

Book reviews

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Desiccation and Survival in Plants: Drying without Dying, eds M. BLACK & H. W. PRITCHARD. 416 pp. Wallingford, CABI (2002). £75.00. ISBN 0 85199 534 9.

Plants may face the challenge of desiccation at all stages of the life cycle. The initial descriptions of how higher plants tolerate low water availability concentrated on the associated morphological syndromes (e.g. waxy cuticles, stomatal distribution) before moving on to physiological explanations (e.g. leaf rolling, C4 and CAM pathways). However, these explanations of drought tolerance represent one response to the challenge – the development of mechanisms to conserve water within the plant in dry environments. For extreme types of so-called ‘resurrection plants’ and for some bryophytes we have described the ability to survive after long periods of intense desiccation. These plants excel at a different response which is described by the book’s subtitle – drying without dying. The editors make it clear they are dealing with desiccation tolerance rather than drought tolerance. Advances in biology over the last 20 years have permitted the mechanisms of desiccation tolerance to be much greater understood. We are now able to explore the molecular genetics of desiccation tolerance with the aim of developing markers to permit selection of crop lines which are more tolerant of, or resistant to, water shortage.

This volume covers all aspects of desiccation tolerance of plants. The editors have assembled a team of authors to cover the widest range of plant types and plant life cycle stages and to rehearse the current paradigms. An initial chapter introduces the topic of drying without dying. Other chapters are assembled in three main sections. The first section reviews the range of methods now available for studies of desiccation tolerance including aspects of cell and molecular biology and biophysics. The second main section deals with the biology of desiccation tolerance in terms of challenge presented by the frequency and intensity of dehydration. These chapters cover desiccation in seeds, pollen and spores, and vegetative tissues. Evolutionary and ecological aspects are also covered. The third main section reviews the mechanisms involved in desiccation damage and desiccation

tolerance. Here the nature of the desiccation stress and the strain applied to the plant system is considered together with the biochemistry, biophysics and molecular genetics of tolerance systems. The dangers of imbibitional injury during rehydration are explained. The final chapter presents some generalizations from the preceding sections in order to provide an element of synthesis and identification of gaps in our knowledge and understanding.

The book is intended as a review of current knowledge and so demands (and repays) careful reading. It is well produced and has a glossary and a good general index as well as a useful taxonomic index. In the preface the editors suggest that the volume ‘... will be of value to all researchers in the field, both beginners and the more experienced, and to those with interests in basic and applied plant sciences ...’. I believe this is true. It would be on my recommended reading list for senior undergraduates and postgraduates and I will use it as a valuable source book.

R. E. L. NAYLOR

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Guidelines for Analysis and Description of Soil and Regolith Thin Sections (+CD ROM), by G. STOOPS. xvi + 184 pp. Madison, WI: Soil Science Society of America (2003). US \$55.00. ISBN 0 89118 842 8.

This book is a new and revised version of the indispensable ‘*The Handbook For Soil Thin Section Description*’, out of print for over a decade. The techniques, applications and uses of soil micromorphology have expanded considerably since the last publication, hence this edition is particularly timely. The author provides an excellent synthesis of the analysis and description of soil and regolith thin sections which will be useful to researchers and students from a wide range of disciplines, from soil sciences to archaeology. Micromorphology has developed a unique lexicon of terminology over the last four decades in which to describe and analyse features. The book clearly illustrates the link between observing soil morphological features and interpreting soil processes.

The book consists of ten chapters dealing with thin section description which review and organize the language in a way that scientific communication can be facilitated. From the historical synopsis and review of microscopic optical techniques to the detailed descriptive terminology of organic compounds, the user has an invaluable guide to the interpretation of micromorphological features. Each chapter contains several examples which are well supported by detailed illustrations with excellent annotations. The author has succeeded in the difficult task of providing both a descriptive reference text and a highly readable book. Student friendly definitions and tables throughout significantly enhance the usability of the text by comparison to its predecessor. In addition, the further detail concerning microstructures, plant residues and thin section artifacts are especially welcomed. The real hidden gem of this text is the invaluable accompanying CD (viewed via a web browser) which provides over 330 superb, high resolution colour images (organized between seven chapters) each supplied with scales of magnification and detailed descriptions (Note: navigation may be slow depending on PC speed). An impressive 125 images of soil pedofeatures alone are presented including an exhaustive list of soil clay, mineral and organic coatings. My one disappointment is that the rapidly evolving field of using image analysis in thin section quantification appears to have been overlooked. I feel this would have increased the overall usability of the book significantly.

This book will be an essential acquisition for all workers in the micromorphology field, ranging from the postgraduate student to the seasoned scientist. Further, it will serve as an excellent reference text for any library supporting soil, earth and archaeological sciences. My only lament is that given the highly specialized nature of the subject area, the book may not acquire the significant readership it deserves.

S. MOONEY

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Improving the Productivity and Sustainability of Rice–Wheat Systems: Issues and Impacts, ed. J. K. LADHA, J. E. HILL, R. J. BURESH, J. DUXBURY & R. K. GUPTA. xix + 231 pp. ASA Special publication 65, American Society of Agronomy (2003). US \$36.00 (paperback). ISBN 0 89118 150 4.

Asia, the largest continent with the highest population, consists of nations whose economies are either fully or partially dependent on agriculture. Over 65% of the population of Asia lives in rural areas. In South Asia, which consists of a group of seven developing

nations, with 22% of the world's population, people survive on 2% of the world's income and 44% of this population lives on less than one US dollar per day. Rice–wheat cropping systems play a significant role in the provision of the staple diets to a significant proportion of South Asians. Hence, improving the productivity of these two staple crops would have a significant impact on food production in the region.

This book, which is a collection of papers presented at the International Symposium held at the ASACrop Science Society of America and Soil Science Society of America annual meeting in 2001, addresses the above issues. The papers, well edited by a group of eminent rice and wheat scientists from IRRI and CIMMYT, brings together the problems and possible solutions of the rice–wheat systems in the Indo-Gangetic plains and in China. The first paper by Gupta *et al.* highlights the importance of this system to the region and also its role in the post green revolution, where there is a greater demand for food due to the exhaustion of the natural resource base. It clearly outlines the history, the current status and possible future development. This chapter itself is of importance to all interested in this productive system of agriculture practiced solely in the developing nations of Asia, where a significant proportion of the world's population survives on meagre resources.

The subsequent chapters address specific issues of the rice–wheat system, ranging from long-term sustainability to managing crop residues and possible researcher–farmer interactions to disseminate the latest information. Hence, this special issue can be considered a comprehensive compilation of information on the rice–wheat system. The chapter on the management of residues particularly impressed me. Residue management is a very important aspect of tropical agriculture where soil organic matter is very low and sustainability depends upon the inclusion of organic residues into cropping systems. Such a practice, if adopted, would have a lasting impact on this cropping system as well as on rice–rice systems practiced elsewhere in Asia. The principles are the same in crop residue management of all tropical cropping systems.

An additional chapter by the editors to conclude the book, highlighting the salient features of the rice–wheat system, its current situation, potentials and future research and development programs would have strengthened the value of this book. My personal view is ASA, IRRI and CIMMYT should consider producing extension material for use by the practitioners of the rice–wheat system, because these farmers are in regions where extension information and research findings are not easily accessible. I encourage this because the results have significant practical value to the practitioners of this system under difficult and marginal conditions and the valuable information in this book would be lost to the real end users.

Who could use this book? This volume is of special value to the scientists, students and practitioners of the rice–wheat system in the Indo-Gangetic plains and in China, and also IRRI and CIMMYT. However, its value does not end there: it contains information which will be very useful to all researchers, extension agents and students who undertake programs on enhancing the productivity of the rice–wheat system and associated cereal cropping systems in the developing world. Hence it would also be a useful source of information for policy makers and funding bodies.

I do congratulate the editors of the book for a very good publication and recommend it for reading to all interested in the rice–wheat systems and other cereal based cropping systems.

U. R. SANGAKKARA

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Herbicide Classes in Development: Mode of Action, Targets, Genetic Engineering, Chemistry, ed. P. BGER, K. WAKABAYASHI & K. HIRAI. xxi+364 pp. Berlin: Springer-Verlag (2002). €139.00, SFR 225.00, £97.50, US \$149.00 (hardback). ISBN 3 540 43147 0.

Rather than covering all herbicide modes of action, this work (as the title suggests) is restricted to those herbicide targets that have received attention, either due to newly commercialized active ingredients or new research, in the past two decades. An exception to this, the chapter on inhibition of aromatic amino acid biosynthesis, reflects the attention that this site of action has received in the development of genetically modified herbicide tolerant crops. Within each of these chapters, symptoms of treatment, biochemical site/mode of action and families of active ingredients are all discussed. In some cases this is enhanced by historical information, discussion of transgenic crops and of the occurrence and biochemistry of naturally

occurring herbicide-resistant species. In addition, agronomic use is often covered, discussing crops in which the herbicides are used and weeds that are targeted.

Crop protection specialists from around the world have authored individual chapters. However, the editors have ensured that this book reads as a complete work as opposed to a collection of related papers. The extensive use of figures clearly illustrates the importance of each target site in the biochemical pathways of plants, helping to demonstrate how inhibition of a target enzyme results in plant death. The inclusion of up-to-date research data gives further information on this, and lends the book a very up-to-date quality. Each chapter is extensively referenced, allowing readers who wish to pursue this subject in more detail ample opportunity.

As well as considering the target sites of herbicides, this book also contains chapters on production of genetically modified herbicide tolerant crops, synthetic routes of modern classes of herbicide and the response of plants towards chiral phytotoxic chemicals. The latter two chapters really set this book apart from other, similar, works on herbicide modes of action. The chapter on synthetic routes provides a fascinating insight into the development of structurally similar products over the last 20 years. This chapter is richly illustrated with tables, chemical structures and figures, with genealogical trees that demonstrate the evolution of herbicide structures, and also provide information on weeds targeted and crops these active ingredients are used in. Readers may even wish to try and predict, from the structures presented, what the next members of these chemical families to be commercialized will be!

This is not a book for those wishing for an introduction to herbicide modes of action. However, for those with a working knowledge of herbicides who wish to find out more, and for plant biochemists and physiologists who wish to investigate how herbicides interact with plant metabolism, this is a very valuable work.

J. READE