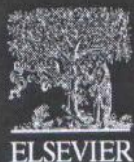
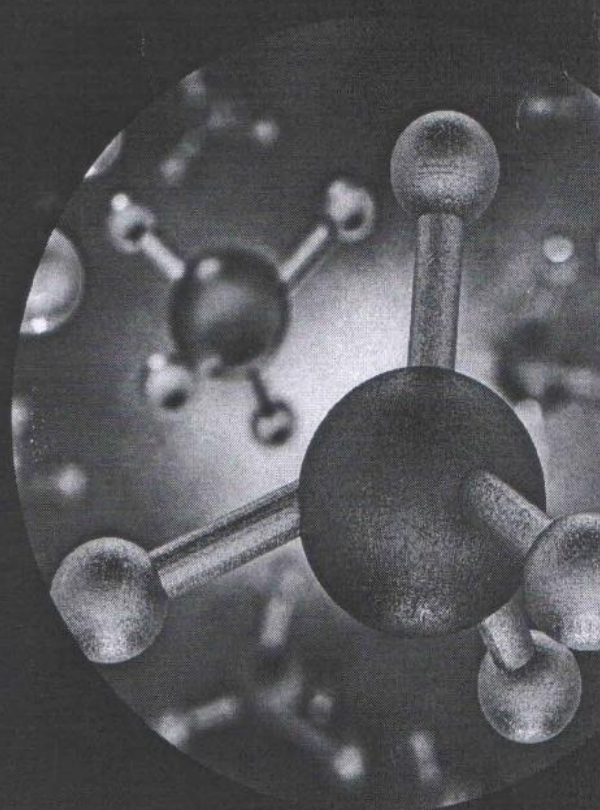
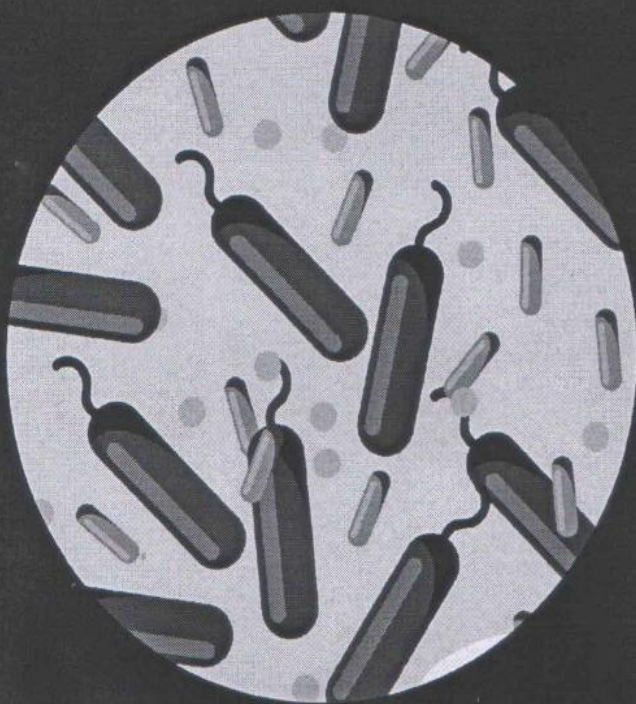


New and Future Developments in Microbial Biotechnology and Bioengineering

Microbial Biotechnology in
Agro-Environmental Sustainability



Edited by
Jay Shankar Singh
D.P. Singh

Table of contents

 Full text access

Front Matter, Copyright, Contributors, Foreword, Preface

Book chapter 

Chapter 1 - Activity and Diversity of Aerobic Methanotrophs in Thermal Springs of the Russian Far East

Ekaterina N. Tikhonova and Irina K. Kravchenko

Pages 1-30

 Purchase View chapter  View abstract 

Book chapter 

Chapter 2 - Promoting Crop Growth With Symbiotic Microbes in Agro-Ecosystems in Climate Change Era

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4/18/25, 11:21 PM

New and Future Developments in Microbial Biotechnology and Bioengineering | ScienceDirect

Honghui Zhu, Xiaodi Liu, ... Qing Yao

Pages 31-41

 Purchase View chapter  View abstract 

Book chapter 

Chapter 3 - *Bacillus*: Plant Growth Promoting Bacteria for Sustainable Agriculture and Environment

Shalini Tiwari, Vivek Prasad and Charu Lata

Pages 43-55

 Purchase View chapter  View abstract 

Book chapter 

Chapter 4 - Role of Microbes in Restoration Ecology and Ecosystem Services

Anil K. Singh, Anjana Sisodia, ... Minakshi Padhi

Pages 57-68

 Purchase View chapter  View abstract 

Book chapter 

Chapter 5 - The Role of Plant-Associated Bacteria in Phytoremediation of Trace Metals in Contaminated Soils

Pratishtha Gupta, Rupa Rani, ... Vipin Kumar

Pages 69-76

 Purchase View chapter  View abstract 

Book chapter 

Chapter 6 - Algae as a Sustainable and Renewable Bioresource for Bio-Fuel Production

M.P. Sudhakar and Shashirekha Viswanaathan

Pages 77-84

 Purchase View chapter  View abstract 

Book chapter 

Chapter 7 - A Green Nano-Synthesis to Explore the Plant Microbe Interactions

Shipra Pandey, Aradhana Mishra, ... Sumit Soni

Pages 85-105

 Purchase View chapter  View abstract 

Book chapter 

Chapter 8 - Microbial Biotechnology: A Promising Implement for Sustainable Agriculture

Reetika Singh

Pages 107-114

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ○ Abstract only

Chapter 9 - Rhizospheric Microbial Diversity: An Important Component for Abiotic Stress Management in Crop Plants Toward Sustainable Agriculture

Deepika Goyal, Om Prakash and Janmejey Pandey

Pages 115-134

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ○ Abstract only

Chapter 10 - Phyllosphere Microbiome: Functional Importance in Sustainable Agriculture

Paramanantham Parasuraman, Subhaswaraj Pattnaik and Siddhardha Busi

Pages 135-148

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ○ Abstract only

Chapter 11 - Fungi as Promising Biofuel Resource

Pallam Revanth Babu and Vemuri Venkateswara Sarma

Pages 149-164

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ○ Abstract only

Chapter 12 - Arbuscular Mycorrhizae: Natural Ecological Engineers for Agro-Ecosystem Sustainability

Kim Maria Rodrigues and Bernard Felinov Rodrigues

Pages 165-175

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ○ Abstract only

Chapter 13 - Biocontrol Strategies for Effective Management of Phytopathogenic Fungi Associated With Cereals

N. Deepa and M.Y. Sreenivasa

Pages 177-189

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ○ Abstract only

Chapter 14 - Municipal Solid Waste to Bioenergy: Current Status, Opportunities, and Challenges in Indian Context

Harshita Negi, Ruchi Agrawal, ... Reeta Goel

Pages 191-203

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ☐ Abstract only

Chapter 15 - Microbes as Bio-Resource for Sustainable Production of Biofuels and Other Bioenergy Products

Pritam Bardhan, Kuldeep Gupta and Manabendra Mandal

Pages 205-222

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ☐ Abstract only

Chapter 16 - Microbes-Assisted Remediation of Metal Polluted Soils

Bhavisha Sharma, Pooja Singh, ... Rajeev Pratap Singh

Pages 223-232

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ☐ Abstract only

Chapter 17 - The Prospects of Bio-Fertilizer Technology for Productive and Sustainable Agricultural Growth

Soma Barman, Subhasish Das and Satya Sundar Bhattacharya

Pages 233-253

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ☐ Abstract only

Chapter 18 - Plant-Microbe Interactions in Ecosystems Functioning and Sustainability

Paramanantham Parasuraman, Subhaswaraj Pattnaik and Siddhardha Busi

Pages 255-266

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ☐ Abstract only

Chapter 19 - *Azotobacter*—A Natural Resource for Bioremediation of Toxic Pesticides in Soil Ecosystems

G. Chennappa, Nidoni Udaykumar, ... M.Y. Sreenivasa

Pages 267-279

 Purchase [View chapter >](#) [View abstract ✓](#)

Book chapter ○ Abstract only

Chapter 20 - Significances of Fungi in Bioremediation of Contaminated Soil

Pankaj Kumar Chaurasia, Shashi Lata Bharati and Ashutosh Mani

Pages 281-294



Purchase

View chapter >

View abstract ✓

Book chapter ○ Abstract only

Chapter 21 - Microalgae-Assisted Phyco-Remediation and Energy Crisis Solution: Challenges and Opportunity

A.K. Upadhyay, Ranjan Singh, ... D.P. Singh

Pages 295-307



Purchase

View chapter >

View abstract ✓

Book chapter ○ Full text access

Index

Pages 309-315



View PDF

View chapter >

About the book

Description

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...

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Key Features

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...

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Details

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Arbuscular Mycorrhizae: Natural Ecological Engineers for Agro-Ecosystem Sustainability

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OUTLINE

12.1 Introduction	165	12.5 Conclusions and Future Perspectives	172
12.2 Ecological Functions of AM Fungi	167	References	172
12.3 AM Fungal Propagules and Inoculum Cultivation	167	Further Reading	175
12.4 Carrier-Based AM Fungal Bio-Inoculants	170		

12.1 INTRODUCTION

Ecosystems are occupied by large numbers of diversified microorganisms that interact in intricate networks (Moënné-Loccoz et al., 2015). Soil formation is the result of such complex network processes, biological, physical, and chemical. Soil microbes are of great significance, as they are responsible for most biological transformations including nutrient recycling thereby facilitating the subsequent establishment of plant communities (Schulz et al., 2013; Singh and Seneviratne, 2017a,b; Tiwari and Singh, 2017; Vimal et al., 2018). The term "mycorrhiza" literally derives from the Greek words "mycos" and "rhiza," meaning fungus and root, respectively (Wang and Qiu, 2006). Mycorrhiza associated with plant roots by an extensive extra-radical hyphal network which acts as an extension of the plant's root system. They are categorized into arbuscular, ecto-, ectendo-, arbutoid, ericoid, monotropoid, and orchid mycorrhiza (Smith and Read, 2008). Arbuscular mycorrhizas (AM) are ecologically important type of mycorrhiza which are most widely commercially exploited in agriculture/forestry (Owen et al., 2015). AM fungi are ubiquitous soil fungi that form symbiotic association with plant roots (Smith and Read, 2008), belonging to phylum Glomeromycota. These fungi are a monophyletic lineage of obligate mycobionts (Schüßler et al., 2001). As the phylum is evolutionarily an ancient form of symbiosis in plants, about 90% of extant plant species are mycorrhizal (Moënné-Loccoz et al., 2015). The fungus penetrates plant root cell walls and develops intra-radical structures (hyphae, arbuscules, vesicles) in the cortical cells of the host root and extra-radical structures (hyphae and spores) in soil (Fig. 12.1). This mutualistic association is characterized by a bidirectional flux wherein the mycobiont helps the phytobiont in acquisition of soil nutrients (mainly P) while the phytobiont provides photo-assimilates (carbon sources) to the mycobiont (Buscot et al., 2000; Brundrett, 2009). The basis this mutualistic association is the ability of AM fungi to form fine hyphae with more favorable surface area-to-volume ratio for nutrient uptake and to secrete enzymes or organic acids to mobilize nutrients (Owen et al., 2015).