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Book reviews

Plant Secondary Metabolism

D.S. Seigler; Kluwer, Dordrecht, The Netherlands, 1998, 759 pp., ISBN 041201 9817, £313.00 or $460.00.

This is not the first account of plant secondary metabolism to be written and it will surely not be the last. Most texts published in recent years have been written as course books for University students. The challenge has been to squeeze sufficient representative structures and facts into a manageable textbook of no more than 250 pages. Here, however, the author has chosen a more comprehensive approach and has described and illustrated every known class and subclass of secondary metabolite. Indeed, there is a veritable wealth of structural formulae and of biosynthetic schemes. There is also a generous coverage of function (where it is known), of natural distribution patterns, of chemical ecology and of biological properties.

Unfortunately, the author has not been helped by his publisher, who instead of deciding to produce the work in two volumes as it deserves, has chosen a single volume with such a small typeface that it is a real strain to read. It is sad that such a splendid text should be marred in this way.

Some of the many attractive features of this book, if you can struggle to read this far, are the introductory summary chapters that interlace the main text. There is an intriguing general introduction, which considers the various hypotheses that have been advanced to explain the profligacy of plants in synthesising so many different metabolites. There are also useful introductions to shikimate metabolites, to the terpenoids and to the alkaloids. The book in fact is strong on alkaloids and there are 11 chapters on the different alkaloid classes which take up nearly a third of the book.

A survey of the extensive biographies, which appear at the end of each chapter, suggest that there is a distinct shortage of literature references after 1990. The recent work on terpenoid biosynthesis involving the 1-deoxy-D-xylulose 5-phosphate pathway is missing. Nevertheless, there is some compensation in the good coverage of the 1970s and 1980s literature, a period when the subject of secondary metabolism was expanding most rapidly.

The very high price will mean that it is likely to be purchased only by libraries. This masterly work is especially good on chemical ecology and medicinal phytochemistry and can be warmly recommended as a valuable reference source.

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Regulation of Primary Metabolic Pathways in Plants

N.T. Kruger, S.A. Hill and R.G. Ratcliffe (Eds.), Proceedings of the Phytochemical Society of Europe No. 42, Kluwer, Dordrecht, The Netherlands, 1999, 311 pp., ISBN 0-7923-5494-X, £105.00.

Proceedings of the PSE first appeared under the imprint of Academic Press in 1965 and then moved on to Oxford University Press for a number of years. This is the first volume to appear that is published by Kluwer. It is beautifully produced, but unfortunately the price seems to have nearly doubled and it is difficult to see many individual phytochemists being able to afford to buy it. This would be a pity since this volume is one of the first books to consider in detail the impact that molecular biology has had on our understanding of primary plant metabolism.

This particular volume is based on a series of review lectures presented at a PSE meeting held at St. Hughes College, Oxford in January 1997. The main aim of the contributing authors was to consider the potential that exists now for modifying the quantity or quality of harvestable crop products through genetic manipulation. At the same time, the various authors describe how

transgenic plants could be invaluable tools in relating plant metabolism to plant physiology or plant ecology.

Of the 14 chapters, no less than four cover carbohydrate metabolism. Thus, Alison Smith reviews the regulation of starch synthesis in storage organs, while C.J. Pollock and co-workers consider fructan metabolism in grasses. Fructosyltransferase genes and their expression are the subject of a chapter by Irma Viju et al. and the sink metabolism in the potato and transgenic technology are discussed by R.N. Trethewey and L. Willmitzer. There is one chapter on the application of genetic manipulation to fatty acid biosynthesis and one on nitrate reductase and its control of intermediary metabolism. The remaining chapters deal with various other aspects of primary metabolism, including photosynthesis.

As a non-molecular biologist, I found that some of the chapters were too terse and I would have welcomed some expansion. To deal with the whole subject of modifying Rubisco the key enzyme of photosynthesis in only 12 pages was a pity. Nevertheless, this is an important contribution to the plant science literature. Anyone wishing to understand the complexities of the regulation of plant metabolism will need to read this volume.

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Heavy Metal Stress in Plants: From Molecules to Ecosystems

M.N.V. Prasad and F. Hagemeyer. Springer-Verlag, Berlin, 1999, 401pp., ISBN 3-540-65469-0, 329,-DM

Over the last few years an increasing interest in understanding the molecular basis of heavy metal tolerance in plants has come into view, with regard to not only scientific but also commercial significance. In "Heavy Metal Stress in Plants" the authors attempt to give in 17 chapters a summary of the phenomenon of heavy metal stress also considering marginal aspects. Three introductory chapters discuss important basic principles of metal chelation and the molecules possibly involved in these processes in plants, giving a deeper understanding of how heavy metals principally react and how they are detoxified. The chapters on the impact of heavy metals on membranes, photosynthesis, respiration, water relations and growth are more descriptive. For the reader it is difficult to distinguish between artificial results, due to the experimental conditions, and physiologically relevant effects. Free radicals and reactive oxygen species are discussed as a part of heavy metal stress in plants in a particular chapter. Methods for a species-selective analysis of heavy metals and their complexes (GC, ICP-MS, HPLC-ESI-MS, analytical electron microscopy) are described very briefly. Phytoremediation for purification of sewage sludges, soils and forest declines is discussed in four chapters in detail. Only little is known about how heavy metals pass the plasma membrane and the tonoplast. There is increasing evidence that heavy metal transporters like those found in bacteria and yeasts are also active in higher plants. A chapter discussing these aspects in detail is missing. Each chapter contains a bibliography, which is up to date and considers modern developments such as new analytical methods and recombinant DNA-techniques used to modify crop plants genetically. The articles describe the heavy metal action partially in great detail, but on the other side ecological and ecophysiological aspects are only briefly considered. Particular aspects of heavy metal tolerance are described in several chapters, e.g. the role of phytochelatins in chapters 3, 4, 10, 14 and 16. The book can be recommended as a valuable text for students and a literature review for scientists in plant physiology and biochemistry, agronomy, forestry and also industrial research workers.

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