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Microbial Strategies for Crop Improvement

 Springer

Microbial Strategies For Crop Improvement

Ahmed A. Elkhoully, Abdelazim Negm



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

Microbial Resource Conservation Sushil K. Sharma, Ajit Varma, 2018-10-31 This book covers broad areas in the conservation of microorganisms It addresses the short medium and long term preservation of agriculturally important microorganisms as well as culture collections and their roles The respective chapters address topics such as conventional approaches to bacterial fungal and algal preservation as well as methods and strategies for preserving recalcitrant microorganisms Readers will also find the latest insights into the preservation of vesicular arbuscular VA fungi and ecology diversity and conservation of endophytes and entomopathogenic fungi Microbes of animal and dairy origin their preservation and biosafety issues are also explored Microorganisms are the silent and unseen majority of life on Earth and are characterized by a high degree of genetic and metabolic diversity It is well documented that no branch of science or society is unaffected by microbial interventions Researchers have documented microorganisms from such extreme and unique environments as deserts and hydrothermal vents and with specific traits that are currently being exploited in agriculture industry medicine and biotechnological applications Such great potential can only be found in microorganisms The aim of this book the first entirely devoted to the conservation of microorganisms and to regulatory mechanisms for access and benefits sharing as per Biological Diversity BD Act 2002 is to promote awareness of our world's microbial wealth and to introduce readers to strategies and methodologies for the conservation of microorganisms which could ultimately save human life on Earth

The Handbook of Microbial Bioresources Vijai Kumar Gupta, Gauri Dutt Sharma, Maria G

Tuohy, Rajeeva Gaur, 2016-06-27 Microbial technology plays an integral role in the biotechnology bioengineering biomedicine biopharmaceuticals and agriculture sector This book provides a detailed compendium of the methods biotechnological routes and processes used to investigate different aspects of microbial resources and applications It covers the fundamental and applied aspects of microorganisms in the health industry agriculture and environmental sectors reviewing subjects as varied and topical as pest control health and industrial developments and animal feed Microbial Interventions in Agriculture and Environment Dhananjaya Pratap Singh, Vijai Kumar Gupta, Ratna Prabha, 2019-11-16 Microbial communities and their functions play a crucial role in the management of ecological environmental and agricultural health on the Earth Microorganisms are the key identified players for plant growth promotion plant immunization disease suppression induced resistance and tolerance against stresses as the indicative parameters of improved crop productivity and sustainable soil health Beneficial belowground microbial interactions with the rhizosphere help plants mitigate drought and salinity stresses and alleviate water stresses under the unfavorable environmental conditions in the native soils Microorganisms that are inhabitants of such environmental conditions have potential solutions for them There are potential microbial communities that can degrade xenobiotic compounds pesticides and toxic industrial chemicals and help remediate even heavy metals and thus they find enormous applications in environmental remediation Microbes have developed intrinsic metabolic capabilities with specific metabolic networks while inhabiting under specific conditions for many generations and so play a crucial role The book Microbial Interventions in Agriculture and Environment is an effort to compile and present a great volume of authentic high quality socially viable practical and implementable research and technological work on microbial implications The whole content of the volume covers protocols methodologies applications interactions role and impact of research and development aspects on microbial interventions and technological outcomes in prospects of agricultural and environmental domain including crop production plan soil health management food nutrition nutrient recycling land reclamation clean water systems and agro waste management biodegradation bioremediation biomass to bioenergy sanitation and rural livelihood security The covered topics and sub topics of the microbial domain have high implications for the targeted and wide readership of researchers students faculty and scientists working on these areas along with the agri activists policymakers environmentalists advisors etc in the Government industries and non government level for reference and knowledge generation **Microbial Products** Mamtesh Singh, Gajendra Pratap Singh, Shivani Tyagi, 2022-11-16 Microbial Products Applications and Translational Trends offers complete coverage of the production of microbial products including biopolymers biofuels bioactive compounds and their applications in fields such as bioremediation agriculture medicine and other industrial settings This book focuses on multiple processes including upstream procedures and downstream processing and the tools required for their production Lab scale development processes may not be as efficient when aiming for large scale industrial production so it is necessary to utilize in silico modeling tools for bioprocess design to ensure success at

translational levels Therefore this book presents in silico and mathematical simulations and approaches used for such applications Further it examines microbial products produced from bacteria fungi and algae These major microbial categories have the capacity to produce various diverse secondary metabolites bioactive compounds enzymes biopolymers biofuels probiotics and more The bioproducts examined in the book are of great social medical and agricultural benefit and include examples of biodegradable polymers biofuels biofertilizers and drug delivery agents Presents approaches and tools that aid in the design of eco friendly efficient and economic bioprocesses Utilizes in silico and mathematical simulations for optimal bioprocess design Examines approaches to be used for bioproducts from the lab scale to widely applied microbial biotechnologies Presents the latest trends and technologies in the production approaches for microbial bio products manufacture and application This book is ideal for both researchers and academics as it provides up to date knowledge of applied microbial biotechnology approaches for bio products

Microbial Symbionts and Plant Health: Trends and Applications for Changing Climate Piyush Mathur,Rupam Kapoor,Swarnendu Roy,2023-05-02 This book provides a comprehensive understanding of the complex relationship between microbial symbionts and plants in the era of climate change It focuses on the plant microbiome associated with different plant organs like roots leaves stems fruit and seeds and showcases their significant role in the enhancement of crop yield and protection in a sustainable manner Concomitantly acumens to the most emerging trends in plant microbial research that includes rhizosphere engineering and metagenomics are also covered in this title The association of microbial symbionts with the host offers a wide advantage in terms of acclimatization to varied environmental conditions A large number of microbes such as cyanobacteria PGPR endophytes and AMF have been shown to improve plant growth and production under the effect of various abiotic and biotic stresses These microbial symbionts secrete several secondary metabolites signaling molecules and hydrolytic enzymes that play a multifarious role in improving plant growth and yield Moreover the symbionts have been known to regulate the host responses at the molecular level Bioprospecting these microbial symbionts will provide an alternative to the chemical based fertilizers and pave the path for the development of biofertilizers The book is a suitable reading material for undergraduate and postgraduate students researchers and scientists working in the field of agricultural biotechnology microbiology mycology and plant pathology and allied fields of plant and microbial sciences The book in this context attempts to provide an integrative and exhaustive study as well as research material that would help the scientific community in wide respect

Microbial Biofilms Bakrudeen Abdul,2020-11-05 This book provides a broad range of applications and recent advances in the search for biofilm materials in nature It also explains the future implications for biofilms in the areas of advanced molecular genetics pharmaceuticals pharmacology and toxicology This book is comprised of 20 chapters from leading experts in the field and it examines immunology and microbiological studies derived from biofilms as well as explores environmental agricultural and chemical impacts on biofilms It is divided into five subdivisions biofilms and its complications biofilm

infections in human body detection of biofilm forming pathogens antibiofilm chemotherapy and biofilms production tools in aquaculture This book may be used as a text or reference for everyone interested in microbial biofilms and their current applications It is also highly recommended for environmental microbiologists medical microbiologists bioremediation experts and microbiologists working in biocorrosion biofouling biodegradation water microbiology quorum sensing and many other related areas Scientists in academia research laboratories and industry will also find it of interest This book includes chapter homework problems and case studies Powerpoints are also available for adopting instructors Discusses and clarifies the resource of isolation and chemical properties from biofilms Discusses the latest pharmaceutical pharmacological and medicinal approaches toward the treatment of chronic and uncured diseases such as Alzheimer s osteoporotic sexual dysfunction sleep sickness allergy treatment asthma hair loss AIDS hypertension antiaging etc Examines immunology and microbiological studies derived from biofilms Explores environmental agricultural and chemical impacts on biofilms Dr Bakrudeen Ali Ahmed Abdul is an Associate Professor the Head of the Department of Biochemistry and Dean of the School of Life Sciences Centre for Research and Development CRD PRIST Deemed University Vallam Thanjavur Tamil Nadu India His research areas include the application of plant biochemistry bioactive compound production biotechnological methods development of pharmaceutical products and pharmacological studies

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

Phosphate Solubilizing Microbes for Crop Improvement Mohammad Saghir Khan, 2009 This book provides a comprehensive source of information on strategies and concepts of microbial technology especially phosphate solubilising microbes for the improvement of crops in different agro ecosystems The book presents the biological importance of phosphorus and strategies adopted for isolation and screening of PSM s mechanisms of P solubilisation mechanisms of plant growth promotion and method for the development of microphos Furthermore some novel approaches including molecular tools used to identify the potential phosphate solubilising microbes are presented The recent advances in understanding the genetics and molecular

biology of phosphate solubilizing bacteria and the genetic engineering of bacterial strains with enhanced phosphate solubilising activity are discussed that is likely to lead to improve the efficiency of microphos inoculants and crop productivity. The problems, prospect and potentials of phosphate solubilising microbes and their impact on agronomically important crops grown in conventional soils are discussed separately. Special attention is paid to highlight the functional variations within phosphate solubilising microbes and to understand the impact of various factors on the phosphate solubilising efficiency and colonization of such naturally occurring organisms. The synergism between phosphate solubilizing microbes and other plant growth promoting rhizobacteria, arbuscular mycorrhizal fungi and their interactive effect on crop productivity is highlighted separately. The book also presents a broad and updated view of the management of plant diseases using phosphate solubilising microbes. The book further describes as to how the growth promoting rhizobacteria facilitate plant growth and how advanced information strategies can be used to manipulate and modify the soil environment. *Microbial Technology for Sustainable Environment*

Pankaj Bhatt, Saurabh Gangola, Dhanushka Udayanga, Govind Kumar, 2021-09-29

Microorganisms are ubiquitous on earth. These microorganisms are able to perform various functions in the environment. Microbial applications are used as biofertilizers, bioremediation, biofortification and other sustainable approaches of environmental development. Indigenous microbial cultures have the potential to perform various functions that are beneficial to achieve the sustainable goals. To date, different strains have been commercialized for the industrial and common applications for the sustainable environment. This book will cover different aspects of microbial technology for sustainable development. *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, Livleen 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.

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