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Microbial Activity in the Rhizosphere

With 35 Figures

 Springer

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Preface

The rhizosphere is a very complex environment in which the effects of the plant on soil microorganisms and the effects of the microorganisms on the plant are interacting and are interdependent. Plant root exudates and breakdown products attract microbes and feed them and, in turn, the plants often benefit from the microbes. Interactions among microorganisms and plant roots are essential for nutritional requirements of the plant. Plant growth, development and productivity are largely dependent on the soil environment in the root region rhizosphere. The new techniques of studying the rhizosphere enables us to get a much better understanding of the dynamics of the rhizosphere population, such rhizosphere studies being of interest to agriculturists, soil biologists, chemists, microbiologists and molecular biologists.

The rhizosphere microbes influence the root environment in several ways. They may change the oxidation-reduction potential, influence the availability of moisture and nutrients, produce growth inhibiting or growth promoting substances in the form of exudates, provide competition and possibly induce many other effects. Mycorrhizal associations are beneficial in mineral uptake and in increasing root surface area for effective ion absorption.

Antagonism, competition and synergism in soil and the rhizosphere (rhizosphere) are the most important microbial interactions to consider in the study of rhizosphere biology. With the growing information on the production of growth regulators, competitiveness of the microbes in the rhizosphere, microsymbionts, and other factors, their effect upon plant growth will become more evident. Experiments on the introduction of microbes or their products in the rhizosphere will help to improve our understanding of the biology of the rhizosphere.

Each chapter of the volume has been written by experienced and internationally recognised scientists in the field. The selection of topics and techniques has been assembled in such a way that it will be useful to the beginner as well as to experienced scientists. The need for such a volume was enhanced due to the fact that no book has been published on this aspect for the last two decades. Several chapters included in this volume treat new approaches, which have probably not been reported before.

We are grateful to Professor Ajit Varma, Series Editor and Dr. Jutta Lindenborn, Editor Life Sciences Springer for their help in various ways. Many minds and hands have helped in the preparation of the volume to which we are indebted. We are grateful to all the authors for their contributions to this volume and for accepting suggestions to produce the final shape of the volume. Since the chapters have been independently written by the authors, there may be some slight overlap or repetition, difficult to avoid in these circumstances.

It is our hope that the information presented in this volume will make a valuable contribution to international root (rhizosphere) research. We believe and trust that it will stimulate further discussions and pursuit of new knowledge in this important subject area. We also hope that it will be useful to all students and researchers in microbial biotechnology, microbial ecology, soil microbiology, applied mycology, agriculture and forestry.

Delhi, Hyderabad
and Bedfordshire,
April 2005

*K.G. Mukerji,
C. Manoharachary,
and J. Singh*

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