

# Mycorrhizal Technology in Agriculture

From Genes to Bioproducts



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# Mycorrhizal Technology In Agriculture

**Wenbin Ji**



## **Mycorrhizal Technology In Agriculture:**

Mycorrhizal Technology in Agriculture S. Gianinazzi, Hannes Schüepp, J.M. Barea, K. Haselwandter, 2012-12-06 Arbuscular Mycorrhiza AM is the most common mycorrhizal type involved in agricultural systems and the most widespread plant root symbiosis The fungi involved Glomales are known to promote plant growth and health by acting as biofertilizers bioprotectors and bioregulators The main aim of this book is to provide readers with theoretical and applied knowledge essential for the use of AM fungi in improving plant health and fitness production of high quality food and in conservation of natural resources The different chapters target understanding the role of AM fungi in sustainable crop production discussing ways to improve biological equilibria between microorganisms in the mycorrhizosphere analysing genetic physiological cellular and molecular bases of AM functioning and establishing technologies for inoculum production according to the regulatory guidelines for application *Mycorrhizae: Sustainable Agriculture and Forestry* Zaki Anwar Siddiqui, Mohammad Sayeed Akhtar, Kazuyoshi Futai, 2008-07-27 Mycorrhizal fungi are microbial engines which improve plant vigor and soil quality They play a crucial role in plant nutrient uptake water relations ecosystem establishment plant diversity and the productivity of plants Scientific research involves multidisciplinary approaches to understand the adaptation of mycorrhizae to the rhizosphere mechanism of root colonization effect on plant physiology and growth biofertilization plant resistance and biocontrol of plant pathogens This book discusses and goes into detail on a number of topics the molecular basis of nutrient exchange between arbuscular mycorrhizal AM fungi and host plants the role of AM fungi in disease protection alleviation of soil stresses and increasing grain production interactions of AM fungi and beneficial saprophytic mycoflora in terms of plant growth promotion the role of AM fungi in the restoration of native ecosystems indirect contributions of AM fungi and soil aggregation to plant growth and mycorrhizosphere effect of multitrophic interaction the mechanisms by which mycorrhizas change a disturbed ecosystem into productive land the importance of reinstallation of mycorrhizal systems in the rhizosphere is emphasized and their impact on landscape regeneration and in bioremediation of contaminated soils Ectomycorrhizae ECM and their importance in forest ecosystems and associations of ECM in tropical rain forests function to maintain tropical monodominance in vitro mycorrhization of micro propagated plants and visualizing and quantifying endorhizal fungi the use of mycorrhizae mainly AM and ECM for sustainable agriculture and forestry Mycorrhiza Ajit Varma, 2008-09-09 This book is perfectly timed for the worldwide explosion of interest in mycorrhizal research With a strong emphasis on the latest findings in genetics and molecular biology it contains all current information and speculation on the structure function and biotechnological applications of mycorrhizas **Organic Agriculture** J.C. Tarafdar, K.P. Tripathi, M. Kumar, 2012-01-01 The purpose of this book is to draw attention to the ill health of the soil to indicate some of the consequences of this to suggest method by which the lost fertility could be restored and to enlist research findings to utilize in making farm products as well as farm resources free from chemical pollution This book provides an overall review of different tools for organic agriculture

followed by discussions on sustainability      *Advances in Plant Microbiome and Sustainable Agriculture* Ajar Nath Yadav, Ali Asghar Rastegari, Neelam Yadav, Divjot Kour, 2020-07-31 Microbes are ubiquitous in nature and plant microbe interactions are a key strategy for colonizing diverse habitats The plant microbiome epiphytic endophytic and rhizospheric plays an important role in plant growth and development and soil health Further rhizospheric soil is a valuable natural resource hosting hotspots of microbes and is vital in the maintenance of global nutrient balance and ecosystem function The term endophytic microbes refers to those microorganisms that colonize the interior the plants The phyllosphere is a common niche for synergism between microbes and plants and includes the leaf surface The diverse group of microbes are key components of soil plant systems and where they are engaged in an extensive network of interactions in the rhizosphere endophytic phyllospheric they have emerged as an important and promising tool for sustainable agriculture Plant microbiomes help to directly or indirectly promote plant growth using plant growth promoting attributes and could potentially be used as biofertilizers bioinoculants in place of chemical fertilizers This book allows readers to gain an understanding of microbial diversity associated with plant systems and their role in plant growth and soil health Offering an overview of the state of the art in plant microbiomes and their potential biotechnological applications in agriculture and allied sectors it is a valuable resource for scientists researchers and students in the field of microbiology biotechnology agriculture molecular biology environmental biology and related subjects      **Sustainable Utilization of Fungi in Agriculture and Industry**

Shanthipriya Ajmera, 2022-07-21 Sustainable Utilization of Fungi in Agriculture and Industry covers current knowledge about different fungal microorganisms including economically important filamentous fungi and yeasts 22 chapters summarize information about scientific investigations and the application of fungi in the production of industrial enzymes organic acids citric acid lactic acid etc biofuel ethanol and hydrogen and bioactive compounds for sustainable processes in agriculture bioremediation and the industrial production of pharmaceuticals Each chapter gives an updated and detailed account on fungal microbes and their sustainable utilization in agriculture white biotechnology and other valuable industrial applications Contributions are written by experts in mycology and industrial biotechnology presenting a broad perspective of the field in a simple yet engaging style Sustainable Utilization of Fungi in Agriculture and Industry is an informative reference for general readers trainees interested in sustainability measures in agriculture and industry The book also serves as a resource for scholars students and teachers involved in botany microbiology biotechnology and life sciences courses      Agriculturally Important Microorganisms Harikesh Bahadur Singh, Birinchi Kumar Sarma, Chetan Keswani, 2016-11-18 The main focus of this book is to survey the current status of research development and use of agriculturally important microorganisms in Asian countries and develop a strategy for addressing critical issues various policy constraints due to which bio pesticides have found limited applications In this book the editors have tried to develop a consensus on issues of such as quality requirements quality control regulatory management commercialization and marketing of agriculturally important

microorganisms in Asian countries All these issues are discussed at national level by competent authorities of Asian countries including India China Malaysia Iran Taiwan Israel Sri Lanka Vietnam and Philippines

**Microbial Technology for the Welfare of Society** Pankaj Kumar Arora,2019-09-12 This book describes various aspects of modern microbiology including microbial enzymes secondary metabolites next generation sequencing microbial based biopesticides microbial based cancer therapies biodiesel and microbial products from fermentation biodegradation bioremediation and wastewater treatment Further it explains how and why microbes play an important role in preserving the welfare of living beings and the environment Many bacteria play a significant part in cleaning our environment by detoxifying various xenobiotic compounds while several microbes produce secondary metabolites that are useful to human beings The book is divided into 15 chapters that cover various aspects of microorganism based biotechnology including recent methodologies such as advanced molecular techniques as well developments in classical microbiological techniques The authors also explain how the latest and classical techniques are being used in modern day microbial biotechnology All chapters were written by experts from prominent universities research laboratories and institutes around the globe Above all they focus on recent advances in microbial technology that promote the welfare of living beings and the environment Mycorrhiza A. Prakash,V.S.

Mehrotra,2005-04-01 The compendium is a compilation of research papers covering various aspects of mycorrhiza presented at the National Conference on Mycorrhiza held at Barkatullah University Bhopal There the contributors come from different field of research have discussed in recent future it will be possible the application of mycorrhizal inoculum in large scale by developing cost effective technology Also demonstrations of the use of mycorrhizal technology have to be carried out in farmer s field and forest nurseries to show the benefits of mycorrhiza in enhancing plant growth and reducing chemical fertilizer use in cultivation practices The departments companies and NGOs involved in afforestation and agricultural activities are advised to include eco friendly mycorrhizal technology in their programmes thus helping in reducing the use of chemicals The book will serve as a useful guide for conducting further research studies on the interactions between plant and mycorrhiza Industrial Applications of Soil Microbes: Volume 3 Ashutosh Gupta,Shampi Jain,Neeraj Verma,2024-04-25

This volume is a compilation of reviews on the industrial usage of soil microorganisms The contents include 16 brief reviews on different soil microbe assisted industrial processes Readers will be updated about recent applications of soil bacteria fungi and algae in sectors such as agriculture biotechnology environmental management The reviews also cover special topics like sustainable agriculture biodiversity ecology and intellectual property rights of patented strains giving a broad perspective on industrial applications of soil microbes Volume 3 emphasizes various soil microorganisms including cyanobacteria and mycorrhiza The 16 chapters cover the ecological significance of mycorrhiza to and their role in sustainable agriculture microbial interactions with nematodes microbes as biocontrol agents and the use of endophytes in agriculture Chapters also shed light on industrial aspects and microbial biotransformation providing a comprehensive view of sustainable agricultural

practices Special topics such as the microbial carotenoids are also included

**Microbial Biostimulants for Sustainable Agriculture and Environmental Bioremediation** Inamuddin, Charles Oluwaseun Adetunji, Mohd Imran Ahamed, Tariq Altalhi, 2022-06-29 Today the agriculture industry is confronted with simultaneous issues of how to fully embrace mass production of safer food in terms of both quality and quantity Most industries are concerned with avoiding significant levels of soil pollution and environmental threats as a result of the excessive and harmful use of synthetic products on crops Therefore there is a need to adopt sustainable technological innovations that can ensure the sustainability of agricultural production systems Microbial Biostimulants for Sustainable Agriculture and Environmental Bioremediation discusses the benefits challenges and practical applications of eco friendly biotechnological techniques using biostimulants derived from beneficial microorganisms The chapters cover the use of these organisms to increase crop production enhance soil fertility and maintain soil health create crop and plant tolerance to different abiotic stressors release required nutrients to the soil increase resistance to plant pathogens pests improve nutrient use efficiency of crops and rejuvenate polluted environments FEATURES Explores the physiological morpho anatomical and biochemical molecular plant rejoinders involved in stimulating crop productivity Provides information on the physiological cellular and molecular modes of action underlying microbial biostimulant interfaces Summarizes methods and approaches for executing microbial stimulant technology Outlines numerous environmental management and remediation strategies This book is an ideal resource for researchers engineers and academics working in soil science crop science water remediation microbiology and biotechnology

**Microbial Biotechnology in Horticulture, Vol. 2** R C Ray, O.P. Ward, 2008-01-01 Plant genetic engineering has revolutionized our ability to produce genetically improved plant varieties Large proportions of our major crops have undergone genetic improvement through the use of recombinant DNA technology and micro organisms play an important role in this development The book focuses on genetic engineering of plants for horticulture

**In Vitro Culture of Mycorrhizas** Stéphane Declerck, Désiré-Georges Strullu, André Fortin, 2005-12-29 This is the first book describing in vitro cultivation of root organs The text describes various biological aspects such as the physiology biochemistry biodiversity and life cycles of fungi as well as the effects of symbiosis on plant growth and development including large scale fungus production for biotechnological use Detailed protocols allow the immediate application of the method to culture mycorrhizal fungi in vitro

**The Science Beneath Organic Production** David Atkinson, Christine A. Watson, 2019-03-08 A groundbreaking book that addresses the science that underpins organic agriculture and horticulture and its impact upon the management of organic systems With contributions from noted experts in the field Organic Agriculture explores the cultural context of food production and examines the historical aspects economic implications and key scientific elements that underpin organic crop production The book shows how a science based approach to organic farming is grounded in history and elements of the social sciences as well as the more traditional areas of physics chemistry and biology Organic Agriculture offers a detailed explanation of the

differences between organic systems and other approaches answering questions about crop production and protection crop rotations soil health biodiversity and the use of genetic resources The authors identify current gaps in our understanding of the topic and discuss how organic farming research may be better accomplished in the future This important book Explores the science that underpins organic farming Contains illustrative case studies from around the world Examines organic agriculture s philosophical roots and its socio economic context Written for scientists and students of agriculture and horticulture this book covers the issues linked to the use of science by organic producers and identifies key elements in the production of food

**Bio-control Agents for Sustainable Agriculture** Debasis Mitra,Sergio de los Santos Villalobos,Anju Rani,Beatriz Elena Guerra Sierra,Snežana Andjelković,2025-04-17 This book covers all aspects of the diversity and core microbiome of the bio control agents Their bioprospecting and application at the field level is also discussed The application of bio control agents is unique in plant production due to various reasons including its environment friendly nature management of plant resistance and incentivizing the rhizosphere to phyllosphere signaling The chapters provide information on major plant associated diversity of beneficial microorganisms various pathogen management strategies and improving plant immunity by the application of bio control agents Additionally the exploitation development and quality control of bio control agent based formulations for farming systems and industrial level production is discussed This approach provides a novel framework for fostering sustainable development in crop production and protection The book targets researchers microbiology students the biofertilizers industry and those in agricultural and environmental fields

**Re-visiting the Rhizosphere Eco-system for Agricultural Sustainability** Udai B. Singh,Jai P. Rai,Anil K. Sharma,2022-10-28 The present book entitled Re visiting the Rhizosphere Eco system for Agricultural Sustainability written by experts in the field provides a comprehensive and consolidated state of art overview of various aspects of rhizosphere biology ecology and functioning The role of rhizosphere microbial diversity in enhancing plant health and plant microbe beneficial symbioses is discussed Main topics include the diversity of plant associated microbes in the rhizosphere below ground communication among the plant soil insects and microbes rhizosphere ecosystem functioning rhizosphere engineering recruitment of microorganisms in the rhizosphere mycorrhizal fungal symbiosis positive interaction of the plants with the beneficial soil microorganisms for inducing the plant growth conferring abiotic and biotic stress tolerance and modulating several pathways of the plants for the proper establishment and revitalization in the degraded and contaminated soils or negative likes the host pathogen interactions leading to the disease development in plants Further chapters focus on the role of signaling during the different stages of the plant microbe coexistence in symbiotic or pathogenic relationships in quorum sensing microbial signaling and cross talk bio film formation and antimicrobial peptides The book also discusses the application of microbes in biodegradation of xenobiotic contaminants bioremediation of heavy metals sustainable agriculture and soil health biological control of insect pests and plant pathogens and the latest tools of omics which offer pioneering

approaches to the exploration of microbial structure and function secretome holobiome below ground interaction and microbial cooperation for sustainable food production and enhanced resource acquisition Descriptions of cutting edge techniques and novel approaches make this book unique in the area of rhizosphere biology This is a useful reading material for researchers and students of microbiology agriculture ecology and rhizosphere studies *Advances in Organic Farming* L.P. Awasthi, 2025-08-21 This book describes critically reviewed key aspects of organic farming and provides a unique and timely science based resource for researchers teachers and extension workers undergraduates postgraduate students primary producers and others interested in organic farming The first section of the book provides an overview of organic farming a general introduction followed by the origins of organic farming the principles of organic farming challenges for organic farming crop protection in organic farming and environmental impacts of organic farming The next section deals with the management of various crop diseases through botanical biopesticides and Integrated Pest Management practices followed by overarching regulatory and management concerns The book is written by a range of specialists with direct experience of organic farming over many years Authors from over a dozen countries in several continents have contributed to this unique and indispensable resource that offers a diverse range of valuable information data and perspectives on organic farming at a time when the world community is increasingly aware of the problems of our current agricultural practices and the importance of creating sustainable agricultural systems for the long term health of humankind and the biosphere as a whole Applied Mycology for Agriculture and Foods Sanjay K. Singh, Deepak Kumar, Md. Shamim, Rohit

Sharma, 2023-12-01 Taking a multidisciplinary approach this book focuses on recent milestones in basic and applied mycology focusing on many and diverse applications in the agricultural food and biofuel sectors Applied Mycology for Agriculture and Foods Industrial Applications provides an informative update of the current biological status of fungi and advances in conventional and modern molecular tools in identification taxonomy of fungi and applications of different taxonomic groups of fungi in various sectors such as agriculture food development postharvesting biological control of crop diseases biofertilizers bioremediation pigments pharmaceuticals enzymes biofuel production etc The volume addresses fungal biodiversity conservation the emerging field of fungal metagenomics the role of fungi in eco safety and warfare and the bioprospecting of fungi for hydrocarbons for biofuel production Several chapters discuss using fungi in agricultural management such as for the biocontrol of plant diseases using entomopathogenic fungi as a pesticide using nematophagous fungi for controlling nematodes that eat crops using fungi in the development of biofertilizers and more The role of fungi in post harvest diseases management in horticultural crops is looked at as well Key features Provides up to date information and advances in biological status and classification of fungi Discusses the comprehensive role of fungi in various sectors in food and agriculture in biofuel production in the production of antibiotics or antimicrobial agents etc Presents the recent systemic taxonomic classifications developments applications in molecular mycology and conservation strategies



for mycoflora Aiming to bridge the knowledge gap between basic and applied aspects of mycology this volume provides a wealth of information that will be valuable for researchers industrial scientists faculty and students in mycology and plant pathology as well as in botany microbiology food microbiology pharmaceutical development biotechnology and biofuel production and other professional disciplines **Instant Insights: Biofertiliser use in agriculture** Prof. Lidia Sas Paszt, Dr Slawomir Gluszek, Dr Sylvia Kratz, Dr Kerstin Panten, Prof Ewald Schnug, Dr Elke Bloem, Dr April Leytem, Dr Robert Dungan, Dr Mindy Spiehs, Dr Dan Miller, Dr M. J. Salomon, Dr S. F. Bender, Dr T. R. Cavagnaro, Prof Marcel van der Heijden, Dr Elisa Zampieri, Dr Iakovos S. Pantelides, Dr Raffaella Balestrini, 2024-06-18 Considers the need to replace the application of synthetic fertilisers with more eco friendly alternatives that have a reduced impact on the environment Reviews recent advances in the use of treated wastes to optimise crop health and nutrition Addresses key issues that can arise as a result of the use of bio based fertilisers *Grand Challenges in Fungal Biotechnology* Helena Nevalainen, 2020-01-08 This volume provides a comprehensive overview of the major applications and potential of fungal biotechnology The respective chapters report on the latest advances and opportunities in each topic area proposing new and sustainable solutions to some of the major challenges faced by modern society Aimed at researchers and biotechnologists in academia and industry it represents essential reading for anyone interested in fungal biotechnology as well as those working within the broader area of microbial biotechnology Written in an accessible language the book also offers a valuable reference resource for decision makers in government and at non governmental organizations who are involved in the development of cleaner technologies and the global bioeconomy The 21st century is characterized by a number of critical challenges in terms of human health developing a sustainable bioeconomy facilitating agricultural production and establishing practices that support a cleaner environment While there are chemical solutions to some of these challenges developing bio based approaches is becoming increasingly important Filamentous fungi the forgotten kingdom are a group of unique organisms whose full potential has yet to be revealed Some key properties such as their exceptional capacity to secrete proteins into the external environment have already been successfully harnessed for the production of industrial enzymes and cellulosic biofuels Many further aspects discussed here such as feeding the hungry with fungal protein and the potential applications of the various small molecules produced by fungi warrant further exploration In turn the book covers the use of fungal cell factories to produce foreign molecules e g for therapeutics Strategies including molecular approaches to strain improvement and recent advances in high throughput technologies which are key to finding better products and producers are also addressed Lastly the book discusses the advent of synthetic biology which is destined to greatly expand the scope of fungal biotechnology The chapter Fungal Biotechnology in Space Why and How is available open access under a Creative Commons Attribution 4 0 International License at [link.springer.com](https://link.springer.com)

## Unveiling the Magic of Words: A Overview of "**Mycorrhizal Technology In Agriculture**"

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