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Book review

***Functionality of Food Phytochemicals*. Recent Advances in Phytochemistry, Vol. 31; T. Johns and J. T. Romeo (Eds.); Plenum Press, New York, 1997, viii + 273 pages, ISBN 0-30645691-5, US$95.00**

This book is a response to the current surge of interest in the functional significance of food constituents. Here 'functional' is used more in the context of physiology and health benefits, but physical and chemical properties, as well as sensory characteristics, more familiar to the food scientist, have been allocated some space. The papers collected here were presented at the Annual Meeting of the Phytochemical Society of North America in 1996.

Accordingly, the majority of the 11 chapters are written by Canadian or US authors, but one is by a Mexican and another by a Frenchman. Between them they cover, peeling the onion: organosulfur and -selenium phytochemicals in genus *Allium* plants (E. Block, E.M. Calvey, C.W. Gillies, J.Z. Gillies, and P. Uden, 30 pp.), health promoting phytochemicals in citrus fruit and juice products (A. Montanari, W. Widmer, and S. Nagy, 22 pp.), chemopreventive agents in foods (B. Stavric, 35 pp.), constituents of wild food plants (A. Sotelo, 25 pp.), biology and biochemistry of underground plant storage organs (H.E. Flores and T. Flores, 20 pp.), behavioural determinants for the ingestion of food phytochemicals (T. Johns, 22 pp.), phytochemicals and wine flavour (S.E. Ebeler, 24 pp.), flavour biogeneration (J. Crouzet, 22 pp.), food colorants from plant cell cultures (F. Cormier, 22 pp.), transgenic manipulation of edible oilseeds (T. Voelker, 13 pp.), and quantitative microscopic approaches to carbohydrate characterisation and distribution in cereal grains (R.G. Fulcher, S.S. Miller, and R.R. Ruan, 25 pp.). There is also a subject index (11 pp).

Each chapter is amply referenced, with many references to 1995 and 1996 and a sprinkling of 1997 ones.

The chapter on *Allium* species is mainly chemical, covering not only the basic chemistry of allicins, but also the dimerised lachrymator, the zwiebelanes, bissulfine, ajoene, cepaenes, and organoselenium compounds. Antibacterial, antifungal, antitumour, antithrombotic, and other types of activity are mentioned and there is a useful table of flavour thresholds and flavour descriptions.

The chapter on citrus fruit deals mainly with the effects related to cancer and to coronary heart disease (CHD) of the flavanones, flavones, limonoids, dietary fibre and pectin, essential oils, and glucaric acid. Here there is some lack of clarity and precision.

The third chapter is the longest and has as many as 256 references. It is the one closest to the aims of the book, by focusing on the protective role of naturally occurring agents in food. These agents are generally characterised here as chemopreventers, nutraceuticals, or functional foods. They are grouped and discussed according to chemical entity, physiological activity, foods in which they appear, mechanism of action, and the disease prevented or organ affected. The chemical entities reviewed are antioxidants, polyphenols/flavonoids, and miscellaneous others, but in between there is a section on selected foods, covering beverages, vegetables (including *Allium*), and grains. There are additional sections on induction of detoxifying enzymes, interpreting epidemiological and other results, and supplements. Reassuringly, "the best advice for the consumer still appears to be to eat a wide variety of grains, fruits and vegetables".

The fourth chapter deals with wild plants, but is restricted to those of Mexico, which, admittedly, encompasses a range of climates and soils. Many plants are mentioned, which makes the lack of authors for botanical binomials (also in other chapters) more regretable. The headings under plants are nutritive value, *Phaseolus vulgaris*, oil seeds, and leaves and flowers, and, under antinutritional factors and toxins, cyanogenic glycosides, protease inhibitors, lectins, and alkaloids.

The fifth chapter is concerned with underground storage organs and deals briefly with medicinal plants, underground crops, and storage proteins, before considering Andean root and tuber crops in some detail. The crops reviewed are potato, sweet potato, oca, mashua, ulluco, maca, mauka, arracacha, and yacon. Some of these are noteworthy for their relatively high protein content: mashua 14–16%, maca 13–16%, and yucon 11–17%. Knowledge of these fascinating underground chemical factories is still all too sketchy and effort devoted to them is likely to be richly rewarded.

The sixth chapter focuses on behavioural aspects. Two topics are raised, psychosocial determinants of behaviour and physiological determinants of phytochemical ingestion, the former only briefly, but the latter more extensively, dealing with tonics, neuropharmacological mechanisms of action, food selection and behavioural effects of nutrients, flavour and conditioned

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effects, pharmacological effects (including adaptogens, stimulants, antispasmodics, and sedatives), and antidepressants.

The seventh chapter is concerned with wine flavour, focusing on bitterness and astringency and the compounds which affect these characteristics, mainly the polyphenols. This is a complex area, which in general is subjected to all too little scrutiny. The polyphenols are also important in relation to wine colour. Wine aroma is reviewed briefly and superficially.

The eighth chapter deals very competently with flavour biogeneration in two sections, biosynthesis (esters, methyl ketones and lactones, and pyrazines) and biogeneration by enzymes from precursors (lyases on cysteine sulfoxides, glucosinolate hydrolysis, glycosidically bound aroma compounds, and oxidative pathways).

The ninth chapter concerns food colorants from plant cell culture, focusing on two processes, anthocyanin production using grape cells and crocetin glycoside production using saffron cells. Useful tables on anthocyanidin and anthocyanin glycosyltransferases and on anthocyanin methyltransferases are presented. Commercially successful processes still seem beyond the horizon.

The tenth chapter deals with edible seed oils, covering biosynthesis, principles of genetically engineering oil composition, modification of unsaturation, manipulation of chain length, and rearranging triglycerides. The final section describes the path from proposal to marketplace for laurate canola. With the first products of single-gene manipulations already on the market, plant biotechnology is at the threshold of making its mark. The rapid increase in knowledge concerning every aspect of fatty acid biosynthesis and the refinement of the technologies involved makes the author think it likely that the next several decades will bring nearly complete control over triglyceride fatty-acid structure and composition.

The final chapter is concerned with quantitative carbohydrate characterisation and distribution in cereal grains using scanning microspectrophotometry and magnetic resonance imaging. The former is used to characterise grain constituents in situ, mapping the distribution of molecular components in the grain, and rapid measurement of key quality traits in different cultivars. The latter has led to improved definition of key physiological processes, such as hydration and germination.

Overall this is an interesting book, covering a multiplicity of topics, amply referenced, but, as can be seen above, one that lacks proper organisation. The editors have not attempted to impose a framework, based on functionality, chemistry, botany, or geography. The reader therefore has to hunt for specific information and the index is only of modest help. The editors have not been firm enough either in relation to style and, although the book is well produced with a profusion of figures and tables and few misprints, there are errors. The price is on the high side. A book for libraries and specialists.

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