

Preface

Plants constitute an excellent ecosystem for microorganisms. The environmental conditions differ considerably between the highly variable aerial plant part and the more stable root system. Microbes interact with plant tissues and cells with different degrees of dependence. The most interesting from the microbial ecology point of view, however, are specific interactions developed by plant-beneficial (either non symbiotic or symbiotic) and pathogenic microorganisms. Beneficial interactions are caused by symbiotic and non-symbiotic bacteria and a highly specialized type of fungi, the mycorrhizae. The pathogenic and detrimental interactions of microbes involve viroids, viruses, bacteria and fungi, and lead to infectious diseases affecting only the plant kingdom.

All land plants grow in intimate association with a complex root microbiota that is distinct from the microbial community present in bulk soil. These interactions are driven by the influence of root physiology and metabolism, which influence the rhizoplane (the 1 mm surrounding the root) environment through adjusting the soil pH, changing soil structure and oxygen availability, producing antimicrobials and quorum-sensing mimics that manipulate microbial communication, providing an energy source in the form of dead root material and carbon-rich exudates, and more. In fact, between 5 and 33 percent of fixed atmospheric carbon is sequestered in the rhizosphere. The microbial communities that inhabit this niche can have a net beneficial or net detrimental impact on plant health, and shifting this balance is of major agronomic interest. Various mutualistic rhizosphere microbes provide the host plant with physiologically accessible nutrients; improve plant growth through production of phytohormones; help plants withstand heat, salt, and drought; act as protectants against phytopathogens; and more.

Microbial community structure differs across plant species and also among some inbred genotypes within single species grown in a common soil. Distinct microbial communities are found in bulk soil, rhizosphere, and endophyte fractions that are influenced by soil type and plant developmental stage. It is also found that plant genotype directs the assembly of robust microbial phenotypes, setting the stage for genetic dissection of responsible host *loci*. Microflora composition of any agro-ecosystem is governed by the equilibrium created by the associations and interactions of all flora and fauna found in the community. In soil, microorganisms live in close proximity and interact among themselves as well as with existing plant communities in different ways. These microbial interactions govern the functioning and stability of agro-ecosystem, playing significant role in the production and productivity crops.

Many plant-microbe interactions have agronomic importance because of either beneficial (e.g., nitrogen fixation or biocontrol) or detrimental (e.g., pathogenesis) effects. Although these systems have been the subjects of scientific research for many years, recently there has been a tremendous increase in our knowledge of them. The increases in this research have followed a similar general increase in plant science research. Hence, this book on Plant-Microbe Interactions is aimed at bringing out the recent developments in this field including the molecular mechanisms, small molecules and proteomics involved in the establishment of Plant-Microbe Interactions and also the strategies for exploiting these interactions to achieve sustainable crop production. We hope that this book will be useful in providing latest informations in this topic to Scientists, Researchers, Ph.D and PG students working in the field of Plant Sciences.

We are very happy to bring out this publication as a commemorial volume on the occasion of the Platinum Jubilee Celebrations and 55th Annual Conference of Association of Microbiologists of India being organized as National Conference on Empowering Mankind with Microbial Technologies (AMI-EMMT-2014) during 12th-14th November, 2014 at Tamil Nadu Agricultural University, Coimbatore. It is also a pleasant coincidence that this Book is released during the launching of Centre of Excellence on Plant-Microbe Interactions with financial support from Ministry of Human Resource Development, Government of India, New Delhi at the Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore. We feel that this attempt is fruitful, if it is able to spur interest among the scientists and researchers to unravel the hidden treasures in this field of research.

We profusely thank all the authors for their keen interest, kind efforts and rich contributions in making this volume highly informative and productive. We whole heartedly thank M/s New India Publishing Agency, New Delhi for readily coming forward to publish this book with neat and timely execution.

Coimbatore

Editors