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Book reviews

Phytophthora Diseases Worldwide by D. C. ERWIN & O. K. RIBEIRO, xii + 562 pp. St Paul, Minnesota: The American Phytopathological Society (1996). US $145 or $180.00 (elsewhere) (hardback). ISBN 0 89054 212 0.

The genus *Phytophthora* (plant destroyer) includes not only pathogens responsible for potato famine, black pod of cocoa and dieback of native Eucalyptus, but also another 50 or so organisms, all causing maybe less spectacular but still very destructive root rots or blights of thousands of plant host species. This book collects and also interprets the literature on 150 years of research on the pathogens and the diseases they cause. It has been a mammoth task to produce and is clearly a labour of love.

Twenty years ago, Ribeiro wrote *A Sourcebook of the Genus Phytophthora* which became a constant guide for all phytophthorologists. He has now joined with former colleague Erwin, to update and expand the subject into a fully comprehensive guide for beginners and experts – all those interested in the diseases and their pathogens, both in the field and in the laboratory. The authors have spent a lifetime researching a variety of these diseases in California and latterly Ribeiro has added hands-on consultancy work in the fields and orchards of the state of Washington to his qualifications.

The first half of the book is an up-to-date review of the biology of *Phytophthora*. The accumulating evidence that these and related oosporic fungi are related to certain algae (did you know that *Phytophthora* is really a colourless seaweed?) and do not belong to the Kingdom Fungi is clearly discussed. How such algal fungi generate variation and produce resistant sexual spores as part of a diploid life cycle follows. The classification of the genus into around 50 species using morphological criteria has always been controversial but now new DNA sequence data are becoming available, indicating that some morphological species are natural groupings while others are not. To identify your pathogen, however, needs a pure culture; excellent instructions are given for baiting, isolation and for making the fungus sporulate. Recent advances in detection using molecular probes are included. The section ends with an in-depth review of the different methods and combinations of methods available for the control of the diseases – from the cultural and biological through chemical to the use of resistant germplasm.

The second half of the book considers each of the currently recognised species one-by-one. Copies of the original drawings/photograph from the first published descriptions of each species are included and characteristics used to distinguish it from similar species are emphasised. Tips are given on culture techniques; the host range and symptoms are listed.

Last, but not least, are nearly 5000 references, making the work a truly useful guide to the literature. It is good to know that many of the earliest references came from the collection of an intrepid, early Californian phytophthorologist, C. M. Tompkins. I am sure the book, with its plethora of well organised and accessible information, will become a classic for pure and applied researchers, extension workers and also for students. With its help, the plant pathologist will handle these pathogens with confidence; they are not difficult to work with, merely different. I, for one, have made this book a constant companion for dipping into for instruction and inspiration.

DAVID SHAW

Wheat Production and Utilisation – Systems, Quality and the Environment, by M. J. GOODING & W. P. DAVIES. v + 355 pp. Wallingford: CAB International (1997). £49.95 (hardback). ISBN 0 85199 155 6.

'Wheat production and utilisation' comprehensively covers a wide range of topics from the basic evolution of wheat and the development of the wheat plant, through cropping and management, to specific end uses of the crop. Probably the most comprehensive chapter covers the 'biology and control of diseases, weeds and pests' and explains their 'effects on grain yield and quality'. The data presented in this and other chapters are very comprehensive and should prove invaluable not only to students of agriculture but also to researchers seeking relevant data to support grant applications.

In the chapter on diseases, weeds and pests, we are told that even in Europe over 25% of potential wheat production is lost by competition from diseases, pests and weeds. In the former USSR, losses rise to over 40%, indicating how a greater knowledge of efficient wheat production can provide enormous economic benefits in reducing crop losses. The specific details of different diseases, pests and weeds causing the yield losses and the measures that can be taken to reduce losses are covered in detail. Importantly, the effects of

the diseases, pests and weeds and also the effects of the various control measures on harvestable grain quality are also discussed. Fungicidal applications, for instance, can be shown to have a major effect on flag leaf survival as measured by green leaf area duration (GLAD). Clear correlations can then be found between GLAD and subsequent benefits of increased grain weight and grain yield.

Whilst most topics are covered accurately and comprehensively, I was disappointed in the coverage given to dwarfing genes. Almost certainly the biggest advance in wheat production this century has been due to the introduction into new varieties of one of two semi-dwarfing genes, designated *Rht1* and *Rht2*, that originated in the Japanese variety Norin 10. At least one of these genes is now present in the vast majority of the world's wheat varieties. The genes prevent yield losses due to the lodging of taller varieties grown under modern systems of intensive agricultural production and also directly increase yield through increases in spikelet fertility. Grain size and percentage N in the grain tend to be reduced, thus reducing grain quality. Whilst *Wheat Production and Utilisation* does include a very poor figure of the effects of the semi-dwarfing genes on plant height when introduced as isogenic lines into a Maris Widgeon varietal background, the main discussion on the effects of dwarfing genes on yield and quality refers to varieties that predated the introduction of *Rht1* and *Rht2*.

With the predicted vast increase in demand for wheat over the next decades *Wheat Production and Utilisation* should play its part in helping to sustain the increases in production achieved over the past 50 years.

A. J. WORLAND

Diagnosis of the Nitrogen Status in Crops, ed. G. Lemaire. x + 239 pp. Berlin: Springer-Verlag (1997). £69.00 or $115.00.
ISBN 3 540 62223 3.

This is an intriguing book, not least because of its authorship. It is written in English by 21 Frenchmen with the blessing, in a foreword, of Professor Duncan Greenwood. The central theme is the development of a comprehensive theory for the decline in critical N % as crops grow. A key element in this theory is the discovery, made independently in Lusignan and Wellesbourne, of a remarkable similarity in the way the critical N % of some quite different crops declines with increase in plant mass per unit area. Other elements include the influence on the critical N % of the proportion of structural and metabolic tissues, light intensity and its attenuation within the canopy, and the formation of storage organs. It seems (p. 74) that the achievement of values of the critical N % for cereal crops at different stages of growth is not that simple and requires a fair amount of data. I also found myself wondering about the application of the concept to the potato crop, because of the dominance of the tuber sink during the later stages of growth.

The 13 chapters are divided into three main parts. Part I introduces the general theory and, in particular, the concept of the Nitrogen Nutrition Index, the ratio of the actual to the critical N %. Part II applies the theory to major agricultural crops, which comprise grassland, wheat and barley, maize and sorghum, grain legumes, potatoes, and mixed crops. Part III is concerned with the practical management of nitrogen nutrition and begins with a useful general discussion of decision-support systems. The systems described are not restricted to those based solely on the theory, but include the measurement of nitrate in xylem sap from stem base segments and leaf N, measured conventionally or radiometrically. The latter measurements emphasise again the point that, although photometric and chemical estimates of chlorophyll correlate well with each other, neither of them correlates conspicuously well with the leaf N %.

The book is written in good English. Our French colleagues either write English better than we do French or were well advised. The occasional spelling mistake was nevertheless to be found. The 'firs cut' in a sorghum experiment gave pause for thought, and Dutch friends would probably prefer to see 'Groninger' as Groningen. Initials, such as NNI for nitrogen nutrition index, are used quite widely; this saves verbiage but creates problems for the browser. The authors are generous with illustrations, but they need to check the labelling of Figure 3.8, whose *x*- and *y*-axes seem almost identical. Each chapter has its own reference list, and these were generally quite comprehensive, extending well beyond the boundaries of France. There is also a general index.

Professor Greenwood's *imprimatur* is never lightly to be ignored, and researchers and extension workers involved in nitrogen management will find plenty to interest them in this book, even if they do not agree with absolutely everything they read. Also, students on agricultural, horticultural or environmental courses should find their horizons usefully broadened by it.

TOM ADDISCOTT

Agricultural Biotechnology – 2nd Asia Pacific Conference, eds V. L. Chopra, R. P. Sharma & M. S. Swaminathan. vi + 304 pp. Lebanon, USA: Science Publishers Inc. (1996). £75.00 (hardback).
ISBN 1 886106 78 9.

This volume is a collection of the presentations made at the second conference on agricultural biotechnology, organised by the countries of Asia Pacific and held in Madras. The year of the conference is not given, but the copyright of the volume is 1996. It

comprises a collection of papers covering a wide range of subjects and with topics presented at a number of different levels. Not surprisingly, all the contributions are concerned with the application of biotechnology (used in a wide sense) to 'manipulating plant characteristics' and are organised under seven headings: Biodiversity (5 papers), Tissue Culture and Micropropagation (6 papers), Molecular Breeding (5 papers), Genetic Engineering (6 papers), Gene Expression (3 papers), Biotic Stress (2 papers) and Crop Nutrient Management (3 papers).

I always find it difficult to judge volumes such as this one, which are basically proceedings of conferences I did not attend. Particularly so when they deal with a fast-moving subject area like biotechnology and when the volume appears, inevitably, some time after the conference. The contributions vary from reviews of general areas, to specific subjects and individual research projects. There is little help in the book's organisation to guide the reader through this variability – perhaps the Conference itself had a structure, other than themes implicit in the seven headings, which is not apparent from this volume. As might be expected, a number of species appear in the contributions representing a range less familiar to agriculturalists in the temperate zone, and with rice being perhaps the most commonly cited species.

I have to admit that I started in an attempt to read the volume from cover to cover and failed. After a modest time I found myself flicking through the pages, finding odd pieces of interesting information but without an overall theme that held my attention. Overall, I think that, although the volume contains some useful facts and pointers to approaches and possibilities, in a wide range of crops, it might form a useful occasional reference on my shelf rather than one that I need to consult regularly.

P. D. S. CALIGARI

Sunflower Technology and Production, ed. A. A. SCHNEITER xix + 834 pp. Madison, USA: ASA, CSSA & SSSA (1997). $75.00 (hardback) (+10% overseas mail).
ISBN 0 89118 135 0.

This book is a welcome extensive revision of *Agronomy Monograph 19*, *Sunflower Science and Technology*, published in 1978. It covers all aspects of the biology, physiology, production and usage of sunflowers. The previous monograph was considered the 'bible' of sunflowers and the new edition will retain this accolade. Each chapter is thoroughly researched and updated by the chapter authors and each concludes with a comprehensive bibliography. Some new chapters are included in the new edition, including one on the rapidly expanding area of biotechnology. The chapters on sunflower physiology, pests and diseases are particularly detailed.

It is an Americocentric book, many of the authors coming from North Dakota State University. This means that the emphasis of much of the content of the book has a North American orientation. The editorial committee have tried to redress this balance by including authors from Australia, Argentina and Yugoslavia, but I feel that French and other European work is under-represented.

I was disappointed to find weed control relegated to a small section in the chapter on sunflower production. In my view it warrants more extensive coverage. Issues of particular relevance for growers in UK receive varied coverage. The problem of bird damage is fully discussed in a chapter of its own, but the effects of slugs and the need for desiccation pre-harvest receive little or no attention, and the ever-present problem of *Botrytis* is only given two pages. It also seems rather idiosyncratic to include nematodes in the chapter on diseases! However, this is an excellent overview of all aspects of the sunflower crop and will be invaluable to researchers and students involved with this crop.

PETER J. W. LUTMAN

Land Resources: on the Edge of the Malthusian Precipice?, eds D. J. GREENLAND, P. J. GREGORY & P. H. NYE vii + 180 pp. Wallingford: CAB International in association with The Royal Society (1997). £40.00 or $75.00 (hardback).
ISBN 0 85199 235 8.

This book contains the papers presented at a Royal Society meeting concerned with how to feed the world population of between 8 and 11 billion expected by 2050. The papers have also been published in the *Philosophical Transactions of the Royal Society*, *Series B*, **352** (No. 356), pp. 859–1033 (1997), although the book has the benefit of an informative and concise 'Introduction and Conclusion' by the editors. They draw attention to the dismal fact that the annual increase in cereal yields has fallen from almost 3% per annum in 1965 to 1·3% per annum at present. They also highlight key constraints and suggest ways forward.

The best papers are excellent reviews of current knowledge, often providing considerable insights, and should be required reading for anyone concerned with development issues. Even the more lightweight papers contain useful information of interest to researchers in the fields covered.

The paper entitled 'Population momentum and the demand on land and water resources' by Fischer & Heilig is thorough and very helpful for non-demographers as it distinguishes between the certain and the more speculative parts of population studies. They project the most intensive mis-match between food demand and the soil and water resources needed to grow it in Africa and South-Central Asia.

Two papers on water resources cover the topic thoroughly and from different viewpoints. One analysis highlights the problem areas and indicates that by 2025 water scarcity will cause 55% of the world's population to be dependent on food imports from better endowed areas.

The paper on 'Trees, soils and food security' by Sanchez *et al.* eloquently summarises the benefits of agroforestry, and touches on a host of other key issues. These include the need to 'recapitalise' many soils using phosphate fertilizer or rock phosphate, ways of introducing additional nitrogen through the practical harnessing of biological fixation and the economic and biological necessity for small-scale farmers to diversify. I shall quote it on many occasions.

The paper on nutrients by Vlek *et al.* draws attention to the alarming imbalance between nutrients removed by crops and the amounts supplied, especially in sub-Saharan Africa. Both the improved recycling of nutrients *and* greatly increased use of fertilizers are essential if the world is to be fed. This message is in direct contradiction to the woolly-minded thinking of some development 'experts' who seem to think that fertilizers are either damaging or unnecessary. Several papers, especially that by Syers, draw attention to the importance of soil organic matter, both as a source of nutrients and through mechanisms influencing crop growth and nutrient availability that are poorly understood. Land degradation, economics (conventional and environmental) and environmental and policy issues are also addressed.

I recommend any individual or organization concerned with development and food security to buy this book. It is certainly of value to a much wider audience than the usual readership of *Philosophical Transactions of the Royal Society*. I am sure that any such purchaser will find that several of the papers will soon become well thumbed and much quoted.

D. S. POWLSON

Plant–Microbe Interactions and Biological Control, eds G. J. Boland & L. D. Kuykendall. xii + 442 pp. New York: Marcel Dekker (1997). $165.00 (hardback).
ISBN 0 8247 0043 0.

Everyone involved or interested in the control of plant disease should have access to this book and researchers in biocontrol of plant disease should add it to their bookshelves. The future reduction in crop losses caused by micro-organisms and weeds depends on the integration of control strategies: biological control will play an increasing role in these strategies and if anyone still doubts this they should read this book.

The publishers have produced another excellent book in their series on *Soils*, *Plants and the Environment*. The book focuses on plant/microbe interactions in relation to biological control and highlights the importance of understanding the inter-relationships between plants/microbes and microbes/microbes if biocontrol is to be successfully developed and accepted in integrated crop management.

I congratulate the editors on such a comprehensive coverage of many important aspects of biological control of crop disease. Each chapter is in the form of a review with a consistent, reader-friendly format, including a general introduction, conclusion and a comprehensive reference list. There are 19 chapters. Chapter 1 is an excellent introductory chapter on the relationship of microbial diversity in the rhizosphere to plant diversity and the need to understand and optimise biological diversity with a view to improving plant health. Chapters 2–10 deal with biological control of soil-borne, foliar and post-harvest diseases caused by micro-organisms. Chapter 11 reviews the two main approaches used in the biological control of weeds (classical and inundative biological control) and includes many relevant examples. The following chapter highlights the problems involved in the formulation of commercial bioherbicides. Novel approaches to biological control are reviewed in the next three chapters (Chapters 13–15), including the control of cucumber mosaic virus using viral satellites, the biocontrol of ineffective *Rhizobium* and *Bradyrhizobium* using strain-specific bacteriophage and the role of chitinolytic enzymes in biological control of fungal pathogens. The remaining chapters review some aspects of the commercial production of biological control agents (Chapter 16) and genetic and molecular approaches to the understanding and improvement of biological control agents.

This book contains a comprehensive collection of reviews with extensive reference sources on the biological control of plant diseases which would be of interest to advanced undergraduates in agricultural and biological sciences, researchers and those involved in crop protection.

GORDON D. CRAIG

Facilitating Sustainable Agriculture: Participatory Learning and Adaptive Management in Times of Environmental Uncertainty, eds. N. G. Roling & M. A. E. Wagemakers. Cambridge: Cambridge University Press (1998). £50.00 or $80.00 (hardback).
ISBN 0 521 58174 5.

Conventional definitions of sustainable development are many and varied, but most include some reference to reducing the negative effects of economic activity in

the present on those living in the future. The editors of *Facilitating Sustainable Agriculture* take a rather different approach and suggest that definitions of 'sustainable agriculture' should be determined by those who have a direct stake in using agricultural resources. The main theme of the book is concerned with how this idea of sustainable agriculture can best be facilitated, through, for example, farmer learning, improvements in support institutions or dialogue between interest groups. Thus, as the editors note, the book addresses the human and social aspects of sustainable agriculture, rather than the economic or agronomic. Those wishing to find coverage of issues such as 'time preference' or experimental evidence on the impact of different crop rotations on soil biomass should look elsewhere.

The book brings together the work of a number of different authors, introduced and concluded by chapters by the editors Roling and Wagemakers. The main part of the book consists of country case studies, which are largely concerned with attempts that have been made to encourage sustainable production systems in different parts of the world. For those interested in promoting sustainable agriculture, these case studies provide ample evidence on how to (or how not to) proceed. Relative success stories – for example in Indonesia and Australia – illustrate the benefits of getting farmers involved in the adoption of sustainable technologies; this contrasts with less successful strategies, such as recent attempts at controlling agricultural input use in the Netherlands.

It is encouraging that the book does not just equate sustainability with low-input or organic farming methods: the editors accept that resource-intensive agricultural methods may be appropriate, where this is agreed amongst stakeholders. Where the book does have faults is in its use of a rather jargon-laden prose style and, despite the 'Synthesis' chapter, there is a lack of a concisely worded section setting out how the type of sustainable agriculture being advocated might best be achieved. This said, the book, especially the case studies, provides a valuable insight into what can be done to make agriculture more sustainable, for the benefit of current and future generations.

STEPHEN RAMSDEN