Book review

V. Gianinazzi-Pearson & S. Gianinazzi (Eds), 1986. Physiological and genetical aspects of mycorrhizae. Proceedings of the 1st European Symposium on Mycorrhizae. CNRS-INRA, Dijon, France. 832 pages. ISBN 2-85340-774-8. Price Dfl. 134.

In recent years, there has been a growing interest in mycorrhizal research, especially in Europe. As a result, the first European symposium on mycorrhizae was held in Dijon in 1985. The symposium was devoted to one theme in mycorrhizal research: physiological and genetical aspects of mycorrhizae.

Those unable to attend the symposium will be pleased to know that the proceedings are detailed and comprehensive.

When reading the proceedings one may readily conclude that information on the mutual recognition between the mycorrhizal partners and the functioning of mycorrhiza is fragmentary. It is striking how many 'mycorrhizologists' humbly stress the limited knowledge of the physiology and genetics of mycorrhiza. The considerable variation between and within (strains of) species and the difficult question, 'What is a fungal species', certainly account for the slow progress in this area of study. However these pessimistic views expressed by many researchers are not at all justified by the 832 pages of the proceedings, containing a vast amount of high quality information in the form of reviews and summaries.

After a historical overview by T.N. Nicholson, J.L. Harley presents a brief introduction in which he, in his enthusiastic way, brilliantly summarizes what we know, what we do not know and what we first need to learn about mycorrhiza. The next 170 pages are dedicated to 16 well defined reviews, which indicate present knowledge. The reviews are divided into four sections: (1) Infection and cellular interactions; (2) Physiology and nutrition; (3) Taxonomy and genetics; (4) 'Non-nutritional', microbial and environmental interactions. The reviews are followed by 12 sections containing 113 summaries of papers, averaging 5-6 pages.

Among the highlights of the proceedings are a considerable number of papers on the effects of abiotic and biotic factors. An important study on the role of mycorrhiza in the ecosystem is that by Abu-Zinadah and Read, who obtained direct evidence that ectomycorrhizal fungi are able to use organic nitrogen. Another significant and relatively new type of study presented (in four summaries) was the role of mycorrhiza in forest die-back and acid deposition.

Two papers, one by Bonfante-Fasolo and Gianinazzi-Pearson, and another by Beringer and Burggraaf review the infection process of plant pathogenic fungi and of *Rhizobium* spp. Research on the process of recognition between the two mycorrhizal partners is predominantly in a descriptive phase (such as EM studies), although the methodology in this kind of studies might be borrowed partially from comparative work in plant pathology.

The proceedings of this symposium can be considered an up-to-date source of knowledge and present-day opinions in the world of physiology and genetics of mycorrhizae. Only the absences of an index and titles in the references prevent me from recommending the proceedings as a handbook. The book can be recommended to all mycorrhizologists and to most plant physiologists. Perhaps J.L. Harley states it best when he says 'to study nutrient absorption by roots, without consideration of mycorrhiza as an essential dimension, is to study artifacts in most cases'.

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Book review

W. Brandenburger, 1985. Parasitische Pilze an Gefässpflanzen in Europa. Fischer Verlag, Stuttgart and New York, 1248 pp. ISBN 3-437-30433-X. Price DM 320.

M.B. Ellis & J.P. Ellis, 1985. Microfungi on land plants. Croom Helm Ltd, London and Sydney, 818 pp. ISBN 0-7099-0950-0. Price £ 45.

To identify fungi on plants, mycologists and plant pathologists consult various sources: fungal floras, compilations of records on host plants, handbooks on diseases of particular crops, and monographs of fungal groups. A classic among the floras is 'Dr L. Rabenhorst's Kryptogamenflora von Deutschland, Österreich und der Schweiz' (1884-1910), presenting descriptions of the species and a list of host plants. A more condensed regional flora, but used throughout Europe, is 'British parasitic fungi' written by W.C. Moore (1959). Well known examples of compilations date back to the beginning of this century or even earlier, but are still being used. Examples are P.A. Saccardo's 'Sylloge fungorum' (1882-1925) with a listing of all fungi known at that time and C.A.J.A. Oudemans' 'Enumeratio systematica fungorum' (1919-1925), in which the fungi occurring on the European flora are listed by host plant.

After many years of good service of these reference books, an up-to-date handbook for the identification of fungi occurring on plants was needed, as two publishers have obviously realized: two comprehensive books on the subject appeared in onde and the same year.

At first sight, there is much resemblance. Both volumes are divided in about the same way: a main part with descriptions of the species by habitat, followed by a second one with numerous illustrations. Furthermore, both of them contain a glossary and indexes of hosts and fungi. On further examination, however, the books appear to be definitely different. Brandenburger presents a detailed survey of the parasites on vascular plants, with emphasis on compilation, whereas Ellis and Ellis describe both parasites and saprophytes, with emphasis on identification. Moreover, in their handbook the habitat 'land plants' is conceived in a broad sense: it includes not only living plants, but also dead substrates originating from plants, such as leaf litter and wood.

Brandenburger's volume is strictly arranged on the basis of plant systematics. The first part (880 pages) includes the lists and descriptions of parasites on genera of host plants. The parasites of one host genus are arranged according to the organs on which they occur. Of each parasite, the symptoms caused and the fungal structures are briefly described. The second part (205 pages) is a treatise of fungal systematics with descriptions of genera of parasitic fungi, illustrated with line drawings. It is a 'book within a book' reminiscent of a concise textbook of mycology, but dealing with parasites only.

Ellis and Ellis' book is a typical fungal flora. In its preface, the aims are set out as follows: 'At the present time there is no general up-to-date book available to which a naturalist can turn when he or she needs to name microscopic fungi, and the task of doing so, especially for the amateur, is a daunting one. We try in this book to make identification simpler and hope by so doing to encourage more people to look at and to learn about microscopic fungi'. Descriptions of plurivorous fungi are grouped according to their habitat: wood and bark, leaf litter, and herbaceous plants. Fungi specific to host plants are described under plant genera which are divided into five main sections: (1) trees, shrubs and woody climbers; (2) herbaceous plants other than grasses; (3) grasses; (4) rushes, sedges, bur-reeds and reedmaces; (5) ferns, horsetails and club-mosses. Common mycoparasites on rusts and downy mildews are included too.

The book contains numerous keys, which are provided when many species occur on one host genus or on one substrate. Figures are presented apart form the text: 206 pages with more than

2000 line drawings, which have been prepared by the authors from original specimens. Less handily, the glossary is not placed at the end but is hidden in the middle of the volume.

I have used the two books for several months for the identification of fungi on plants. Before describing my experience, let me stress how easy it is to find omissions in a handbook that attempts to include the vast mycoflora on plants. By far the most species collected could be identified to species level without difficulty. This applied to fungi occurring on stems and leaves rather than to those on roots or other subterranean parts. For identification of the latter, I was more successful with Brandenburger's book than that of Ellis and Ellis, where common species such as those of *Polymyxa* in beet and barley and *Ligniera* in many hosts are lacking. With both books, I failed to identify the minute microsclerotia on haulm bases in a senescent potato crop as those of *Verticillium dahliae*. I also failed to place the oospores of *Lagena* sp. and the microsclerotia of *Microdochium bolleyi* in roots of grasses and cereals. Perhaps, Brandenburger does not consider these fungi as parasites; but because of their frequent occurrence in living roots, a pathologist should know them.

The system of reference to symptoms on other hosts, as followed by Brandenburger, saves space, but is inadequate for parasites that cause different symptoms on different hosts. An example is *Rhizoctonia solani* on potato. Neither the white collar with basidia around the haulm base nor the sclerotia on the tuber are mentioned. Brandenburger does mention the fungus as a parasite of potato, but refers for its symptoms to those on *Abies* spp., where it causes a seedling disease.

Most fungi are clearly described. There remain, however, some difficult groups which require monographs or other special literature for precise identification. Though Brandenburger mentions the most important and recent monographs, Ellis and Ellis confine themselves to recommending a few handbooks and the 'Guide to the literature for the identification of British fungi' by M. Holden.

For several reasons, Ellis and Ellis' book is easier to use than Brandenburger's. Its lay-out is magnificent: each category (host plant, fungal group) is clearly indicated and the names of the substrates or the hosts involved are repeated at the top of each page. This cannot be said of Brandenburger's book, in which the names of hosts have been printed faintly, whereas those of the fungi are in bold, which often puzzles the reader about the host involved.

A second convenience for the user of Ellis and Ellis' book is the presentation of clear keys for identification. Brandenburger does not include keys: when many parasites occur on one host plant, the reader is compelled to go through the descriptions of quite a number of species before finding the one that fits the features of his specimen.

The figures given by Ellis and Ellis are of great help in the identification. The authors admirably succeeded in representing the most characteristic features in simple line drawings.

It is impossible to describe the parasites on the European flora or the microfungi on land plants without a vocabulary of many technical terms. Use of the books requires a good basic knowledge of mycology, even when most of the terms are well explained in a glossary, as has especially been done by Brandenburger. For a few terms, the explanation by Ellis and Ellis may be too brief for the general 'naturalist' addressed in their preface. After annelides have been defined as 'closely annelate, holoblastic, conidiogenous cells' one needs to know, for instance, what holoblastic means.

In my recent experience, identification of fungi on plants has become easier with the appearance of the volumes, which is especially so for fungi on plant remains, including wood and litter, with Ellis and Ellis' book. Much knowledge and perseverance has been required to prepare the two books. Both volumes will remain reference books for many years to come and all pathologists involved in diagnosis of plant diseases will need regular access to a copy. Those, who want to buy a copy for private use will be pleased with the price of 'Microfungi on land plants', which is quite reasonable for such a book. For the purchase of Branderburger's heavy volume, I would suggest perusal before making a decision.

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