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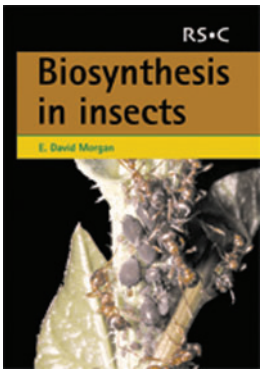

Biosynthesis in Insects

by E. David Morgan
RSC, Cambridge
2004, 199 pp
ISBN 0-85404-691-7
Softcover, £35

The number of insect species on earth has recently been estimated at over four million, and taken together with related arthropods their number exceeds that of all other species combined. Despite this dominance of biodiversity, and their economic and ecological importance, our knowledge of insect natural products and their modes of formation is substantially less than that for plants or microorganisms. This reflects the relative difficulty of working with insects. In general, insect species are more difficult to obtain in the quantities needed for the isolation and structure determination of their component chemicals, and do not lend themselves to metabolic studies in the way that microorganisms, and to a lesser extent plants, do. These barriers are progressively yielding to the dramatically increasing capability of modern spectroscopy, particularly nuclear magnetic resonance and mass spectrometry, to establish molecular structure and isotopic labelling patterns on ever-smaller amounts of material. There has also been a view that insects are basically what they eat, so that any novelty in their chemical make-up merely reflects novel metabolites sequestered from their food sources, usually plants. While this view certainly remains true to an extent, its generality has also been severely reduced by modern technology.

David Morgan has written the first monograph to deal with biosynthetic pathways in insects. While the main emphasis is on insects, the discussion is of necessity not confined to that group but supplemented where necessary by drawing on our knowledge of biosynthesis in plants, microorganisms, and higher animals. Following a brief overview of the subject, chapter 2 introduces the reader to enzymes and their action, the important coenzymes, and to the concept of chirality. Chapters 3 and 4 deal with fatty acids and derived compounds, and the related topic of polyketides and acetogenins. With this background established, a useful diversion is made into experimental methodology in chapter 5, including radio-isotope and heavy isotope labelling. The increasing structural and biosynthetic complexity of mono- and sesquiterpenes, and higher terpenes and steroids, are considered in chapters 6 and 7. Chapter 8 concerns aromatic compounds of both shikimate and acetate origin, and insect pigments of various types from melanin to aphins, pterins, tetrapyrroles, and ommochromes. Alkaloids and substances of mixed biosynthetic origin are considered in chapter 9. The final chapter, 10, addresses the important topic of storage and metabolism of plant metabolites by insects. Each chapter is accompanied by a selection of key references for background and further reading, and concludes with a series of questions with which readers can assess their understanding of the material against answers provided at the end of the book. An appendix of common abbreviations and a detailed subject index citing both pages and figures complete the monograph.

Biosynthesis in Insects is a timely monograph, given the growth of our understanding of insect chemistry and metabolism. Attractively produced, it is abundantly illustrated with figures depicting structures and biosynthetic sequences, eighteen beautiful colour plates, and line drawings. Aimed primarily at graduate students with interests in entomology, insect chemistry, and chemical ecology, the book in many ways functions as an introductory guide to biosynthetic pathways in general, as exemplified by the routes to the pheromones, hormones, defensive secretions, venoms, pigments, and surface coverings of the insect world. Teachers and research workers in these fields will also welcome this concise integration of previously scattered information.

Personally I found this a most interesting and informative monograph. Inexperienced students who constitute the primary target readership, however, should be warned that unfortunately it contains a large number of errors, and they should proceed with caution. Some of these errors are trivial and easily recognized (‘dueterium’), but many are not obvious and will either mislead or confuse them. Text cross-references to figures in other chapters are sometimes incorrect. The discussion of isotope incorporation does not clearly distinguish the crucial difference between specific incorporation of a radioactive precursor used in tracer amount, and the isotopic enrichment produced by a stable isotope precursor used at much higher level. Extensive errors occur in the figures themselves, affecting over a quarter of the figures in some chapters. These errors range from ill-defined depictions of configurations to incorrect absolute configurations (including that of ‘the only example of a methylalkane pheromone with known chirality’) and structures that are wrongly named or simply wrong, frequently containing additional carbon atoms (e.g. the same pheromone, and even stearic and linoleic acids). A question asks the reader to suggest steps in the biosynthesis of an incorrect structure for caryophyllene oxide (misspelt in two figures), and an answer is provided. Hopefully such matters will be corrected at the next printing and a figure will be added to assist chemists with insect taxonomy, then this very useful monograph will then achieve its aims and potential.

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