

Preface

Mycology is a potentially expanding area involving almost all facets of human health, nutrition and diseases. Diverse and ubiquitous distribution of fungi attained the status of '*Fifth Kingdom*' among the three major evolutionary lines along with plants and animals. Macrofungal diversity (macro- and macro-morphological) is enormous and dependent on a variety of substrates and geographic locations. A rough estimate reveals the macrofungi varieties to number 53,000 to 110,000 globally. They belong to a variety of basidiomycetes and ascomycetes known for their nutrition, medicinal value, novel metabolites, toxins and interaction with higher forms of life (plants and insects). Macrofungi are of special interest to explore their diversity, distribution, ecological functions and ecosystem services.

Interestingly, facts on edibility and medicinal novelty of many wild mushrooms are a product of ethnic knowledge of locals and tribals throughout the world. Mushrooms are a viable alternative non-conventional food source (other than plants and animals) owing to their nutritional, low-fat and low-calorie features (e.g., minerals, amino acids, vitamins and unsaturated fatty acids). However, few mushrooms are cultivated as a source of human nutrition and for therapeutic purposes. Wild and cultivated mushrooms are well known for their bioactive components (e.g., phenolics, tannins, vitamins, flavonoids, carotenoids, phytic acid, pigments and L-DOPA) and antioxidant activities (ferrous ion-chelation, DPPH radical-scavenging, reducing power, antioxidant activity, hydrogen peroxide scavenging, superoxide scavenging, lipid peroxidation, β -carotene-linoleic acid cooxidation and nitric oxide synthase activity). Many wild mushrooms are endowed with therapeutic potential, especially nutraceuticals, and are capable of preventing many lifestyle diseases (e.g., cardiovascular diseases, hypocholesterolaemic properties and anti-cancer agents).

Despite several hundred species of macrofungi having questionable edibility, they are the potential pool of valuable macromolecules and secondary metabolites of pharmacological and industrial interest. Bioactive polysaccharides, proteins, peptides, phenolic compounds and terpenes are known from various macrofungi. Macrofungi are a potential source of compounds responsible for the regulation of blood glucose and can demonstrate hepato-protective, antioxidant, cytotoxic, anti-inflammatory and antimicrobial potential. Some of the bioactive metabolites also serve as specific taxonomic markers. Many novel metabolites of macrofungi pave the way for the synthesis of new compounds. In addition, macrofungi are a valuable tool for green synthesis of nanoparticles, as opposed to the less ideal chemical and physical methods.

Another dimension of the macrofungi is their mutualistic association as ectomycorrhizae. Ectomycorrhizal fungi play an important role in the forestry/sylviculture/plantations resulting in uptake of water, absorption of minerals, protection against pathogens and below-ground nutrient transfer and prevention of erosion by binding the soil particles. Beyond mutualistic association, ectomycorrhizal fungal association is partly responsible for phytogeographical distribution in several habitats including extreme ecosystems. Besides involvement in biogeochemical cycles, macrofungi are known to degrade environmental pollutants, facilitating bioremediation.

Macrofungal research has become an important global commitment of the 21st century and there is an upsurge in understanding the roles of macrofungi in human, agricultural and environmental processes. In this contribution, we attempted to broadly balance the basic and applied aspects of diversity, ecology and biotechnology of macrofungi. To reflect the recent aspects, many colleagues contributed novel chapters based on their vast experience in consultation with voluminous literature. This book addresses: (1) the diversity and ecology of edible, toxic, medicinal and ectomycorrhizal macrofungi; (2) the impact of ectomycorrhizal fungi in terrestrial ecosystems, forests and plantations; (3) nutritional potential and cultivation of edible wild mushrooms; (4) novel metabolites of macrofungi useful in food, pharmaceutical and cosmeceutical industries; (5) eco-friendly synthesis of nanoparticles by mushrooms; (6) proteomics of edible and medicinal mushrooms. In addition, this book also encompasses experimental designs, methodological approaches, biogeochemical cycles, conceptual models, life history strategies and linking mycorrhizal diversity to plant performance.

This contribution hopes to initiate interest among the readers in order to expand their knowledge on macrofungi and to generate new ideas on basic and applied facets with future avenues. It is a valuable resource to graduates, post-graduates and researchers (in botany, microbiology, ecology, biotechnology, forestry, life sciences and environmental sciences) for understanding the diversity, ecology, therapeutic value, mutualistic associations and biotechnological potential of macrofungi. We are indebted to Prof. D.L. Hawksworth for an excellent overview, grateful to all contributors who delivered the chapters on time and for meticulous attention by the publisher to materialize production of this book.

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