
Preface

Microbial biodiversity is a continuing problem in the estimates of overall biodiversity. A great extent of our knowledge about microbes results from the approximately 1 % of culturable microbes present on our planet. Thus, we are relatively unfamiliar with a vast magnitude of unculturable microbes that represent a significant part of microbial diversity. With recent revolutionary developments in different domains of “-omics” to which an appropriate term might be “Revolomics” that includes metagenomic and next-generation sequencing technologies, we are beginning to understand microbial diversity and the exploration of novel genes and metabolic products. Another aspect of diversity is to search for new microbial habitats that may possess hidden culturable microbes that may add to estimated and discovered microbial diversity. Many such unconventional habitats such as marine ecosystems, thermal vents, and ice caps are now being explored for novel microbes, and one result is that microbes in these habitats can provide new chemical diversity with the potential to be exploited as drug leads for many human pathogens. Since most of the planet is covered with marine ecosystems, it is reasonable to accept that a huge microbial diversity remains to be discovered from deep sea and from marine organisms. Regarding the land mass of our planet, 9.4 % is covered by the forests with a wealth of associated microbes. Forest vegetation not only has microbes on the surface (phyllosphere, epiphytes, rhizosphere, etc.) but also has symbiotic microbes within (endophytes, mycorrhizas, dark septate endophytes). All higher plants on this planet have a form of symbiotic association with microbes called “endophytic” symbiosis. A single plant may contain hundreds of microbes, and thus, the diversity of endophytes is likely to be many times greater than plant diversity. Mutualistic endophytic microbes with an emphasis on the relatively understudied fungal endophytes are the focus of this special book. Plants are associated with microorganisms, endophytic bacteria and fungi, which live inter- and intracellularly without inducing pathogenic symptoms, but have active biochemical and genetic interactions with their host. Endophytes play vital roles as plant growth promoters, biocontrol agents, biosurfactant producers, and enzymes and secondary metabolite producers, as well as in providing a new hidden repertoire of bioactive natural products with uses in pharmaceutical, agrochemical, and other biotechnological applications. Apart from these virtues, the microbial endophytes may be adapted to the complex metabolism of many desired molecules that can be of significant industrial applications. These microbes

can be a useful alternative for sustainable solutions for ecological control of pests and diseases and can reduce the burden of excess of chemical fertilizers for this purpose.

This book is an attempt to review the recent development in the understanding of microbial endophytes and their potential biotechnological applications. We have tried to recognize several research domains of endophytic research in which significant progress has been made such as ecology and biodiversity, host-endophyte interactions, bioactive compounds from endophytes, and future challenges. Attempts have been made to summarize the development achieved so far and future prospects for further research in this fascinating area of research.

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