

BOOK REVIEWS

Plant Proteins: edited by G. NORTON. Butterworths, London. 1978. 352 pp. £16.

A more accurate title for this book would be 'Plant Proteins as Human Foods', since the subject matter is restricted to the application of scientific knowledge on plant proteins to the problems of feeding an ever-increasing world population. It is, in fact, the proceedings of an Easter school in Agricultural Sciences held in 1976 in the University of Nottingham and it suffers the disadvantages of many such works in the variable coverage of the chosen topics and in indifferent book production.

The nineteen chapters are laid out in a reasonably logical sequence in seven sections: properties and biosynthesis; development of seed reserves; associated undesirable factors in seeds; agricultural production; the improvement of quality and yield; nutritional aspects; applications in the food industry. In the first section, there is an excellent and authoritative introductory chapter by D. Boulter and E. Derbyshire, which cleverly encapsulates in the space of 22 pages most of the major developments in the biochemistry of plant proteins of the last decade. This is followed by accounts of chloroplast proteins and legume protein biosynthesis by R. J. Ellis and A. Yarwood respectively. Storage protein is laid down in seeds in protein bodies and the processes of such deposition are reviewed here, with appropriate EM illustrations, in respect of oil seeds, legumes and cereals by G. Norton and coworkers and L. G. Briarty. Toxic factors associated with seed protein may be either low molecular weight or proteinaceous; the toxic effects of non-protein amino acids, trypsin inhibitors, phytohaemagglutinins and other agents are considered briefly in chapters by L. Fowden and I. E. Liener. The problems

of dealing with these toxic factors in food plants are, however, only briefly touched upon.

Increasing the world supply of plant protein depends either on improving the yield and quality of the seed protein in well established crop plants or on exploiting new sources, such as Pirie's leaf protein or microbial protein. All these familiar topics are reviewed in some depth here. The nutritional inadequacies of plant protein (especially the low lysine content) have often been unfairly over emphasized—perhaps by keen meat eaters!—and P. R. Payne, in an excellent chapter on human protein requirements, describes how difficult it is to obtain any really satisfactory estimate of these dietary requirements. All sorts of psychological factors come in here and the same author points out how the pleasure of meat eating in primitive societies was closely connected with the excitement of communal hunting of wild animals and the concomitant avoidance of the monotonous labour which agricultural work involves. The problem of low lysine content has, as is well known, been solved in barley and maize by breeding strains in which the balance of endosperm proteins has been changed in favour of high-lysine at the expense of low-lysine protein types. It is, however, interesting to read here, in the chapter on protein quality, that the protein of oats and of most legumes is not deficient at all in this respect. Indeed, the problem of amino acid balance in plant proteins is solved, as R. L. M. Syngé has frequently pointed out, by simply eating protein from a variety of plant sources.

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Regulation of Enzyme Synthesis and Activity in Higher Plants: edited by H. SMITH. Phytochemical Society Symposia Series No. 14, 388 pp. Academic Press, London, 1977. £16.

The enzymes of higher plants were at one time sadly neglected by biochemists, because of the technical difficulties of isolating them and of their ready denaturation by reaction with phenolics and other endogenous plant constituents. In recent years, most of these difficulties have been overcome and a considerable body of literature now exists on plant enzymes, their properties and their *in vivo* regulation. It was highly appropriate for the Phytochemical Society to choose plant enzymes for consideration in their main Symposium of 1976 and the present volume is the valuable, permanent record of that

meeting. In this collection of review essays, we almost have two books for the price of one, since the first half deals more specifically with enzyme synthesis and degradation while the second half is devoted to methodology. Both parts successfully complement each other and together provide a broad and detailed vista of recent progress in our understanding of enzyme synthesis and activity in higher plants.

Outstanding among the methodology chapters is that by M. J. C. Rhodes on extraction and purification. I know of no other such widely useful and penetrating essay on the basic problems of separating enzymes from plant tissues and any novice starting out for the first time to isolate and purify a plant enzyme could do no better than absorb all the many practical hints outlined here. R. M. Leech then critically reviews the

fractionation techniques available for determining the subcellular distribution of plant enzymes, while histochemical procedures are ably covered in a further chapter by J. L. Hall and his associates. Affinity chromatography is a technique only just beginning to be applied to plant enzymes and a timely introduction to the subject is provided by P. D. G. Dean and M. J. Harvey. The remaining two chapters in this section cover immunochemical approaches (J. Daussant *et al.*) and density labelling for investigating enzyme levels in plants (C. B. Johnson).

Evidence is accumulating that control of biosynthetic enzymes in plants is modified by similar processes (e.g. end-product inhibition) to those operating in bacteria. In spite of this advance, there are also considerable complexities remaining in our understanding of enzyme regulation in the primary metabolism of plants. Some of these outstanding problems are discussed in a series of fascinating, speculative chapters by G. R. Stewart and D. Rhodes, B. J. Miflin, D. D. Davies and M. M. Yeoman

and coworkers. Hormonal control is then briefly outlined by J. E. Varner and D. T. Ho, while photocontrol is described in a much more comprehensive fashion by H. Smith, E. E. Billett and A. B. Giles. Regulation through isozymes is considered by J. G. Scandalous, who uses as illustration the five forms of alcohol dehydrogenase present in maize. In a theoretical chapter, J. Ricard *et al.* consider conformational changes and the modulation of enzyme catalysis, with reference to PAL and to NADP reductase-ferredoxin complexes in plants. Inactivation of enzymes through proteolysis is the subject of the final chapter by W. Wallace.

In summary, this is an excellent collection of inter-related essays and it will surely be widely read by plant scientists. Since it contains several valuable, comprehensive review chapters, it will inevitably remain a standard reference on plant enzymes for a long time to come.

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