

in detail acting as an ideal reference text for comparison with experimental data. Another area covered extensively by the volume is the health implications of phytosterols in prevention of disease states including cancer and cardiovascular disease. Here the effects of phytosterols in typical foods as well as enhanced level in functional foods are discussed. The safety implications of high phytosterols diets are also documented providing a balanced view and precautions that must be considered.

One of the highlights of the book was the chapter by Robert Moreau, which provides the applied information of the products that are on the market, and really shows phytosterols as commercial functional food ingredients. The chapter is an important aspect of the book as it illustrates the commercial end product that has resulted from the analytical and nutritional studies carried out previously and described within the book. In contrast the final chapter relating to “prospects of increasing nutritional phytosterol levels in plants” was a little disappointing. The genetic

tools are now fully available for enhancement of phytosterols by both a genetic modification and/or conventional breeding approach, as recent examples have shown (e.g. Holmberg et al., 2003 *Plant Journal* 36 (1), 12–20). However the chapter did not fully explore these avenues.

Overall the book is an essential addition to any library serving an organisation actively engaged in Food chemistry. In addition, the material provides important information for both researchers and students involved in plant biochemistry, nutrition, food science, medicine, and analytical chemistry.

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J.T. Romeo, Secondary Metabolism in Model Systems. Recent Advances in Phytochemistry, vol. 38, Elsevier, Oxford, 2004, ISBN 0-08-044501-2, 130 GBP

This volume forms part of the continuing excellent series of ‘Recent Advances in Phytochemistry’ derived from the Proceedings of the Phytochemical Society of North America. Volume 38 originates from a series of mini-symposia held at the 43rd annual meeting of the Society (August 2003) in Peoria, Illinois. These symposia covered the secondary metabolism of *Arabidopsis*, rice, maize, soybean and *Aspergillus*, respectively. It therefore represents an in-depth assessment of the diversity of secondary metabolism in three major crops, a model plant and a fungal genus of agronomic importance. To me, while the coverage of all five organisms was useful, the sections on *Arabidopsis* and rice were the most timely. Many phytochemists have tended to underestimate the diversity in secondary metabolism of these two ‘fully-genomic’ plants and this view is comprehensively challenged in this book. The first three chapters consider the natural products chemistry and biology of the terpene, glucosinolate and phenylpropanoid pathways in *Arabidopsis*. The chapter on terpenes in *Arabidopsis* is an excellent illustration of what can be achieved by combining state-of-the-art phytochemistry and molecular genetics to fast-track our understanding of a group of compounds originally over-looked in this plant. In very short order, the synthesis and complex regulation of mono- and sesquiterpenes has been determined and important insights gained into the functional significance of these compounds in plant defence and insect attrac-

tion. The section on glucosinolates looks at the features of the biosynthetic pathway which have allowed a family of bioactive metabolites to evolve from a single intermediate. This approach gives useful insights into the diversification of other branches of secondary metabolism in other plants. The section on phenylpropanoids is a highly advanced review of monolignol and sinapate ester synthesis, with a detailed look at key individual biosynthetic steps identified through analysis of the respective mutants. It is a very useful illustration of the level of understanding which can be achieved by years of detailed study of a single pathway in an organism where there are an abundance of molecular genetic tools available.

Chapters 4 and 5 consider secondary (indole and benzoxazinone) and primary (carotenoid) metabolism in maize. With the benzoxazinones there is a nice common thread with *Arabidopsis*, showing the importance of tandem gene duplications in the evolution of metabolic pathways. Chapters 6 and 7 consider the secondary metabolism of rice from a genomic and systems-based approach respectively. In particular chapter 6 poses some interesting questions about the metabolic plasticity of rice and should have phytochemists around the world probing for the pathways suggested from the genetic blueprint of this major world crop. The systems approach described in chapter 7 will also play its part in the longer term, but based on the title referring to integrating the genome and metabolome, the level of detail presented was sketchy and the quality of the graphics much to be desired. Chapters 8 and 9 focus upon soybean. In chapter 8, we have an up-beat assessment of

the benefits of metabolic engineering of isoflavone and saponin biosynthesis from the group at DuPont Crop Genetics. There are major health benefits to be gained here and this chapter gives some excellent insights into the large amount of work being undertaken to metabolically improve soybean in the industrial sector. While well-written, chapter 9 was less useful, being more of a general overview of the value of expressed sequence tag microarrays in the global analysis of pathways.

The final two chapters examine the secondary metabolism of *Aspergillus nidulans* and *Aspergillus flavus*, respectively. With the important links with crop quality these latter chapters form a useful link to the plant chapters and broaden the metabolic chemistry covered in the volume as a whole. Again the importance of genetic approaches and the advantages of genome coverage emphasised.

The editor has done a good job of assembling the volume which will form a useful review of the state of play in our understanding of the secondary metabolism of these

five model organisms. In particular the volume collectively identifies key emerging issues in phytochemistry, namely the evolution and diversification in secondary metabolic pathways based around a restricted range of precursors and a limitation in the types of reaction mechanisms available to drive biosyntheses. As such it is a very useful read for researchers and advanced level teachers of phytochemistry who may still be sceptical about the value of model organisms in studying metabolic diversity and is a useful point of reference for future studies in other crops and medicinal plants.

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