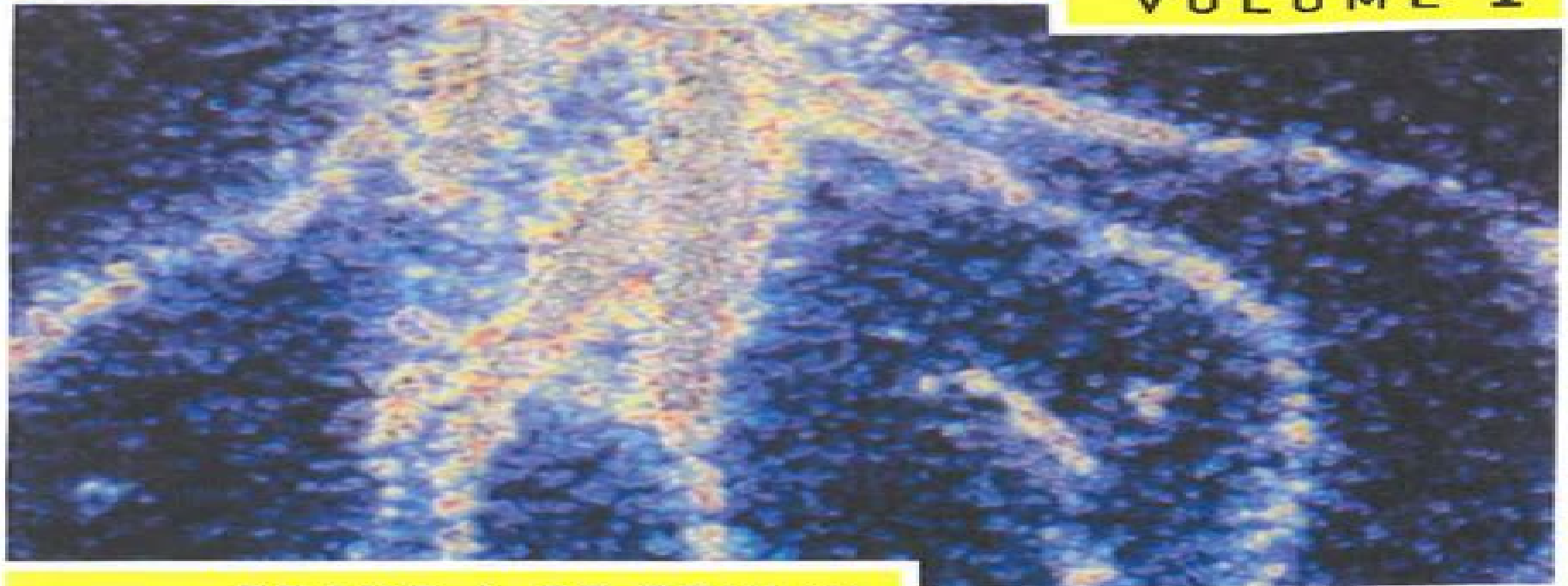


MOLECULAR MICROBIAL ECOLOGY OF THE RHIZOSPHERE

VOLUME 1



EDITED BY FRANS J. DE BRUIJN

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Molecular Microbial Ecology Rhizosphere Bruijn

KJ Lindholm-Leary



Molecular Microbial Ecology Rhizosphere Bruijn:

Sustainable Agriculture Javid Ahmad Parray, Newsheen Shameem, 2019-11-21 *Sustainable Agriculture Advances in Plant Metabolome and Microbiome* focuses on the advancement of basic and applied research related to plant microbe interaction and their implementation in progressive agricultural sustainability. The book also highlights the developing area of bioinformatics tools for the interpretation of metabolome, the integration of statistical and bioinformatics tools to manage huge generating data, metabolite profiling and key signaling driven substances along with a section on the role of key biosynthetic pathways. Focused on selecting positive and effective interactive core microbiome which will be adaptive and sustainable, this book will help researchers further improve the quality and productivity of crops through sustainable agriculture. Details the two way interactive approach to both plants and microbes. Describes setting up core and functional microbiomes. Presents the relationship of metabolomics and biocontrol. *Molecular Microbial Ecology of the Rhizosphere* Frans J. de Bruijn, 2013. The ultimate reference on the benefits of plant microbe interactions. The advent of sophisticated molecular techniques in recent years has spurred an unprecedented growth in the study of the rhizosphere, the soil space where symbiotic interactions occur between plant roots and microbial communities. This comprehensive two volume reference surveys the state of the art of this rapidly expanding field bringing together a wealth of information on the molecular microbial ecology of the rhizosphere. Featuring contributions by leading experts from around the world, this exhaustive work combines review articles with original research papers exploring all facets of plant microbe interactions including the latest molecular tools and experimental results from different habitats. Readers will gain valuable insight into an encyclopedic range of topics and learn to develop strategies for using microbes and plants in cutting edge application areas such as sustainable agriculture and phytoremediation. Coverage includes: How plants structure microbial communities in the rhizosphere to encourage beneficial organisms and ward off pathogens. How signaling between plants and microorganisms promotes plant growth and development as well as nitrogen fixation and mycorrhization. Biocontrol and disease suppression approaches for ameliorating environmental stresses affecting the roots of plants and trees. A plethora of culture independent molecular techniques including genomic sequencing and metagenomics. Applications and implications for ecological studies: decontamination of heavy metals and food production in the era of climate change. Properties of bacterial endophytes leading to maximized host fitness. Engineering the rhizosphere. The Biased Rhizosphere concept. *Molecular Microbial Ecology of the Rhizosphere* is a must have resource for soil microbiologists, molecular microbial ecologists, plant biologists, researchers working on plant microbe interactions and anyone with an interest in microbiology, ecology and agriculture. **Microbial Based Land Restoration Handbook, Volume 2** Vimal Pandey, Umesh Pankaj, 2022-12-07. Microorganisms are a good indicator of soil health. Plant growth promoting microorganisms protect plants from the stresses of water, salt, metal, biotic and so on and are well known for strategically modulating the plant mechanisms.

to defend and mitigate environmental stresses Taking a multidisciplinary approach this volume explores the role of plant microorganisms in ecological and agricultural revitalization beyond normal agriculture practices and offers practical and applied solutions for the restoration of degraded lands to fulfill human needs with food fodder fuel and fiber It also provides a single comprehensive platform for soil scientists agriculture specialists ecologists and those in related disciplines Features Presents cutting edge microbial biotechnology as a tool for restoring degraded lands Explores the aspects of sustainable development of degraded lands using microorganism inspired land remediation Highlights sustainable food production intensification in nutrient poor lands through innovative use of microbial inoculants Explains the remediation of polluted land for regaining biodiversity and achieving United Nations Sustainable Development Goals Includes many real life applications from South Asia offering solutions to today s agricultural problems This book will be of interest to professionals researchers and students in environmental soil and agricultural sciences as well as stakeholders policy makers and practitioners with an interest in this field

Progress in Soil Microbiome Research Javid Ahmad Parray,2024-11-21 This book focuses on the latest research in soil and microbiome evaluating new and emerging innovations Recent research has connected specific microbial taxa to plant productivity and it is now possible to link changes in microbiome structure to the functioning of plants or crops due to advanced approaches It provides Insights into basic microbiome research Focusing on its applications in agriculture Soil bioremediation Environmental restoration It addresses the impact of global change on soil microbial diversity and ecosystem functions We aim to tailor microbiome applications to individual host species better improving treatment efficiency The book will discuss microbiome dynamics in various environments and their potential to improve soil and plant health to meet growing food demands It will also highlight the current developments in microbiome research and their implications for climate change

- 1 Linking the dynamics of microbial communities to microbiome function
- 2 Recent soil microbiome applications and harnessing for sustainable agriculture food security and environmental management
- 3 An advanced and elaborative view of the most recent microbiological research findings
- 4 Simple insightful illustrations of current microbial biotechnology trends
- 5 Future advances in microbial biotechnology research for sustainable development

New and Future Developments in Microbial Biotechnology and Bioengineering Jay Shankar Singh,DP Singh,2019-03-19 New and Future Developments in Microbial Biotechnology and Bioengineering Microbial Biotechnology in Agro environmental Sustainability describes in detail the various roles of microbial resources in the management of crop diseases and how microbes can be used as a source of income for biomass and bioenergy production In addition the book covers microbial inoculants as bio fertilizers to enhance crop productivity along with degraded land restoration Users will find the latest information in the field of microbial biotechnology and its further applications in bio fertilizers bio pesticides its generation as an alternative source of energy restoration degraded and marginal lands the mitigation of global warming gases and more Describes microbial biotechnology and its applications in sustainable agriculture Provides information on the

use of a variety of microbes for crop production Outlines microbe based separation techniques for the removal of metal contaminants from soil Describes the role of microbial agents in the generation of alternative sources of energy Includes microbial tools and technologies for the restoration of degraded and marginal lands the mitigation of global warming gases and the bioremediation of polluted sites **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

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 **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 *Mycorrhizosphere and Pedogenesis* Ajit Varma,Devendra K. Choudhary,2019-07-13 The present book highlights importance of mycorrhiza in soil genesis wherein it reflects mycorrhizal occurrence and diversity various tools to characterize them and its impact on soil formation health together with crop productivity The edited compendium provides glimpses on the mycorrhizal fungi and their prominent role in nutrient transfer into host plants and presenting view on application of mycorrhiza for crop biofortification It focuses on the mechanisms involve in weathering process employed by mycorrhiza with highlighting the current and advanced molecular approaches for studying mycorrhizal diversity Further book emphasizes following aspects in details significance of AMF in phytoremediation of hydrocarbon contaminated sites the role of mycorrhiza in soil genesis using scientometric approach the concept of mycorrhizosphere xenobiotic metabolism molecular approaches for detoxifying the organic xenobiotics and the role of mycorrhizosphere in stabilizing the environment in an eco friendly way In addition the book will be benign to researchers that involved in mycorrhiza characterization especially by deploying metagenomics PCR based and non PCR based molecular techniques that may be utilized to study the microbial diversity and structure within the mycorrhizosphere

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 *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 Plant-Microbe Dynamics Tanveer Bilal Pirzadah,Bisma Malik,Khalid Rehman Hakeem,2021-06-06 Plants and microbes have co evolved and interacted with each other in nature Understanding the complex nature of the plant microbe interface can pave the way for novel strategies to improve plant productivity in an eco friendly manner The microbes associated with plants often called plant microbiota are an integral part of plant life The significance of the plant microbiome is a reliable approach toward sustainability to meet future food crises and rejuvenate soil health Profiling plant associate microbiomes genome assemblies of all microbes is an emerging concept in understanding plant microbe interactions Microbiota extends the plant capacity to acclimatize fluctuating environmental conditions through several mechanisms Thus unraveling the mystery of plant microbe dynamics through latest technologies to better understand the role of metabolites and signal pathway mechanisms is very important This book shares the latest insight on omics technologies to unravel plant microbe dynamic interactions and other novel phytotechnologies for cleaning contaminated soils Besides it also provides brief insight on the recently discovered clustered regularly interspaced short palindromic repeats CRISPR Cas9 which is a genome editing tool to explore plant microbe interactions and how this genome editing tool helps to improve the ability of microbes plants to combat abiotic biotic stresses **Interactions in Soil: Promoting Plant Growth** John Dighton,Jennifer Adams Krumins,2014-05-19 This book

investigates soil ecology and biodiversity for its ability to maintain a balance of beneficial organisms to support plant growth. This subject is discussed by a group of international authors in natural agricultural and urban systems. The importance of biodiversity per se and specifically the feedbacks between the plant and soil biota in mediating soil function are emphasized. Examples are selected from allelopathy and invasive plant species along with the hitherto overlooked role of viruses in soil. The book is intended to provide a framework for a holistic understanding of the essential role of soil organisms in promoting plant growth.

Priming and Pretreatment of Seeds and Seedlings Mirza Hasanuzzaman, Vasileios Fotopoulos, 2019-10-15

This book introduces readers to both seed treatment and seedling pretreatments taking into account various factors such as plant age, growing conditions and climate. Reflecting recent advances in seed priming and pretreatment techniques, it demonstrates how these approaches can be used to improve stress tolerance and enhance crop productivity. Covering the basic phenomena involved, mechanisms and recent innovations, the book offers a comprehensive guide for students, researchers and scientists alike, particularly Plant Physiologists, Agronomists, Environmental Scientists, Biotechnologists and Botanists who will find essential information on physiology and stress tolerance. The book also provides a valuable source of information for professionals at seed companies, seed technologists, food scientists, policymakers and agricultural development officers around the world.

New and Future Developments in Microbial Biotechnology and Bioengineering: Microbial Biofilms Mukesh Kumar Yadav, Bhim Pratap Singh, 2019-10-10

New and Future Developments in Microbial Biotechnology and Bioengineering: Microbial Biofilms is divided into three sections: microbial adhesion, biofilms in medical settings, microbial adhesion, biofilms in agriculture and microbial adhesion, biofilm in the environment and industry. Chapters cover adhesion and biofilm formation by pathogenic microbes on tissue and on indwelling medical devices, including sections on human infections, microbial communication during biofilm, mode of growth, host defense and antimicrobial resistance and more. Other sections cover the biofilms of agriculturally important and environmental friendly microbes, including biofilm formation on plants in soil and in aquatic environments. Finally, the latest scientific research on microbial adhesion and biofilm formation in the environment and in industry is covered. Provides an overview on the growth, structure, cell to cell interactions and control, dispersal of bacterial and fungal of in vitro and in vivo biofilms. Presents an overview on the microbial adhesion, biofilm formation and structures of single species and multi species biofilms on human tissues, medical devices, agriculture, environment and chemical industries. Includes chapters on microbial biofilms of pathogenic microbes on human tissues and in medical indwelling devices. Covers factors affecting microbial biofilm adhesion and formation.

Advances in Organic Farming Vijay Singh Meena, Sunita Kumari Meena, Amitava Rakshit, Johnson Stanley, Srinivasa Rao, 2021-08-10

Advances in Organic Farming: Agronomic Soil Management Practices focuses on the integrated interactions between soil, plant, microbe, environment elements in a functioning ecosystem. It explains sustainable nutrient management under organic farming and agriculture with chapters focusing on the role of nutrient management in

sustaining global ecosystems the remediation of polluted soils conservation practices degradation of pollutants biofertilizers and biopesticides critical biogeochemical cycles potential responses for current and impending environmental change and other critical factors Organic farming is both challenging and exciting as its practice of feeding the soil not the plant provides opportunity to better understand why some growing methods are preferred over others In the simplest terms organic growing is based on maintaining a living soil with a diverse population of micro and macro soil organisms Organic matter OM is maintained in the soil through the addition of compost animal manure green manures and the avoidance of excess mechanization Presents a comprehensive overview of recent advances and new developments in the field OF research within a relevant theoretical framework Highlights the scope of the inexpensive and improved management practices Focuses on the role of nutrient management in sustaining the ecosystems

Microbial Models: From Environmental to Industrial Sustainability Susana Castro-Sowinski, 2016-11-17 This book describes selected microbial genera from the perspective of their environmentally and commercially sustainable use By focusing on their physiology and metabolism and combining historical information with the latest developments it presents a multidisciplinary portrait of microbial sustainability The chapters provide readers descriptions of each genus in the form of microbial models that move us closer to the goal of sustainability selected chapters also include worldwide market information and lists of corresponding patents

Phytomicrobiome Interactions and Sustainable Agriculture Amit Verma, Jitendra Kumar Saini, Harikesh Bahadur Singh, Abd El-Latif Hesham, 2021-01-12 A guide to the role microbes play in the enhanced production and productivity of agriculture to feed our growing population Phytomicrobiome Interactions and Sustainable Agriculture offers an essential guide to the importance of Phytomicrobiome and explores its various components The authors noted experts on the topic explore the key benefits of plant development such as nutrient availability amelioration of stress and defense to plant disease Throughout the book the authors introduce and classify the corresponding Phytomicrobiome components and then present a detailed discussion related to its effect on plant development controlling factors of this biome its behaviour under the prevailing climate change condition and beneficial effects The book covers the newly emerging technical concept of Phytomicrobiome engineering which is an advanced concept to sustain agricultural productivity in recent climatic scenario The text is filled with comprehensive cutting edge data making it possible to access this ever growing wealth of information This important book Offers a one stop resource on phytomicrobiome concepts Provides a better understanding of the topic and how it can be employed for understanding plant development Contains a guide to sustaining agriculture using phytomicrobiome engineering Presents information that can lead to enhanced production and productivity to feed our growing population Written for students researchers and policy makers of plant biology Phytomicrobiome Interactions and Sustainable Agriculture offers a clear understanding of the importance of microbes in overall plant growth and development

Understanding Microbial Biofilms Surajit Das, Neelam Amit Kungwani, 2022-10-27 Selected for Doody's Core Titles 2024

in Microbiology Understanding Microbial Biofilms Fundamentals to Applications focuses on the microbial biofilms of different environments The book provides a comprehensive overview of the fundamental aspects of microbial biofilms their existence in nature their significance and the different clinical and environmental problems associated with them The book covers both the fundamentals and applications of microbial biofilms with chapters on the introduction to the microbial community and its architecture physiology mechanisms and imaging of biofilms in nature and fungal algal and bacillus biofilm control In addition the book highlights the molecular and biochemical aspects of bacterial biofilms providing a compilation of chapters on the bacterial community and communication from different environments Finally the book covers recent advancements in various aspects of microbial biofilms including the chapters on their biotechnological applications All the chapters are written by experts who have been working on different aspects of microbial biofilms Illustrates fundamental aspects surrounding microbial biofilms along with recent advancements Provides an overview on the principal aspects of biofilms i e formation regulation distribution control and application Updates on the progress on biofilm regulation through omics Serves as a classical manual for all researchers academicians and students who would want complete insights on biofilms in a single resource Covers all recent advancements and amendments on microbial biofilms

Salt Stress, Microbes, and Plant Interactions: Causes and Solution Mohd Sayeed Akhtar, 2019-10-17 This book offers an overview of salt stress which has a devastating effect on the yields of various agricultural crops around the globe Excessive salts in soil reduce the availability of water inhibit metabolic processes and affect nutrient composition osmotic balance and hydraulic conductivity Plants have developed a number of tolerance mechanisms such as various compatible solutes polyamines reactive oxygen species and antioxidant defense mechanisms ion transport and compartmentalization of injurious ions The exploitation of genetic variation use of plant hormones mineral nutrients soil microbe interactions and other mechanical practices are of prime importance in agriculture and as such have been the subject of multidisciplinary research Covering both theoretical and practical aspects the book provides essential physiological ecological biochemical environmental and molecular information as well as perspectives for future research It is a valuable resource for students teachers and researchers and anyone interested in agronomy ecology stress physiology environmental science crop science and molecular biology

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