Management of Microbial Resources in the Environment

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Editors

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Springer

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Preface

Microorganisms are microscopic forms of life that include bacteria, protozoa, algae, fungi and viruses, and comprise the greatest number of individual organisms on the earth. At best, however, science has identified and is aware of only a minute fraction of them. Somewhere between 0.1 and 1.0% of all bacterial species have been described and the vast majority of the remaining bacterial species is unknown. Uncultured organisms comprise the vast majority of the microbial world. Although culturing has been indispensable for increasing our understanding of specific organisms, problems with using culturing for community analysis arise from the fact that an artificial homogenous medium typically allows growth of only a small fraction of the organisms. Culturing fails to reproduce the ecological niches and symbiotic relationships encountered in complex natural environments that are required to support the full spectrum of microbial diversity. Microorganisms are valuable genetic resources, which contribute to the global economic and social development. Microbial Resources include the exploration, collection, characterization, evaluation and conservation of microbes for sustainable utilization in the development of the global/national economy, i.e. Agriculture, Ecosystem, Environment, Industry and Medicine. Microbes play a critical role in natural biogeochemical cycles and make up about 60% of the Earth's biomass. Many research institutes/universities all over the world are carrying out microbiological and biotechnological research, which results in generating lots of genomic resources like cDNA libraries, gene constructs, promoter regions, transgenes etc. These are valuable resources for gene discovery and transgenic product development.

In this book we provide up-to-date information about the management of microbial resources in the environment. This book covers the ecology of microorganisms in natural and engineered environments; genomic, metagenomic and molecular advances in understanding of microbial interactions; microbial diversity and phylogeny; ecological studies of human, animal and plant microbiology and disease; microbial processes and interactions in the environment; and technological developments. This book is not intended to serve as an encyclopedic review of the subject. However,

the various chapters incorporate both theoretical and practical aspects and may serve as baseline information for future research through which significant development is possible.

The book has twenty chapters, with each focused on a specific topic to cover diverse perspective topics. An introductory chapter on management of microbial resources in the environment is included. Topics include: recent development in the methods of studying microbial diversity, microbial resource centers towards harnessing microbial diversity for human welfare, polyphasic identification and preservation of fungal diversity, fungal biodiversity: a potential tool in plant disease management, bioinformatics approaches in studying microbial diversity, recent advances in metagenomic studies of soil microbial communities, mobile genetic elements (MGEs) carrying catabolic genes, conjugative plasmids in anthropogenic soils, potential eco-friendly soil microorganisms, current aspects of metal resistant bacteria in bioremediation, anaerobic digestion of the organic fraction of municipal solid waste, microbial insecticides: food security and human health, microbes (PGPR) in sustainable agriculture, antibiotic resistance gene pool and bacterial adaptation to xenobiotics in the environment, synthetic lethal genetic interaction networks and their utility for anticancer therapy, adaptation of *Candida albicans* for growth within the host, role of marine anaerobic bacteria and archaea in bioenergy production, bacteriocins: natural weapons for control of food pathogens, and anaerobic degradation of lindane and other HCH isomers.

With great pleasure, we extend our sincere thanks to all our well-qualified and internationally renowned contributors from different countries for providing the important, authoritative and cutting edge scientific information/technology to make this book a reality. All chapters are well illustrated with appropriately placed tables and figures and enriched with up to date information. We are also thankful to the reviewers who carefully and timely reviewed the manuscripts. Dr. Abdul Malik is also thankful to the Department of Biotechnology, Govt. of India, New Delhi for DBT CREST award/Fellowship during the preparation of the book.

We are extremely thankful to Springer, Dordrecht, the Netherlands for completing the review process expeditiously to grant acceptance for publication. We appreciate the great efforts of the book publishing team, especially of Dr. Alexandrine Cheronet, Senior Publishing Editor Environmental Sciences in responding to all queries very promptly.

We express sincere thanks to our family members for all the support they provided, and regret the neglect and loss they suffered during the preparation of this book.

Aligarh, India
Freiburg, Germany
Braga, Portugal

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Elisabeth Grohmann
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