

BOOK REVIEWS

Plant Infection, the Physiological and Biochemical Basis: edited by Y. ASADA, W. R. BUSHNELL, S. OUCHI and C. P. VANCE. Springer, Berlin, 1982. 362 pp. DM 126 (\$50.40).

This book contains 22 essays in which leading U.S. and Japanese plant scientists discuss their recent researches towards improving our knowledge of the scientific basis of resistance and susceptibility of plants to microbial disease. These essays arose from a joint U.S.–Japanese seminar held in May 1981 in a closed session in Minnesota, U.S.A. and in spite of the absence of any European contribution, together they provide a representative picture of recent research efforts. Much of the work described here has appeared in the primary literature but most authors have been provided with more space than is usually available in a research paper to expand and speculate about the significance of their findings.

In a brief book review, one can only pick out a few salient points among the many interesting papers that are collected here. The possibility that physical factors at the leaf surface may provide resistance to fungal pathogens has often been dismissed in the past because of lack of experimental data; new evidence, discussed here by R. T. Sherwood and C. P. Vance, indicate that papilla formation in grass leaf epidermal cells is actually induced by mildews and may prevent infection in favourable circumstances. The protection of plants from infection by immunisation is another idea from the past—a method that works with animals—which is now undergoing revival through the studies of J. Kuc; here, he describes his

latest results which indicate that such protection can work in the case of members of the Cucurbitaceae. Controlled infection with *Colletotrichum lagenarium* or tobacco necrosis virus protects cucumber from a broad range of potential pathogens.

Important probes for improving our experimental understanding of the subcellular site of microbial infection in the higher plant are the host-specific toxins manufactured by pathogens. These toxins are discussed in several chapters, but notably in one by J. M. Daly on the polyketols and terpenoids of *Helminthosporium* and in another by T. Ueno and his colleagues on the cyclic peptides of *Alternaria*. Elicitation of the phytoalexin response is another area of active research at the molecular level and N. T. Keen provides a useful and thoughtful review of the present position on elicitors, with some emphasis on his own studies of the *Phytophthora megasperma*–soya bean symbiosis. The final paper on hypersensitive cell death, its significance and physiology by K. Tomiyama covers a complementary area of study, this time with reference to the *Phytophthora infestans*–potato interaction.

In summary then, this is a useful, timely and well produced collection of essays, which can be warmly recommended to anyone working on this subject. To the general reader, it provides a useful account of developments since the Springer Encyclopedia volume 'Physiological Plant Pathology' appeared, back in 1976.

Plant Science Laboratories, JEFFREY B. HARBORNE
University of Reading

Micromolecular Evolution, Systematics and Ecology: An Essay Into a Novel Botanical Discipline: by OTTO R. GOTTLIEB. Springer, Berlin, 1982. 170 pages. Soft cover DM 79, approx. US \$33.00.

After agreeing to review Professor Gottlieb's slim volume "Micromolecular Evolution, Systematics and Ecology", I waited in eager anticipation for its arrival on my desk. Thankfully, I was not disappointed although make no mistake about it, this is not an easy book to read and on numerous occasions over the past few months I have, after struggling for some time with its complicated sentences, been forced to put it aside in favour of rather lighter reading. Basically, Professor Gottlieb has set out to show how information obtained from the study of secondary products (flavonoids, alkaloids, polyacetylenes and the like) or 'micromolecules' can be successfully used to support the evolutionary development and taxonomic classification of certain groups of higher plants. Of course, there is nothing particularly new about such an approach to plant taxonomy, but where this book differs fundamentally is in the careful integration of data relating to different types of secondary products and their possible allelochemic functions, and the novel but entirely logical

numerical arrangement of these substances according to skeletal type and oxygenation pattern. The result is a rather mathematical view of chemosystematics which I feel could discourage some casual readers from delving deeper into the book. The importance of micromolecules to systematics in a wide range of plant taxa is described in detail (Chapters 4–16), and it could be said that there is something here for almost everyone. As a result the compounds considered include flavonoids, alkaloids (benzylisoquinolines, indoles, quinolines and quinolizidines), iridoids, polyacetylenes and xanthonenes, and in some chapters, notably that dealing with the Papilionoideae, data for various natural products (flavonoids, isoflavonoids, quinolizidine alkaloids and non-protein amino acids) are combined to give a more coherent systematic picture.

Although Professor Gottlieb's book seems remarkably free of typographic errors, it does have some shortcomings not least of which is the fact that it is written in a curiously wordy fashion, and often I found it necessary to read sentences or paragraphs several times before their meaning became even partially clear. The lack of a really comprehensive reference section is also disappointing. Take Table 12.2 for example in the chapter covering the

Papilionoideae. This table details the occurrence of (+)- and (-)-pterocarpan (a type of isoflavonoid) in Old and New World legumes, and relies on information obtained from a by no means comprehensive review (Isoflavonoids by E. Wong in "The Flavonoids") and a survey of reports which appeared in *Phytochemistry* between 1975 and 1979. (What about relevant papers, and there are several, published in other learned journals?). Of course, the table is designed to illustrate an interesting trend towards (+)-pterocarpan in New World Papilionoideae and I would not have expected it to be one hundred percent complete, but what I do find somewhat irritating is the lack of a precise reference for each given piece of information. As a result there is no easy way of locating the original research papers, and hence of checking the table for accuracy. Lastly, because of the way it is arranged the book tends to give the impression of being a series of edited scientific

papers rather than a unified account, but this is a small point and considering the complexity of the subject a rather 'journal-style' presentation is probably acceptable.

These minor criticisms apart, the book contains a wealth of useful and thought-provoking information, and anyone interested in secondary products and plant systematics should at least make an attempt to read and evaluate it for him or herself. Although I suspect this is probably not a book which large numbers of students or researchers will buy, I do hope that it becomes available for reference in University libraries and those of other Institutes as Professor Gottlieb's novel approach to systematics and evolution undoubtedly deserves to be widely recognized.

Plant Science Laboratories,
University of Reading

JOHN L. INGHAM

Fungal Metabolites, Volume II: by W. B. TURNER and D. C. ALDRIDGE. Academic Press, London, 1983. 631 pp. £44.

In 1971, W. B. Turner produced a first volume, listing the nearly a thousand secondary metabolites produced by fungi whose structures had been established at that time. Now, with the assistance of Dr. Aldridge, he has provided us with a supplementary volume covering the literature of the intervening 12 years. The number of new structures are double that in the first volume! As in the first volume, compounds are classified according to biosynthetic origin and details of biosynthetic experiments are included whenever such information is available. The second volume thus follows the same plan as the first and cross-reference between the two is readily achieved because the same headings and sectional numberings are used.

A particularly admirable feature of this volume II is that new fungal sources of compounds reported in volume I are carefully listed in appropriate sections. This is particularly useful in the sterol chapter. That ergosterol, a characteristic fungal sterol, has been found in many new sources is hardly surprising; perhaps more interesting is the fact that a number of 'higher plant' sterols such as stigmasterol and sitosterol have now been identified in a respectable number of fungal genera. The most interesting fungal sterols are probably antheridiol and the oogoniols, which act as sex hormones in the aquatic fungus *Achlya*, and new structural assignments are included here.

From the human viewpoint, fungal metabolites continue to command interest because of the possibilities of finding new drugs of comparable value to the penicillin antibiotics. According to these authors, the immunosuppressant agent cyclosporin A, a cyclic peptide from *Trichoderma*, is currently showing the greatest promise of utility. Economically too, the various phytotoxins isolated from fungi are important if only because of their deleterious effects on higher plants in causing many of the symptoms of plant disease. They are also useful exper-

imental tools for studying the flow of ions across the plasmalemma of higher plants. Structures of the many diterpene-based fusicoccins and cotylenins can be found in this volume. It is unfortunate that the corrected structures of the *Helminthosporium sacchari* toxins arrived too late for inclusion here (but see V. Macko *et al. Experientia* 1983, 39, 343).

The chemotaxonomic interest of these two volumes is also very considerable. Although not commented on in any detail, the raw data now available can be used by anyone wishing to seek correlations between natural distribution and chemical complexity among the fungi. While many of the compounds reported are unique to the fungi, a substantial number also appear in unrelated plant sources. Many well known higher plant substances are reported here for the first time, e.g. ferulic acid, geraniol, myrcene and limonene, but the most distinctive finding is of the betalain pigment vulgaxanthin II from beetroot in the fly agaric *Amanita muscaria*. Such parallel occurrences do not necessarily imply biosynthetic homology across the phyla. Indeed, as reported here, the only known fungal flavonoid, chloroflavinin of *Aspergillus candidus*, is biosynthesized by a different route from that followed in higher plants.

This volume, as the first one, is an essential reference to any scientist remotely interested in either secondary metabolism or in the fungal kingdom. It is excellently provided with hundreds of literature references, as well as formula, organism, and subject indexes. Although the price has increased five-fold, compared with Volume I, it is still good value. It must have been a considerable labour of love to have produced this elaborate and complex listing of so many chemical formulae and we are deeply indebted to the authors and publisher for what will remain a standard reference in the years ahead.

Plant Science Laboratories,
University of Reading

JEFFREY B. HARBORNE