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Book Reviews

A Whole Plant Perspective on Carbon–Nitrogen Interactions

Jacques Roy and Eric Garnier (eds).
SPB Academic Publishing, The Hague. 1994.
314 pp. Hardback, Dfl.130.00; US$70.00; ISBN 90-5103-086-X.

It has been known for some time that any metabolic function in an organism is the result of a multitude of intrinsic and extrinsic controls. What is new is the realization that metabolic dynamics is governed by such a fine network of both metabolic and hormonal signals that it can hardly be described in other than mathematical terms. In plant physiology, metabolic regulation of carbon and nitrogen fluxes, which determine growth and development to a large extent, is also gaining recognition as such a fundamental, yet intricate mechanism. This renewed interest is stimulated by the possibilities of modifying metabolic routes and their controls by molecular genetic interventions; it now becomes clear how complicated plants are in this respect, and how little we know about their metabolic dynamics. This book is a necessary preamble to further studies along this line. It deals with aspects such as the coupling of nitrogen and carbon assimilation in plants, and the integration in space and time of these processes. It deals with the interaction between sources and sinks with regard to the partitioning of resources and the effects of external supplies on growth and development. It does not answer all the questions, but the questions that are asked are well formulated and evoke further thinking. The book is based on a meeting of European plant physiologists in 1991 in preparation of a (later established) European Science Foundation Scientific Network on Whole Plant Physiology. It is organized into three parts dealing with: (i) the mutual interaction of carbon and nitrogen metabolism; (ii) distribution patterns of carbon and nitrogen metabolites, and (iii) the effects of carbon and nitrogen on plant development. In short, it is an integrative account of carbon and nitrogen fluxes in an extremely complex system. Clearly, it has been written with great enthusiasm by all contributors, and this enthusiasm is contagious. I consider this to be a standard textbook for the current state of knowledge in this area, and recommend anyone interested in metabolic dynamics to buy and to read it.

H. VAN DEN ENDE

Flora Malesiana. Series I. Spermatophyta, Volume 11, Part 3: Sapindaceae

F. Adema, P.W. Leenhouts and P.C. van Welzen.
Rijksherbarium/Hortus Botanicus, Leiden. 1994.
768 pp. Paperback, Dfl.100.00 ISBN 90-71236-21-8.

Among plant taxonomists the *Flora Malesiana* is often praised as the best Flora in the world. Unfortunately, the monographic often multidisciplinary approach, which is at the root of the work, causes slow progress. In recent times it was decided to change the policy and to follow a somewhat different setup aimed at a faster rate of production. This has led critics to qualify the new approach as 'quick and dirty'. Therefore, the publication of the now completed volume on Sapindaceae, still honouring the best traditions of quality and thoroughness, is a memorable event. Simultaneously, one is awed by the enormous amount of time and manpower needed to achieve such a major accomplishment. Three main authors sign for the treatment of the 42 genera, which collectively comprise *c.* 235 species. They were assisted by another 10 researchers who contributed to a lesser extent dealing with a number of the smaller genera and, in particular, with specialities such as palynology, phytochemistry and wood anatomy.

The Founding Father of the Foundation *Flora Malesiana*, the late C.G.G.J. van Steenis, formulated what went into history as Van Steenis's Rule, *viz*: 'A good hard-working taxonomic botanist is capable of monographing 12–15 species per annum.' This means that one person could have finished the work under consideration in 15–20 years. Actually we witness here the successful results of team-work that stretched over a period of more than 30 years.

It may be questioned whether the co-operation of so many different authors unfavourably affects the homogeneity of the resulting work. In particular, views on species-concept may differ widely. This, however, becomes largely rhetorical when one considers the work of a single author. For instance, Leenhouts, the Nestor of the project, struggled with the circumtropical genus *Allophylus*, which includes up to 250 species. After thorough examination he concluded that all this variability is best considered to represent a single very variable and complex species: *A. cobbe* (L.) Raeuschel. On the other hand the same author, in his treatment of particular species of *Dimocarpus, Litchi* and *Nephelium*, sometimes arrives at a classification that does not even

shun the rank of subvariety. It is to be noted that recognition of infraspecific microtaxa is most often linked to domestication and cultivation as a fruit-tree of the species concerned. Therefore, in the opinion of the present reviewer, the use of cultivar-groups and cultivars could have presented here a workable alternative. As it is, a seeming lack of balance does not affect the taxonomic value of the treatment as a whole. It only emphasizes the author's pragmatic approach, in which the criterion of usefulness is given special weight, next to his ability and perfect right to solve the intricacies of the taxonomy of cultivated plants within the framework of rules and ranks outlines in the International Code of Botanical Nomenclature (1994 Tokyo Code art. 28).

In western temperate Europe very few exotic Sapindaceae found their way into cultivation. But among these *Koelreuteria paniculata* Laxm. is frequently seen in The Netherlands, where it grows as a small ornamental tree. Checking the keys, one based on vegetative and flower characters and a second using vegetative parts and fruits, I decided to try my luck on *Koelreuteria*. And, as you may have guessed already, it proved to be absent in both. Of course a work of this size contains a few flaws, but apart from these the authors may be proud of their monumental original contribution to the knowledge of the Sapindaceae in the part of the world covered by the *Flora Malesiana*.

J.J.F.E. DE WILDE

Ethnobotany and the Search for New Drugs: CIBA Foundation Symposium 185

Derek J. Chadwick and Joan Marsh (eds).
John Wiley & Sons Ltd, Chichester, 1994.
ix+280 pp. Hardback, UK£47.50; US$76.00. ISBN 0-471-950240.

This book is the follow-up of the Symposium on Ethnobotany and the Search for New Drugs, held in Fortaleza, Brazil, from 30 November to 2 December 1993 and organized by the Ciba Foundation. Many important drugs in Western medicine are derived from plants, e.g. digoxin, atropine, quinine, vincristine, pilocarpine, tubocurarinine, and recently taxol and artemisinin. The plant kingdom still offers enormous potential for further discoveries. In this respect, an ethnobotanical approach, starting with plants that are traditionally used for medicinal purposes, is a valuable one.

The work contains the texts of 16 lectures (with abstracts and references) delivered by reputed scientists in the field, followed by a survey of the subsequent discussions, plus a general introduction to the whole compilation and final conclusions. From the contents of the book it becomes clear that ethnobotany is recognized as a tool in the search for new pharmaceuticals and that it may lead to very interesting, multidisciplinary projects.

Topics that are discussed include: traditionally used medicinal plants from South America, Mexico, China, India and Africa; the search for antiviral and cancer drugs from natural sources; the conservation of natural habitats and the cultivation of medicinal plants in order to prevent the overexploitation of wild species; the role of the pharmaceutical industry in drug discovery and development from plant sources; intellectual property rights; and anthropological aspects.

It may be concluded that a broad range of aspects related to ethnobotany, ethnopharmacology and ethnomedicine are discussed in the book. The contributions are clearly written, and provided with good illustrations. Overall, the lay-out is fine and the book is well-edited. A subject index with more than 700 entries completes this volume. I warmly recommend this book to anyone who is interested in drug discovery from natural sources, based on the traditional knowledge of the plants' healing properties.

H.J. WOERDENBAG

Photomorphogenesis in Plants

R.E. Kendrick and G.H.M. Kronenberg (eds).
Kluwer Academic Publishers Group. 1994.
xxxiv+828 pp. Hardback, Dfl.535, US$297, UK£214. ISBN 0-7923-2550-8.

In contrast to animals, plants can see light in various ways, using a variety of photoreceptors. With those they can sense the rate, the spectral composition, the direction and duration of illumination. Each photoreceptor is the starting point of a signalling pathway, involving amplification, down-regulation and desensitization of the signal before a physiological response is elicited. Different photoreceptors probably do not act independently because their signalling pathways are interconnected. This results in a quite sophisticated network of information processing, of which we just start to see a glimpse. This book gives an overwhelming account of the variety of means by which plants cope with light as an environmental cue. The editors have attempted to provide comprehensive coverage of all aspects of light sensing in plants, and the emphasis is of course on the major photoreceptors, the phytochrome family and blue light receptors. It also includes a chapter on methodology and molecular and genetic approaches, and it contains 'selected topics' such as photomodulation of growth, phototropism, and photobiology of algae, fungi and cryptogamic plants. The result is a

most fascinating encyclopedia of plant physiology, focused on light. It should be on the shelves of all botany departments as a reference text but, more than that, it should be read because it concerns the essence of plant life. For that matter, it is an essential tool for teaching and practising plant physiology. The drawback of such a drive for completeness is that it has become a heavy volume, with a price that few individuals can afford.

H. VAN DEN ENDE

Morphogenèse et Dynamique

Denis Barabé and Robert Brunet (eds).
Orbis Publishing, Frelighsburg (Qué./Canada).
1993. viii+152 pp. Paperback. ISBN 2-9800545-6-9.

The aim of this book, containing papers from a symposium held in 1992, is to explore how mathematics can help to understand morphogenesis, and to indicate where morphogenesis is so complicated that it escapes mathematical treatment. This is an interesting theme, not least because much of the work in plant development is being done without the use of mathematically formulated theories or models, and the question is whether this neglect of theory is always justified. However, the book is far from complete in its coverage of the different theoretical and experimental approaches to morphogenesis, and no general conclusions about the possibilities of applying mathematics to plant development can be drawn from the book.

One paper that convincingly shows the power of a mathematical analysis of a developmental problem is that by G. Cusset on periodicity in growth. The question considered is how to distinguish between periodicity in growth curves as a result of an endogenous rhythm and periodicity caused by artefacts of curve fitting. The paper shows how pseudo-oscillations can arise when an incorrect S-curve equation is applied to the measurements, or when the measured organ is in fact composed of several elements that started growth at different times. The paper shows the importance of a careful analysis of the growth pattern, and at the same time presents mathematical tools to do this analysis.

The relationship between model and observations is not as clear in other papers. Presenting a theory of phyllotaxis, R.V. Jean describes all phyllotactic patterns as a sequence of numbers of spirals, and derives various parameters from the mathematical properties of these sequences. This approach sometimes leads to surprising consequences. For example, a distichous pattern (leaves in two rows as in grasses) is described as a system of 2 and 17 spirals, and in Jean's theory this implies that the distichous pattern cannot be determined by the plant before a considerable number of leaves have been formed on the shoot. Also, it implies that it would be much more expensive for a plant to maintain the distichous pattern than, for example, the common spiral Fibonacci-type pattern. It would be desirable to test these consequences by observation or experiment, but the weak point of the theory is that it is not clear to what properties of the plant the parameters of the theory refer. Although the questions raised by Jean may be intriguing, it is thus doubtful whether the answers can be formulated within the parameters of his theory.

Several other theories presented in the book suffer from a discrepancy between the quantitative detail in which the theory is presented and the underlying detail of knowledge about what happens in plants. Examples include reaction–diffusion theory, discussed in the introduction, and a biophysical model of apex development, presented in a contribution by P.B. Green. The book offers no suggestions about how this gap between theory and observation could be bridged. It is clear, though, that the solution to this problem should come from new types of observations and experiments. As the book amply shows, there are enough interesting theories and mathematical tools available that could give elegant explanations of morphogenesis, provided that we can make the right kind of observations.

JOHANNES BATTJES

Domestication of Plants in the Old World, 2nd edn

Daniel Zohary and Maria Hopf.
Oxford University Press, New York, 1994.
x+279 pp. Paperback, UK£15; Dfl.51. ISBN 0-19-854896-6.

Tracing the domestication of plants in the Old World is an exercise in evolutionary biology and in the history of civilization. Domestication of plants is not incidental to the development of civilization, it is an essential part of it. Domestication requires ever more insight and technology and, while it provides resources, it draws on the efforts of a large part of the population and regulates their lifestyle. The history of domestication of plants and animals is inextricably interwoven with the history of technology and culture, religion and warfare.

Historical research depends primarily on quality and quantity of the preserved material.The amount of archaeological information on crop plants that is available is impressive and has increased considerably since the first edition of this book. However, the material is not evenly preserved. While the

Near East, Egypt and Europe are reasonably well documented, much less is known about East Asia and the rest of Africa. Still, the wild progenitors of most cultivated species and their present and presumably original distribution are known. Unlike other evolutionary events, we have a very good living record of the initial and final states of the biological processes, both genetically and geographically, and we can obtain experimental evidence for the kind and amount of change involved in domestication.The archaeological data help us with times and rates of change and rates of spread. Each plant species has its own requirements and provides different benefits so that a comparison of the available data on a great number of species allows interesting comparisons.

The bulk of the book, chapters 2–9, is a concise summary of the available evidence on some 80 species of cereals, pulses, oil and fibre crops, fruit trees and nuts, vegetables and tubers, condiments and dye crops, with an added chapter on fruit collected from the wild. Chapter 10 lists the plant remains in representative archaeological sites. All of this is documentation of the conclusions, 7 pages of text so concentrated they can be seen as an abstract.

I do not believe that anyone will read this book cover to cover, but it is difficult to put it down once one has started to leaf through it looking for interesting facts.The book certainly is an indispensable source of information for anyone who needs to know about cultivated plants, both as unique material for the investigation of basic questions in evolution and genetics and as components of human civilization. As such, it should not only be consulted by specialists looking through text, maps and references for details on plants important to their research, but also by teachers introducing students to the biology of plants and to the history of our culture.

KONRAD BACHMANN

Flechten Erkennen: Luftgüte Bestimmen

Ulrich Kirschbaum and Volkmar Wirth.
Verlag Euigen Ulmer, Stuttgart, 1995. 128 pp.
Paperback, DM 19.80. ISBN 3-8001-34772.

Lichens are often used as bioindicators for air pollution. They are relatively sensitive because there is no mineral uptake from the substrate. Many species have diminished or even become extinct due to the SO_2-pollution of which heavy industries and power plants are the main sources. In recent years many lichen species are recovering, reflecting the drastic reductions in SO_2-emission.

Another rather recent development is the spread of nitrophilous lichens due to HN_3-pollution from manure. In fact, lichens are the only tool evaluating the NH_3-emission, and they are therefore widely used in The Netherlands.

The present book presents a standard method for evaluation of the air quality from the epiphytic lichen vegetation. It also provides colour photographs and descriptions of 66 species.

The book is certainly very useful in southern Germany and some regions beyond, but it is of limited use in The Netherlands. The selection of species is insufficient for our situation and includes some very rare species, whereas several common ones are not treated; six listed species do not occur in The Netherlands at all.

Furthermore, the species which indicate HN_3-pollution are not mentioned, and the wrong conclusions can easily be drawn when the procedure described here to assess the air quality is followed in lowland agricultural regions. However, the procedure is probably adequate for upland regions in Central Europe.

A. APTROOT

