(SEWANA) and few other countries held at ICARDA's headquarters in Aleppo, Syria in March 1995. The workshop was held to discuss, develop and integrate the knowledge generated in various disciplines towards improvement of productivity of durum wheats in the Mediterranean region.

Durum and bread wheats form the staple component of the diets of millions of people and the basis of farming systems throughout much of the world. Durum is perhaps best known for its use in pasta in the international scale, but it is also an important food for rural communities for products such as couscous, burghul and durum bread. About 90% of the world's durum wheat is grown in the Mediterranean region, particularly in the drier areas. As manufacturing and marketing of durum products are also concentrated in the region, the majority of durum research is also conducted in Mediterranean countries. Until recently, the various Mediterranean durum research programmes tended to work independently. A collaborative programme was initiated by the CIMMYT/ICARDA with durum-breeding programmes in West Asia, North Africa and various southern European universities with multiple objectives, including improvement of durum wheats by combining high grain quality with resistance to the main abiotic and biotic stresses encountered in Mediterranean region, to use the available genetic variation found in durum local landraces and wild relatives and to use DNA molecular markers in durum breeding.

In the Mediterranean region drought may occur alone or in combination with temperature extremes (cold, frost and heat). Irrigation is limited and in many areas nonexistent. Therefore genetic manipulation of plants to improve productivity and stability by increasing abiotic stress tolerance is the only practical solution. In addition, the biotic stresses, poor crop management and weed control inefficiency also curtail durum wheat yields. The CIMMYT/ICARDA durum-breeding programme has developed a strategy that aims at breeding improvement germplasm resistant to drought as well as to cold and heat and with responsiveness to improved conditions when they occur.

A number of papers discuss the durum wheat-breeding strategies in the countries of the Mediterranean region. The research has clearly shown that selection efficiency is greatest when selection is made (1) in the environment in which the varieties will be commercially grown; (2) for a combination of resistance to abiotic stresses and yield potential; and (3) for adaptation to variable environmental conditions. The genetic base of durum has been widened by using landraces and wheat relatives such as *Triticum turgidum* subsp *dicoccoides*, *T. monococcum* and *Aegilops* spp. for providing genes for biotic and abiotic stresses. The recombinants and the advanced populations obtained by crossing adapted durum genotypes and the wild relatives are tested in the labs and fields in SEWANA. A few papers discuss the techniques employed to solve the problems associated with inter-specific and inter-generic crosses.

Quality is a prerequisite for durum production and protein content is directly related to pasta quality. A number of papers have focused on the use of molecular tools such as PCR primers, for screening the quality parameters by identifying wheat storage proteins genes. Papers were also presented on the storage protein analysis in durum landraces and use of *T. dicoccoides* for improving grain quality in durum wheat.

This symposium proceedings will be very useful for the wheat workers in the national and international research institutes. In India, durum wheats are largely grown in central India, characterized by water-limited conditions associated with high temperatures. Improvement of durums for both productivity and quality is an important aim of Indian agriculture. The wealth of information on the various facets of improving durum wheat will be of immense value to the teachers, students and research scholars in the agricultural research institutions. Indian agriculture is now moving from self-sufficiency to global commercialization. While we had a production of 78 million tonnes of wheat in 1999–2000, we have hardly been able to export because of quality and phytosanitary requirements. The durum research provides us an opportunity to be in the international market provided that many scientists and laboratories could effectively participate in a common programme aiming to export durum wheat. We should have a similar intensive discussion to identify research priorities, individual scientists and groups to achieve our objectives. I strongly recommend this book for the libraries of agricultural universities and national institutes working on improvement of wheat.

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Probing Photosynthesis: Mechanism, Regulation and Adaptation. M. Yunus, U. Pathre and P. Mohanty (eds). Taylor & Francis, 11 New Fetter Lane, London EC4P 4EE. 2000. 558 pp. Price: £ 85.00.

This book has been written to commemorate the 60th birth anniversary of P. V. Sane, well known for his contributions in the area of photosynthesis. A profile of Sane has been portrayed by S. K. Sinha in the beginning of the book. One of the major contributions of Sane is building an indigenous thermoluminescence equipment with very fine resolution and using it to probe photophysical and photochemical phenomena in photosystems I and II, in collaboration with V. G. Tatake, T. S. Desai and S. S. Rane at Bhabha Atomic Research Centre. The editors have appropriately decided to honour Sane by bringing out a collection of articles highlighting techniques used to probe various aspects of photosynthesis.

Photosynthesis sits at the gateway of energy transduction process, hails solar energy and channels it to all living systems on the earth. Besides the academic interest, our attention to photosynthesis generates from its importance in crop productivity. Photosynthesis consists of a chain of processes starting from absorption of light occurring in femtosecond time scale to enzymatic reactions consuming several seconds and even minutes

and crop productivity taking a few months. All these processes are threaded together so that to understand one, the knowledge of the other is necessary. Therefore, whenever there is a discussion on photosynthesis, broadly the following topics are included:

(1) Structure and function of the protein complexes: photosystems I and II, ATPsynthase, Rubisco (1,5-ribulose bisphosphate carboxylase-oxygenase);
(2) Adaptation of photosynthetic process to natural changes in the climate and stress situations;
(3) Crop productivity.

Accordingly, the editors organize the above three topics in the first three parts. The fourth part deals with the instrumentation and theories of some recent techniques used to probe photosynthesis. Govindjee, who has travelled nearly half a century with the progress in photosynthesis, discusses the 'Milestones in the photosynthesis research' in the opening chapter. The chapter not only gives a brief account of the development in research on various fields in photosynthesis, but also provides a critical evaluation on the state-of-the-art of research in the area. The article orients the mind of a reader to proceed with the elaborate discussion on different topics discussed subsequently in the book.

Part I of the book contains articles on structural and functional aspects of the light-harvesting antenna complexes, ATP-synthase, electron transport system and oxygen-evolving complex. Discussion by Itoh and Iwaki (chapter 2) on the role of novel chlorophyll-*d* (in oxygenic photosynthetic organism *Acarychloris marina*) and Zn-bacterial chlorophyll-*a* (in anoxygenic photosynthetic organism *Acidiphyllum rubrum*) reminds one with a pleasant surprise that nature has a never-ending hidden treasure of biodiversity. Our knowledge on even types of chlorophylls in nature is incomplete.

The grey areas in photosynthesis are probed by three major groups of tools, usually in combination, spectroscopy, enzyme kinetics and molecular biology. Enzyme kinetics is the ubiquitous tool in all biological studies and photosynthesis is no exception to it. Ahrling and Styring review the probing of oxygen-evolving catalytic Mn-centre, which is spectroscopically rich in information. The complexity of this tetranuclear metal centre can be appreciated by the fact that even after accumulation of data spinning out of two very powerful tools in metal ion studies – electron paramagnetic resonance (EPR) and extended X-ray absorption fine structure (EXAFS) – the organization, oxidation states and magnetic properties of the centre still await an unambiguous solution. Reviews on Rubisco, carbon assimilation, biodiversity and adaptation to stress reveal how powerful molecular biology is, as a tool to probe photosynthesis. These reviews also provide clues regarding how this tool can further be utilized to produce mutants with higher carbon-assimilating capacity, hence the crop productivity, which is the ultimate goal of research in photosynthesis.

Another powerful spectroscopic probe for the study of photosynthesis is chlorophyll. This is the important pigment in photosynthesis. Looking at the subtle changes in the fluorescence properties of the molecule yields many important inferences regarding photosynthesis. Technical progress in the instrumentation of fluorescence has sharpened the tool to cut deep into the process for a better insight into the phenomenon. The discussion on pulse amplitude modulated (PAM) fluorescence spectroscopy in part IV of the book brings home the power of this technique in the hands of a photosynthesist. This part includes three more chapters discussing details of theory, instrumentation and methodology of other techniques, namely Fourier transform infrared (FT-IR) spectroscopy, electro spray-mass spectroscopy (ES-MS) and photoacoustics. Barber and Sharma discuss the precise determination of oxidation and phosphorylation sites in D1 protein of photosystem II complex using ES-MS. It would have been a difficult task to arrive at such inference by biochemical methods. ES-MS has been shown to be the tool of choice for structural and post-translational modification studies on membrane proteins. FT-IR difference spectra are effective in monitoring various redox-active species of photosystems I and II. Therefore, it can throw light on the mechanism of photosynthetic processes. Photosynthesis involves conversion of some part of absorbed light into heat (thermal effect), uptake of CO_2 and release of O_2 (photobaric effect) and change of volume of molecules (chroic effect). These result in small and rapid changes in the pressure of the system detected by piezoelectric transducers or microphones. Hence photosynthetic samples are ideal for photoacoustic technique. These elegant tools are recently being used to probe photosynthesis.

The book under review has the quality to be popular among the photosynthesists as a handbook of research. Graduate students will like it as an advanced textbook. Research scholars will consider it as a valuable reference book.

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