Fungal Biology

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About the Series

Fungal biology has an integral role to play in the development of the biotechnology and biomedical sectors. It has become a subject of increasing importance as new fungi and their associated biomolecules are identified. The interaction between fungi and their environment is central to many natural processes that occur in the biosphere. The hosts and habitats of these eukaryotic microorganisms are very diverse; fungi are present in every ecosystem on Earth. The fungal kingdom is equally diverse, consisting of seven different known phyla. Yet detailed knowledge is limited to relatively few species. The relationship between fungi and humans has been characterized by the juxtaposed viewpoints of fungi as infectious agents of much dread and their exploitation as highly versatile systems for a range of economically important biotechnological applications. Understanding the biology of different fungi in diverse ecosystems as well as their interactions with living and non-living is essential to underpin effective and innovative technological developments. This series will provide a detailed compendium of methods and information used to investigate different aspects of mycology, including fungal biology and biochemistry, genetics, phylogenetics, genomics, proteomics, molecular enzymology, and biotechnological applications in a manner that reflects the many recent developments of relevance to researchers and scientists investigating the Kingdom Fungi. Rapid screening techniques based on screening specific regions in the DNA of fungi have been used in species comparison and identification, and are now being extended across fungal phyla. The majorities of fungi are multicellular eukaryotic systems and therefore may be excellent model systems by which to answer fundamental biological questions. A greater understanding of the cell biology of these versatile eukaryotes will underpin efforts to engineer certain fungal species to provide novel cell factories for production of proteins for pharmaceutical applications. Renewed interest in all aspects of the biology and biotechnology of fungi may also enable the development of "one pot" microbial cell factories to meet consumer energy needs in the 21st century. To realize this potential and to truly understand the diversity and biology of these eukaryotes, continued development of scientific tools and techniques is essential. As a professional reference, this series will be very helpful to all people who work with fungi and should be useful both to academic institutions and research teams, as well as to teachers, and graduate and postgraduate students with its information on the continuous developments in fungal biology with the publication of each volume.

More information about this series at http://www.springer.com/series/11224

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Editor

Mycoremediation and Environmental Sustainability

Volume 1

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Preface

The buildup of toxic chemicals and heavy metals in the environment is an ever-increasing and serious problem. These toxins threaten humans, animals, and the present ecosystem. Fungi feature among nature's most vital agents for the decomposition of waste matter and are crucial components of the soil food web, providing nourishment for the supplementary biota that live in the soil environment. The degree of sustainability of the physical environment is an index of the survival and well-being of all-inclusive components in it. Additionally, it is not sufficient to try disposing toxic/deleterious substances with any known method. The best method of sustaining the environment is such that returns back all the components (wastes) in a recyclable way so that the waste becomes useful and helps the biotic and abiotic relationship to maintain an aesthetic and healthy equilibrium that characterizes an ideal environment.

Researchers have been able to tailor fungal strains to neutralize toxic weapons and waste. Research is being done to use mycoremediation in the field of national defense against chemical and biological warfare and used to help mend war-torn environments. Mycoremediation practices involve mixing mycelium (the vegetative part of a fungus) into contaminated soil, placing mycelial mats over toxic sites, or a combination of these techniques in one or more treatments. Toxins in our food chain (including heavy metals, PCBs, and dioxins) become more concentrated at each step, with those at the top being contaminated by ingesting toxins consumed by those lower on the food chain. Fungal mycelia can destroy these toxins in the soil before they enter our food supply.

This book should be enormously advantageous for botanists, researchers, technocrats, policy makers, and scientists of fungal biology and those who are interested in environmental suitability. I am honored that the leading scientists who have extensive, in-depth understanding and expertise in fungal biology and environmental concern took the time and effort to develop these outstanding chapters. Each chapter is written by internationally recognized academicians so the reader is given an up-to-date and detailed account of our knowledge of the fungal system and innumerable applications of fungi.

We are indebted to the many people who helped to bring this book to light. I wish to thank series editors Dr. Vijai Kumar Gupta and Dr. Maria G. Tuohy and Eric Stannard, senior editor of Botany, Springer, for generous assistance, constant support, and patience in initializing the volume. Special thanks go to my exquisite wife Dr. Avita Maurya for her continuous support and inspirations in putting everything together. Dr. Prasad in particular is very thankful to Professor Ajit Varma, Amity University, for the kind support and constant encouragement. Special thanks are due to my esteemed friend and well-wisher Mr. Manjit Kumar, kith and kin, and all faculty colleagues of AIMT, Amity University.

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