

## BOOK REVIEW

### Microbial Ecology of Aerial Plant Surfaces

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This book is based on the proceedings from the 8<sup>th</sup> International Symposium on the Microbiology of Aerial Plant Surfaces, held at Oxford University in 2005, which brought together scientists studying the biology and ecology of the phyllosphere. The phyllosphere is a special environment, which is accessible, ubiquitous and the site of many interesting microbial functions. The aerial plant surface is providing a habitat for the direct study of the plasticity of the genome, the diversity of mixed communities and the complexity of aggregates that maintains and defines the diversity of functional microbial communities. The essays in this book highlight some of the best research seeking to answer these questions.

Section I of the book concerns the **biodiversity and population genetics of phyllosphere communities**. The aerial portion of plants supports a diversity of microorganisms, including bacteria, fungi and archaea. Chapter 1 provides an up to date and detailed overview of phyllosphere biology, and eloquently considers the major questions that remain unanswered. Chapter 2 is focused on the use of a variety of methods to assay changes in bacterial and fungal community structure and its functions in phyllosphere and rhizosphere on three field grown crop plants (wheat, pea and sugar beet) through a growing season. In Chapter 3 is described how different sampling strategies affect the diversity recorded in tropical and temperate bacterial and fungal phyllosphere communities. The chapter demonstrates considerable leaf-to-leaf variation in diversity and between adjacent epiphyte and endophyte biotas. Chapter 4 reports about the effect of environmental changes on the ecosystems of the temperate forest phyllosphere. It was found that environmental changes in climate, CO<sub>2</sub> levels, UV radiation and air pollutants all affect the phyllosphere microbial populations which in turn can exhibit altered growth and activity.

Section II is considering the **spatial distribution and biofilm structures of microbes on the phylloplane**. Chapter 5 provides a comprehensive review of the progress in methods, models and the understanding of the formation of bacterial biofilms, and stresses the roles of signaling and biofilm formation in bacterial adaptation and fitness. Chapter 6 is focused on integration of molecular methods and light microscopy in the analysis of high density multi-population aggregates of bacterial phyllosphere communities. In Chapter 7 is examined the role of plant genetics in determining both phyllosphere and rhizosphere microbial communities. It is proposed that the genotype of a host plant is an important factor that can impact diverse communities, thus providing a plant-related basis to ecological and evolutionary processes. The main topic of Chapter 8 is a survey of biofilm formation and cellulose expression amongst soil and plant-associated pseudomonads.

Section III is focused on **biological control and pathogenicity**. Chapter 9 reviews the use of bacteria and fungi as biological control agents (BCAs) against a variety of plant diseases and pests. The subjects of Chapter 10 are the ecophysiology of BCAs in the phyllosphere, and the consideration of employing physiological manipulation of the growth of fungal BCAs. Chapter 11 reviews the use of

alternatives to synthetic pesticides and biological control agents produced commercially which are being sought in many areas of plant protection. Compost teas (extracts) are being extensively used in urban, horticultural and agriculture settings for their fertility and disease control properties.

Section IV deals with **gene expression and phyllosphere genomics**. The bacterial pathogen *Xanthomonas euvesicatoria* was used (Chapter 12) to study the molecular interactions between pathogen and its plant host, particularly during the less-understood early stages of the „susceptible“ reaction when a virulent pathogen invades a susceptible host. Chapter 13 highlights research on the potato pathogen *Erwinia carotovora* subsp. *atroseptica* (the first plant pathogenic enterobacterium fully gene-sequenced). The author reveals the complex interactions and diversity of genes potentially involved in the non-pathogenic component of the bacterium life cycle, and gives examples that demonstrate the presence of genes responsible for the expression of phytotoxins. The relevance of *Pseudomonas syringae* in the phyllosphere is analysed in Chapter 14.

Section V is focused on **leaf colonisation and dispersal**. The results and views on various aspects of this topic are summarised in four chapters (15–18). One study deals with the effect of fungal endophytes on colonisation by leaf surface endobiota, and describes also epiphyte-endophyte interactions on *Medicago* spp. Another subject was the interaction of plant genotype and ultraviolet-b (UV-B) radiation and their effect on phyllosphere diversity of maize. Reviewed is also the significance of heterogeneity, spatial configuration, scale and other factors used in landscape ecology for microbial ecology. The method of DNA Microarrays with focus on importance of defining detailed changes in the microbial community structure was applied.

Section VI concerns **aerobiology and plant surface microbiology**. Chapter 19 summarises the study of human enteropathogenic bacteria in context with the strong evidence for presence of these bacteria on fresh fruits and vegetables, namely investigations of *Salmonella enterica* colonisation of the phyllosphere of cilantro plants (*Coriandrum sativum*). Post-harvest spoilage of wheat grains by phyllosphere fungi is analysed in Chapter 20, and illustrates how an understanding of the fundamental biology of interactions that start in the phyllosphere and other aerial plant surfaces can lead to improvements in the quality and safety of the food produced. Plant atmosphere exchange of reactive gases ( $O_3$ ,  $SO_2$ ,  $HNO_3$  and  $HCl$ ) which are deposited on external surfaces of vegetation is the focus of the last Chapter 21.

In conclusion, this book is an excellent summary of important recent information about the phyllosphere and will be of significant interest to students of various branches of biology and ecology, as well as researchers, university lecturers and professionals in microbiology, plant pathology, plant protection and plant ecology.

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