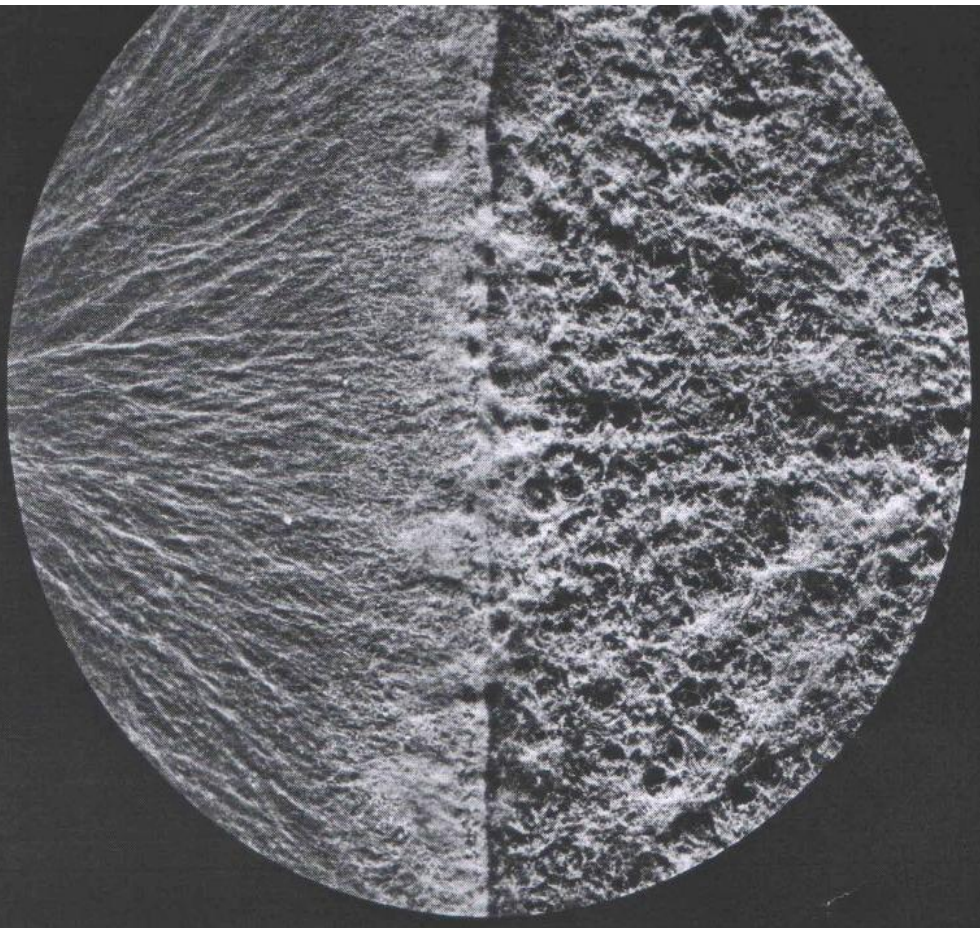

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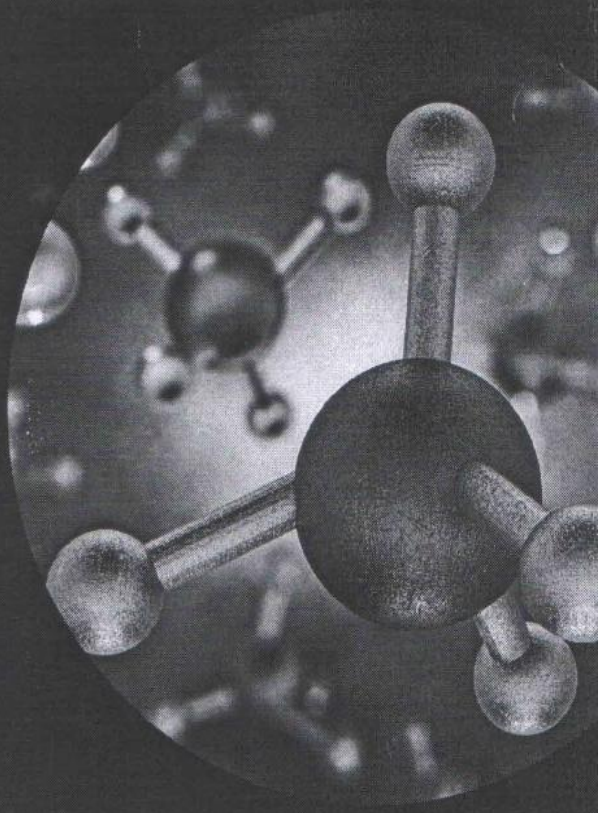

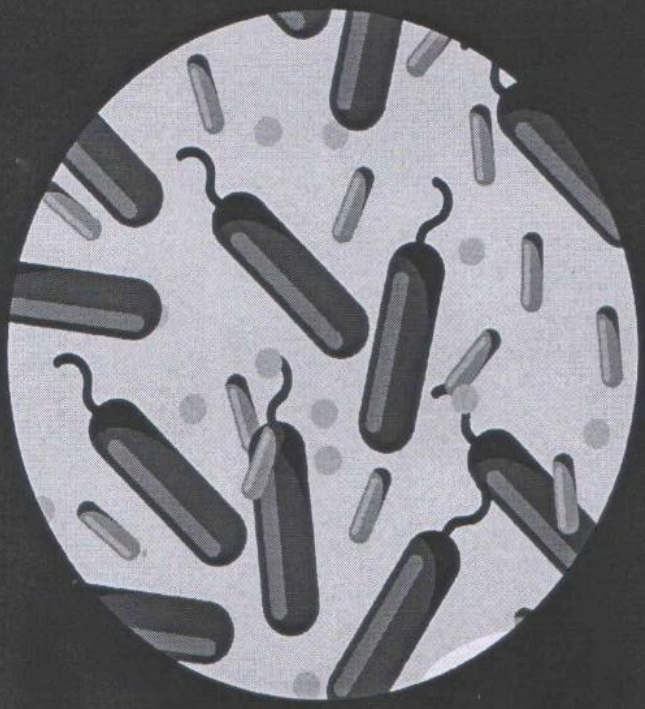

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About the book

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

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- 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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CHAPTER

12

Arbuscular Mycorrhizae: Natural Ecological Engineers for Agro-Ecosystem Sustainability

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OUTLINE

12.1 INTRODUCTION

Ecosystems are occupied by large numbers of diversified microorganisms that interact in intricate networks (Moënne-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 (Moënne-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).

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