Book reviews

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Pests of Fruit Crops: A Colour Handbook, by D. V. Alford, 450 pp. London: Manson Publishing Ltd (2007). £95.00 (hardback). ISBN 1840760516.

It is rare to see such a comprehensive, well-illustrated book of insect and mite pests of a wide range of fruit and hops. This Colour Handbook builds on the very successful 'A Colour Atlas of Fruit Pests', first published in 1984, which was largely limited to pests in the British Isles. This fully revised edition now includes pests in Europe, and as such will be valuable for many consultants, growers, researchers, students and lecturers who are increasingly working throughout Europe. A comprehensive list of pests of top and small fruits is illustrated with over 1100 high quality photographs which should aid accurate identification of the pest. Most of the images in the book have been taken by the author and reflect the pest itself or the damage it causes. Very occasionally, images of small insects and mites would have benefited from being enlarged, or alternatives sourced elsewhere, e.g. image 259, raspberry beetle adult, is in my opinion too indistinct to be useful. Similarly, a better understanding of mites would have benefited from images of examples of individuals or small groups. This may be nit-picking, as more than adequate images of the damage caused are shown. The description of the various stages of the pest's development is simple and concise and the life history and damage, although brief, is more than adequate for the purpose of the book.

Accurate identification is essential as pest management of high quality and high value fruit relies more on Integrated Pest and Disease Management or Integrated Fruit Production systems. Having access to such a comprehensive Handbook will make this task much easier and accurate so that the appropriate control strategy can be chosen.

I would strongly recommend this book to anyone working or teaching in the field of fruit crops. The new layout is clear and to a large extent 'future-proofed' as this edition does not refer to control measures which are constantly changing and rapidly become out dated. I might criticize the book for the cost, but the quality of the finish and images to a large extent justifies the price asked. If the previous editions are anything to go by, this will become a well-thumbed book that needs to stand up to constant use.

STUART C. GORDON

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Inositol Phosphates: Linking Agriculture and the Environment, eds B. L. Turner, A. E. Richardson & E. J. Mullaney, 288 pp. Wallingford, UK: CABI (2007). £60.00 (hardback). ISBN 978 1 84593 152 1.

Inositol phosphates are abundant in nature, and most of the phosphorus (P) in seeds, and much of the P in soils and sediments, occurs as *myo*-inositol hexakisphosphate (phytate). Indeed, it is estimated that commercially produced seeds and fruit contain about 51 Mt phytate, which is apparently equivalent to about two thirds of the annual application of inorganic P fertilizers. Unfortunately, phytate cannot be digested by monogastric animals, such as pigs, chickens and humans, and phytate in soils is generally unavailable for plant growth. For these reasons, efforts have been made recently to reduce phytate in diets of monogastric animals and to understand the transformations of inositol phosphates in the environment both to improve P use in agriculture and to reduce losses of P to susceptible ecosystems.

Benjamin Turner, Alan Richardson and Edward Mullaney have done an excellent job in editing this book to produce a narrative of interesting and informative chapters of consistently high standard. All chapters are current and authoritative, and conclude with a summary and recommendations for further research that provides a perfect *aide memoire* for busy students, teachers and researchers.

The book begins with a useful glossary of terms provided by Stephen Shears and Benjamin Turner. It illustrates the nine stereoisomers of the parent inositol moiety and describes the nomenclature used to describe the many phosphorylated derivatives (63 different compounds are possible in the case of *myo*-inositol alone) and their conformational isomers. The following chapters then review the classical methods used to determine the structures of inositol phosphates present in plants, microbes, soils and waters, and the application of modern high-resolution analytical techniques to this problem. Pushpalatha Murthy describes how inositol phosphates can be identified by NMR spectroscopy using ^{1}H, ^{31}P and ^{13}C nuclei, William Cooper and co-workers describe how high-performance chromatography and mass spectrometry can be combined to determine the inositol phosphates present in complex biological and environmental matrices, and Michael L'Annunziata reviews the use of radioisotopes to elucidate the biochemical pathways of transformation of inositol phosphates and provide both biological and chemical insights.

Chapters by Jane Hill and Alan Richardson, Ralf Greiner, Edward Mullaney and Abdul Ullah then describe the phytases of micro-organisms and plants, their biochemical properties, occurrence in cells and in soils, the regulation of their abundance by P bioavailability, their physiological functions, phylogenetic distributions and ecological significance. Phytases initiate the stepwise release of phosphate (Pi) from phytate and are important for mobilizing P for uptake and metabolism. They are divided into four groups based on their protein structure and catalytic mechanism: (i) histidine acid phosphatases, which are widespread in bacteria, fungi and plants, (ii) cysteine phosphatases, which have been identified in rumen bacteria, (iii) β-propeller phytases, which occur mainly in bacteria and (iv) purple acid phosphatases, which occur in a variety of organisms. Intracellular phytases release Pi from stored phytate and extracellular phytases mobilize Pi from organic substrates during periods of P demand. These chapters also highlight the commercial use of phytases to reduce phytate concentrations in animal feeds and human foods, and the potential for generating transgenic plants that are better able to grow on high-phytate, low Pi soils.

Two chapters consider in detail the genetic engineering of transgenic plants capable of utilizing soil phytate. Alan Richardson and colleagues report that plant roots are innately unable to acquire P from phytate, but that transgenic plants secreting soluble phytases into the rhizosphere grow better than untransformed plants on high-phytate, low Pi soils. Timothy George and colleagues consider the impact of the soil environment on the activity of these phytases. They explore the effects of immobilization and/or inactivation of phytases by absorption to soil particles, the influence of cations and anions in the soil solution on their catalytic activities, their susceptibility to denaturation by environmental factors, such as temperature and pH, and to proteolytic degradation. Thus, they identify the challenge for protein engineers to improve the biochemistry of secreted phytases to exploit soil phytate for crop nutrition.

An alternative to the addition of phytase to feed and food is to produce crops with innately low phytate concentrations. A chapter by Victor Raboy describes the phytate biosynthetic pathways in plants, and identifies genes encoding enzymes that can be targeted to reduce seed phytate concentrations without affecting yields. Plants with mutations in these genes have been used to develop low-phytate soybean and cereal crops which, when fed to monogastric animals, reduce P concentrations in animal waste. Pursuing the theme of low-phytate feed, Xin Gen Lei and Jusus Porres consider the benefit of reduced phytate diets for swine and poultry nutrition. Such diets not only improve P utilization but can also increase the bioavailability of other essential elements, such as calcium, zinc and iron, which are complexed by phytate. The positive environmental impacts of reducing P in animal manure, to achieve a better NP ratio for agricultural applications, is discussed by April Leytem and Rory Maguire, who note that much of the phytate in manure is degraded by microbial activities during storage. The details of processes that affect the solubilization and transformation of inositol phosphates in manure, which are important for their ultimate environmental fate, are discussed by Thanh Dao.

The final chapters in the book address the amounts and significance of different inositol phosphates in the environment. In reviewing inositol phosphates in soils, Benjamin Turner concludes that the contribution of inositol phosphates to soil P varies widely (between 1 and 60%) and that, in addition to *myo*-inositol phosphates, soils contain low concentrations of other phosphorylated inositol stereoisomers, such as *neo*-, D-*chiro*- and *scyllo*-inositol phosphates, that occur nowhere else in nature. The origin of these compounds is unknown. Luisella Celi and Elisabetta Barberis describe the abiotic processes stabilizing inositol phosphates in the soil and restricting their degradation by phytases. Such processes include adsorption on clay particles or organic matter, and complexation or precipitation with cations such as Fe and Al in acid soils or Ca and Mg in neutral or basic soils. Since run-off is generally considered to be the major route by which P reaches water bodies, the abundance of inositol phosphates in the soil influences the amount of P delivered to watercourses and, consequently, water quality. Ian McKelvie discusses the sources and transformations of inositol phosphates in aquatic systems and their effects on P availability to aquatic organisms and, consequently, eutrophication.

I very much enjoyed reading this book and would recommend it to anyone interested in the chemistry and biology of inositol phosphates.

P. J. WHITE

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