

NEWSCORNER

The Mycota, vol 9 (2001). Fungal associations [B. Hock (ed)]. Springer, Berlin Heidelberg New York. XVII, 250 pp., 69 figs., 16 tables. Hardcover: DM 229, FF 863, £79; US \$109. ISBN 3-540-62872-X

Given the large numbers of fungal associations with other organisms, this new volume of *The Mycota* appears slender. It contains 13 chapters, of which seven deal with mycorrhizas, one with the recently discovered endosymbiotic fungus *Piriformospora indica*, one with the intriguing endocytosymbiosis between *Geosiphon pyriforme* and cyanobacteria, three with lichens, and one with various fungal-bacterial interactions. The first 12 chapters deal with symbioses that are mutualistic while the last covers a range of associations that are symbiotic in the broader sense.

Emphasis on mycorrhizal associations is not surprising, because of their near ubiquitous occurrence in plant ecosystems and rapidly developing knowledge of them at molecular and cellular levels. The chapter by V. Gianinazzi-Pearson, D. van Tuinen, E. Dumas-Gaudot and H. Dulieu nicely explores the genome of Glomalean fungi – still recalcitrant because of their unculturability. The authors suggest possible mechanisms for genetic diversity that are compatible with the presumed asexual reproduction in these fungi, and raise consequential evolutionary questions. The molecular theme with Glomalean fungi is continued by P. Franken and N. Requena, in relation to function and signalling in arbuscular mycorrhizas. This chapter commendably covers a lot of references very succinctly. A very valuable chapter by A. Hahn, S. Wright and B. Hock brings together much information on immunochemical characterization of mycorrhizal fungi, again with emphasis on Glomalean fungi. P. Bonfante covers a key component of mycorrhizas in general, the interfaces between the fungi and plant roots. As she emphasizes, very little is known about the biogenesis and functional basis of mycorrhizal interfaces, despite recent technical advances. However, there are rapid developments in visualizing cytoskeletons and understanding their roles as “tracks and highways” for the movement of organelles and molecules that are important in mycorrhizal and other biotrophic fungal associations. One of the highlights of the book is the chapter “Lipids of mycorrhizae” by M. Sancholle, Y. Dalpé and A. Grandmougin-Ferjani. This review fills an enormous gap in the mycorrhizal literature and includes useful suggestions for future research into lipids in these associations.

The chapter by P. Jeffries and J. M. Barea: “Arbuscular mycorrhiza – a key component of sustainable plant-soil ecosystems” is a good summary of a very broad field. It is rather an “outsider” in the volume not only because of its ecological theme but because there is,

unfortunately, no complementary chapter to deal with other types of mycorrhizas. In fact, although Bonfante and Sancholle et al. review mycorrhizas in general, the only chapter specifically devoted to the second major class, ectomycorrhizas, is that by U. Nehls, J. Wiese and R. Hampp on the exchange of carbohydrates between symbionts in ectomycorrhizas. This is fine, but the volume leaves much unsaid about other functional and related aspects of ectomycorrhizas and indeed other mycorrhizal classes.

The record for the chapter with the largest number of authors goes to A. Varma, A. Singh, Sudha, N. S. Sahay, J. Sharma, A. Roy, M. Kumari, D. Rana, S. Thakran, D. Deka, K. Bharti, T. Hurek, O. Bleichert, K. -H. Rexer, G. Kost, A. Hahn, W. Maier, M. Walter, D. Strack and I. Kranner, for: “*Piriformospora indica*: an axenically culturable mycorrhiza-like endosymbiotic fungus”. Molecular studies now place this fungus close to the *Rhizoctonia solani* group (Ceratobasidiales), and details of its colonization and intraradical morphology are becoming well understood. This is not the case for the functional basis of its positive effects on plant growth. The authors list many parallels with Glomalean fungi, but these may be over-stated seeing that increased plant growth can be produced by fungal exudates collected from culture media. Reference is made to papers in preparation that describe effects on ³²P acquisition but with no detail. It would have been better to give the actual results: the association is certainly one that urgently requires concerted physiological investigation. Citation of papers “in preparation”, “communicated” or “in press” does not help the reader. I assume that most of these have now appeared in the literature.

A. Schüßler and M. Kluge describe another fascinating association, that between *Geosiphon pyriforme* and cyanobacteria (*Nostoc*). The fungus is now firmly placed in the Glomales and the chapter is a first-class review of structure and compartmentation of *Geosiphon*, development of the symbiotic interface, and metabolism and nutrient transport, along with a discussion of parallels with arbuscular mycorrhizal symbioses. The authors deserve a prize for perseverance in working with a really tiny symbiosis: the *Geosiphon* bladders that contain the *Nostoc* are only about 2 mm long.

The first of the chapters dealing with lichens, by R. Honegger, comprehensively describes thallus structure (with excellent illustrations) and growth of lichen-forming ascomycetes. The second chapter is by S. Ott and H.T. Lumbsch, with emphasis on morphology and classification, this time with no illustrations and some uncompromisingly detailed descriptions of taxa of the ascomycete lichens. The third chapter, by F. Oberwinkler, covers the morphology, taxonomy, physiology and ecology of the diverse Basidiolichens. A brief section on systema-

tics and evolution summarizes some of the first work on molecular taxonomy, which is still in its infancy with lichens in general.

Lastly, J. W. Bennett and T. Feibelman tackle the broad topic of fungal-bacterial interactions. Written not as a review but as a “provocation” to mycologists, the chapter covers similarities between bacteria and fungi (e.g. in production of secondary metabolites) and results of mixed bacterial and fungal associations (e.g. fermentations) as well as closer interactions, as in the rhizosphere and mushroom cultivation. The possible involvement of some fungi in microbial biofilms is also mentioned. Although very “broad-brush”, the chapter has a good list of references for further reading by those interested in microbial interactions.

The book’s production is of Springer’s usual very high standard. Inconsistencies of style between chapters are very few, although “mycorrhizae”, “mycorrhizas” and (in the plural) “mycorrhiza” all make an appearance. My verdict is that some chapters are very good and none

are sub-standard. However, I am not persuaded that the volume as a “stand-alone” whole is a great success. The editor (B. Hoch) acknowledges the omission of important fungal associations such as (non-mycorrhizal) endophytes or symbioses with insects. A few extra chapters dealing with such associations would have had added considerable value. Alternatively, as previous volumes of *The Mycota* (specifically volume 4, *Environment and Microbial Relationships*, and volume 5, *Plant Relationships*) include chapters on fungal associations with plants and microbes, a concluding comparative overview with reference to these volumes and other relevant books would have been useful. The book is not cheap. It will doubtless be added to the volumes of *The Mycota* already on shelves of libraries, but I will be surprised if there are many individual purchasers.

Andrew Smith
University of Adelaide