

Delmer, D.P., Merchant, S. (ed.): **Annual Review of Plant Biology. Vol. 55, 2004.** - Annual Reviews, Palo Alto 2004. 681 pp. ISBN 0-8243-0655-4.

The names of editors of this book series and their sequence have recently often changed, but the high quality of presented reviews remains high. This is, of course, reflected in a high impact factor of these yearly books (16.240 for the year 2004). The reviewed volume contains 23 review papers prepared by 52 authors. As usual, most of them (28) work in the U.S.A. The other authors work in universities and research institutes in Japan (7), Germany (4), Australia, the Netherlands, Switzerland, and the U.K. (2 each), and in Austria, France, Russia, Spain, and Sweden (1 each). Hence the author selection is really international.

Traditionally, the first review is on life and scientific results of some well known scientist. In this volume it is Masaki Furuya, whose contribution lies mainly in discovering the action of phytochromes. The next review (A.G. Rasmusson *et al.*) is on activities and roles of mitochondrial NAD(P)H dehydrogenases, their purification and comparing with these enzymes from bacteria and fungi. A membrane model of their function in electron transport chain is supplemented. J. Bender deals with DNA methylation and epigenetics, the signal function of RNA, and with factors controlling this process. Structural biology is a modern line of research: this is shown in the review of the important enzyme of C_4 photosynthesis, phosphoenolpyruvate carboxylase (K. Izui *et al.*). Its primary and three-dimensional structure, kinetics, catalytic and regulatory functions, and role of phosphoenolpyruvate carboxylase kinase are analysed. Another review dealing with C_4 photosynthesis is that of G.E. Edwards *et al.*: it describes evolution of this carbon cycle in dependence on changes in atmospheric conditions, and formation of the Kranz-type leaf anatomy and dimorphic chloroplasts. Compartmentation in the Chenopodiaceae plants *Bienertia* and *Borszczowia* enables to accomplish carbon fixation in a single chlorenchyma cell.

B.S.J. Winkel reviews metabolic channelling in plants that enhances and regulates cellular biochemistry. Examples in this field are cystein synthase complex, Calvin cycle of photosynthesis, biosynthesis of dhurrin (a cyanogenic glucoside in sorghum), the phenylpropanoid pathway (transforms phenylalanine into secondary products such as lignins, stilbenes, or flavonoids), *etc.* The next, very specialized review deals with the structure and function of a cell wall pectic polysaccharide rhamnogalacturonan II (M.A. O'Neill *et al.*).

Genetic variation is another modern topic. M. Koornneef *et al.* review the literature on such variation in the common model plant *Arabidopsis thaliana*: the authors deal mainly with genetic and molecular bases of variation, mapping and cloning, and changes in flowering time and plant growth. Genetic regulation of time to flower is the topic of review written by Y. Komeda: he deals with genetic network, gibberellin

and other pathways, floral meristem identity genes, information signal, *etc.* Molecular mechanism of gibberellin signalling throughout plant development is reviewed (T. Sun and F. Gubler) with regard to regulation of responsive genes (mutants, proteins, models, signal transduction and gene expression, feedback regulation, interaction with other hormones, *etc.*). From the medical point of view important dietary phytoestrogens are described according to their health beneficial properties (R.A. Dixon). In the future, metabolic engineering should produce new controlled dietary sources with these characteristics.

Four families of kinases have been implicated in Ca^{2+} signalling: the response mechanisms, sensors, decoders, genes, or functions in plant growth and development are reviewed by J.F. Harper *et al.* P. Maliga describes plastid transformations in higher plants. They depend among others on genetic markers, gene design, and gene knockouts and overexpression. Biotechnological applications enable production of plants with agronomically, pharmaceutically, and industrially important proteins. Generation of Ca^{2+} signals in plants is another related topic (A.M. Hetherington and C. Brownlee). Dissecting their components, propagation, oscillations, and transients of these signals are described in detail.

Seedborne fungal endophytes (such as *Epichloë*) help grasses in protection against herbivores, enhance drought tolerance and nutrient status, improve root growth, *etc.* These results of symbiosis are described together with molecular biology a mechanisms of action by C.L. Schardl *et al.* (interesting colour photographs are supplemented). Transport of organic carbon and nitrogen containing substances (sugars, amino acids, peptides) between source and sink is dealt with by S. Lalonde *et al.* They deal with transporters, regulation and energization of transports, their sensing and characterization. Reactive oxygen species in plants (K. Apel and H. Hirt) are another important topic of recent research: their toxicity, detoxification mechanisms, induction by abiotic stresses, function as signalling molecules, effects on photosynthetic electron transport and in stomata closure, *etc.* are often explained by genetic analyses using mutants and by comparison with mechanisms in animals and yeast. Phytosterols, their biosynthesis and accumulation, conjugation, gene organization and expression, metabolism and functions are reviewed by P. Benveniste. In another review, L.V. Kochian *et al.* try to solve the question how can crop plants tolerate soil acidity (surprisingly, 50 % of the world's potentially arable soils are acid!). All is related to toxic concentrations of aluminium and manganese and suboptimal concentrations of phosphorus. Physiological, genetic, and molecular bases of crop tolerance to aluminium and phosphorus deficiency and the respective tolerance loci are stressed. Knowledge of the virus-induced gene silencing vectors enables to understand the virus/host interactions

(D. Robertson). As usual, functional genomics is important.

Literature on visualizing chromosome structure and organization is reviewed by E. Lam *et al.* The main technique is fluorescence probe-based hybridization enabling by modern microscopic instruments detailed studies of chromatin organization and dynamics. Selective removal of short-lived regulatory proteins controls many processes of growth and development of plants (J. Smalle and R.D. Vierstra). The pathway involves ubiquitin and a 2-MDa protease complex.

The last review (S.P. Long *et al.*) deals with an important problem of future human life: rising of atmospheric CO₂ concentration and its effect, global

change of climate. The review is based on the highest amount of references per chapter in this volume (222). Important are results from the Free-Air CO₂ Enrichment (FACE) studies using controlled elevation of CO₂ concentration in special enclosures. Comparison of relative changes of many photosynthetic and other parameters in different plant types (Fig. 6) gives clear view on eventual down-regulation and acclimation of stomatal and photosynthetic production functions.

All reviews end with description of future perspectives of the given research field. A detailed subject index is supplemented. Helpful is also the cumulative index of authors of volumes 45 - 55 and chapter titles in these volumes.

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Otegui, M.E., Slafer, G.A. (ed.): **Physiological Bases for Maize Improvement.** - Food Products Press, New York - London - Oxford 2000. 218 pp. USD 69.95. ISBN 1-56022-889-X.

The book is based on original presentations made by the speakers at the international workshop which took place at the University of Buenos Aires in Argentina in 1998 (October 8 - 9). The principal aims of this workshop and of this book, too, are to integrate new scientific views and ideas on the physiological bases of genetic improvement of maize yield and to define prospective physiological characteristics that might be useful in realistic breeding programmes. Authors of this publication addressed several important topics. They are analysing tools to maximize yield potential under different environmental regimes (for instance characteristic of high latitude, temperate, and tropical regions), as well as physiological keys modifying crop responses to environmental stresses (such as water, nutrients, pests and weeds). They are also striving for description how these traits are identified and used in breeding programmes, and how crop modelling can help in these processes.

The book is divided into eleven chapters. Majority of them are focused on the physiological bases of maize breeding for higher yield potential (chapter 2 through 5: Improving maize grain yield potential in a cool environment, Processes affecting maize grain yield Potential in temperate conditions, Improving maize grain yield potential in the tropics, Factors affecting kernel number in maize) and on tolerance to biotic and abiotic stresses (chapter 6 through 9: Maize improvement for drought-limited environments, Strategies to maintain ovary and kernel growth during drought, Variation in apical dominance and its implications for herbivory resistance, Competitive ability, and biomass partitioning,

Breeding maize to face weed problems). These chapters are preceded by an introductory chapter discussing roles of physiology in future maize breeding (chapter 1: Is there a niche for physiology in future genetic improvement of maize yields?). The last but one chapter deals with mathematical models (chapter 10: Use of simulation models for crop improvement). Chapter 11 offers a synthesis of the workshop discussion, based on selected poster presentations on yield potential and stress tolerance (Recent research on maize grain yield in Argentina).

Contributions of the authors from research centres in Argentina, Australia, Canada, Mexico, USA and Zimbabwe were prepared in a similar layout. They consist of an introduction, main part, summary, conclusions and a bibliography. They are written by comprehensible language, clearly arranged, supplemented with simple pictures and charts appropriate for this type of publication. There is only missing, in my opinion, a chapter discussing and integrating all results of scientific research, ideas and visions from workshop contributions into a general conclusion.

This book is worth reading. I can recommend it mainly to researches, plant physiologists and breeders, working in different fields related to maize yield as well as to other cooperating specialists (*e.g.* agronomists, crop ecologists, entomologists, weed scientists). This book could be also very helpful for advanced undergraduate and postgraduate students in courses on plant/crop physiology, plant breeding, crop production, and other related subjects.

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