

# Preface

Roots – the hidden half of the plants – are important organs for absorption of water and nutrients from the soil. Roots release many carbon compounds as exudate. These compounds provide support to develop a symbiotic relationship with soil-borne fungi, often called as mycorrhiza. The fungal partner (mycobiont) provides the plant with improved access to water and nutrients in the soil due to a profusely branched hyphal network that spreads from the root surface and extends far into the soil. The plant, in return, supplies carbohydrate for fungal growth and survival. The mycorrhizae in general and ectomycorrhizae (ECM) in particular are more beneficial to the plants growing in nutrient-poor soil. Ectomycorrhizal plants are resistant to soil-borne diseases and often tolerate drought stress. In fact, the ECM is responsible for the succession of ecosystems.

There is enormous diversity of ectomycorrhizal fungi in a forest. The ECM can be used as indicators of quality and also for the development of forest ecosystem. ECM could be applied for reforestation as they accelerate the plant growth by supplying water and nutrients. Interestingly, without ECM, healthy woodland community cannot be maintained. Moreover, some ectomycorrhizal fungi produce edible sporocarps (fruiting bodies), which are eaten by the people and thus important for the food industry.

For better performance of the plants, it is necessary to inoculate them at seedling stage by ECM to make their life safe. ECM plays a multifunctional role during symbiosis with higher plants. These fungi have diverse roles as bioremediators, bioprotectors, biofertilizers, and stress indicators. They are the true “mycoindicators” of the forest ecosystem. There are many metal chelating molecules produced by ectomycorrhizal fungi, which have remarkable biotechnological significance. Furthermore, ECM secretes important secondary metabolites.

Molecular approaches are very important for the identification and differentiation of the fungi forming symbiosis with higher plants. Molecular tools are also important to understand how the genes are expressed during symbiosis with higher plants. The ectomycorrhizal fungi can be transformed by using *Agrobacterium tumefaciens*.

The main goal of this book is to provide information to the readers regarding diversity and applications of ectomycorrhizae and the use of modern biotechnological tools in understanding and transforming them.

The volume is divided into three parts, viz. (1) diversity, morphology, and applications, (2) biotechnological aspects of ectomycorrhizal fungi, and (3) functions and interactions. The whole book has been made user-friendly and worth reading.

Part I includes three chapters, out of which the first chapter explains how ectomycorrhizal inoculation benefits the members of family dipterocarpaceae. The second chapter discusses the status of ectomycorrhizal fungi in South America, while the third chapter deals with inocula and the techniques of inoculation into the host plants.

Part II incorporates the molecular approaches in the systematics of ECM, gene expression during symbiosis, *Agrobacterium*-mediated gene transfer, biotechnological process, and signaling in ECM symbiosis and RNA-silencing.

In Part III, ectomycoremediation, functions of ECM when challenged with heavy metals, scale issues concerning the role of ECM in functioning of ecosystems as indicators of stress in forests, effect of pesticides on ECM, their secondary metabolites, carbon and nitrogen interactions, interaction of *Cantharellus* with *Dendrocalamus*, and edible ectomycorrhizal fungi have been included.

This volume would be of utmost importance to students, researchers, and teachers of botany, mycology, microbiology, forestry, and biotechnology. The readers should find the book full of information and reader friendly.

In planning this volume, invitations for contributions were extended to leading international authorities working with ectomycorrhizae. The editors would like to express sincere appreciation to each contributor for his/her work and for their patience and attention to detail during the entire production process. We sincerely hope that these eminent contributors will encourage us in the future as well, in the greatest interest of the academia.

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