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Biodiversity and Natural Product Diversity: Tetrahedron Organic Chemistry Series Volume 21

By Francesco Pietra, Pergamon Press, 2002, Price US$45.00, 368 pages in paperback, ISBN 0-0804-3707-0

Defining and cataloguing biodiversity is a difficult task, and explaining how the diversity of natural products relates to the diversity of living organisms is also challenging. That is what the author sets out to do in this monograph. Although the book contains many examples of natural product diversity, both in terms of chemistry and biological activity, it is less successful in providing a clear and compelling explanation of how biodiversity leads to chemical diversity.

The book is made up of six sections of varying lengths: the concept of biodiversity; the relationship between biodiversity and natural product diversity; natural product diversity at the ecosystem level; natural product diversity at the functional level; biotechnology and chemical synthesis of natural products; and threatening and management of natural product diversity.

The opening chapters briefly explore various concepts and definitions of biodiversity and possible changes in biodiversity throughout evolution. The next section moves on to consider possible ways to relate the diversity of natural products to levels of biodiversity. Various problems are highlighted, in particular the fact that estimates of the diversity of natural products are hampered because the numbers of many species, particularly of micro-organisms, are not known. Also, many bacteria are not readily grown in culture so that it is difficult to isolate their secondary metabolites for study.

So far, it seems impossible to correlate genetic approaches to taxonomy with chemical approaches. The author introduces a numerical system for comparing the size and complexity of different chemical compounds. Because this system is used subsequently in detailed comparisons of individual structures from different sources, it would be helpful to have a more extensive discussion on the strengths and weaknesses of the chosen system.

In the following section, natural product diversity is considered at the level of major ecosystems. The detailed information is presented in maps and charts. The maps are too small for easy comprehension and the charts are too densely packed for easy reading. It seems that only rather broad conclusions can be reached about the levels of biodiversity in different ecosystems, and caution needs to be applied because not all systems are equally researched. One chapter attempts to summarize the molecular complexity of the different chemical classes (alkaloids, peptides, and so on) that are known to exist in different environments. Although this is a valuable attempt to classify and condense important information, the complex 3D multicoloured graphs are difficult to decipher.

The largest section in the book is given over to 'functional diversity', for example, a consideration of the variety of natural products with different biological activities, such as signalling and defense compounds, antifeedants and toxins. The uses to which natural products have been put are also discussed, with examples being given of the diversity of chemical structures. Because this is a massive area to review, some of the coverage is understandably sketchy and some of the examples are misleading (e.g. α-bungarotoxin is not an anticholinesterase, and ω-conotoxin does not block acetylcholine receptors).

The functional diversity section is followed by consideration of the roles of biotechnology and chemical synthesis. Although the topic of synthetic developments from natural products is obviously relevant to drug discovery, it is not clear why it is relevant to a book that is relating natural product diversity to biodiversity.

Finally, there are two short general chapters on threats to biodiversity and how biodiversity can be conserved or managed.

Overall, the book contains some interesting information. However, it is unlikely to be particularly useful to scientists concerned with drug discovery. Factual errors about drug types and uses have crept in, probably because of the need to condense so much information in a small volume. The dense format also makes the book a little hard to read, and parts of the text needed the touch of a sympathetic editor.

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