Manoj Kaushal
Ram Prasad *Editors*

Microbial Biotechnology in Crop Protection

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Preface

Population increase coupled with degradation of agricultural lands aggravates crop protection and production challenges around the globe. The increased farm fragmentations resulted in pest and disease infestations in farms due to increased movement, carrying planting materials and resistance to major chemical fertilizers and pesticides and overexploiting of natural resources. Thus, producing enough crop yields to feed the rapidly growing population by sustaining its nutritional quality and maintaining plant and soil health is the major challenge for growth and development. Furthermore, classical techniques and products used for agriculture farming are also at their threshold limits of effectiveness in fighting emerging pest and disease problems and protecting agricultural productivity. One of the possible ways to deal with these ever-increasing crop protection issues is through microbial biotechnology approach. Crop protection through microbial biotechnology involves the application of microorganisms in farms through the engagements of modern biotechnology techniques for sustaining future agriculture developments. Microorganisms are the natural solution for the emerging crop protection issues without affecting the production and soil fertility. Many research reports suggested that broad application of microbes used in single or consortia is highly effective in crop protection systems compared to synthetic fertilizer and pesticides. Looking at the present need and future scenario, in this book, we are emphasizing the role of microbial communities for crop protection against major pests and diseases (fungal as well as bacterial) through the use of diversified biotechnological approaches such as biofertilizers, biopesticides, and value additions in crops. Further, the book reflects the emerging paradigms of genetic engineering manipulation through beneficial gene transfer from microorganism which might be the other solution for crop protection. The book meets the growing need for a comprehensive and holistic outlook on crop protection issues, underlying principles, important perspectives, and emerging biological approaches and techniques that are the need of today's sustainable agriculture. The chapter focuses on the broad application of microbes in sustainable agriculture, genetic dependency of plants on the beneficial functions, and symbiotic cohabitants.

We are extremely honored to receive chapters from professors and leading scientists with enormous experience and expertise in the field of crop protection, microbiology and biotechnology, and sustainable agriculture development. The

book targets the academicians, researchers, scientists, doctoral and graduate students working on crop improvement approaches.

Our sincere gratitude goes to the contributors for their insights on Microbial Biotechnology in Crop Protection. We sincerely thank Dr Naren Aggarwal, Editorial Director, Springer and Ms Aakanksha Tyagi, Associate Editor for their generous assistance, constant support, and patience in finalizing this book.

Dar es Salaam, Tanzania — Manoj Kaushal
Bihar, India — Ram Prasad

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About the Editors

Manoj Kaushal, Ph.D. is a Systems Scientist with nearly a decade of teaching and research experience at various national and international institutes. Currently, he is working with International Institute of Tropical Agriculture (IITA) and has been associated with CGIAR consortium for more than six years. His research interests include cropping systems, tropical and semiarid smallholder agriculture, microbiome, and agroecologies tolerance to biotic and abiotic stresses. Moreover, he has authored more than 50 research papers in peer-reviewed journals and book chapters.

Ram Prasad, Ph.D. is associated with Department of Botany, Mahatma Gandhi Central University, Motihari, Bihar, India. His research interest includes applied and environmental microbiology, plant–microbe interactions, sustainable agriculture, and nanobiotechnology. Dr. Prasad has more than two hundred publications to his credit, including research papers, review articles, and book chapters, five patents issued or pending, and edited or authored several books. He has twelve years of teaching experience and has been awarded the Young Scientist Award and Prof. J.S. Datta Munshi Gold Medal by the International Society for Ecological Communications; FSAB fellowship by the Society for Applied Biotechnology; the American Cancer Society UICC International Fellowships for Beginning Investigators, USA; Outstanding Scientist Award in the field of Microbiology by Venus International Foundation; BRICPL Science Investigator Award and Research Excellence Award, etc. Previously, he served as Assistant Professor, Amity University,

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