

## Book Reviews

### **Cell Culture and Somatic Cell Genetics of Plants. Volume 4. Cell Culture in Phytochemistry**

F. Constabel and I.K. Vasil (eds)  
Academic Press, London, 1987. xvi + 314 pp.  
Illustrated, hard cover, \$59.00. ISBN 0-12-715004-8.

This is the fourth volume in the series *Cell Culture and Somatic Cell Genetics of Plants*; entitled *Cell Culture in Phytochemistry*. Two important events form the base for this volume, and the next: volume 5, entitled *Phytochemistry in Cell Culture*. These events are the realization of industrial plant cell culture for the production of phytochemicals, and a molecular biological approach to understanding the regulation of product synthesis.

The new volume is divided into three parts, part I is the Introduction. Part II (Accumulation of phytochemicals) contains the following chapters: Physiology of the accumulation of secondary metabolites with special reference to alkaloids; The compartmentation of secondary metabolites in plant cell cultures; Regulation of synthesis of phenolics and cell growth and accumulation of secondary metabolites. Part III (Special techniques) contains a wide variety of laboratory techniques such as cell cloning, selection of mutants, elicitation, immobilization, cryopreservation, plant regeneration, two-phase cultures, continuous culture and the use of immunoassays in the detection of plant cell products.

Some overlap occurs between the chapters, but all are written in a very clear and comprehensive way by leading scientists in the field of interest. Sometimes, (apparent) contradictory remarks are made in the different chapters, for instance about the influence of cytodifferentiation on the production of secondary metabolites.

The editors obviously intended to present a complete overview, since a topic such as cryopreservation, for instance, is treated both in volume 1 (2 chapters), volume 2 and volume 4, and also plant cell immobilization is examined in volumes 1 and 4, with little variety in the contents.

Without too much depth, a good overview is presented of the current 'state of the art', with relevant up-to-date references. For example, the chapter 'Elicitation: methodology and aspects of application' gives a very extensive review of the elicitors used, the methods, the specific problems, etc.

As can be seen from the contents, this volume contains both biological and technological chapters. The reviewer's impression from these chapters is that these two groups of scientists can and will co-operate in a

mutually beneficial way to achieve their common goal: the production of commercially interesting products with plant cell cultures.

This book can be recommended as a good overview of the topics mentioned and as a starting point for understanding new techniques, both for researchers in the field and for students interested in this area of science.

R.M. BUITELLAR

### **Progress in Plant Protoplast Research**

K.J. Puite, J.J.M. Dons, H.J. Huizing, A.J. Kool, M. Koornneef and F. A. Krens (eds)  
Kluwer, Dordrecht, 1988. xvii + 414 pp. Illustrated, hard cover, Dfl 180.00. ISBN 90-247-3688-9.

The history of protoplast research can clearly be followed in the proceedings of the successive International Protoplast Symposia, that were held at Jena (GDR) in 1963, Brno (Czechoslovakia) in 1967, Salamanca (Spain) in 1971, Nottingham (UK) in 1975, Szeged (Hungary) in 1979, Basel (Switzerland) in 1983 and recently, December 1987, in Wageningen (The Netherlands).

In 1960, the first publication appeared on the mass isolation of plant protoplasts using cell wall degrading enzymes. In the early seventies, due to increasing application of suitable culture media, plant regeneration from protoplasts was achieved. It then took only a few years to obtain the first regenerated hybrid plants from fused protoplasts. Genetic manipulation using somatic cells became a real possibility. Although these earlier successful results were obtained with representatives of the *Solanaceae* family and with *Daucus carota*, the protoplast system became more and more important in botany and agricultural sciences. Currently, protoplasts of more than 200 species can be regenerated into plants. These include several monocotyledonous and woody species that lost their recalcitrance when isolated from appropriate donor tissue, and cultured in suitable media. In addition, a wide array of genetic manipulation techniques have been developed using protoplasts, or are under development.

The present book gives the proceedings of the Symposium held in Wageningen, 1987. It contains nearly 150 contributions from lecture or poster presentations, thus giving a representative picture of the protoplast research with special reference to its application in plant breeding. The main attention has focused on the isolation, culture and morphogenesis of protoplasts, on the possibility for genetic

manipulation via somatic hybridization, cybridization, organelle transfer, partial genome transfer and direct gene transfer, and on the many new techniques involved in these genetic manipulations, e.g. microculture, micro-injection, electrofusion, microcellfusion, flowcytometric and biochemical selection procedures and electroporation. Attention is also given to some agronomically important characteristics that can be handled via protoplast manipulation, e.g. cytoplasmic male sterility, herbicide resistance and pathogen resistance. In addition, a few contributions deal with physiological and fundamental aspects.

The book is not so easily accessible as a reference source, however, because it suffers from two shortcomings: (1) the table of contents only gives the full titles and authors' names of the lecture and poster presentations, but does not classify them into distinct topics of protoplast research, as indicated on the back cover of the book; (2) the book lacks a subject index; it only contains an index of organisms, and an index of authors.

Nevertheless, the present book is an indispensable source of information and inspiration for all scientists and plant breeders working in the field of protoplast research.

L.J.W. GILISSEN

### Flowers from St Martin

H.E. Coomans and M. Coomans-Eustatia.  
De Walburg Pers, Zutphen, The Netherlands, 1988.  
160 pp. Illustrated, hard cover, Dfl35.00.  
ISBN 90-6011-587-2.

The book presents 50 watercolours of flowering plants by the Dutch physician H.E. van Rijgersma (1835–1877), who lived for 14 years on the island of St Martin. The main part of the book is preceded by the following chapters: a biography of Hendrik Elingsz. van Rijgersma; an overview of Van Rijgersma's place in the zoological and historical literature; a brief exposition of the history of botany on The Netherlands Antilles; a description of the vegetation of St Martin; and the history of the discovery of Van Rijgersma's manuscript of the *Flora of St Martin* in the United States of America.

The beautiful plates of the present work are printed in four colours, from colour slides, which were made by the first author in 1964 from the original watercolours; the original sketchbooks have since been lost. The few pencil-drawings that were too vague to be suitable for reproduction have been redrawn.

As the sequence of plants in Van Rijgersma's sketchbook is not according to botanical classification, the authors have provided a list of all printed species in their families in the correct systematical arrangement.

This attractive book is a homage to Van Rijgersma and is of importance to the cultural and scientific history of The Netherlands Antilles.

A.M.C. EMONS

### The Euphorbiales. Chemistry, taxonomy and economic botany

S.L. Jury, T. Reynolds, D.F. Cutler and F.J. Evans (eds)

Academic Press, London, 1987. (Reprinted from the *Botanical Journal of the Linnean Society*, 94: (1 & 2), 1987). 326 pp. Illustrated, paperback, \$25.00. ISBN 0-12-393480-4.

In the last two decades, symposium publications on the chemotaxonomy of the Leguminosae, Umbelliferae, Cruciferae, Solanaceae, Compositae and Rutales have been published. In this symposium volume about the Euphorbiales, from the Phytochemical and Linnean Societies, the interaction between chemistry and taxonomy is only present in a chapter on the chemotaxonomy of the latex triterpenoids from populations of North American and European euphorbias.

This book is to be considered as a series of essays, which exceed in length and detail the lectures presented at the symposium in April 1986. The taxonomy of the Euphorbiales, the segregate families from the Euphorbiaceae and the succulent Euphorbia species from eastern tropical Africa, are discussed at length in the first three chapters. Other papers describe the wood anatomy, pollen morphology, and the laticifers from the Euphorbiaceae. The use of several Euphorbiaceae in primitive and advanced societies is reviewed by Richard Schultes and the possibility of using euphorbs as a source of fuel oil by modern society is discussed by Melvin Calvin. Almost one-third of this volume is devoted to latex constituents in euphorbs. New aspects of the biosynthesis of rubber, the major component in the latex from *Hevea brasiliensis*, are presented by B.L. Archer and B.G. Audley. The diterpenoids occur in many Euphorbias as minor constituents but their tumour-promoting properties have attracted much attention. Only nine pages are devoted to the biosynthesis of these irritant compounds, but no less than five chapters review several aspects of the molecular mechanism of tumour-promotion in animal cells. A botanist may be more interested in the miscellaneous chemical constituents (and their biological properties) from the economic plants of the Euphorbiaceae listed in the final chapter.

This volume provides a wide variety of high quality papers containing a solid body of data on the chemistry, taxonomy and economic botany of the Euphorbiales. Only the often controversial discussions which accompanied the majority of papers in

London have not been included. This relatively inexpensive book is well illustrated and a valuable investment for those who are interested in the Euphorbiales.

H.W. GROENEVELD

### Oxford Surveys of Plant Molecular and Cell Biology

B.J. Mifflin (ed.)

Vol. 3. Oxford University Press (in co-operation with the ISPMB), Oxford, 1986. 477 pp. Illustrated, soft cover, £86.00. ISBN 0-19-854202X.

The series *Oxford Surveys of Plant Molecular and Cell Biology* started in 1984 and is published in co-operation with the International Society for Plant Molecular Biology (ISPMB). The volumes, which are edited once a year, contain 10–12 review articles on current developments in molecular genetics, biochemical and cell genetics, cell biology, and interactions between plants and micro-organisms. The volumes also include a section devoted to news and views on certain areas of research that have been prominent during the preceding 12 months.

The reviews in this present volume deal with the following subjects: legume storage proteins and their genes (Casey *et al.*), plant organelle genetics through somatic hybridization (Pelletier), embryo-lethal mutants and seed development (Meinke), herbicide resistance and its genetic manipulation (Comai & Stalker), RFLPs in plant genetic improvement (Beckmann & Solter), structure and control of expression of rRNA genes (Flavell), N<sub>2</sub>-fixation and O<sub>2</sub> in legume root nodules (Witty *et al.*), plant phytochrome (Jordan *et al.*), the molecular biology of fruit ripening (Grierson), and heat shock response (Nagao *et al.*). The section of 'news and views' concentrates on nodulation genes (Rossen *et al.*), the molecular genetics of bacterial plant pathogens (Daniels), the molecular mechanisms of somatic embryogenesis (Nomura & Komamine), and abscisic acid-regulated gene expression during angiosperm embryo development (Quatrano). All the review papers conclude with an extended and up-to-date reference list. Unfortunately in the reference lists of the 'news and views' papers, the titles are omitted.

Some minor criticisms concern the usefulness of forthcoming volumes which might increase if a list of titles and names of the authors of the review papers concerning the previous volumes was provided. The layout of the first page (contents) of each review needs improvement, e.g. typography, and an indication of the page number.

Nevertheless, the contents of the reviews are of high quality and written by authors who are well-known specialists in their fields of research (and for that reason were invited to write the review). The volumes

in general, and the present volume of the series in particular, are recommended to all scientists who need a clear and thoroughly written survey of a certain specific research area within the field of plant molecular and cellular biology.

L.J.W. GILISSEN

### Handbuch der Pflanzenanatomie

K. Napp-Zinn

Band VIII, Teil 2B: Anatomie des Blattes II.

Blattanatomie der Angiospermen B. Experimentelle und ökologische Anatomie des Angiospermenblattes.

2. Lieferung. Gebrüder Borntraeger, Berlin-Stuttgart, 1988. xii + 910 pp. 118 figures, soft cover, DM344.00. ISBN 3-443-14015-7.

The second volume of Napp-Zinn's *Experimental and Ecological Anatomy of the Angiosperm Leaf* does not only provide a meticulous review of the vast literature on genotypic and internal factors that affect leaf structure, it also gives easy access to all the information on environmental effects on leaf anatomy, described in the first volume published 3 years ago, through a 380 page section containing the bibliography and indexes to both volumes.

In his foreword the author returns to his three-pronged attack: (i) against the scientific arrogance of those who do not attempt to consult the older literature in their field; (ii) against cuts in the budgets of scientific libraries and; (iii) against linguistic ignorance, which attracted so much attention in reviews of the first volume. Significantly, these two pages are now in English.

The genetic basis of leaf structure is discussed with reference to infraspecific leaf anatomical variation (subspecies, varieties, ecotypes, provenances, female and male individuals, mutants, cultivated forms), sexual and somatic hybrids, chimeras, and ploidy levels. The relationship between the 'internal conditions' and leaf structure is reviewed under headings such as: injury and infections, the molecular basis of gene function (with sections on plant hormones, nucleic acids and proteins, and primary metabolites), and regeneration and propagation in relation to leaf anatomy. Each of the numerous sub-chapters starts with an account of the earliest studies and ideas on the subject, and a review of the effects of certain factors in individual leaf anatomical structures is often followed by a systematic survey of plant groups for which literature data are available. Emphasis is placed on results obtained with cultivated plants more than in the previous volume. For any academic botanist, as well as for agriculturists and horticulturists, the tremendous potential of leaf anatomical studies to solve practical problems (e.g. in selecting superior cultivars with respect to resistance or yield), brought to light by Dr Napp-Zinn, will be an eye-opener.

The last chapter of the book, entitled 'perspectives', gives an insight into the author's personal views after surveying such a multitude of leaf anatomical data. Using the examples of important research themes of the last century (leaf size and structure in relation to cell size and number; channelled morphogenetic reactions to a multitude of external and internal factors; physiological leaf anatomy), the author demonstrates how limited our possibilities are of providing generally valid hypotheses on the basis of our present knowledge. All the processes involved and the factors affecting them are so complex, and each genotype is so unique that generalizations would soon lead to oversimplification. In a way this answers my lighthearted wish for more 'synthesis' in the review of volume 1 (*Acta Bot. Neerl.* 35: 58–59).

Although extremely well written, the reading of this book is not easy because by its very nature it is a comprehensive, compact, and thorough compilation of the immense literature covering well over a century of multidisciplinary research. The value of the book is thus mainly as a truly encyclopedic source of reference, and for that matter, the 220 pages of literature references and 160 pages of indexes to authors, plant names and subjects are crucial. It should be inconceivable that any contemporary student of ecological or experimental leaf anatomy will embark on a new research project without first resorting to Napp-Zinn's books, and finding out which results have been achieved and where to find more detailed information.

Not only the present volume, but five contributions on leaf anatomy of Gymnosperms and Angiosperms in the Handbuch series, covering altogether 3224 pages, published between 1966 and 1988, have now been offered to the scientific community by Dr Napp-Zinn. We owe a great debt of gratitude to him for providing easy access to so much valuable information. All the volumes are indispensable in any botanical, agricultural or horticultural library of scientific standing.

P. BAAS

### Découvrir et reconnaître les galles

E. Westphal, R. Bronner and P. Michler  
Delachaux & Niestlé S.A., Lausanne, 1987. 96 pp.  
Illustrated, soft cover, FS25.00. ISBN 2-603-00610-X.

Plant galls are peculiar, being interesting plant malformations with a highly typical shape that depend on both the plant and the vector species.

This present book gives a selection of a 100 odd but more common examples of the several thousand known galls, often with colourful photographs. Though some pictures seem to be taken with a daylight emulsion in tungsten light, this does not reduce their practical value. The descriptions may stimulate

further study. They are lively, with details on physiology, use and other aspects. The plastic cover of my copy was of poor quality and therefore not much use as a field guide. The book will be appreciated mainly as a primary introduction to the strange world of plant galls. The English *Pocket Encyclopedia of Plant Galls*, by A. Darlington (Blandford Press, 1968), describes far more species, but in less detail. The Dutch *Gallenboek*, by W.M. Doctors van Leeuwen (Thieme & Cie, Zutphen, third impression, 1982), gives many details on species determination for over 1000 plant galls. Compared with these two books, the present one gives more illustrations, but for a higher price.

H.H. VAN GENDEREN

### Theory and Models in Vegetation Science. Proceedings of a Symposium, Uppsala, July 8–13, 1985

I.C. Prentice and E. van der Maarel (eds)  
Junk Publishers, Dordrecht, 1987. (Reprinted from *Vegetatio*, 69). 223 pp. Illustrated, Dfl250.00,  
US\$122.50, UK£85.75. ISBN 90-6193-646-2.

The book contains 22 contributions presented at a symposium of the Working Group for Data Processing of the International Association for Vegetation Science. The aim of the symposium, and thus of the book, is a collection of mathematical and conceptual models concerning vegetation dynamics, both in time and space, as well as those aspects of population dynamics that are relevant to vegetation science.

It is impossible to discuss each chapter, therefore a selection is presented. Noy-Meir and van der Maarel highlight the relations between community theory and community analysis from a historical viewpoint and create the framework. As a general conclusion, it is obvious that the complex nature of the interactions between individuals at the intra- and interspecific level, and the impact of abiotic and biotic factors on the real population and vegetation is not covered by those models, which assume a spatially uniform habitat (e.g. S. Ellner's model describing the population dynamics of annual plant species). Such an assumption is in direct conflict with the statement made by D.W. Roberts, that current vegetation theory neglects the effects of vegetation on the environment, and with the model presented by R.J. Hobbs and V.J. Hobbs, which demonstrates that soil disturbance by gophers affects both short-term spatial patterning and long-term species composition.

For those with a real interest in vegetation science and the population biology of plants, the contrast of the various papers may be very stimulating, if they bear in mind that a population is a genotype assemblage which cannot be reduced to one genotype, as implicitly in all models of all kinds.

W.H.O. ERNST

**Botanisch Basisregister**

Centraal Bureau voor de Statistiek  
 Centraal Bureau voor de Statistiek, afdeling  
 Natuurlijk Milieu, Voorburg/Heerlen, 1987. 121 pp.  
 Dfl26.00. ISBN 90-6786-083-2.

This *Botanisch Basisregister* supplies automatic, encoded information on Dutch seedplants and ferns. (Dutch means found in the open air in The Netherlands, in situations other than those cultivated. For instance, such plants as *Ailanthus altissima*, *Pontederia cordata* and *Solanum tuberosum* are included.) The information covers a large range of qualities and concerns: taxonomy and systematics, the origin and frequency of occurrence in The Netherlands, position and size of the whole distribution area, duration and form of life, height, flower colour, seasonal variation in leaf presence, rough anatomical structure in relation to water management and gas exchange, sex distribution and flowering time. Data are also given for the associated vegetation types, for soil water, light, temperature, pH and nitrogen preference, and for tolerance to salt and heavy metals.

I would first like to state that this work is a good initiative that may develop usefully with time. However, I have a number of objections to the design. Ellenberg's work, from which many data are derived, is based on observations of Central-European populations that differ from the corresponding Dutch populations. For example, *Origanum vulgare* is recorded as indifferent with regard to temperature, while the Dutch populations behave as thermophiles. In the future, therefore, data should as much as possible be based on observations from, and experiments with, Dutch populations. Moreover it seems unwise, to me, to accumulate groups of data that overlap considerably, e.g. syntaxonomical beside ecological groups, and preference for groundwater level beside that for soil moisture.

I would also like to mention the following minor points. Distribution areas should have been defined in an *absolute* and not in a relative sense. *Taraxacum* should have been split up, at least into ecologically different groups. Symbols should have been used once only, and not as 'X' for 'unknown', 'indifferent' and 'avoiding'. Phosphate tolerance should be added in a forthcoming issue and heavy metals should be divided into copper, zinc, cadmium, etc.

It is not clear to me who will use this *Basisregister*. If it is designed as a computerized flora it is highly advisable to have it on a par with the *Flora Europaea Databasis*. If it is also partly intended for the modern technocrat, my advice is to examine a book like the *Oecologische Flora*, which is currently produced by Weeda and the Westra family.

J.H. IETSWAART

**Opportunities for Phytochemistry in Plant Biotechnology. Recent Advances in Phytochemistry, Vol. 22**

E.E. Conn (ed.)  
 Plenum Press, New York and London, 1988.  
 xii + 201 pp. Illustrated, hard cover, \$49.50. ISBN  
 0-306-42935-5.

The nine chapters of this book represent an arbitrary choice. It is not obvious why, for example, a chapter on 'Molecular approaches to understanding cellular recognition in plants' (Bacic & Clarke) and on 'Oligosaccharide signalling for proteinase genes in plant leaves' (Ryan)—undoubtedly very interesting subjects—are included, but not one on recent developments in the field of tissue and cell culture. There is, however, a chapter on 'Somaclonal variation and its genetic basis', which amply discusses its use as a breeding tool.

A chapter on 'Genetic manipulation of the fatty acid composition of plant lipids' (Somerville & Browse) pays much attention to unsaturated fatty acids in membrane and seed storage lipids, and deals particularly with experiments with *Arabidopsis thaliana* mutants. But the author's opinion that the physiological role of lipid unsaturation in plant cells suggests a protective function against free radical production as by-products of photosynthesis seems, to me, too much a chloroplast-based view.

Other valuable chapters are those of Kent Peters & Long on 'The role of plant compounds in the regulation of *Rhizobium* nodulation genes', and especially a very concise one on 'Initial interactions between plant cells and *Agrobacterium tumefaciens* in crown-gall tumour formation' (Cangelose & Nester).

An interesting subject concerns 'Studies on the 5-enolpyruvylshikimate-3-phosphate synthetase genes of higher plants and engineering of glyphosate resistance' written by nine plant molecular biologists of the Monsanto Company (USA). This work is an example of research that aims to promote the use of herbicides in agriculture. Glyphosate (Roundup®) in the hands of irresponsible people may rapidly devastate large areas of natural vegetation, without killing genetically manipulated crops. That is why I cannot hail the described work and I wonder whether agriculture, with its over-production problems, needs glyphosate-tolerant crops.

The volume ends with a perspective of Leone Dure about the role of phytochemistry in the future of plant biotechnology. Fortunately, this author rejects the old myth of scarcity of food. He states that world hunger cannot be the critical driving force behind recombinant DNA work in plants. 'Were (the at present already existing) farming practices universally efficient, over 10 billion souls could be sustained on our earth'.

Unfortunately, the present volume does not stress the potential importance of phytochemistry for biotechnological production of pharmaceutically important plant products. In my view it is in this field in particular that research should be promoted.

As in the other volumes of this series, the present one is well produced. It is clearly written but, unfortunately, the references are not alphabetically arranged. This book can be recommended for those who work and teach in the field of phytochemistry/chemical botany.

J. VAN DIE

### **Advances in Botanical Research, Vol. 14**

J.A. Callow (ed.)

Academic Press, London, 1987. xi + 198 pp.

Illustrated, hard cover, £28.00. ISBN 0-12-005914-2.

This volume contains extensive contributions by: R.J. Ellis & C. Robinson on 'Protein Targeting', J.C. Gray on 'Control of Isoprenoid Biosynthesis in Higher Plants', and M. Ginzburg on 'Dunaliella: A Green Alga Adapted to Salt'.

Ellis & Robinson discuss (pp. 1-24) the basic principles of protein targeting, mostly derived from research on animal and prokaryotic organisms. However, research points to the universality of its mechanism, and thus to the applicability of experimental approaches to the study of plant cells. The

principles of protein targeting are reviewed with respect to three organelles of the eukaryotic (plant) cell: the nucleus, the mitochondrion and the chloroplast, and opportunities for genetic engineering are discussed.

The review presented by J.C. Gray (pp. 25-91) concerns the rapidly expanding field of isoprenoid metabolism in plants. Not only are the isoprenoids the largest natural group of plant metabolites but their functions are very diverse and include protection and defence, light harvesting, light perception, electron transport, structural components of membranes, intermediates in polysaccharide synthesis, growth factors and hormones. The author stresses the control of biosynthetic processes, in particular the role of enzymes and compartmentation.

Ginzburg (pp. 95-183) reviews the extensive literature (about 250 references) on *Dunaliella*, a small algal flagellate, growing profusely in salt marshes such as the Dead Sea, the Great Salt Lake, and salt evaporating ponds in (sub)tropical regions. Growth conditions, cell anatomy, cell composition, enzymes, photosynthesis, and the regulation of cell volume are examined. The book is a welcome addition to a series of thoroughly edited and printed volumes and deserves a place on the bookshelves of libraries of universities and other laboratories that are active in molecular and ecological research.

J. VAN DIE