

the names of viruses?’ will be useful for writing research papers and theses.

The sections on the transmission of viruses by insects, nematodes, fungi and seeds are presented with useful diagrams of virus pathways within transmitting insects and of fungal vector life cycle. Some of the features of nematode transmission, namely that the retention and not the ingestion is specific for the virus–nematode combination, make interesting reading. The chapter on fungal transmission of viruses provides new insights into possible mechanisms of transmission. The terms *in vitro* and *in vivo*, hitherto used in a rather confusing manner for fungus-transmitted viruses, have been renamed appropriately as ‘externally-borne’ and ‘internally-borne’. The molecular basis of virus transmission through seeds is well presented.

Molecular biology of plant virus movement has been clearly presented under the two main headings of ‘Coat protein-dependent movement’ and ‘Coat protein-independent movement’. The host factors involved in virus movement are also discussed.

The section on the mechanism of RNA synthesis by viral RNA-dependent RNA polymerase (RdRp) concludes that the RdRps follow the same ordered set of steps followed by DNA-dependent RNA polymerases. A number of experimental results (mainly autoradiograms) are presented to shed light on the relatively dimly-lit pathways of RNA synthesis.

This book highlights novel aspects of plant virus gene expression strategies. This section can enthuse any reader to learn more about these clever strategies, especially those used by luteoviruses, which are a ‘translational goldmine’. After discussing the replicase-driven template switching as the mechanism for RNA recombination events in plant viruses, the book proceeds to trace the evolution of *Potato virus Y*, the type species of *Potyvirus* genus of the largest plant virus family *Potyviridae*.

The chapter on the molecular epidemiology of begomoviruses suggests that customized disease resistance can be engineered based on virus epidemiology. However, the geminivirus disease complexes, which are an emerging threat, are only touched upon in passing, perhaps because this book was published just before the flood of publications on geminivirus satellites.

The book then focuses on the sophisticated mechanisms of ribosome shunting,

leaky scanning and activated reinitiation adapted by plant pararetroviruses. The chapter on the recombination in plant DNA viruses presents the interesting finding that begomovirus as well as badnavirus-derived sequences are found in the plant genome. The role of replication in recombination is clearly presented.

My vote for the best chapter in the book goes to Valkonen’s description of natural resistance to viruses. The responses of plants to virus infections are lucidly presented.

The chapter on engineering resistance to plants discusses the mechanisms of pathogen-derived resistance: both protein and RNA-mediated.

The expression of antibodies in plants is a chapter that talks about protecting not only plants from virus infections, but also about making anticancer antibodies in plants. Use of plant virus vectors for vaccine development is another important application discussed in this chapter.

The final section of this book is devoted to the detection of plant viruses, (including those present in vectors) and viroids by nucleic acid hybridization and PCR. This section will be useful for practical virology classes.

In short, this book affords satisfaction to the reader, in addition to being a guide for teaching and research on plant virology.

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**Photosynthetic Nitrogen Assimilation and Associated Carbon and Respiratory Metabolism.** Christine H. Foyer and Graham Noctor (eds). *Advances in Photosynthesis and Respiration* (Series Editor Govindjee, University of Illinois at Urbana Champaign, USA). Kluwer Academic Publishers, Dordrecht, The Netherlands. 2002. vol. 12. 284 pp. Price: US\$ 135.

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Kluwer Academic Publishers have not only shown their leadership in publishing high-ranking journals and advanced

books in plant sciences, but have also taken bold steps in bringing out some high-impact trendy series on plant biology. One such series *Advances in Photosynthesis and Respiration* (AIPH), is being published under the supervision of Govindjee, University of Illinois at Urbana-Champaign, USA. This series has already published eleven volumes.

The latest book (vol. 12) under review is not only novel in its approach, but also in its content and get-up. Like vol. 11 of the series (reviewed in *Curr. Sci.*, 2003, **84**, 235–236), it emphasizes the regulatory interlinking processes involved in photosynthesis-driven carbon and nitrogen metabolisms. Regulation of biological processes, including signal perception and transduction is the frontline research area in plant biology. The establishment of a structure–function correlation or reaction mechanism in a metabolic process like nitrogen assimilation is not enough. The editors aptly point out in their preface that nitrogen assimilation is a key cellular function in plant cells, that works in tandem with respiration and photosynthesis. The evolution of oxygenic photosynthesis may be closely linked to nitrogen utilization in the plant and algal cells. In order to poise the cellular redox balance, the plant cells adjust for the optimal energy balance between chloroplasts and mitochondria as well as partitioning of assimilate in various plant parts. The obligatory cooperative interaction of multitudes of metabolic reactions occurring in chloroplasts and mitochondria not only requires intricate adjustment of metabolic fluxes for recycling of metabolites among organelles, but more importantly, for their integrated spatial–temporal controls. With the emerging technologies and ‘pressure’ on producing genetically engineered crops, the understanding and appreciation of the physiological regulation is vital; and both research and teaching of plant biology thus call for new approaches.

This book is a timely publication. It contains 16 critical overviews contributed by 37 authors (including three from India). These overviews discuss photosynthesis, nitrogen-use efficiency, the control of nitrate and nitrite metabolisms, regulation of ammonia-assimilation, carbon–nitrogen cycling in photorespiration, significance of mitochondrial function in light in terms of carbon and nitrogen interactions, regulation of carbon and nitrogen through gene expressions and

intra- and intercellular transport of carbon and nitrogen compounds. Besides these, the book also provides a perspective on crop improvement through optimizing carbon-nitrogen budgets *in vivo*, modulation of regulatory phosphorylation cycle and nitrate oxide synthesis and nitrogen-signalling process in plants. A chapter on ammonium-assimilation in cyanobacteria has also been included (see vol. 1 of this series, *Molecular Biology of Cyanobacteria* edited by Don Bryant).

Nitrogen metabolism has been an important topic in plant metabolism, and books on nitrogen assimilation in plants and cyanobacteria appear regularly. Readers thus keenly look for novelty in newly published books. And, in this volume, a regulation road-map for new research incentives on nitrogen assimilation relating controls and switches of regulations in metabolic pathways, their crosstalks and down regulation as well as the mechanisms, both perception and relay of signals by small molecules is evident. The first chapter by the editors discusses nitrogen nutrition on amino acid (AA) metabolism, inspects the diurnal changes in the leaf-AA and the supply of carbon C for AA synthesis. Not only the inter-pathway regulations, but also signalling by small molecules such as nitrate, sugars and abscisic acid (ABA), and their interactions on growth and development provide deep insights. The photosynthetic nitrogen-use efficiency of various crops and its environmental factors are of key concern in agriculture. The manipulation of nitrogen-use efficiency of crops, using recombinant DNA technology, provides not only better agricultural economics, but also a clear environment (chapter 2). Since the extent of different nitrogen components of photosynthetic apparatus (the chloroplasts) varies with different genotypes and different growth conditions, the form of nitrogen used and site of nitrogen assimilation by plants can be manipulated by agronomic breeding and genetic engineering techniques. The optimization of carbon and nitrogen budget and their energetic considerations, including water-use economy are vital for crop improvement (chapter 16). Induction of enzymes by nitrate, an important nutrient for plants and algae, continues to be a challenging subject. Chapter 4 provides a fascinating discussion on the current developments on molecular mechanisms and controls in nitrate-assimilation.  $\text{NO}_3^-$  induces a host of enzymes like glutamine

synthetase, glutamate synthetase, Fd-NADP reductase,  $\text{NO}_3^-$ -transporters, etc., besides nitrate reductase (NR) and nitrite reductase (NiR). Microarray analysis of  $\text{NO}_3^-$ -stimulated coordinated expression of genes of several regulatory kinases, methyl transferase and a specific nitrate-transacting factor and the 'nitrate box' for NR and NiR genes. Complex control mechanisms involving protein phosphorylation, poly-activation of ubiquitous NR-binding protein are called 14-3-3. The signal transduction pathways for regulating carbon-nitrogen metabolism in plants have been well-illustrated in this volume. Nitrate reduction at the plasma membrane, nitrate transport and conversion of  $\text{NO}_3^-$  to  $\text{NH}_4^+$  by nitrate reductase of higher plants, and the regulation of NiR have been critically discussed (chapter 5). In plants, photo-respiration represents a beautiful example of integrated coordination of carbon and nitrogen metabolisms – the use of mutants and transgenic plants has richly supplemented our understanding of glyoxalate feedback regulations (chapter 8). Phosphoethanol pyruvate carboxylase (PEPc) is a crucial plant enzyme that plays multifaceted roles like anaplerotic supply of carbon-skeleton for AA biosynthesis in  $\text{C}_3$  plants, and fixing  $\text{CO}_2$  in  $\text{C}_4$  and CAM plants. In  $\text{C}_4$  plants, the crosstalks between mesophyll and bundle-sheath enzyme is regulated via classical second messengers like pH, phospholipase C, inositoltrisphosphate and calcium. Besides these types of regulatory circuits of PEPc in  $\text{C}_4$  and CAM, the  $\text{C}_3$  PEPc is regulated by a kinase, PEPc-K (chapter 9). Functional cooperation between mitochondria and chloroplasts, the two bioenergetic organelles has always been a fascinating topic in plant metabolism – the light/dark modulations and poisoning of plant-mitochondria status have been reinvigorating research topics in recent years. Mitochondria may play a role in photoinhibition *in vivo* and thus in crop productivity (chapters 9 and 10). Short or long distance, the intra- and intercellular transport of carbon and nitrogen in plants is tightly coordinated – a lucid account of it is given in chapter 15.

This volume is the first one in AIPH series that deals with 'respiration', and it is quite exciting to read the chapter on alternative oxidase and its role in physiological processes and development (chapter 11). Major thrust in current research in plant biology is the elucidation of signal perception and transduction in plants.

Chapter 13 provides a detailed account of nitrogen controls of plant structure and function. Carbon and nitrogen regulatory actions through transcriptional and post-transcriptional gene expressions have been effectively dealt with in chapter 14. The authors present a model (similar to the two-component model in bacteria), designated as his-asp-phosphoregulating model that pictures a mechanism on how plants communicate with the nutritional environment.

Each of the sixteen chapters, written by leading researchers in the book, is short, focused on the selected theme, well-illustrated and presents to the readers new outlooks on the subject. The editors have taken care not only in bringing uniformity in presentation by various authors, but also in complementarities in topics so that the readers can take a peep at the networks of regulation in carbon and nitrogen assimilation by plants, algae and cyanobacteria. It is a commendable effort.

Over the years, the Indian universities, both traditional and technical/agricultural, have laid emphasis in the research and training in nitrogen metabolism. A significant number of projects are being funded by a variety of governmental agencies that deal with nitrogen metabolism. However, studies on nitrogen assimilation in coordination with photosynthetic and respiratory metabolisms and/or the regulation of carbon and nitrogen fluxes have not been seriously considered. This book is thus going to attract the attention of researchers involved in nitrate and nitrite metabolisms in specific agricultural and forestry crops.

This year in January, the International Plant Physiology Congress, IPP-2003, met in New Delhi. The book of abstracts of the Congress reveals that the bulk of the presentations centred around the stress effects on carbon and nitrogen metabolisms. The deliberation at the Congress stressed the use of gene-manipulation strategies to ameliorate the damages due to abiotic and biotic stresses. Unless there is a complete understanding of metabolic fluxes, regulatory circuits, regulatory valves of long- and short-distance transport and more importantly, the mechanism(s) of signal perception and relays, the promises offered by crop biotechnology may not be reflected in the 'harvest'. This book is thus a timely one; a value-added reference book for plant biologists. The book gives the readers a new appreciative insight into the complexities in

metabolic communication pathways, plant signalling systems and their coordination. Researchers, instructors, students of crop science, biotechnology and plant physiology may find this book immensely useful. The editors and contributors deserve applause. Kluwer Academic Publishers, as in the previous volume of the series, have maintained the high quality in publication and therefore high cost. Unless the book comes to the reach of a wide spectrum of readers, the impact of the book as a valuable reference text may not be fully realized. This reviewer would very much like the book to be made available in all universities.

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**Prospects and Problems of Environment across the Millennium.** M. N. Madhyastha *et al.* (eds). Daya Publishing House, 1123/74, Deva Ram Park, Tri Nagar, Delhi 110 035. 2003. 327 pp. Price: Rs 750.

This sleek volume, a collection of 34 papers, is the outcome of a National Symposium held at Mangalore during December 2000. The papers cover an assortment of topics related to environment and its management, some of them faintly so. The book has parts devoted to coastal zone, environmental health, human health, pollution, environmental monitoring, waste management, conservation and futurology. Many papers are the outcome of scientific research and others are general write-ups.

Ananda Rao's analysis of the environmental issues regarding the beaches and estuaries of Karnataka is relevant, and these issues require immediate attention. He has also suggested measures to safeguard their ecology and to uplift coastal economy as such. One paper each deals with the problems and prospects associated with the mangroves of Kerala and of

Sunderbans–Orissa region. Ananda and Sridhar highlight the fungal diversity of mangrove ecosystems, a rarely researched field.

Water shortage and salt-water intrusion in the Kanyakumari district form the subject of the article by Anitha Mary and Lazarus. Neglect of ponds and lakes, population growth and consequent developmental pressures, including overuse of groundwater, have culminated in such crisis. Kanyakumari indeed reflects the hydrological problems faced by much of the Indian coast.

The study by Agashe *et al.* on the dynamics of pollen and fungal spores in the Bangalore air will be of interest to aerobiologists and doctors. It can as well create awareness about these potential agents of allergies among the vulnerable people. Shyama's work on the alarming rise in congenital malformations (CMs) in Goa (41 per 1000 live births in 1991 to 105 in 1998), also causing increased mortality of infants, however, needs to be corroborated with data from adjoining coastal regions before drawing any meaningful conclusions. Most CMs are however believed to be the result of complex interaction of genetic and environmental factors.

The role of fibre-rich diet for good health is a well-established medical truth. The meticulous study by Menon *et al.* on rats shows that fibrous diet can prevent intestinal tumours. The inclusion of fibre from coconut kernel and black gram in the diet checked the loss through excretion of tumour-preventing beta-glucuronidase and mucinase. Rats fed with protein-rich and fibre-free diet were prone to tumours in the colon. Fibre also modified the catabolism of cholesterol.

The section on environmental pollution has one paper dealing with the dispersion of CO in the air from automobiles and another on the dispersion of gaseous pollutants from industrial stacks. Snehal *et al.* observed that the abundance and diversity of the molluscs and bivalves of the Indian coast are poised for a decline due to crude oil pollution. Thin-shelled bivalves showed more sensitivity to water-soluble fractions of crude oil, and to other hazardous hydrocarbons, for which the Mumbai coast is a major sink.

Disconcerting are the findings of Shivaramaiah *et al.* about the residue of the deadly pesticide Endosulfan in the soils of coffee plantations and in the coffee berries, sampled in the Coorg

district of the Western Ghats. Endosulfan residues were detected in all the 14 soil samples of sprayed plantations as well as in 10 out of the 14 samples of coffee berries.

Today's environmental impact assessment (EIA) is intended to protect the totality of the environment, which includes biophysical, social, economic, cultural and aesthetic aspects, explains Manoranjan Ghose. The EIA should see that development activities carried out should not compromise the needs of future generations. The book also carries the case study of an EIA conducted for a foundry in Coimbatore.

Wastewater purification using low-cost biological methods was attempted by Shiny *et al.* Using *Daphnia*, a freshwater flea, and *Cyprinus carpio*, a fish, they converted organic matter in the waste water into zooplankton and caused its mineralization as well. There was considerable reduction in the biochemical oxygen demand (BOD) and in the population of coliform bacteria. *Daphnia* was effective in improving the bacteriological quality of water.

The construction of a nuclear power plant at Kaiga on the bank of the Kali River in the forest-clad Uttara Kannada district in the central Western Ghats, had witnessed raging controversies and unprecedented public opposition in recent times. With the power production already commenced, the Kaiga Generating Station, is today a reality. Explaining graphically the waste disposal mechanism adopted at the plant, Venkata Ramana *et al.* try to allay public fears of possible threats to human life and to the fragile environment prevailing around from radioactive substances. Their statement that 'radioactivity releases to the environment are kept within the authorized limits as stipulated by the Atomic Energy Board' could have gained greater credibility, had they supported it with data. The public fears continue as the Municipality of Karwar town, at the river-mouth of Kali, recently turned down a proposal to supply the river water to the town.

R. S. Goel's advocacy of major dams as a panacea for the country's poverty, brushing aside their environmental and social costs, is not substantiated except hyperbolically. Terming the apprehensions about major dams as 'fantasies built around unfounded data', the writer goes on the offensive against the opponents and terms their stand against large