advances in the field with this new volume presenting interesting chapters on topics such as Plant Microbe Partnerships Symbiotic Secrets of the Rhizosphere The role of rhizosphere microbes in phosphorus mineralization and acquisition Microbial Contributions to Soil Carbon Sequestration Role of Mycorrhizal Fungi in Nutrient Cycling Bioremediation Potential of Rhizosphere Microbes Rhizosphere Remedies Harnessing AMF for Disease Management and Genetic Engineering of Rhizosphere Microbes Provides the latest information on Rhizosphere Revelations Offers outstanding and original reviews on a range of grapevine research topics Serves as an indispensable reference for researchers and students alike

Recent Advances in Food Biotechnology Ajay Kumar, Kiran Patruni, Vijai Singh, 2022-06-24 This book highlights important aspects of food biotechnology It is very thoughtfully divided into five sections The first section introduces the readers to food biotechnology and discusses functional foods use of plant and animal biotechnology in improving food quality The second section deals with food microbiology and includes topics such as application of microbial surfactants use of probiotics beneficial microorganisms used in food industry etc The third section describes important macro and micromolecules in foods It includes chapters on food enzymes gluten free formulations use of biopolymers biofortification of food and other important topics The next section discusses novel technologies such as use of nanotechnology in food

industry reverse micelle techniques genome editing in food crops etc The book culminates with a section on food quality and management It describes important topics about biosafety and regulatory issues in food biotechnology This book is meant for students researchers and course instructors in food science food technology and biotechnology It is also useful for industry experts in the area of food technology

Rhizobiont in Bioremediation of Hazardous Waste Vivek Kumar, Ram Prasad, Manoj Kumar, 2021-05-22 This book describes many novel approaches of microbial bioremediation including conventional and modern approaches metagenomics biosurfactants and nano based bioremediation Also presents up to date knowledge about biodegradation of solid and liquid contaminants in the rhizospheric zone by plant rhizo microbiome interface It also illustrates communication pathways based on evolving methodologies bioinformatic tools which provides insights into the functional dynamics of bioremediation process by the host microbiome interface The different chapters explain the mechanism and outcomes during the process of bioremediation The book broadly depicts the following Advances in bioremediation through nanoremediation rhizo remediation bioremediation of different ecosystems like polluted waters industrial effluents bioremediation of metal and organic pollutants toxic dyes etc The book is very useful for researchers and students in the fields of applied and environmental microbiology It is also meant for industry experts and professionals working in the field of bioremediation and waste management

Plant Health Under Biotic Stress Rizwan Ali Ansari, Irshad Mahmood, 2019-05-08 The book illustrates the use of putative microbial agents which provide good protection to the plant from biotic pathogens attack An up to date knowledge on plant microbiome interaction strategies in terms of improved sustainability has been discussed Information from experts across the globe on the application of microbes for providing amicable solution in sustainable agriculture has been gathered In addition information related to microbes mediated resistance levels leading to enhanced plant health has been well presented The chapters have emphasised the use of Plant Growth Promoting Rhizobacteria PGPR and other potential biocontrol agents antagonists in the management of plant diseases which provide extensive information to the readers Literature on microbial root colonization plant growth promotions and also on the protection of plants from attack of various soil borne pathogens have been presented in a coherent way Information on the application of potential strain of the bio control fungi endophytes actinomycetes strengthening the plants ability which rescue the plant from pathogens attack leading to improved plant health has also been underpinned

Frontiers in Soil and Environmental Microbiology Suraja Kumar Nayak, Bibhuti Bhusan Mishra, 2020-03-03 Soil harbours a wide range of microorganisms with biotic potentials which can be explored for social benefits The book *Frontiers in Soil and Environmental Microbiology* comprises an overview of the complex inter relationship between beneficial soil microbes and crop plants and highlights the potential for utilisation to enhance crop productivity bioremediation and soil health The book focusses on important areas of research such as biocide production pesticide degradation and detoxification microbial decay processes remediation of soils contaminated with toxic metals industrial wastes and hydrocarbon pollutants

Features Presents the state of the art of microbial research in environmental and soil microbiology Discusses an integrated and systematic compilation of microbes in the soil environment and its role in agriculture and plant growth and productivity Elucidates microbial application in environmental remediation Explores advanced genomics topics for uncultivable microbes of soil *Agriculturally Important Microorganisms* Bibhuti Bhusan Mishra, Suraja Kumar Nayak, Avishek Pahari, 2021-11-23 The book encompasses different Agriculturally Important microorganisms AIMs mechanisms of action and modes of application for sustainable agriculture The potential of microbes in nitrogen fixation solubilizing nutrients like phosphorous Potassium tolerance to etc are the major strength of the book There is relatively a new frontier use of Plant Growth Promoting Rhizobacteria PGPR in enhancing crop productivity These microbes inhabit at the rhizospheric region of the root and facilitate plant growth through a variety of direct and indirect mechanisms These PGP have been identified to solubilize phosphate Potassium Zinc produce siderophore IAA Hydrogencyanide fix ammonia and many more Today such microbes are extensively studied not only as a biofertilizer or fortification of nutrient to the plant but also a potential agent to decrease application of chemical fertilizer and other agrochemicals The book also gives an insight to this aspect also Last but not the least a light has been thrown on use and application of nano biofertilizer for sustainable agriculture Note T F does not sell or distribute the hardback in India Pakistan Nepal Bhutan Bangladesh and Sri Lanka This title is co published with NIPA

Microbes Based Approaches for the Management of Hazardous Contaminants Ajay Kumar, Lिवleen Shukla, Joginder Singh, Luiz Fernando Romanholo Ferreira, 2024-07-08 Learn the various microbiological aspects one deals with in environment management and the remediation of toxic contaminants in the environment In recent years the accumulation of hazardous contaminants has caused a broad based deterioration in global environmental quality These have had wide ranging negative social impacts affecting climate soil and water ecosystems and more As traditional methods of contaminant mitigation have proven inadequate to the task microbial based remediation offers the clearest most environmentally friendly path forward for this crucial aspect of global environmental stewardship *Microbes Based Approaches for the Management of Hazardous Contaminants* offers comprehensive coverage of novel and indigenous microbes and their applications in contaminant mitigation Surveying all the major microbial products and methods for degrading and remediating hazardous pollutants it offers a key tool in the fight against global environmental degradation The result is a cutting edge introduction to an essential subject *Microbes Based Approaches for the Management of Hazardous Contaminants* will also find Current and future approaches to microbial degradation Detailed discussion of biofilms exopolysaccharides enzymes metabolites and many more Coverage of metabolic engineering as an alternative strategy *Microbes Based Approaches for the Management of Hazardous Contaminants* is ideal for those working in the field for the application of microbes in the remediation of hazardous pollutants and environment management particularly those interested in environmental sciences microbiology and microbial technology environmental biotechnology and molecular

biology **Management and Development of Agricultural and Natural Resources in Egypt's Desert** Ahmed A. Elkhoully, Abdelazim Negm, 2021-05-31 This book reviews the economic potential of various natural resources found in the Egyptian deserts that could help fill the food gap in Egypt e g the date palm olives and domestic animals Bearing in mind that the entire country is subject to arid or hyperarid climatic conditions only a small portion 3% of total area is agriculturally productive in comparison the dominant deserts These aspects combined with a growing population ca 100 million citizens and water resources scarcity have produced severe adverse effects on natural resource utilization This book presents innovative methods for addressing desert soil s key problems soil erosion salinity pollution decreased fertility minerals and weed and pest control Its goal is to help authorities reclaim the desert and optimally utilize the minerals and the available natural resources to support the sustainability agenda 2030 Besides it offers researchers guidance on remaining gaps and future research directions Lastly and importantly it provides essential information on investment opportunities in desert cultivation such as the fields of food fodder and medicinal plants **Biofilms in Plant and Soil Health** Iqbal Ahmad, Fohad Mabood Husain, 2017-10-02 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 *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

Sustainability Challenges in the Agrofood Sector Rajeev Bhat,2017-02-08 Sustainability Challenges in the Agrofood Sector covers a wide range of agrofood related concerns including urban and rural agriculture and livelihoods water energy management food and environmental policies diet and human health Significant and relevant research topics highlighting the most recent updates will be covered with contributions from leading experts currently based in academia government bodies and NGOs see list of contributors below Chapters will address the realities of sustainable agrofood the issues and challenges at stake and will propose and discuss novel approaches to these issues This book will be the most up to date and complete work yet published on the topic with new and hot topics covered as well as the core aspects and challenges of agrofood sustainability

New and Future Developments in Microbial Biotechnology and Bioengineering Harikesh Bahadur Singh,Anukool Vaishnav,2022-02-03 New and Future Developments in Microbial Biotechnology and Bioengineering Sustainable Agriculture Advances in Microbe Based Biostimulants describes advances in microbial mechanisms involved in crop production and stress alleviation Recent developments in our understanding of the role of microbes in sustainable agriculture and disease management have created a highly potential research area The plant holobiont has a significant role in stress signaling nutrient use efficiency and soil health and fertility for sustainable developments The mycorrhizosphere hyphosphere phyllosphere rhizosphere and endosphere are critical interfaces for the exchange of signaling and resources between plants and soil environment This book is an ideal reference source for microbiologists agrochemists biotechnologists biochemists industrialists researchers and scientists working on agriculturally important microorganisms and their exploitation in sustainable future applications Gives insights into mechanisms of plant microbe interaction Introduces new aspects and advances in plant microbe interaction for disease management Includes descriptions and modern practices on how to harness the potential of microbes in sustainable agriculture applications

The Role of the Microbiome in Plant and Soil Health in a Changing Climate Amita Kaundal,Dinesh Yadav,Anoop Kumar Srivastava,2024-10-14 In the past few decades climate change has become one of the biggest threats to the Earth s ecosystem and biodiversity Several environmental stress factors such as salinity and drought have already threatened the viability of sustainable agriculture an alarm bell to researchers Soil salinity hampers development through its effects on the morphological physiological and biochemical processes associated with plant growth Drought on the other hand affects the productivity of crops It is anticipated that by 2050 drought will be the leading cause of hampered crop production due to

increases in the magnitude of climate change. These changes present a formidable challenge when it comes to feeding a global population which will require an 84% annual increase in crop production. Climate change induced environmental changes and the continuously growing world population therefore demand renewed efforts to increase food production. In this regard the role of the phytobiome in assuring soil plant health will be an important issue across crop wide and area wide research. A plant's microbiome plays an important role in guiding plant growth and development. Plants adapted to extreme conditions such as those in desert or saline environments harbor microbes in their rhizosphere or endosphere that help to provide the required physiological resistance necessary to survive in those environments. Microorganisms like bacteria, fungi and viruses associated with plant roots increase plants resistance to various abiotic and biotic stresses. Microorganisms also moderate stress for crop plants paving the way for sustainable agriculture.

Phyto-Microbiome in Stress Regulation

Manoj Kumar, Vivek Kumar, Ram Prasad, 2020-03-16. This book addresses phyto microbiome mediated stress regulation. Fundamentally speaking the microbial community's importance for the survival of plants under stress conditions has already been confirmed. This book focuses on the roles of those rhizospheric microbiomes that are advantageous to plant developmental pathways. Gathering contributions by authors with specialized expertise in plant growth and health under stress conditions as well as opportunistic pathogenic bacteria, the book reviews the functional aspects of rhizospheric microorganisms and how they impact plant health and disease. It offers a compendium of plant and microbial interactions at the level of multitrophic interactions and identifies gaps between future demand and present research on plant stress. In closing the authors highlight several directions for reshaping rhizosphere microbiomes in favor of microorganisms that are beneficial to plant growth and health.

Plant Microbe Symbiosis

Ajit Varma, Swati Tripathi, Ram Prasad, 2020-04-01. This book provides an overview of the latest advances concerning symbiotic relationships between plants and microbes and their applications in plant productivity and agricultural sustainability. Symbiosis is a living phenomenon including dynamic variations in the genome, metabolism and signaling network and adopting a multidirectional perspective on their interactions is required when studying symbiotic organisms. Although various plant microbe symbiotic systems are covered in this book it especially focuses on arbuscular mycorrhiza (AM) symbiosis and root nodule symbiosis, the two most prevalent systems. AM symbiosis involves the most extensive interaction between plants and microbes in the context of phylogeny and ecology. As more than 90% of all known species of plants have the potential to form mycorrhizal associations, the productivity and species composition as well as the diversity of natural ecosystems are frequently dependent upon the presence and activity of mycorrhizas. In turn, root nodule symbiosis includes morphogenesis and is formed by communication between plants and nitrogen fixing bacteria. The biotechnological application of plant microbe symbiosis is expected to foster the production of agricultural and horticultural products while maintaining ecologically and economically sustainable production systems. Designed as a hands on guide, this book offers an essential resource for researchers and students in the areas of agri-

biotechnology soil biology and fungal biology

Plant Stress Mitigators Anukool Vaishnav, S.S. Arya, D. K.

Choudhary, 2022-05-05 This edited compilation explores role of climate change in plant stresses their mitigators their role mode of action and application The book discusses molecular and physiological mechanisms involved in plant stress physiology and the working mechanism of stress mitigators It collates information from latest research conducted on plant stress mitigators and highlights new strategies related to beneficial microorganisms that support plants under various stresses These mitigators have gained attention of both farmers and industry for their application in organic farming Plant stress mitigators have a huge global market They follow different action mechanism for enhancing plant growth and stress tolerance capacity including nutrient solubilizing and mobilizing biocontrol activity against plant pathogens phytohormone production soil conditioning and many more unrevealed mechanisms This book elaborates stress alleviation action of different plant stress mitigators on crops grown under optimal and sub optimal growing conditions It addresses mainly three subthemes 1 Climate change impacts on plant and soil health 2 Microbe mediated plant stress mitigation and 3 Advances in plant stress mitigation The book is a relevant reading for Post graduate students researchers in the field of plant stress physiology Plant microbe interaction biochemistry and plant molecular biology and industries related to seed production biofertilizer and biopesticides

Bacteria in Agrobiolgy: Plant Growth Responses

Dinesh K. Maheshwari, 2011-06-23 The future of agriculture strongly depends on our ability to enhance productivity without sacrificing long term production potential An ecologically and economically sustainable strategy is the application of microorganisms such as the diverse bacterial species of plant growth promoting bacteria PGPB The use of these bio resources for the enhancement of crop productivity is gaining worldwide importance Bacteria in Agrobiolgy Plant Growth Responses describes the application of various bacteria in plant growth promotion and protection including symbiotic free living rhizospheric endophytic methylotrophic diazotrophic and filamentous species

New and Future Developments in Microbial Biotechnology and Bioengineering Joginder Singh Panwar, Praveen Gehlot, 2020-06-16

New and Future Developments in Microbial Biotechnology and Bioengineering Recent Advances in Application of Fungi and Fungal Metabolites Environmental and Industrial Aspects provides a comprehensive overview of recent development and applied aspects of fungi and its metabolites in environmental and industrial settings Fungi and fungal metabolites have great prospects for developing new products in a wide range of sectors Many fungal metabolites are environmentally friendly clean non toxic agents used for environmental management practices This book offers a systems approach and provides a means to share the latest developments and advances about the exploitation of fungal products including their wide uses in the field of environment and industry Introduces the aspects and advances of fungi and fungal metabolites in environmental and industry perspectives Discusses the potential of fungi and its metabolites in environmental management Includes a description of traditional uses and the modern practices of harnessing the potential of fungi and its metabolites in solving environment issues Provides details about

usage of fungi and its metabolites for environmental management and industrial purposes **Plant Growth Promoting Rhizobacteria for Sustainable Stress Management** R. Z. Sayyed, Naveen Kumar Arora, M. S. Reddy, 2019-08-28

Increasing agro productivity to feed a growing global population under the present climate scenario requires optimizing the use of resources and adopting sustainable agricultural production. This can be achieved by using plant beneficial bacteria, i.e., those bacteria that enhance plant growth under abiotic stress conditions and more specifically microorganisms such as plant growth promoting rhizobacteria (PGPR) which are the most promising candidates in this regard. 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 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 do so, 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.

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