

Mahendra Rai
Ajit Varma
Editors

SOIL BIOLOGY

Diversity and Biotechnology of Ectomycorrhizae

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Diversity And Biotechnology Of Ectomycorrhizae Soil Biology

Mahendra Rai,Ajit Varma



Diversity And Biotechnology Of Ectomycorrhizae Soil Biology:

Diversity and Biotechnology of Ectomycorrhizae Mahendra Rai,Ajit Varma,2010-11-15 Ectomycorrhizal fungi play multifunctional roles during symbioses with higher plants They can serve as bioprotectors biofertilizers bioremediators and stress indicators Further they are the true mycoindicators of forest ecosystems where an enormous diversity of ectomycorrhizal fungi can be found Some ectomycorrhizal fungi also produce edible sporocarps i e fruiting bodies which are important for the food industry Ectomycorrhizal fungi also produce various metal chelating molecules which are of remarkable biotechnological significance and which also secrete useful secondary metabolites Molecular approaches are required for the identification and differentiation of fungi forming symbioses with higher plants while molecular tools are important to understand how genes are expressed during symbiosis with higher plants Students researchers and teachers of botany mycology microbiology forestry and biotechnology will find a valuable source of information in this Soil Biology volume

Diversity and Biotechnology of Ectomycorrhizae Mahendra Rai,Ajit Varma,2011-04-08 Ectomycorrhizal fungi play multifunctional roles during symbioses with higher plants They can serve as bioprotectors biofertilizers bioremediators and stress indicators Further they are the true mycoindicators of forest ecosystems where an enormous diversity of ectomycorrhizal fungi can be found Some ectomycorrhizal fungi also produce edible sporocarps i e fruiting bodies which are important for the food industry Ectomycorrhizal fungi also produce various metal chelating molecules which are of remarkable biotechnological significance and which also secrete useful secondary metabolites Molecular approaches are required for the identification and differentiation of fungi forming symbioses with higher plants while molecular tools are important to understand how genes are expressed during symbiosis with higher plants Students researchers and teachers of botany mycology microbiology forestry and biotechnology will find a valuable source of information in this Soil Biology volume

Bioremediation and Biotechnology, Vol 4 Rouf Ahmad Bhat,Khalid Rehman Hakeem,2020-10-20 The rapid thriving of industries conversion of agricultural land to residential areas habitat destruction deforestation and use of recalcitrant synthetic substances enhanced the rate of degradation of the environment Although there are various conventional techniques for degradation and cleaning of noxious pollutants from disturbed environs they are energy inefficient and costly to install Bioremediation has emerged recently as an alternative and novel approach to manage and control environmental pollutants This volume focuses explicitly on the remediation of noxious substances in stressed environs It includes expert contributed chapters on bio monitoring by way of evaluating the relationship of biota with the polluted stressed environs sustainable plant based degradation of noxious pollutants and the application of biotechnologies to achieve tailored responses Academicians researchers scientists and students will find this work essential for sustainable treatment of noxious pollutants This book also serves as a core guide for training teaching and research in conservation biology and environmental rehabilitation

Mycorrhiza - Function, Diversity, State of the Art Ajit Varma,Ram Prasad,Narendra

Tuteja,2017-05-11 This is the fourth updated and revised edition of a well received book that emphasises on fungal diversity plant productivity and sustainability It contains new chapters written by leading experts in the field This book is an up to date overview of current progress in mycorrhiza and association with plant productivity and environmental sustainability The result is a must hands on guide ideally suited for agri biotechnology soil biology fungal biology including mycorrhiza and stress management academia and researchers The topic of this book is particularly relevant to researchers involved in mycorrhiza especially to food security and environmental protection Mycorrhizas are symbioses between fungi and the roots of higher plants As more than 90% of all known species of plants have the potential to form mycorrhizal associations the productivity and species composition and the diversity of natural ecosystems are frequently dependent upon the presence and activity of mycorrhizas The biotechnological application of mycorrhizas is expected to promote the production of food while maintaining ecologically and economically sustainable production systems

Industrial Applications of Soil

Microbes: Volume 4 Shampi Jain,Ashutosh Gupta,Neeraj Verma,2024-11-22 Industrial Applications of Soil Microbes is a compilation of reviews on the industrial usage of soil microorganisms Readers will be updated about recent applications of soil bacteria fungi and viruses in sectors such as agriculture biotechnology environmental management Volume 4 includes review on mycorrhizal fungi endophytes and a range of microbial chemicals and processes beneficial at industrial scale The 19 chapters start with an overview of mycorrhizae as biofertilizers their symbiosis with plants and their applications in improving crop yield stress management and soil health Case studies on *Lycopersicon esculentum* highlight practical benefits Soil microbes endophytes and microbial proteases are discussed for their role in biocontrol disease management and crop improvement The volume also explores eco friendly nematicides viruses in temperate fruit crops mushrooms nutritional value and metagenomics for bioinoculants Overall the volume emphasizes sustainable practices and future prospects involving microbes and microbe assisted processes

Mushrooms, Humans and Nature in a Changing World Jesús

Pérez-Moreno,Alexis Guerin-Laguet,Roberto Flores Arzú,Fu-Qiang Yu,2020-04-28 This book focuses on recent advances in our understanding of wild edible mycorrhizal fungi truffle and mushrooms and their cultivation In addition to providing fresh insights into various topics e g taxonomy ecology cultivation and environmental impact it also demonstrates the clear but fragile link between wild edible mushrooms and human societies Comprising 17 chapters written by 41 experts from 13 countries on four continents it enables readers to grasp the importance of protecting this unique invaluable renewable resource in the context of climate change and unprecedented biodiversity loss The book inspires professionals and encourages young researchers to enter this field to develop the sustainable use of wild edible mushrooms using modern tools and approaches It also highlights the importance of protecting forested environments saving species from extinction and generating a significant income for local populations while keeping alive and renewing the link between humans and wild edible mushrooms so that in the future the sustainable farming and use of edible mycorrhizal mushrooms will play a

predominant role in the management and preservation of forested lands

Physical and Physiological Forest Ecology

Pertti Hari, Kari Heliövaara, Liisa Kulmala, 2012-12-24 This book introduces a holistic synthesis of carbon and nitrogen fluxes in forest ecosystems from cell to stand level during the lifetime of trees Establishing that metabolism and physical phenomena give rise to concentration pressure and temperature differences that generate the material and energy fluxes between living organisms and their environment The editors and authors utilize physiological physical and anatomical background information to formulate theoretical ideas dealing with the effects of the environment and the state of enzymes membrane pumps and pigments on metabolism The emergent properties play an important role in the transitions from detailed to more aggregate levels in the ecosystem Conservation of mass and energy allow the construction of dynamic models of carbon and nitrogen fluxes and pools at various levels in the hierarchy of forest ecosystems

Edible

Ectomycorrhizal Mushrooms Alessandra Zambonelli, Gregory M Bonito, 2013-01-30 Edible ectomycorrhizal mushrooms EEMMs comprise more than 1000 species and are an important food and forest resource In this volume of Soil Biology internationally recognized scientists offer their most recent research findings on these beguiling fungi Topics covered include complex ecological interactions between plants EEMMs and soil organisms comparative genomics high throughput sequencing and modern research tools genetic selection of fungal strains and techniques for inoculating plants economic and social considerations surrounding wild collected EEMMs and practical information concerning soil management and EEMM cultivation The book will be a useful guide for anyone interested in soil ecology forestry or the genetics and cultivation of EEMMs and provides an extensive knowledge base and inspirations for future studies on these ecologically and economically important fungi

Climate Change, Air Pollution and Global Challenges

Hojka Kraigher, Marko Bajc, Tine Grebenc, 2013-11-19 Mycorrhizal fungi have evolved with their plant partners and enabled them with better growth in stressed and disturbed environments by better nutrient acquisition and protection against pathogens Any stress or disturbance belowground is reflected first in changes in mycorrhizal community structure The complex mycorrhizal networks and interactions among mycorrhizosphere organisms regulate the carbon dynamics and stability of forest ecosystems by beneficial interactions or collaboration rather than by competition especially under stress and disturbance This chapter provides an overview of mycorrhizal forms structure and functions their vulnerability and their central role in complex mycorrhizosphere interactions Their disruption may lead to the loss of essential functions of forest ecosystems The conservation of belowground interactions should be among priority areas of future research and monitoring programmes and strategies

Plant Science

Nabin Kumar Dhal, Sudam Charan Sahu, 2012-09-17 The book Plant Science consists of 12 chapters divided into three sections authored by many researchers from different parts of the Globe Section I Plant and Environment describes the relationship between plants and environment particularly enumerating species environment relationship and response of plants to different environmental stress conditions Section II Plant Microbe relation embodies

broadly on both positive and negative aspects of microbes on plants Section III Plant Biotechnology shed light on current biotechnological research to develop modern technology for producing biologicals and also increasing plant immunity in present environmental conditions The book Plant Science will be helpful to a wide group peoples readers scientists researchers and allied professionals We recommend it to you enjoy reading it save the plant and save life Endophytes: Biology and Biotechnology Dinesh K. Maheshwari,2017-11-02 This book discusses the latest developments in our understanding of microbial endophytes their ecology diversity and potential biotechnological applications It covers all the latest advances concerning the endophytic interaction of microorganisms in a wide array of plants reported on by experts from the entire globe The diverse microbial community which consists of archaeal bacterial fungal and protistic taxa can be found in all plants The endophytic lifecycle reveals how microorganisms play essential roles in plant growth fitness and diversification Diversity is an integral component of ecology In soil ecology below ground interactions of plant and microorganisms are accomplished by endophytes which reside in the plant s internal tissues The microbial world in general and endophytes in particular reflect a unique degree of genetic and functional metabolic diversity Currently significant attention is being paid to endophytic microorganisms as their repertoire of cells and metabolites hold immense potential with regard to biotechnological applications for sustainable development The diversity of bacterial endophytes guarantees that there are endophytes capable of forming compatible associations with all agronomically important plants including monocots and dicots The study of endophytes diverse nature in connection with biodiesel medicinal and agriculturally important crop can lead to a better understanding of applicable facets The topics in this dynamic field of study are so diverse and vast This volume will benefit all botanists microbiologists ecologists plant pathologists physiologists agronomists molecular biologists environmentalists policymakers conservationists and NGOs working to protect species and prevent the loss of biologically significant genetic material **Nutrient Use Efficiency: from Basics to Advances** Amitava Rakshit,Harikesh Bahadur Singh,Avijit Sen,2014-12-26 This book addresses in detail multifaceted approaches to boosting nutrient use efficiency NUE that are modified by plant interactions with environmental variables and combine physiological microbial biotechnological and agronomic aspects Conveying an in depth understanding of the topic will spark the development of new cultivars and strains to induce NUE coupled with best management practices that will immensely benefit agricultural systems safeguarding their soil water and air quality Written by recognized experts in the field the book is intended to provide students scientists and policymakers with essential insights into holistic approaches to NUE as well as an overview of some successful case studies In the present understanding of agriculture NUE represents a question of process optimization in response to the increasing fragility of our natural resources base and threats to food grain security across the globe Further improving nutrient use efficiency is a prerequisite to reducing production costs expanding crop acreage into non competitive marginal lands with low nutrient resources and preventing environmental contamination The nutrients most commonly

limiting plant growth are N P K S and micronutrients like Fe Zn B and Mo NUE depends on the ability to efficiently take up the nutrient from the soil but also on transport storage mobilization usage within the plant and the environment A number of approaches can help us to understand NUE as a whole One involves adopting best crop management practices that take into account root induced rhizosphere processes which play a pivotal role in controlling nutrient dynamics in the soil plant atmosphere continuum New technologies from basic tools like leaf color charts to sophisticated sensor based systems and laser land leveling can reduce the dependency on laboratory assistance and manual labor Another approach concerns the development of crop plants through genetic manipulations that allow them to take up and assimilate nutrients more efficiently as well as identifying processes of plant responses to nutrient deficiency stress and exploring natural genetic variation Though only recently introduced the ability of microbial inoculants to induce NUE is gaining in importance as the loss immobilization release and availability of nutrients are mediated by soil microbial processes

Bio-Geo Interactions in Metal-Contaminated Soils Erika Kothe,Ajit Varma,2012-01-05 Metal contamination is an increasing ecological and ecotoxicological risk Understanding the processes involved in metal mobilization sorption and mineralization in soils are key features for soil bioremediation Following an introduction to the physical chemical and biological components of contaminated soils various chapters address the interactions of soil microorganisms plants and the water phase necessary to transfer metals into biological systems These include topics such as potential hazards at mining sites rare earth elements in biotic and abiotic acidic systems manganese redox reactions biomineralisation uranium in seepage water metal resistant streptomycetes mycorrhiza in re forestation metal hyper accumulation in plants microbial metal uptake and their potential for bioremediation This book will be of interest to soil biologists geologists and chemists researchers and graduate students as well as consulting companies and small enterprises involved in bioremediation

Biotechnology of Ectomycorrhizae P. Bonfante,M. Nuti,V. Stocchi,2012-12-06 Forty years after the discovery of the helix nature of DNA and more than twenty after the first applications of recombinant DNA technology to the pharmaceutical industry the Pandora s vase of biotechnology seems far from being empty New products for agriculture and the food industry are constantly being placed on the market and powerful monitoring techniques have been developed to track non modified and genetically modified vaccines viruses microbes and plants released into the environment Molecular approaches for taxonomic purposes which might also be useful for quality control and assurance have been successfully developed and used for taxonomic purposes in the last decade for both prokaryotic and eukaryotic cells including yeasts and filamentous fungi Mycorrhizae are one example of a traditional biotechnology that can greatly benefit from the latest molecular approaches These universal symbioses between soil fungi and plant roots play a central role in most of the natural and agricultural ecosystems in such key processes as nutrient cycling soil structural conservation and plant health For these reasons mycorrhizae have been successfully used to improve the quality of forest and agricultural seedlings to produce high quality micropropagated plants and to increase the

production of edible mushrooms of high economic value such as truffles However although controlled inoculation of oak and hazel seedlings with ectomycorrhizal truffles has been carried out for decades in France and Italy and is still expanding commercially several technological gaps remain to be filled

Beneficial Plant-microbial Interactions M. Belén Rodelas González, Jesús Gonzalez-López, 2016-04-19 Beneficial Plant microbial Interactions Ecology and Applications provides insight into the mechanisms underlying the interactions of plants and microbes the ecological relevance and roles of these symbioses the adaptive mechanisms of plant associated microorganisms to abiotic stress and their contribution to plant stress tolerance and the poten

Biofertilizers for Sustainable Agriculture and Environment Bhoopander Giri, Ram

Prasad, Qiang-Sheng Wu, Ajit Varma, 2019-08-09 This book provides a comprehensive overview of the benefits of biofertilizers as an alternative to chemical fertilizers and pesticides Agricultural production has increased massively over the last century due to increased use of chemical fertilizers and pesticides but these gains have come at a price The chemicals are not only expensive they also reduce microbial activity in agricultural soils and accumulate in the food chain with potentially harmful effects for humans Accordingly it is high time to explore alternatives and to find solutions to overcome our increasing dependence on these chemicals Biofertilizers which consist of plant remains organic matter and microorganisms might offer an alternative They are natural organic biodegradable eco friendly and cost effective Further the microbes present in the biofertilizers are important because they produce nutrients required for plant growth e g nitrogen phosphorus potassium as well as substances essential for plant growth and development e g auxins and cytokinins Biofertilizers also improve the physical properties fertility and productivity of soil reducing the need for chemical fertilizers while maintaining high crop yield This makes biofertilizers a powerful tool for sustainable agriculture and a sustainable environment The book covers the latest research on biofertilizers ranging from beneficial fungal bacterial and algal inoculants to microbes for bioremediation wastewater treatment and recycling of biodegradable municipal agricultural and industrial waste as well as biocontrol agents and bio pesticides As such it offers a valuable resource for researchers academics and students in the broad fields of microbiology and agriculture

RECENT TRENDS AND LATEST INNOVATIONS IN LIFE SCIENCES VOLUME - I

Aditee Pandya , Pragna Pandya- Amruta Jadhav , Aakash Pawar- -Nirbhay S. Pimple & Sanjay S. Gaikwad--Dr. Sangeeta Dongre--Dr. A. Mushira Banu--Dr. Vinod Anantrao Shinde-Greeshma K P, S. Muthulingam & Sam John--M. N. Narule -Fused Analogues-Thirupathy Jayapalan--Ezhumalai Yamuna, & Kumaresan Prabakaran-Sonalismita Mahapatra, Modi Kiran Piyushbhai--Dr. Anand Shanker Singh & Dr. Manisha-- Saumya Surekha, Ashish Kumar Lamiyan -Mr. Jige Sandipan Babasaheb--Dr. B. Arifa Farzana--Dr. Santosh Karajgi, 2022-10-01 Edited by DR ANAND SHANKAR SINGH DR MANISHA DR D JAYARAJAN DR ARUNA KUMARI NAKKELLA All rights reserved No part of this publication may be reproduced or transmitted in any form or by any means without permission Any person who does any unauthorized act in relation to this publication may be liable for criminal prosecution and civil claims for damages GLOBAL ACADEMY Biochemistry and

Molecular Biology Dirk Hoffmeister, 2016-02-19 This new edition provides a comprehensive look at the molecular genetics and biochemical basis of fungal biology covering important model organisms such as Aspergilli while also integrating advances made with zygomycetes and basidiomycetes This book groups a total of 15 chapters authored by expert scholars in their respective fields into four sections Five chapters cover various aspects of gene expression regulation These range from regulation in organismal interactions between parasitic fungi and their host plant heavy metal stress and global control of natural product genes to conidiation and regulation through RNA interference Two chapters are dedicated to signal transduction highlighting MAP kinase dependent signaling and heterotrimeric G proteins Fungal carbohydrates are the subject of the third section which addresses both polymeric cell wall carbohydrates and trehalose as an important low molecular weight carbohydrate The fourth section emphasizes the metabolism of major elements carbon nitrogen sulfur and critical cellular pathways for primary and secondary products

Advancements in Microbial Biotechnology for Soil Health Ravi Kant Bhatia, Abhishek Walia, 2024-03-18 This edited book covers the latest trends to improve soil health It provides an easy to understand information to the readers This book acts as a reference book for various agronomists and research scholars working in the field of agriculture This edited book covers advanced technologies and practices carried out worldwide to improve soil health In the present scenario it is very important to save soil health and replenish it in a sustainable manner from various anthropogenic hazards As soil is the source to almost all lives on earth and it is duty the scientific community is developing ways to disseminate and communicate the most recent advancements to restore its health Content of the book is designed in such a way that it provides a compressive information to the readers to restore the soil health that will ultimately help to improve the health of microbes animals as well as plants that thrive in the soil and ultimately the quality of life of human being This book helps research scholars and teachers working in agriculture horticulture and environmental management by utilizing advances in microbiology and biotechnology It is of interest to undergraduate and graduate students teachers researchers environmentalists agriculture and horticulture scientists capacity builders policy makers and all other stakeholders

Plant Biology and Biotechnology Volume - I Mr. Rohit Manglik, 2024-01-23 EduGorilla Publication is a trusted name in the education sector committed to empowering learners with high quality study materials and resources Specializing in competitive exams and academic support EduGorilla provides comprehensive and well structured content tailored to meet the needs of students across various streams and levels

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