Advances in Photosynthesis – Photosynthesis: Physiology and Metabolism. R. G. Leegood, T. D. Sharkey and S. Von Caemmerer (eds). Series editor, Govindjee, University of Illinois, USA. Kluwer Academic Publishers, The Netherlands. ISBN 0-7923-6143-1. Hard bound. 2000. 624 pp. vol. 9.

The editors of *Advances in Photosynthesis* (*AIP*) series set out with a goal to publish a series of volumes on current advancements in all aspects of photosynthesis research. These books would provide the state-of-the-art overviews that are attractive for graduate students and young researchers, as well as useful for expert investigators in the field. The first volume of the series, *The Molecular Biology of Cyanobacteria* edited by Don Bryant, set the high standards on the critical and authoritative nature of the texts for all the subsequent volumes of the *AIP* series. The volume under review has further increased the quality of carefully edited texts dealing with CO_2 fixation, assimilation and metabolism and related physiology in photosynthetic organisms, higher plants, algae and cyanobacteria. The cover page of the book announces the novelty of the contents.

As the editors rightly state in the preface, a full understanding of the process of CO_2 conversion into sugars requires a deep appreciation of the integrated aspects of plant cell metabolism and control of gene expression by metabolism. The 24 chapters of the book have been contributed by some fifty authors, including the three editors who are internationally known for their contributions in the field. The book emphasizes on the regulation of the metabolic pathways of CO_2 fixation in photosynthetic tissues and on photorespiration, cellular partitioning of carbon into sucrose, sugar alcohols, fructans and starch. Important interactions between CO_2 assimilations, respiration and nitrogen metabolism and the importance of export of metabolite out of the leaf, providing a regulatory control on CO_2 assimilation as well as feedback control of assimilated carbohydrate on respiration and nitrogen assimilation have been so well-documented that they give a new outlook to the so-called 'dark reactions' of photosynthesis. The import of CO_2 into the CO_2 fixation-site in photosynthetic organisms involves varied strategies. These aspects of imports and their economy of the processes as well as the structural and functional regulatory features have been extensively discussed in the first eleven chapters, which provide new insights into the metabolism and environmental control of physiology of plants.

The opening chapter by the editors offers a superb overview of the topics that are discussed in the book. In this chapter, the editors tell us about the current trends in research related to carbon and nitrogen metabolisms and how the use of transgenic plants, mutants and antisense RNA technology has opened up new dimensions in our overall understanding of plant metabolism and physiology. The editors illustrate with specific examples that the effect of a small change in the levels of a regulatory enzyme may not be restricted to the specific reaction it catalyses, but needs to be assessed on the basis of the total growth development and physiology of the plant under specific environmental conditions. A small change in the metabolic step marks a profound change in the overall physiology of the plant.

The chapter on regulation of Calvin cycle enzymes is an encyclopedic documentation of the enzymes, their genes' organization, expression and regulation through CO_2, sucrose, sugar and redox sensing. Their multi enzyme-like interactions, regulation of biochemical reaction in chloroplasts ferrodoxin/thioredoxin system have also been characterized. The authors here also illustrate how studies of Calvin cycle enzymes with antisense RNA have shown that even a non-allosterically regulated enzyme in the Calvin cycle could be highly important for photosynthesis and plant growth. Equally illuminating is the chapter dealing with Rubisco-catalytic mechanisms and assembly. It provides very fascinating descriptions on the sequential reactions in carboxylation and oxygenation and also on the assembly of Rubisco subunits. In India and also elsewhere, there is a great interest in the *in vivo* study of Rubisco physiology. The chapter dealing with this specific *in vivo* aspect of Rubisco-specificity and its dependence on environmental factors or nitrogen status provides a critical assessment on the current developments on this topic. The kinetic parameters discussed in this chapter are useful for workers in this field.

Photorespiration continues to be a challenging area of research in plant physiology, as this involves three organelles in the leaf cell: chloroplasts, mitochondria and peroxisomes. Naturally, the photorespiratory metabolism involves coordinated regulation in transport, compartmentation of metabolites, feedback controls and regulation in gene expression. Discussions documenting the novel developments on the transport of metabolites across the chloroplast-envelope and also the biochemistry of the transporters are very illuminating. The relationship between CO_2 fixation carbohydrate metabolism in terms of co-operation between the two bioenergetic organelles, chloroplasts and mitochondria, has been an evergreen topic in photosynthesis. The ATP sharing between the two ATP-generating organelles was thought to be not required because of the classic finding that chloroplasts generate enough NADPH and ATP to drive all the necessary biochemical reactions for CO_2 assimilation and protein synthesis. However, under *in vivo* situation and perhaps, under many environmental constraints, the ATP sharing and regulation via NADPH/NADH levels in the two organelles serves as a crucial control mechanism. These novel aspects are adequately presented in the book. Similarly, the co-ordination between sucrose synthesis, nitrate reduction as well as organic and amino acid biosynthesis in plant tissues is presented based on the recent results obtained from transgenic plants and membrane H-ATPase-mediated protein phosphorylation. The starch metabolism in leaves, control of allocation and partioning of photosynthate between source and sink tissues involving sugar-regulated gene expression, intercellular transport and pholem loading of sucrose and amino acids constitute novel topics where the use of molecular biology techniques has given an additional dimension to our understanding of crop and plant physiology. The discussions on these themes as well as on the regulation of sugar–alcohol biosynthesis and metabolism that plays a role in stress tolerance of plants and the biosynthesis of vacuolar fructans in temperate gramenae and storage roots, adds to the comprehensiveness of the book.

Diffusion of CO_2 into the leaf, the stomatal conductance and CO_2 entry into mesophyll cells and into the chloroplasts constitute a delicate balance between CO_2 and water loss. Development of fast-measuring techniques for assessing stomatal conductance such as chlorophyll-*a* fluorescence and isotope discrimination techniques have brought about remarkable improvements in our understanding of the complex process of acquisition of CO_2 into the mesophyll cells, particularly in C_4-type plants. Comprehensive reviews of the current status of our understanding of the entry of CO_2 from air to chloroplasts in higher plants and in cyanobacteria and algae and also that of carbonic anhydrase (CA), the enzyme that catalyses anhydrase reversible hydration of CO_2 in microorganisms, including cyanobacteria and higher plants as well as the α, β and γ isoforms this CA provides a deep appreciation into complexities involved in the regulation of photosynthetic CO_2 fixation in plants. The chapters devoted to these topics enhance the depth of our understanding of these complex processes.

The regulatory physiology of CO_2 fixation by the so-called C_4 plants having specialized anatomical and biochemical features to supress oxygenation reaction of Rubisco and photorespiration, the transport of CO_2 in these C_4 plants and developmental aspects of C_4 photosynthesis and the ecophysiology of C_4 plants have been elegantly elucidated in three consecutive chapters of the book. In spite of the overlapping contents, each contribution gives a new dimension to our current understanding of photosynthesis in C_4 plants and also in C_3–C_4 intermediate plants. Topics on C_4 photosynthesis as well as that of C_3–C_4 intermediates have attracted many crop and ecophysiologists in India. Thus the detailed discussions of these topics and also molecular aspects of Crassulacean acid metabolism (CAM) and ecophysiology of CAM plants may provide new directions to research in these fascinating aspects of plant metabolism. The physiological diversity of plants would add to genetic biodiversity features.

Photosynthesis is the unique feature of plant biochemistry. However, the molecular acrobatics involved in the photosynthetic carbon reduction reactions and complexities involved in the energetics and economy of CO_2 import and metabolite transport of photosynthates as well as environmental regulation of the physiology of photosynthesis make the presentation of photosynthetic metabolism in an integrated and coordinated fashion difficult and thus in many texts, these uniquely fascinating aspects of photosynthesis have fragmentary presentations. This book paves the path for integrated presentation.

The editors of this book have done a commendable job dealing with all aspects from molecular biology to ecophysiology, comprehensive and current overviews of physiology and metabolism of photosynthesis in higher plants, algae and cyanobacteria. Each chapter contains a wealth of information, includes some 200 to 500 citations and is laden with illustrative sketches, diagrams, tables and reproduction of original data. The presentations in the 24 chapters are uniform and quite up to date. However at times, too many citations in the text make the reading difficult. This book will be useful to all plant scientists and crop biologists and because of its scope and contents will have predictably a long shelf-life. The book also has many attractive and novel features beginning from the cover page to the end – it provides the readers with a feeling of fresh new tasty breads in colourfully attractive basket.

Teachers and instructors in plant and crop physiology, molecular biology, biochemistry, structural biology and microbiology would find this book a tempting source for use in the classrooms and researchers will like to have a handy desk copy. This reviewer shares the agony of the students for not being able to add a copy of this book to their own collections because of the high cost. But this copy should be made available in their libraries.

The editors and the contributors of this volume will receive the appreciation of the large body of readers which they richly deserve for their scholarly efforts. The Kluwer Academic Publishers have leadership in publishing high quality text and reference books in plant biology and this book will add to their reputation.

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Plant Galls of India. M. S. Mani. Science Publishers, Inc., P.O. Box 699, Enfield, New Hampshire 03748, USA. 2000. 2nd edn. 477 pp. Price: Indian subcontinent – Rs 375; other countries – US $112.

The study of plant galls in the Indian subcontinent is, in essence, synonymous with M. S. Mani. His efforts match those of the world pioneers, E. P. Felt (America), W. Docters van Leeuwen (South-east Asia), C. Houard (France), and A. Trotter (Italy). Over the last seventy-odd years, Mani has been relentlessly surveying the gall flora of India, in addition to studying the taxonomy and biology of gall-inducing cecidomyiids and chalcids. He will be remembered by gall researchers throughout the world for his volume *Ecology of Plant Galls*. When I received a copy of the present book – the revision of 1973 edition – for review, I felt pleased that he had up-dated his work for the newer generation of scientists interested in galls, both in India and elsewhere. Prior to his study in 1930s, only a few passing references on insect-induced galls were available through the works of the British Raj entomologists, C. F. C. Beeson, G. B. Buckton, Y. Ramachandra Rao, and T. V. Ramakrishna, and botanists, A. H. Sundar Raman and R. D. Saksena. Mani's predoctoral research on the biology and taxonomy of gall midges and his doctoral thesis (*Journal of Royal Asiatic Society of Bengal* (*Science*), 1948, **14**) brought thoroughness to this discipline by integrating the study of both the insect and host plant. The following incident illustrates his passion for galls: about 15 years ago, shortly after holidaying in Fiji, he published his paper on the plant galls of Fiji[1]. Diverse galls and their inducers were investigated by the School of Entomology at St. John's College (Agra), which he founded and directed till the early 80s, the Allahabad group (S. N. Prasad and Prabha Grover), the Bangalore group (G. P. Channabasavanna), the Calcutta group (D. N. Raychaudhury and Samiran Chakraborty), the Dehra Dun group (R. N. Mathur), the Jodhpur group (H. C. Arya and Uma Kant), and the Madras group (T. N. Ananthakrishnan). It is no exaggeration to say that these groups became active only because of the direction and