

Book Reviews

Gene Manipulation in Plant Improvement II. 19th Stadler Symposium

J.P. Gustafson (ed.).

Plenum Press, New York NY. 1990. ix + 437 pp.

Illustrated, hardcover. US\$89.50. ISBN 0-306-43595-0.

This book comprises a series of contributions to the 19th Stadler Genetics Symposium, which was held in March 1989 at the University of Missouri, Columbia, Missouri, USA. The 22 chapters written by renowned scientists cover a vast area in the field of plant breeding from economic models of grain production to genetic modification by particle bombardment.

Although the main theme of this book is genetic improvement of crop species in general, practically all papers deal or refer to examples with arable crops, particularly the cereals. Nevertheless, the broad framework of topics, from conventional plant breeding to biotechnology, provides a clear overview of the problems and strategies of up-to-date gene manipulation in plant improvement. The diversity of the topics shows that the editor has succeeded in his aim to illustrate these issues from different points of view. Although the conference was held 3 years ago, the items are still valid. All chapters are lucidly written and very accessible. Furthermore, the variation in form of the chapters, from reviews, and articles to laboratory protocols coupled with index at the end renders this book attractive to read.

The first three chapters evaluate the impact of variety development on crop production. Genetic improvement not only significantly increased grain yield, but also effected a decrease in wheat production in western Canada, due to a switch to the production of higher-valued crops by the farmers. In Chapter 3, the author replies with arguments from the practice against some myths concerning the plant breeders' responsibility regarding the world's food supply, genetic manipulation and genetic vulnerability of monocultures. In Chapter 4, the use of marker systems and strategies for targeting genes with economically important traits is discussed. Intraspecific sexual hybridization (Chapters 5 and 6) and induced mutation (Chapter 7) are held to be valuable techniques to analyse and/or extend the genetic basis of crop species but it is concluded that they may become even more important in combination with cell biological techniques (in-vitro fertilization and double haploid mutants from mutated microspores). In this framework, a chapter on somatic hybridization would certainly not have been out of place.

Chapters 8 to 16 deal with cell and molecular biological techniques with regard to the genetic improvement in crop species. The main topics in this section are

transformation, regeneration and haploid production. Recalcitrance with respect to regeneration or transformation is discussed mainly with regard to cereal crops. It is noted that monocotyledons cannot be transformed by the *Agrobacterium tumefaciens* system, whilst the major problem in direct gene transfer is regeneration from protoplasts. For these problems rice may be considered as a model system (Chapters 8 and 13). One of the most promising techniques for the introduction of foreign DNA into cereal cells is, perhaps, particle bombardment, which is described by Klein *et al.* in Chapter 14. The authors also pay attention to the issue of variation of transgene expression.

One of the most important traits in plant breeding is disease resistance. This item is briefly mentioned in Chapter 12 with regard to insect resistance. However, in Chapters 15, 16 and 17, non-conventional strategies of resistance to viruses are broadly discussed, for instance the use of viral protein-coding sequences (e.g. coat protein) and non-protein-coding sequences (satellite sequences and ribozymes).

It is reported that RFLP mapping has become an important tool for mapping genomes of crop species (Chapters 18 and 19). The integration of a conventional, a physical and a molecular map of the genome into one comprehensive and integrative map is being developed in maize using interval and deletion mapping.

In the final three chapters, gene regulation studies are evaluated within the framework of plant breeding. Chapter 20 discusses the use and possibilities of the GUS system not only as a destructive tool, but also as a non-destructive technique to study gene expression. Moreover, the author proposes to use the GUS system in fusion genetics to target specific compounds, like plant growth regulators, as glucuronide conjugates into GUS-active cells. In Chapter 21 auxine-responsive mRNAs and the genes that have been identified are described. The final chapter gives a summary of findings on the molecular basis of differential expression of ribosomal RNA genes. In conclusion, this book presents a valuable collection of papers on gene manipulation in modern plant improvement and is recommended to all persons who are working in this field or are interested in specific areas within this field.

P.F. FRANSZ

Seaweed Resources in Europe. Uses and Potential

M.D. Guiry and G. Blunden (eds.)

John Wiley and Sons, Chichester. 1991. xi + 432 pp.

Illustrated, hardcover. £65.00. ISBN 0-471-92947-6.

This book, produced on the initiative of the Cost Action Programme 48, a subprogramme of the EC

BRIDGE (biotechnology) programme, brings together different aspects of seaweed utilization in Europe. In view of their industrial importance, the seaweed polysaccharides are given prominent coverage. Not only is their application in biotechnology and their use in food and pharmaceutical preparations treated, but also the molecular structure and physical behaviour of seaweed colloids.

The book also contains a geographical and taxonomic guide to European seaweeds of economic importance. Here, the coverage of Macaronesia, which is largely at least politically still in Europe, is somewhat outdated. The 'Zeewierengids' as discussed by Coppejans *et al.* is cited only for Belgium and there are many spelling mistakes. Other interesting chapters are on animal and human nutrition, agricultural uses, seaweed harvesting and seaweed cultivation.

The final chapter on conclusions and outlooks starts with the following sentences: 'So what is the future for European species of marine algae as sources of economic products? This is difficult to answer.' Even after a careful study of the topic that conclusion remains. It is clear that it is necessary that the EC continues to assist the exploration of the natural resources of marine macroalgae in Europe. Not only in launching research programmes, but also in establishing optimal EC regulations to make exploration of these natural resources commercially viable.

'Seaweed resources in Europe' provides a fascinating insight into this field of research and (potential) utilization and is of special value to biologists, chemists, coastal authorities and government agencies, particularly those with an interest in natural products and the (marine) environment.

W.F. PRUD'HOMME VAN REINE

Horticulture—New Technologies and Applications

J. Prakash and R.L.M. Pierik (eds). Kluwer Academic Publishers, Dordrecht. 415 pp. Illustrated, hard cover. ISBN 0-7923-1279-1.

One of the largest horticultural enterprises in India, Indo-American Hybrid Seeds, celebrated its 12th anniversary in 1990 with an entitled 'New Frontiers in Horticulture'. The seminar covered all areas of horticulture ranging from production technology and landscaping to biotechnology. Accordingly, the symposium proceedings contain review papers (often of high standard) and specialist papers (mostly of low standard) in all these areas.

My major criticism of this book concerns its general layout. A combination of reviews and specialist papers is only useful when a limited area is covered. A volume containing the general papers only would have given an adequate introduction to new advances in horticulture. The printing quality of some papers is extremely poor.

As there are no author, plant or subject indexes, it is difficult to consult this book.

G.J. DE KLERK

Biotechnology—Current Progress

P.N. Cheremisinoff and L.M. Ferrante (eds). Technomic Publ. Co., Lancaster, PA and Basel. 1991. ix + 357 pp. Illustrated, hardcover. Sfr. 150.00. ISBN 0-87762-766-2.

The preface states that this book is the outgrowth of three earlier books published by Technomic Publishing. This may be so but it does little to clarify the concept on which the current book is based. Moreover, it appears that this book is supposed to grow into a series, but it is not clear where the series is heading. This first volume presents an odd collection of articles on very different topics and at very different levels, some of them with little relevance to what is generally regarded the domain of biotechnology. For instance, one would not expect in a book like this articles on the cytoskeleton and intracellular movement in plant cells (Anne Mie C. Emons *et al.*) or on the structural analysis of chloroplast DNA (Masahiro Sugiura), informative as they may be. Furthermore, the book contains some very elementary article such as, Biotechnology and Genetics: Concepts and Applications, Genetic Engineering in Yeast: Methods and Applications and Plant Cell Development and Secondary Metabolites next to very technical articles such as the chapter on biosensors (Isao Karube & K. Yokohama). Nevertheless, some articles are of interest to biotechnologists such as a lucid presentation of genetic engineering of industrial yeasts (Merja Penttilä & Tor-Magnus Enari). The book also features a few articles written by East European researchers which makes for interesting viewpoints absent from the Western literature. However, on the whole I cannot see this book (or series) as an important addition to the biotechnological literature.

J.G.H. WESSELS

Oxford Surveys of Plant Molecular and Cell Biology. Vol 7

B.J. Mifflin (ed.). Oxford University Press, Oxford. 1991. 334 pp. Illustrated, paperback. £25.00. ISBN 0-19-857750-8.

This volume comprises eight authoritative reviews of important advances in the field of cell or molecular biology of plants. In each article not only the current state of art of the subject but also specific data and the items that need further investigation are presented. At the end of each article, a detailed list of references is given.

A. Karp discusses somaclonal variation with particular emphasis on the causes and origins, molecular mechanisms, specific features and implications of

somaclonal variation in genetic manipulation. Price discusses the molecular biology of starch synthesis and its regulation, giving details on the localization and properties of starch biosynthetic enzymes as well as on the identification and isolation of important genes, i.e. the waxy and ADP glucose pyrophosphorylase genes. The chapter by R.E. Slater and J.C. Gray is concerned with the chromatin structure of plant genes, especially the structural changes that may be correlated with changes in gene activity. B.K. Singh *et al.* review the importance of the shikimate pathway, which is present only in plants and micro-organisms. The lack of shikimate pathway in mammals has made the enzymes of this pathway an ideal target for the development of herbicides. Numerous compounds are derived from the shikimate pathway (chromagens, phytoalexins, cyanogens, auxins, lignins, folic acid, etc). The article by S. Hake and N. Sinha covers the analysis of leaf development, using the traditional techniques of histology and morphology as well as genetics (mutations, segregations) and molecular biology (protein and RNA localization, gene isolation and expression). The possible mechanisms that lead to variation in leaf development and an impressive list of various leaf mutants in maize, pea and tomato have been presented and discussed. G.J. Goodall *et al.* review some of the recent cellular and molecular studies on the expression of pathogenesis-related proteins, encoded by large multigenic families and reported in many monocot and dicot plant species. Y. Eyal and R. Fluor focus on the splicing of nuclear precursors of messenger and transfer RNAs and on the synthesis and structure of the U small nuclear RNAs which participate in various RNA processing events in the nucleus. Finally, L.E. Marsh *et al.* describe the replication strategies and evolution of (+) strand RNA viruses that are responsible for the majority of viral infections of animals and almost all viral infection of plants.

The subdivisions and the texts of the articles are clear and consistent throughout the book. Also the figures, tables and diagrams are well documented and informative.

This paperback edition is very reasonably priced. It is comprehensive and a useful updated source book for students and scientists who wish to extend their knowledge on cellular and molecular biology of plants.

K.S. RAMULU

Lehrbuch der Botanik für Hochschulen. 33., neu bearbeitete Auflage

P. Sitte, H. Ziegler, F. Ehrendorfer and A. Bresinsky. Gustav Fischer, Stuttgart, 1991. xviii + 1030 pp. Illustrated, hardcover. DM118.00., ISBN 3-437-20447-5.

The 'Strasburger Lehrbuch der Botanik', written in German, is a textbook covering Botany in the broad

sense, with morphology, anatomy and systematics of lower and higher plants discussed next to plant physiology, geography and evolution and some topics from cell biology and genetics. Within this broad coverage, the four authors manage to present the general concepts and to illustrate them with many detailed and interesting examples.

The text is well-written in a very concise style, which may hamper full understanding at the first reading. Throughout the text, technical terms are followed by cross-references for more detailed explanations. This reduces the need to consult the register, and—so the authors hope—may also encourage readers to continue to read on a particular subject; at first, however, one has to get used to the interruptions.

Between text, tables, diagrams, and photographs there is a functional separation. The text gives the general information and the relation to other topics, while the tables and the (usually very clear) diagrams give the detailed information and sometimes illustrate the variability in nature. The photographs mainly serve for illustration of all the different manifestations of plant tissues and organs. Photographs have been introduced only in the latest editions of this textbook and are still increasing in number; they make the book pleasant to read, and add an aspect of realism (what it really looks like) to the visual information (how it is constructed) in the diagrams.

It might be impossible (for the four authors) to treat all the topics in such a diverse book to the same quality. It is certainly impossible (for this reviewer) to evaluate all topics adequately. Therefore, I will make only some remarks. The section on anatomy is very clear. For example, the explanation on the different arrangements of tissues in vascular bundles, which takes up only two pages, mainly diagrams, is to be admired. However, even though the anatomy–systematics–physiology combination has been present in this book from its first edition (1894), I would not use this book in a physiology course. For an example from hormone physiology, the discovery, biochemistry, transport and general effects of auxins are discussed in only four pages. For information on auxins in relation to cell elongation or apical dominance, the reader is referred to other sections, where the topic is discussed in general. No mention is made of the (search for) auxin receptors, and the concept of polar auxin transport involving apoplasmic movement between cells is seen as problematic. The list of further reading for the physiology section contains only one reference later than 1987, and includes reviews on hormone binding from 1976 and on cell walls from 1975. This is too out-dated for a book published in January 1991.

In conclusion, this book can be recommended to students taking introductory courses on botany, plant anatomy or systematics. The photographs and diagrams make it suitable for use during practical courses. With more than 1000 pages, the book is

certainly not too expensive for the amount of information it contains.

M.J.M. SMULDERS

Plant Tissue Culture Manual

K. Lindsey (ed.).

Kluwer Academic Publishers, Dordrecht. 1991.

Loose leaf binder. Dfl.135; US\$76.50; £45.50.

ISBN 0-7932-1115-9.

In the 50-year history of plant tissue-culture a large number of techniques have emerged. The aim of the book under review is to present a broad range of these techniques in a form which is readily accessible to those with little previous experience. The book contains 26 chapters grouped, quite arbitrarily, in four sections and is published in a plastic-covered, ring-bound format. Most chapters include a detailed step-by-step protocol.

The chapters deal with either general experimental approaches for some basic techniques or detailed protocols for specific species. Every experienced tissue-culture researcher will note many omissions. Some very basic shortcomings in Chapter 1 on media preparation may serve as an example. As all tissue culture starts with preparation of the medium and as many people are uncertain about the correct procedures, this chapter should have presented a detailed overview. It is, however, very short and barely mentions the many possible pitfalls. For instance, the author only briefly discusses agar. It is well known that both the brand of agar and the lot may determine the success of the culture *in vitro*. Furthermore, agar usually contains very high levels of macro- and microelements and sometimes contributes more to their final concentration than the dose added according to the protocol. Agar also contains high levels of unidentified organic compounds and might adsorb components of the medium. Another omission is a thorough discussion of the stability of plant hormones during autoclaving and in the medium or the tissue during the culture. The large differences in the rates of uptake of auxins and cytokinins are not mentioned.

Other chapters cover the initiation and proliferation of callus, cell suspensions, somatic embryos, roots or shoots, and with clonal propagation of orchids, palms and conifers. Thirteen chapters cover transformation techniques. Cytological and RFLP analysis of regenerated plants are treated in three chapters. Various topics are missing or are not adequately covered. The initiation of shoot cultures, for example is treated only with regard to the use of tobacco seeds as the starting material. Regeneration of roots, the final and often crucial step in the micropropagation of most crops, and the elimination of viruses using meristem culture are not covered. In the chapters on breeding techniques, embryo rescue and haploid induction have been omitted.

In spite of these criticisms, this book is valuable because it contains a wealth of accessible information. Moreover, additions will be published in the near future. These should definitely include chapters indicating general trends in this field. For practical use, a non-experienced researcher will appreciate the many step-by-step protocols. However, in cases where these recipes do not work and the protocol has to be changed, it is important to have general guidelines.

G.J. DE KLERK

Flora Malesiana series II—Pteridophyta: Ferns and Fern Allies Volume 2, Part 1: Tectaria Group

R.E. Holtum†

Rijksherbarium/Hortus Botanicus, Leiden. 1991.

pp. 132. Dfl.50. ISBN 0-90-71236-11-0.

The *Tectaria* group of genera is one of many pantropical alliances of ferns that have their major concentrations of genera and, in this case, also species in East and South East Asia. In the present treatment, 11 genera are recognized, grouped around the largest genus by far, *Tectaria*, with no fewer than 105 species in the area. *Ctenitopsis*, *Hemigramma*, and *Quercifilix* are included.

The taxonomic history of the group is briefly discussed; it was raised to family rank after the manuscript was finished but before it was published. Many authors prefer to treat it as a subfamily or a tribe of a more broadly circumscribed family Dryopteridaceae. The key to the genera is very revealing, as it shows that the criteria for distinguishing them concern mostly characters such as structure of the dermal appendages and the leaf architecture, much less than soral characters and sterile-fertile leaf dimorphism that were stressed in the past. Somewhat surprisingly, the prevalence of catadromy and heterodromy in the alliance is not mentioned. Both chromosome base numbers of 40 and 41 are present.

The accounts of the genera are often based on thorough preliminary revisionary work by the same author. For each genus a summary of its taxonomic history is usually given; the information is occasionally somewhat anecdotic. The reviewer considers the distinctness of *Heterogonium* and *Tectariidium* from *Tectaria* to be somewhat debatable.

Most of the species in this group of ferns are large plants with leaves of complicated structure that vary much between proximal and distal parts, yet the descriptions are notably concise and yet complete. The excellent drawings by P.J. Edwards are very important in supplying complementary data. The reviewer found the keys to be very well designed. A surprisingly large number of species, especially from

†Deceased.

the Philippines and New Guinea, are only known from the type collection and it may be assumed that more are still awaiting discovery.

Some workers may criticize the absence of cladistic work underlying the treatment. In the reviewer's opinion this is hardly a drawback, as the results of the application of cladistics in taxonomic pteridology have so far been modest and/or debatable. In view of the large number of synonyms for the species in the present treatment, due to their greatly fluctuating classification, the presence of a name index for this fascicle is very welcome.

It is saddening to realize that the author did not live to see this publication in print, the last in a very long series of important contributions to the taxonomy of the ferns of the Malesian area.

K.U. KRAMER

Computer Assisted Vegetation Analysis

E. Feoli and L. Orlóci (eds).

Kluwer Academic Publishers, Dordrecht. 1991. ix + 498 pp. Hard cover. Dfl.425.00; US\$235.00; £142.00. ISBN 0-7923-1126-4.

Volume 11 in the series 'Handbook of Vegetation Science' treats modern developments in computer-assisted vegetation analysis. The book is divided into two parts. The first part deals with various methods and problems of data analysis, the second part with computer packages for the vegetation sciences. Part 1 is mainly a collection of articles already published or soon to be published in periodicals. Only six of 34 papers are original. Seven of the nine papers in Part 2 are originals.

As always when a book is composed of articles that have previously appeared in various periodicals, it is difficult to maintain a coherent treatment of the subject. The editors have tried to introduce some coherence by categorizing the various articles under eight headings: sampling, databases, characters and character selection, similarity measures, classification, evolution of classifications, ordination analysis of spatial patterns, and computer packages. The handbook is not a general introduction to the subject. Its value lies in the fact that it presents an accurate state-of-the-art picture of data analysis in vegetation science. Recent developments such as the idea that a vegetation is a fuzzy system or the introduction of character sets instead of a traditional taxonomy based on the species concept will certainly find their way into vegetation science. New ideas about sampling and pattern evolution are presented and sometimes illustrated by examples. The second part of the book deals with computer packages for the vegetation sciences. Some of the articles are less lucid than others in describing these and some of the formulas and references presented in the text are not very clear. The book is not

a textbook for beginners but very valuable for researchers in the field and for advanced PhD students.

T.A. WIJMSTRA

Plant Molecular Biology 2

R.G. Herrmann and B.A. Larkins (eds).

Plenum Press, New York. 1991. xii + 766 pp.

Hardcover. ISBN 0-306-44024-5.

Volume 212 of the 'NATO ASI Sciences' series contains the proceedings of the VI NATO Advanced Study Institute on Plant Molecular Biology, held in Elmau, Bavaria, Germany from 14 to 23 May, 1990. It is a massive volume containing 74 papers under the following headings: plant viruses, subviral RNAs and viroids (nine papers) nitrogen fixation, nitrogen metabolism (five papers), phytopathology (five papers), agrobacterium, transformation (five papers) genome analysis, RFLP (five papers), transposons (five papers), mitochondria, chloroplasts, photosynthesis (10 papers), gene expression, photoreceptors (six papers), plant development (five papers), protein transport (five papers), storage proteins (four papers), stress reactions (five papers), and interesting pathways (five papers). The papers summarize the lectures of the invited speakers and the posters, and have been printed from finished copy submitted by the authors. Reproduction of text and figures is very good. The articles vary in depth of treatment and style. The overall quality of the papers is high, and many papers are concise reviews. All have useful lists of full references to papers cited. The emphasis is on results rather than methods, but an infinite variety of technical approaches is mentioned; the relevant protocols are accessible via the references. The book adequately represents the 1990 status of plant molecular biology both in the choice of the topics and the depth of treatment. The voluminous list of authors not only contains many of the traditional leaders in the field but also a refreshing amount of new names. Due to the very extensive coverage and the many short reviews included in the papers, the volume will remain a source of valuable information for years to come, especially for topics outside the narrow speciality area of the reader, and a good handbook for graduate students in plant molecular biology.

K. BACHMANN

Flechten von Nord- und Mitteleuropa. Ein Bestimmungsbuch.

R. Moberg and I. Holmäsén.

Gustav Fischer Verlag, Stuttgart. 1992. 237 pp.

Illustrated, hard cover. DM78.00. ISBN 3-437-20471-8.

This illustrated field guide for lichens is a nearly unchanged translation of the Swedish 'Lavar' (1982)

by the same authors. The photographs in full colour are for the most part good, but the keys (a key to the genera at the end of the book, the other keys in the introduction!) are rather concise.

This is not the lichen flora of western Europe for which we have been waiting. The choice of treated species has not been changed and is thus very Scandinavian, including rare Swedish endemics. Of the 100 most common lichens in The Netherlands (from the 600) only one-third are treated. The original text has been translated nearly literally and gives information on ecology and distribution with emphasis on Scandinavia. However, maps are added which show the approximate distribution in north-west Europe of all 300 species. These maps are rather crude and very inaccurate, showing species for The Netherlands which do not occur here and omitting species which are present.

There are some minor errors which apparently have not been detected in the first version such as upside

down photographs (e.g. *Collema flaccidum* and *Parmelia stygia*) or possibly wrong identification (e.g. *Evernia mesomorpha*), but more are added in this version, especially printing errors in the names in figure legends.

The nomenclature has been left unchanged, and I consider this to be an advantage because at least 20 names of taxa treated have been changed since 1982. There is one notable exception: in the key to the parmelioid species, the modern generic segregates are used. However, in the photograph legends everything is called *Parmelia* without any reference to the eight different generic names in the key. Moreover, some mistakes are introduced with the new generic names in the key that were not corrected in another part of the book.

The book will be especially useful if utilized in combination with other recent floras.

A. APTROOT