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BOOK REVIEW

Trees-Contributions to Modern Tree Physiology. Edited by Heinz Rennenberg, Walter Eschrich and Hubert Ziegler, Backhuys Publishers, Leiden, 1997. 565 pp, $130. ISBN 90-73348-67-6.

Forest decline is a serious problem in many parts of Europe, but especially in Germany. For this reason it has probably been researched more extensively in that country than in any other. This book demonstrates how seriously the problem is taken and the consequent level of commitment of the German National Science Foundation to funding research into tree physiology. It contains 32 papers which are the outcome of a programme of research aimed at a better understanding of the physiology of healthy trees, thereby assisting interpretation of data obtained from trees in decline. All but three of the papers originate from German institutions.

The book is divided into seven sections, each ostensibly comprising papers on related topics, although it has to be said that the relationship is rather tenuous in some cases. The first section, on the structure and function of tree surfaces, is concerned mainly with the chemistry, structure and function of cuticular and epicuticular waxes, and lenticels. The importance of these structures and their relevance to the role of air pollutants in forest decline is well highlighted in the first four papers. The fifth deals with gas transport in the tree, in particular with the process known as "pressurised ventilation" and its role in moving oxygen to the rhizosphere, where roots are growing in waterlogged anoxic conditions.

The second section deals with biomass production, transport, storage, and re-utilisation, and links to the last paper in the preceding section with a paper on leaf-gas exchange in light and sunflecks. The section contains a mixed bag of topics ranging from the carbohydrate physiology of conifers, storage and mobilisation of carbohydrates and lipids through isoprene and monoterpene production to phloem loading, translocation and unloading and xylem transport. Inserted between the papers on xylem transport and mineral mobilisation, and storage and mobilisation of carbohydrates and lipids, is a chapter on the structure and function of rays. It is frequently forgotten that ray tissue together with axial parenchyma may constitute as much as 40–50% of the wood. These cells are alive in sapwood, and must play an important role in the physiology of the tree. Sauter and Witt provide a timely reminder of this in their paper.

The third section, on water relations, contains only three papers, and is therefore necessarily limited in breadth. The paper by Dreyer (one of the three in the book by non-German authors), deals with the effects of drought on photosynthesis, and has clear relevance to forest decline. Steudle and Heydt concern themselves with the question of whether the mechanism of water transport across roots in trees differs from that in herbs. They conclude that there are similarities and differences which can be explained by a composite transport model involving symplastic and transcellular transport of water and minerals. In the final paper in this section, Popp and co-workers discuss the physiological role of cyclitols in trees. It is concluded from seasonal changes in distribution, that they function as organic osmolytes, encouraging movement of water to where it is required (buds about to undergo enlargement), or away from where it is not needed (leaves about to undergo abscission). The section on nutrition contains reviews of nitrate and sulphur nutrition and a paper dealing with magnesium deficiency.

Section 5 contains eight papers on the topic of mycorrhizal association with tree roots. This is the largest group of papers on a single topic in the book, a fact which reflects increasing awareness of the importance of such associations for the health of forest trees. Three papers on lignification, heartwood formation, and photomorphogenesis form the subjects of the three papers in section 6 and the book concludes with two papers by the editors Eschrich and Ziegler. These provide a brief overview of the current state of knowledge in what are called "peculiarities in tree physiology".

The book is a mixture of review and research papers which cover a wide range of physiological issues. However, the relative lack of an international dimension in terms of authorship reveals itself in the form of imbalance in subject emphasis. Some topics are well covered, while others are barely mentioned. Thus, while lignification is the subject of a review, cellulose, the other major wall component is not considered. It has to be emphasised, however, that the book has no pretensions to being comprehensive, it being clearly stated in their preface that it was the outcome of a specific research programme.

Phytochemists as well as tree physiologists will find much to interest them in this book, which is timely, informative, and well-presented. It will bring both the specialist and general reader up to date in a field which is moving increasingly rapidly. The importance of healthy forests is beginning to be appreciated by politicians and funding bodies outside Germany.

J. R. Barnett
Department of Botany, School of Plant Sciences,
University of Reading,
U.K.