

## Preface

The complexity of plant surface microbiology is based on combinations. A large number of microbial species and genera interact with several hundred thousand species of higher plants. At the same time, they interact with each other. Therefore, this book describes only some very important model interactions which have been studied intensively over the last years. The methods developed for some important groups of microorganisms can be used for a large number of other less studied interactions and combinations. The pace of discovery has been particularly fast at two poles of biological complexity, the molecular events leading to changes in growth and differentiation, as well as the factors regulating the structure and diversity of natural populations and communities.

The area of plant surfaces is enormous. A single maize plant has a leaf surface of up to 8000 cm<sup>2</sup>, a single beech tree has a leaf surface of around 4.5 million cm<sup>2</sup>. The leaf area index (LAI) varies from 0.45 in tundra areas up to 14 in areas with a dense vegetation. Calculated for all plant surfaces above ground, the surface area is more than 200 million km<sup>2</sup>. This area is still surpassed by the below ground surface areas of plants, especially those with an extensive root hair system. For a single rye plant, a root hair surface of around 400 m<sup>2</sup> has been calculated. Even if this is an exceptional case, it can be assumed that in many plants the root and root hair surface is ten times larger than the surfaces of the above ground plant parts. This means that more than 2000 million km<sup>2</sup> of plant surface is present underground. Taking both figures together, it exceeds the land surface area of the planet Earth of 149 million km<sup>2</sup> by more than a factor of 10.

This volume summarizes and updates both the state of knowledge and theories and their possible biotechnological applications. It will thus be of interest to a diverse audience of researchers and instructors, especially biologists, biochemists, agronomists, foresters, horticulturists, mycologists, soil scientists, ecologists, plant physiologists, plant molecular biologists, geneticists, and microbiologists.

In the planning of the book, invitations for contributions were extended to leading international scientists working in the field of plant surface microbi-

ology. The basic concepts in plant surface microbiology are discussed at length in 30 chapters including a few specialized and innovative methodologies and novel techniques. The editors would like to express deep appreciation to each contributor for his/her work, patience and attention to detail during the entire production process. It is hoped that their reviews, interpretations, and basic concepts will stimulate further research. We are confident that the joint efforts of the authors and editors will contribute to a better understanding of the advances in the study of the challenging area of surface microbiology and will further stimulate progress in this field.

It has been a pleasure to edit this book, primarily due to the stimulating cooperation of the contributors. We would like to express sincere thanks to all the staff members of Springer-Verlag, Heidelberg, especially, Drs. Dieter Czeschlik and Jutta Lindenborn for their help and active cooperation during the preparation of the book.

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