Phytochemistry, 1969, Vol. 8, pp. 1835 to 1836. Pergamon Press. Printed in England

BOOK REVIEW

Comparative Biochemistry of the Flavonoids, J. B. HARBORNE. Academic Press, New York 1967. 90 sh.

FLAVONOIDS constitute a group of structurally and, as far as known, biosynthetically related plant constituents. Although a few have been found in animals, for example in the wings of certain butterflies, these are also of plant origin. The chemistry of flavonoids is well known and has been reviewed in several recent monographs. All flavonoids contain a simple C_6-C_3-C_6- skeleton and what makes the group large is the virtually endless variation on that theme. Such variations include state of oxidation, patterns of hydroxylation, degree and type of alkylation, glycosidation and acylation. Many new flavonoids, even novel types, will certainly be found in the future but it can scarcely be denied that interest in flavonoids is gradually changing in the direction of biology; function, biosynthesis, genetics and last but not least systematic distribution.

It is an almost superhuman task to master all these different aspects and who other than J. B. Harborne could do this, a man who has devoted all his scientific efforts to the study of these compounds, particularly the anthocyanins.

The increased interest among biochemists and botanists in the flavonoids makes it important for chemists to devise simple micro-methods for the rapid and, as far as possible, accurate identification of flavonoids which allow, for example, screening of taxa and studies on the effects of hybridization and of external factors. Harborne has been one of the pioneers and is still one of the most active workers in this field.

In his book, the three first chapters contain an almost (up to October 1966) complete account of the structurally elucidated anthocyanins, the common flavones and their glycosides and most of the minor flavonoids, chalcones, flavanones, aurones, isoflavones etc. Harborne draws freely on his unique personal experience in tabulating available data, published and unpublished, for the characterization of flavonoids by spectral and chromatographic methods and suggests suitable sources for the isolation of reference samples. In a following chapter he presents a comprehensive review of the distribution of the flavonoids in higher plants, from the mosses up, discussing evolutionary reasons for the preponderance of some anthocyanins in certain geographical regions and systematically interesting types of anthocyanidin glycosides. He also discusses specialized topics such as flavonoids with unusual hydroxylation patterns and the remarkable fact that in the order Centrospermae, including Cactales but excluding the suborder Caryophyllineae, betalains occur with the exclusion of anthocyanins. However, other flavonoids may be present. This is one of the most important results of molecular taxonomy and the phenomenon surely has phylogenetic significance.

The most important chapters are those dealing with the distribution of flavonoids in Archichlamydeae, Sympetalae and Monocotyledoneae. Flavonoids isolated from a large number of species are tabulated and those from especially interesting families are thoroughly

discussed. The preponderance of the "common" anthocyanins and flavones is very great. Anthocyanins are particularly common in reproductive organs where they obviously serve the function of attracting insects and birds to ensure cross-pollination. It is peculiar, however, that young cones of wind-pollinated gymnosperms frequently contain anthocyanins. As in other groups of natural products it is the uncommon "aberrant" flavonoids that have the greatest taxonomic value. *Primula* and *Dionysea* characteristically contain flavones with few or no hydroxyl groups. 3-Deoxyanthocyanins are common in cryptogams and in the family Gesneriaceae, one of Harborne's own important contributions. They are only occasionally found in other angiosperms. The same holds true for the isoflavones which are frequent only in the Papilionatae. There are many similar cases. Obviously the ability to synthesize such unusual flavonoids has developed independently in many unrelated plants. We still know far too little about their biosynthesis and it is possible that chemically identical flavonoids are synthesized in different ways in different plants. The question of whether or not some flavonoids should be regarded as primitive and others as advanced is also very unclear. This problem is briefly touched upon in a later chapter on chemical taxonomy.

The colour of flowers, particularly of cultivated plants, varies greatly due to mutations, and genetic investigations have resulted in the identification of many genes controlling steps in the synthesis of flavonoids. This intriguing and important subject is well covered. However, the elucidation of the factors interposed between gene and product remains a problem for the future. The discussion of the biosynthesis of flavonoids is brief. The function of the flavonoids, especially the uncommon ones, is just as unclear as is that of most other secondary metabolites. Clearly in many cases they possess a positive selective value. Mostly, however, their function, if any, remains completely obscure.

The indexing of books such as the present one poses many problems. The indices tend to occupy a very considerable portion of the available space. Botanists will easily find what they are looking for in Harborne's book, but chemists will be perhaps less fortunate.

It is a formidable undertaking to collect and discuss a vast number of facts from so many different fields and Harborne is to be congratulated on the result of all his labour. The book abounds in details, yet it is very readable and most stimulating.

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