

Preface

Soils sustain an immense diversity of prokaryotic and eukaryotic organisms. Microbial functions in ecosystems are as diverse as the microbes themselves. Microbes adapt to these microhabitats and live together in consortia, interacting with each other and with other parts of the soil biota. Microorganisms play an essential role in the functioning and sustaining of all natural ecosystems including biogeochemical cycling of nutrients and biodegradation.

Plant–microbe interactions involving plant growth-promoting rhizosphere microorganisms (PGPRs) are of beneficial agricultural importance, e.g., improve plant productivity, suppress disease-causing microbes and nematodes, and accelerate nutrient availability and assimilation. PGPRs compensate for the stress and reduction in plant growth caused by weed infestation, drought, heavy metals, salt, and other unfavorable environmental conditions and are frequently used as biofertilizers. Biochemical and molecular tools are continuously being developed in an attempt to better appreciate microbial abundance and distribution in natural environments to evaluate community structures with ecosystem functions and to develop appropriate biofertilization and remediation approaches.

Bioaugmentation, biostimulation, and biocontrol approaches using microbial inoculants, biofertilizer, bio(chemicals), and organic amendments have been used for a long time to improve soil biology, fertility, crop productivity, and soil remediation. In comparison with chemical-synthesized pesticides and fertilizers, biofertilizers have several advantages including: they are relatively more safe, potentially reduced environmental damage and human health risk, much more targeted activity, effective in small quantities, multiply themselves but are controlled by the plant and indigenous microbial populations, decompose more quickly than conventional chemical pesticides, and can be used in conventional or integrated pest management systems.

This volume, *Bioaugmentation, Biostimulation, and Biocontrol of the Soil Biology Series*, is a selection of topics related to biological processes with an emphasis on their application in improving soil health, fertility, and plant productivity. Topics include an overview of the role of bioaugmentation, biostimulation, and biocontrol in soil biology; beneficial interactions of PGPRs and their products; application of biofertilizer technology for pulse production; beneficial role of

phosphate-solubilizing microorganisms in soil, composting of lignocellulosic wastes and beneficial utilization of agro-industrial waste material for bioaugmentation and soil amendment; various bioaugmentation strategies for bio- and phytoremediation of contaminated soils, role of biosurfactants in soil biology and remediation, and various aspects of biocontrol strategies for suppression of soil-borne diseases for the protection of agricultural and horticultural plants

Experts in the area of soil science and environmental microbiology from diverse institutions worldwide have contributed to this book. This book should prove to be useful to students, teachers, and researchers in the disciplines of soil and environmental sciences, microbiology, biochemistry, and biotechnology.

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