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Book review

Plant pathogenesis and resistance – biochemistry and physiology of plant–microbe interactions. Jeng-Sheng Huang. 2001. Kluwer Academic Publishers, Dordrecht, the Netherlands. ISBN 0-7923-7118-6. € 250 Euro.

Up to a few years ago, there were no textbooks on the biochemistry and physiology of plant diseases that incorporated the newer developments in this rapidly expanding field. Meanwhile, plant physiologists and molecular biologists have discovered the fascinating ways by which plants are able to cope with the multiple threats posed by their natural environment, and molecular-genetic tools have greatly contributed to a better understanding of how pathogens are capable of attacking plants and how plants employ both preformed and inducible mechanisms to defend themselves. Of the books that appeared recently on the market, 'Plant Pathogenesis and Resistance' takes a more traditional approach. There is information on infection processes and pathogenicity factors of fungi and bacteria, whereas viruses receive scant attention. Chapters on cell wall degrading enzymes and on toxins are by far the largest in the book. Signal transduction in the plant and the dynamics of host defense together make up less than 40%, illustrating that this book is concerned mainly with pathogenesis *per se*, and to a lesser extent with mechanisms of resistance in the plant host. An excellent chapter on the *Rhizobium*-legume symbiosis seems somewhat out of place in a book on plant pathogenesis and resistance. However, this well-studied combination is an exemplary model of the two-way molecular communication that takes place between a plant and an invading microorganism. The latter is not made explicitly clear, however, and the chapter ends with a description of the effects of diseases on nodulation and nitrogen fixation.

Treatment of the different topics follows a (bio)chemical approach by concentrating primarily on classes of compounds. For instance, enzymes that degrade pectic substances are described by the type of enzymatic activity, and phytoalexins by their chemical structure. The book contains many tables, providing much factual information without being truly comprehensive. This approach makes it easy to find whether specific enzymes or compounds are involved in plant-microbe interactions, but makes it difficult to obtain an integrated picture of which factors play a role in specific plant–pathogen combinations. There are very few cross-references here. Because the interactions between pathogens and their hosts are highly specific, each pathogen makes use of a specific combination of pathogenicity factors to attack its host. Conversely, the host attempts to counteract such invasion by mounting a coordinated response comprising several mechanisms. As a reader, one becomes overwhelmed by the variety of compounds that are listed as being involved in host–pathogen interactions. From such compilations one might easily get the impression that there is no clear conceptual framework in which such diversity would fit. After the extensive description of the enzymes involved in the dissolution of plant cell walls, there are a mere seven pages devoted to their role in plant pathogenesis and no mention is made of the apparent redundancy of microbial enzymes that is commonly encountered and may be related to differential pathogenicity on specific host plants. Plant defenses: fortification of cell walls, phytoalexins, and pathogenesis-related proteins are described in separate chapters without reference to their being induced collectively, e.g. during a hypersensitive reaction. No mention is made of the gene-for-gene relationship that lies at the basis of many, if not most, forms of resistance that have been well-studied at the biochemical and physiological level. Likewise, the topic of induced resistance remains largely hidden, and the fact that pathogenesis-related proteins are induced systemically, in contrast to the other types of defensive responses, is mentioned only in passing. In the first part of the book fairly basic and hardly up-to-date introductions are given on, e.g., photosynthesis and respiration in healthy plants, physiological processes that should be well known to prospective readers.

For a single author, writing a book on this broad and rapidly evolving subject is a formidable task. The compilation of so much data, also from the older literature, provides a source of information that would be difficult to collect otherwise. Where the author

comes to describing the role of specific compounds in pathogenesis in more detail, such as melanization in the penetration from fungal spores or the practical uses of phytotoxins, the text makes good reading. However, much remains factual information of which the functional significance is not immediately clear. For instance, the distinction between specific and non-specific elicitors is not made clear, and the description of each elicitor separately creates the impression that each elicits specific responses in plants, whereas the results from the literature merely reflect the parameters measured rather than the full response of the plant. Critical discussion of older findings that are superseded by newer insights are scarce, and few attempts are made to explain inconsistencies and discrepancies in the literature. Thus, of the four groups that have published on promotor analysis of *PR-1* expression in response to salicylic acid, results from two are described in consecutive paragraphs as if they employed different methodologies, and no attention is drawn to the fact that the results described are contradictory.

The strength of this book lies in its systematic treatment of the factors involved in plant pathogenesis. At a time when genomics and transcriptomics are the fashion, it is good to realize that organisms function through the flow of metabolites that build up their structure and regulate their functioning. In that respect, biochemistry and physiology deserve more attention. This book contributes by providing a large source of information.

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