

Volume Preface

More than 120 000 different fungal species have been described and it is estimated that there exist more than 1.5×10^6 species. Fungi have adopted many different ways of living in very diverse habitats as saprophytes, pathogens, symbionts or endophytes. Fungi and their products are used for the fermentation and processing of food and feeds, for biological control and for the production of vitamins and amino acids. Some of their secondary metabolites are used in medicine, e.g. as antibiotics, immunosuppressants, cholesterol-lowering drugs or as agrochemical fungicides. Recently, progress in the field of mycology has been substantial due to new methodological approaches and technologies, many of them DNA-based, strongly adding to the motivation to compile a new volume of "The Mycota".

Mycota XV "Physiology and Genetics: Selected Basic and Applied Aspects" provides a selection of state of the art reviews in traditional and new fields of mycology. As addressed in Chap. 1, DNA sequencing of functionally conserved homologue genes has resulted in new approaches to taxonomy, which hopefully will result in phylogenetic trees and taxonomic groups which can be understood and accepted by the majority of mycologists. As a homothallic fungus *Sordaria macrospora*, producing only sexual meiospores and no asexual conidia, is an ideal model for studying all stages of fruiting body formation and development. The application of several genetic tools allows advanced studies of genetic interactions controlling developmental plasticity (Chap. 2). Chapter 3 summarizes the current knowledge of *int* genes, internal protein sequences, which are "selfish elements" in fungal genomes. They are transcribed and translated together with their host protein and excised at the protein level. Chapter 4 gives an overview of fungal apoptosis in yeasts and filamentous fungi. Similarities and differences between fungal and mammalian apoptosis are discussed and the role of apoptosis in development and ageing are described and evaluated. A broad view on ways and means of the vegetative and sexual interaction of fungal colonies as well as the communication of fungi with bacteria, plants and animals is offered in Chap. 5. In the interaction of yeasts killer toxins play an important role. Their structures, modes of action and resistance as well as possible applications are discussed in Chap. 6. Chapter 7 deals with aspects of evolutionary and ecological interactions of fungi and insects; and Chap. 8 offers an insight into the occurrence and metabolites of endophytic fungi. Not all compounds isolated from plants are genuine plant metabolites but are produced by fungi. Thus the ergoline alkaloids present in *Convolvulaceae* are produced by fungi living in close association with secretory glands on the leaf surface (Chap. 9). Basidiomycetes are a rich source of unique secondary metabolites in most cases not found in other fungi. Chapter 10 offers a survey of new compounds isolated within the past decade, with special emphasis on bioactive metabolites. Genome-wide approaches to identify genes or gene products essential for the establishment of pathogenic interactions between plant host and

fungal pathogen are discussed in Chap. 11. In addition, the authors stress the important role of small molecules in identifying and validating new targets for fungicides. Helminths can pose serious problems to animal and human health. It is therefore quite remarkable that fungi produce low molecular weight compounds specifically interfering with reactions not present in the mammalian hosts, paving the way to non-toxic medications or agrochemicals (Chap. 12). Chapter 13 describes the occurrence, structures and biological activities of peptides and depsipeptides produced by fungi and discusses the importance of these compounds as lead compounds for agricultural and pharmaceutical applications. The sequencing of whole fungal genomes has revealed that there are many more genes supposedly coding for secondary metabolites than there are compounds already isolated and characterized. As can be seen in Chap. 14, homologue overexpression of a regulatory gene construct can indeed lead to silent gene expression and production of the corresponding metabolite. Chapters 15–17 deal with genes, enzymes and products of important biogenetic pathways. Nonribosomal peptide synthetases of fungi differ in some major aspects from the corresponding bacterial enzymes. The same is true for fungal polyketides which constitute a large part of the fungal secondary metabolome. The importance of the detrimental mycotoxin ochratoxin A for human health and the alimentary industry was recognized only recently. The investigation of its biosynthesis and regulation is important for developing strategies for its avoidance in food and feed. Chapter 18 is devoted to genetic and metabolic engineering in fungi, key areas of research aiming at the improved application of these organisms in biotechnology.

We do hope that readers enjoy reading this volume of *The Mycota*. We are very grateful to the contributing authors, whose expertise and efforts have made this project possible. We thank Dr. Andrea Schlitzberger of Springer Verlag for her support and engagement during the preparation of this volume.

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