
Book reviews

Principles of Crop Improvement, 2nd edn, by N. W. SIMMONDS & J. SMARTT. Oxford: Blackwell Science. £59.50 (hardback). ISBN 0 632 04191 9.

The first edition of this book was written by the well known first author and published in 1979. This second edition is claimed to be an updated and revised version produced largely by the second author. In fact the principal update appears to be an additional chapter on biotechnology written by Drs Millam and Spoor. To me this chapter was rather disappointing as most of it was devoted to a description of transformation technology and its likely potential. The use of molecular markers in QTL analysis and marker-assisted selection is already having an impact on crop improvement. It is likely to be of greater significance than transformation in the short term and is a topic which deserved more attention. About 85% of the 1050 references in the extensive bibliography are pre-1980 and the authors suggest that the subject has not fundamentally changed in the last 20 years. However I feel that throughout the book they have underestimated the effect that computers are having on breeding procedures including the use of genetic resources databases, implementation of multivariate selection (including molecular markers) and new iterative methods for the analysis of trials including genotype \times environment interactions.

The book is said to be aimed at honours degree–early postgraduate students. However I feel they would find it heavy going to read from cover to cover, although there are some useful summaries at the end of each chapter to act as a guide. In fact the book contains sufficient detail for practising plant breeders and agronomists to dip into and broaden their horizons. Grain crops receive most attention with relatively few examples from fruit, vegetable and forage crops. This may be justified in terms of world seed markets but the importance of so-called ‘minor’ crops should not be underestimated in terms of local agriculture. The social context of crop improvement is discussed in the final chapter but political problems arising from the use of ‘third-world’ genetic resources are rather glossed over. I think the diagrams in the book are rather too complex to be useful for the average reader and the black and white boxes don’t really work for me. However despite these reservations the book remains a valuable basic text on what is a very complex subject.

M. O. HUMPHREYS

Oilseed Crops, 2nd edn, by E. A. WEISS, ix + 364 pp. Oxford: Blackwell Science (1999). £89.50 (hardback). ISBN 0 632 05259 7.

‘Oilseed Crops’ is the second edition of a text first published in 1983. Following an assessment of world production and trade in oilseeds, it contains chapters on Castor, Groundnut, Safflower, Sesame, Soybean, Sunflower, Crambe, Niger and Jojoba considered under headings of Botany, Ecology, Soils, Fertilisers, Cultivation, Weed Control, Irrigation, Intercropping, Harvesting, Storage, Pests and Diseases. These crops were all covered in the first edition. Rapeseed has been omitted from this edition since the author considers the crop to be unprofitable in the high-altitude tropics – rapeseed oil is easily and cheaply available on the international market. The oilseeds being considered in this text are those considered to have potential for cultivation in tropical and semi-tropical areas.

Post-harvest aspects of oilseed production are cursorily covered in the final chapter, Oilseed Processing and Products, which is a general review of oil extraction processes followed by short descriptions of the properties and uses of the oils. The composition and use of the various oilcakes produced from oilseed crushing is barely touched upon. Those with an interest in post-harvest aspects of oilseed production such as storage, handling and processing would, therefore, be advised to consult more specialist texts.

This second edition does not contain much new material that was not included in the first edition with many illustrations remaining the same. However, the tables of production figures have been updated as has the extensive reference list. The book also contains a useful glossary of technical terms used in oilseed and oil technology.

Some minor errors are apparent; for example the reference to chlortetracycline (a solid) as a solvent for jojoba oil is clearly meant to be carbon tetrachloride.

This book remains an important reference work on pre-harvest aspects of oilseeds, which it covers comprehensively and admirably. This makes it an excellent and practical guide to oilseed crop production at a reasonably affordable price.

A. SWETMAN

Cotton: Origin, History, Technology and Production, eds C. W. SMITH & J. T. COTHREN. xiii + 850 pp. New York: John Wiley and Sons, Inc. (1999). £161.00 (hardback). ISBN 0 471 18045 9.

This large (850 pp.) volume in the Wiley Series in Crop Science effectively updates and replaces the classic work of Kohel and Lewis (1984). It must be said at the outset that its focus is entirely on cotton in the United States of America. The USA is second in cotton area (after India) and production (after China) and the home of many production and processing advances, but there is a great deal of comparative information from other systems whose lack is sorely missed. As the forthcoming volumes in the series are on rice and sorghum we must hope that this is an aberration. This book's authors include many of the 'big names' in US cotton production who have condensed the current information in their fields.

The book is in four sections. The first, with four chapters on the origin and history of cotton, starts with a global update on current thoughts on the history of domestication of cotton (co-authored by the only one of the 50 authors who is not from the USA). This section includes an extremely full (72 page) discussion of the history, pedigrees and development of the US upland cultivars. The second section focuses on the cotton plant; summarizing the current state of knowledge of morphology, physiology, fibre and seed quality and on genetics and the techniques for the development of new cultivars. Disappointingly the new transgenic technologies warrant only a couple of pages, mainly on the history of transformations. The third group of chapters, on production and production hazards, covers US production statistics, practices, pests, weeds and diseases and includes a chapter on cotton marketing. The pest descriptions and biologies are unexceptionable. The control sections, however, are too brief and generalized to be useful (for example there is a large table of chemical control materials and their chemical and trade names but no indication of which species they might be effective against). The final section of five chapters on processing and products, covers ginning, classing, spinning, yarn preparation and fabric formation and finishing, with an addendum on cottonseed processing.

The work is let down by the poor quality of the black and white photographic reproductions which are little better than photocopy quality, doing no service to the ginning and spinning chapters in particular. A little more critical editing might have been appreciated; some of the tables (for example that on the impact of insecticide use on yield), are very unclear, and there are quite a number of spelling errors in Latin names (as in *Encarsia formosana* for *formosa*); Balls' classic work on the cotton plant in

Egypt is given different dates in different chapters; a poor black and white reproduction of a micrograph of a boll wall is repeated as a more successful colour plate later in the work etc.

It is a little difficult to see at whom such a large (and expensive) tome is directed. The material is not presented in such a way as to provide practical advice to research scientists, growers or extension agents, for whom Kohel and Lewis' volume or that of J. Munro (1984) – both called Cotton, are still excellent guides. For the practising scientist, the volume provides a compendium of reviews of information but would hardly replace the primary sources. Possibly the best use of the text could be made by students of cotton crop science, prior to specialization (rather a small market one would have thought). If that is the case, however, the background level of technical knowledge required to read the chapters is arguably too high (a glossary of technical terms would have been useful). In all a useful library volume, rather than an essential practitioner's manual.

D. A. RUSSELL

Compendium of Soybean Diseases, 4th edn. ed. G. L. HARTMAN, J. B. SINCLAIR & J. C. RUPE. vi + 100 pp. St. Paul, Minnesota: APS Press (1999). \$37.00 (paperback). ISBN 0 89054 238 4.

This book belongs to a much admired, much used series of compendia from the American Phytopathological Society. The new edition claims to have international appeal with contributions from soybean authorities around the world. Since soybean originated in Asia and is a major crop there, inclusion of knowledge from this and other parts of the world is to be expected. In fact, most of the contributors are from the United States. However, most, if not all, of the soybean diseases of economic importance in the world are included and most importantly the material is authoritative and reliable.

After the Introduction, there are three Parts: (I) Infectious diseases, (II) Noninfectious or stress disorders and (III) Disease management. There is also a new appendix usefully listing microbial pathogens (are nematodes microbes?), insects associated with soybean and hosts of soybean pathogens. Part II of the third edition (Diseases of Unknown or Uncertain Cause) has been omitted since most of these have now been attributed to known pathogens. The format for each entry is an updated version of a well-trying formula: (introduction), symptoms, causal organism, disease cycle and epidemiology, management. Virus diseases have been brought into this format. There have been many changes or omissions to the content of black and white photographs accompanying the

entries, not always for the better in the opinion of the reviewer. Keys to the identification of some fungi, e.g. *Colletotrichum*, are a welcome addition.

Quite wisely the editors have omitted classification schemes for bacteria, fungi and nematodes because taxonomic changes occur so rapidly. However, for the bacteria some mention of the recent renaming of *Xanthomonas* species would have been useful as a guide to the reader familiar with older names. Similarly, synonyms of fungi seem to have been omitted in this edition, e.g. *Phytophthora sojae*. A reader familiar with the species *P. megasperma* would look in vain in the text or index. Quite rightly, though, the classification of viruses is now included together with the 'genus' of each soybean virus according to current thinking as this relates to epidemiology and management. Within each type of pathogen (bacteria, fungi ...) the diseases are ordered by the part or parts of the plant affected and then alphabetically by common name of the disease which may or may not include the name of the causal organism. This quirky ordering does not always make for easy access, e.g. *Cercospora* blight and frogeye leaf spot both caused by *Cercospora* spp. should perhaps be better grouped together. 'Rust' is used instead of 'soybean rust'. Since this edition claims to have international appeal, a more consistent approach might have been better for the sake of readers not familiar with American common names.

Some entries remain essentially the same from the third edition but there are numerous instances of entries with updated content and references and overall a thorough job has been done to provide the latest information. This is particularly true of the section dealing with virus diseases. Information on management (rather than control) has been very considerably updated, reporting new resistant cultivars, new races, etc., and is much less prescriptive than before (but still with an emphasis on fungicidal control). The section on seed and post-harvest pathology has been rewritten to give cross-referencing to fungi already considered and updated, e.g. rust, brown stem rot. Similarly, Part II Noninfectious or stress disorders represents a thorough reworking of the equivalent Part of the third edition with the information now more accessible. Finally, Part III Disease Management Strategies has been rewritten and includes useful content on 'Preemptive measures' such as beneficial bacteria and arbuscular mycorrhizal fungi.

Altogether this new edition of an old favourite is very welcome and recommended to readers of this journal. With the minor reservations and criticisms above, the Compendium remains a very useful guide to diseases for soybean growers, experimental agronomists and plant health specialists alike.

R. BLACK

Nitrogen Nutrition and Plant Growth, eds H. S. SRIVASTAVA & R. P. SINGH. x+347 pp. Enfield: Science Publishers Inc. (1999). £52.00 (hardback). ISBN 1 57808 032 0.

Nitrogen has a pivotal role in plant nutrition. It is often the most limiting element in agrosystems and ecosystems alike, but overuse of fertilizers in the former can lead to problems in the latter. This collection of nine reviews by renowned authorities from Europe, India, Canada, Japan and Israel provides the 'current art of knowledge' on various physiological facets of N nutrition: 1. Nitrogen Nutrition During Seed Germination and Seedling Formation (22 pp.); 2. Root Absorption and Assimilation of Inorganic Nitrogen (22 pp.); 3. *Rhizobium*-Legume Association (58 pp.); 4. Foliar Absorption and Use of Airborne Oxidized Nitrogen by Terrestrial Plants (70 pp.); 5. Physiology of Nitrogen-Fixing *Casuarina*-*Frankia* Symbiotic Association (32 pp.); 6. Role of Nitrogen in Plant Morphogenesis *in vitro* (26 pp.); 7. Role of Nitrogen Source in Carbon Balance (52 pp.); 8. Nitrogen, Stress and Plant Growth Regulation (22 pp.); 9. Slow-Release Nitrogen Fertilizers and Plant Nutrition (32 pp.).

Each chapter provides a sound and authoritative overview supported with a wealth of references. Whilst the content cannot be faulted, it is all too easy to quibble with the choice of topics and their layout. The obvious logical progression – germination, root uptake, symbiosis, foliar uptake, assimilation, N/C interaction, growth – is adhered to initially, but falls apart *en route*. 'Foliar absorption' pops up between the 'fixation' chapters, whilst 'N and morphogenesis' sits uncomfortably between 'fixation' and 'carbon balance'. If there is a common theme or link running through the chapters, it is probably the comparison of nitrate and ammonium as sources of N for plants.

There are the inevitable duplications and imbalances in a collection of this type. Thus LATS and HATS (low and high affinity transport systems) are covered in chapters 2 and 7, although the emphasis is on woody plants in the latter. Nearly half the book is given over to three chapters; two on symbiotic N fixation and a very extensive chapter on the foliar absorption of nitrogen oxides. The processes of nodulation and fixation are comprehensively covered from 'molecular biology' to 'factors affecting' in the 'fixation' chapters. The *Rhizobium*-Legume system has been much reviewed in the past so it is good to see the *Casuarina*-*Frankia* association given equal billing on this occasion. Actinorhizal species, of which *Casuarina* is one, are mainly trees and woody shrubs which fix more nitrogen on a global basis than do legumes yet remain comparatively unknown. Members of Casuarinaceae are becoming increasingly important for fuelwood in the Third World.

Foliar absorption of nitrogen oxides is extensively

covered in the context of 'friend' (sources of N) or 'foe' (phytotoxins) in chapter 4. The associated topic of ammonia absorption, and release, by leaves is not covered however, despite a recent surge of research activity in this area. Of particular interest to agronomists, but again not covered, is the foliar absorption of compounds such as urea which are important in bread wheat production.

The culturing of cells and tissues *in vitro* is an integral part of GMO research, so the effects of N source on plant morphogenesis (chapter 6) is of considerable interest at present. Chapter 7 considers the effects of N source on interactions between C and N metabolism particularly in woody plants such as carob. The carob, along with the tomato and other species, also features in chapter 8 ('N, stress and growth') where the part played by nitrate transport to shoots in regulating growth is considered. The most practical chapter, on slow-release fertilizers, seems strangely out of place in this largely physiological text. This chapter summarizes the types of fertilizer that are available and gives case studies on the response of specific crops to these potentially environmentally friendly products.

This is primarily a plant physiology text, so practical agronomists and environmental physiologists will have to hunt for the bits that may be of interest to them. There is scant coverage of important agronomic topics such as N cycling during growth and crop N requirements per se. Despite a wealth of physiological knowledge, down to the genetic and molecular level, on absorption, transport, assimilation and function of this important nutrient, we are still not able to reliably diagnose sub-clinical deficiencies in crops, to predict soil supply and crop requirements, or to use N fertilizers as efficiently as we would like.

The book is aimed at 'students, researchers, professionals and planners in agriculture, biotechnology, horticulture, forestry, botany, biochemistry, physiology, molecular biology'. My guess is that it will appeal most to researchers in the above disciplines; students may find it useful but pricey; crop production specialists will find much of it rather academic.

P. B. BARRACLOUGH

Management of Tropical Agroecosystems and the Beneficial Soil Biota, ed M. B. REDDY. xvii + 387 pp. USA: Science Publishers, Inc. £59.00 (hardback).
ISBN 1 57808 045 2.

A large and rapidly growing proportion of the world's population is dependent on food production from tropical soils of inherently low fertility exposed to extremes of rainfall, heat and drought. Farmers have developed traditional farming practices under these

conditions which are sustainable at low population densities but there is an increasing need to intensify production in many developing countries where extensification of agricultural systems is no longer an option. Addressing problems of soil management and conservation is increasingly recognized as essential to achieve the genetic potential of existing crops let alone high yield varieties. Central to the sustainable management of most tropical soils is importance of soil organic matter for the maintenance of soil physical and chemical properties. Less energy-intensive tillage practices and improved management of organic manures are increasingly recognized by national agricultural research systems, and international agencies, as underpinning sustainable agricultural development. Interest in adoption of less aggressive agricultural practices has led to a resurgence of awareness of the contribution of the soil biota to soil fertility. In addition, it is increasingly recognized that soils contain a major component (but largely unquantified) of the total biodiversity in any system. Since agricultural systems are increasingly replacing natural vegetation cover in many areas of the developing world, their status for conserving soil biodiversity is also of global importance.

This book addresses both of these basic and applied aspects of tropical soils management. It is structured into three sections with 15 review papers from a good international spectrum of authors with expertise in tropical soils. The first section, 'Soil Environmental Factors and Processes', is mainly concerned with soil physical properties and tillage practices related to the management of problem soils in Australia, South America and West Africa. The second section, 'Beneficial Soil Microorganisms', addresses the effects of management on microbial communities in cultivated soils, biological control of root pathogens, nitrogen fixers and mycorrhizal associations. The final section, 'Beneficial Soil Fauna' mainly describes the effects of management practices on soil fauna communities. This includes a particularly nice study on the use of ant species diversity as bioindicators for different types of traditional farming systems in Venezuela.

This book does not contain many new concepts or insights into the relationships between soil fertility and the soil biota. However, with much of the literature in these fields strongly weighted towards temperate systems it is very useful to have a book of reviews from authors with a tropical soils perspective. The volume is nicely produced and good value for library or personal use in research and teaching. It is unusually free of errors except, ironically, a date in my own Foreword!

J. M. ANDERSON

Modelling Soil–Biosphere Interactions, by C. MÜLLER. xii + 354 pp. Wallingford: CABI Publishing (1999). £49.95 (hardback). ISBN 0 85199 353 2.

Christoph Müller introduces his book by saying that he has on countless occasions read publications that include mathematical descriptions of soil or biosphere processes and not been able to grasp the main idea. The problem is often that the author is far more familiar than the reader with the ideas involved and assumes, incorrectly, that partial differential equations, for example, are as much meat and drink to the reader as they are to him or her. If you experience that sinking feeling at the sight of equations, which might be the case for some readers of the journal, this book is for you. Only basic mathematical skills are needed to follow the treatment of the various biosphere processes, and the author tells you how to use the ModelMaker mathematical modelling package to do the nasty bits for you.

This book really does begin at the very beginning, with a quotation from the first chapter of Genesis on the dedication page and some very basic mathematics in the Introduction. Some people will be able to skip these basics, but maybe they will find themselves sneaking back to them, just in case. This chapter also introduces some mathematical tools, the transport equation and the various orders of kinetics. Subsequent chapters deal with nitrogen transformations in the soil (all of them), soil temperature and heat flow, soil water (static and flowing), the soil energy balance, plant growth and physiology, and finally leaching. For each topic, the author supplies equations and tells you how to use them in ModelMaker. I doubt if specialists in each topic will agree with all the equations supplied, but I do not think that matters. Once the novice modeller has taken the plunge and got to grips with these equations he or she can start looking to see if other sets of equations will do the job better. In the leaching section, for example, mobile and immobile categories of water could be taken into account.

The book is generously illustrated and has a comprehensive index and a good reference list, but there is one thing that Christoph Müller might think of adding if there is a second edition. That is a chapter on evaluating models – validation as some people prefer to say. After all, if you have gone to all the trouble of learning how to develop a model, you might as well find out whether it works.

T. ADDISCOTT

Environmental Soil and Water Chemistry: Principles and Applications, by V. P. EVANGELOU. xix + 564 pp. Chichester: John Wiley & Sons (1998). £51.95 (hardback). ISBN 0 471 16515 8.

The author's stated objective in writing this book was to provide a single text covering both soil and water chemistry at a level suited to students at the senior undergraduate/early postgraduate stage. The trigger was a perceived change over 18 years of teaching in the needs of the students being taught. Their interests had evolved from the early approach of fertility management for maximum yield through to growing environmental awareness and perception of soil and water as valuable natural resources that must be protected.

The principles half of the book is divided into three sections. The first, on water chemistry and mineral solubility, starts at a rather basic level, with what is best described as a crash refresher course on some key basic chemical concepts. It relies heavily for some of its content on earlier classic works. However the chemical content builds rapidly from then on, and indeed some might, at times, question the need to have included all of the selected material. The comprehensive build up of background information continues through sections on soil minerals and their surface chemical properties, and on electrochemical kinetics.

There are four applications sections, covering soil dynamics and agricultural-organic chemicals, colloids and transport processes, land disturbance-related pollution and its control, and finally water quality and soil and water decontamination technologies.

This is nearly an excellent book, and I would certainly recommend it to academics teaching environmental chemistry or soil and water chemistry courses for their personal use and for their library's shelves. It contains a wealth of useful teaching material and ideas about presentation, and, used selectively, could be a valuable reference work. It falls short of excellent on four accounts, the need for better checking by a competent chemist/proofreader, the need for a better index, the occasional use of some very dated material that cried out for updating, and the sometimes curious selection of material. For example, you won't find cadmium, mercury or molybdenum in the index, even although the first two elements at least figure quite prominently in the text. Nitrogen is apparently a monatomic gas on page 3, helium is used to fill dirigibles, chromium is both a metal and a non-metal, g and gm can be used interchangeably, and so on. There are many other examples. Equivalents are used extensively, and mol_c is introduced (but not discussed) in an appendix table, where the reader may also be interested to find finally that the abbreviation for seconds is s, and not sec.

Perhaps that's not surprising when liquid density is still in lb/ft³ and lb/U.S. gal!

Thus the overall impression tends to be that the author has turned a valuable set of lecture notes, accumulated over a couple of decades, and a wealth of first hand research experience into a textbook. Unfortunately he never quite got around to fully updating the notes in the process, which is a great pity.

M. S. CRESSER

Managing Risk of Nitrates to Humans and the Environment. Proceedings of a Masterclass Conference Organised by the Agricultural Sector and Toxicology Group of The Royal Society of Chemistry, eds W. S. WILSON, A. S. BALL & R. H. HINTON. x + 340 pp. Cambridge: The Royal Society of Chemistry (1999). £69.50 (hardback). ISBN 0 85404 768 9.

This book presents the proceedings of a conference organized by the Royal Society of Chemistry and held at the University of Essex in September 1997. The objective of the meeting was to review the nitrate research being carried out in the agricultural, environmental and medical spheres and to re-assess the concerns about nitrate and current limits on nitrate concentrations in water. The book follows the structure of the meeting and is organized into three sections, each containing eight papers.

The first section, entitled 'The Nitrate Problem in Agriculture', starts with an overview of nitrogen dynamics in natural and agricultural ecosystems followed by a description of the current status of measurements and models to predict nitrate losses. Two papers examine the fate of fertilizer nitrogen in agriculture. Also included are more specific papers dealing with the effects of straw incorporation on nitrate leaching, the contribution of soluble organic nitrogen, the effects of elevated CO₂ concentrations

on nitrogen cycling and the risks and benefits to livestock of nitrate in ensiled grass.

The second section, 'Environmental Aspects of Nitrates', examines the atmospheric nitrogen cycle and the impact of nitrate and nitrite in surface waters, particularly their contribution to eutrophication and acidification and toxicity to invertebrates. Other papers examine the fate of nitrates from land-spreading of sewage wastes, amino nitrogen in humic substances as a source of nitrate and policies to control nitrate pollution from agriculture. Most contributions are written from a UK/European perspective but two papers broaden this perspective by describing nitrate pollution from agriculture and other sources in India.

The final section, entitled 'Nitrate and Health', considers the metabolism of dietary nitrates and nitrites, their effects in experimental animals and possible links between nitrate exposure and the occurrence of diabetes in children. In contrast to the foregoing papers, which are largely concerned with the possible adverse effects of nitrate, the remaining contributions describe the growing body of evidence that dietary nitrate may actually have a beneficial role in protecting against pathogens in the human gut.

The papers are generally well-written but as specialists are unlikely to understand all the terms used by those from a different discipline, a brief glossary would have been helpful. The book is valuable in bringing together the different aspects of the nitrate problem in one volume and is a useful source of up-to-date information for researchers and policy-makers. However, it provides no overall conclusions about what levels of nitrate loss may be acceptable. The reader is left to arrive at his or her own conclusions and though this does encourage careful reading of the full text, the task would be easier if there had been some attempt to link the separate sections. The conclusion of many readers is likely to be that more information is required. This book will be a valuable guide to what questions we should be asking.

S. CUTTLE