

# Preface

Symbiosis is a biological phenomenon that involves close association between two or more organisms. Plant microbe symbiosis is one of the most intriguing relationships in the living world which has to be exploited for feeding an ever increasing human population in a sustainable way, maintaining the balance, diversity and productivity of agroecosystems in an ecofriendly manner. It takes several millions of years for establishing an intimate relationship between as diverse organisms as those belonging to prokaryota, fungi and plantae. Plants and microbes communicate and understand each other by the help of molecular dialogues. It is essential to decode these dialogues so as to establish a successful symbiotic relationship for the enhancement of crop productivity. This book looks into the plant growth promoting (PGP) microbes that generally colonize the rhizosphere region and help the host plant in one way or the other. Understanding of how symbiotic associations are established between plants and microbes that can be of particular relevance to modern day agriculture is also provided in the book.

The book comprises 16 chapters contributed by researchers from around the globe that provide detailed review on current status of research related to plant microbe interactions for developing new and alternative ecofriendly agrotechnologies. The diversity of plant ecosphere is huge and we still know only a fraction of what is happening in this dynamic ecosystem. There are so many useful microorganisms residing in the rhizosphere region which form symbiotic relationships with plants. Some of the best known or studied PGP microorganisms like *Rhizobium*, *Pseudomonas*, mycorrhiza, endophytes etc. have helped in understanding the symbiotic relationships between plants and diverse microbes of the rhizosphere or soil. But still a lot has to be done so as to use these beneficial microbes as sustainable and successful agri-biotechnology. Overall, a comprehensive approach that merges the fundamentals with the advanced techniques in the fields of functional genomics, proteomics, metabolomics and bioinformatics is required to bioengineer the future formulations that are reliable and more effective in their action. The book on one hand covers the fundamentals of plant microbe symbiosis and on the other hand provides inputs for the future research in the field. It is now clear that the multifaceted and diverse mechanisms of plant associated microbes

participate and are involved in promoting plant growth, protecting plant health, sustaining the plant under stress, pollutant or contaminant affected conditions and protecting plants from the attack of phytopathogens.

Researchers working in the field of rhizosphere biology, PGPRs, plant-microbe interactions, bioformulation technology and related fields will find the compilation extremely useful. The book will be of great value to the teachers and graduate and postgraduate students of life sciences, specifically microbiology, biotechnology, biochemistry and agriculture sciences. Readers will find a feast of updated information as well as the future direction for research in the field.

Finally, I would like to thank all those who have in one way or other helped in compilation of this wonderful volume. I acknowledge the support of all the contributors to this tome. My sincere thanks to all the authors for their cooperation, providing latest information on the subject and despite their busy schedules sticking to the timelines of the project. Thanks to Dr. Mamta Kapila from Springer (India) for pushing me hard to initiate the project and once the initiation materialized, the product was also formed. My gratitude to Prof. D. K. Maheshwari, Department of Botany and Microbiology, GKVV, Haridwar, for time to time advice, ideas and support. I would like to thank my research scholars Mr. Sachin Singh, Ms. Sakshi Tewari, Mr. Jitendra Mishra and Ms. Rachna Singh for helping in compilation of manuscript. Last but not least, special thanks to my wife Ms. Preeti Arora for her tolerance and tireless support during the phase of compilation and my sons Pranay and Nav for their rejuvenating presence.

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