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Merchant, S., Briggs, W.R., Chandler, V.L. (ed.): *Annual Review of Plant Biology*. Vol. 59, 2008. - Annual Reviews, Palo Alto 2008. 831 pp. ISBN 978-0-8243-0659-5.

This voluminous book contains one introductory essay dealing with life work of an excellent scientist plus 29 reviews dealing with various topics of actual plant research. They were prepared by 68 well-known scientists from all over the world.

The introductory paper describes life and discoveries of E.E. Conn, an American plant biochemist whose name is connected with cyanogenic plants, those that contain hydrogen cyanide in a bound form releasing it when the plant tissue is macerated. The cyanogenic glycosides are usually linked to D-glucose. In contrast to other reviews of the volume, nine photographs of scientists and only a selection of cited papers are presented.

The following papers can be divided into about ten groups according to their main topic. The questions of signalling, sensory photoreceptors, and genetic regulatory

network are one of them. The introductory review deals with nitric oxide signalling which modulates the activity of plant proteins and mobilizes calcium, and compares the mechanisms in plants and animals. Sensory photoreceptors in algae include proteins, cryptochromes, phototropins, phytochromes, and rhodopsins; the review shows how they regulate algae development, photosynthesis, orientation in nature, and control their circadian clock. Plant phytochromes and interacting proteins are another important subject, not only limited by the well-known red/far-red mechanism. The role of metabolism of trehalose and its products in signalling and coordination of metabolism with plant development are stressed in another review. Ubiquitin and cullin ligases are related to hormonal signalling, plant development, and responses to environmental factors.

Another topic is growth. The formation of shoot apical meristems, the role of auxin, and the differential expression of the respective genes have been modelled mainly in *Arabidopsis* and the recent results are in the focus of one review. Gibberellin metabolism is another review topic. The paper deals with gene control, gibberellin biosynthesis, activity, and deactivation, control mechanisms, environmental stimuli, *etc.* A specialized review deals with molecular basis of plant architecture: branching, internode elongation, and shoot development. These processes are genetically determined but may be changed in various mutants. The new achievements in feedback loops and genetic strategies of auxin perception, action, signalling, and transport are reviewed next. Growth substances of the same name appear and disappear during the history of research. One example is florigen, once a popular and then almost forgotten term. Florigen moves to the shoot apex, perceives day length, changes gene expression, and controls plant flowering; mechanisms of these processes are explained in one of the reviews.

Three reviews deal with photosynthetic topics: One of them deals with the often used chlorophyll *a* fluorescence method and its use for estimating the efficiency of photosystem 2 and the roles of photochemical and non-photochemical quenching. Another topic is the role of glutathione in photosynthetic organisms: the paper describes the respective pathways of synthesis, reduction, polymerization, and degradation of glutathione, as well as its distribution in plants and functions. Plastid evolution, development of their endosymbiosis, functions in photosynthesis of various organisms, especially of different groups of algae, transfer of genes, supply of proteins to endosymbiosis, and biochemical pathways in endobiosynthesis are the main questions of this review.

Water relations are represented by three reviews. One is on flooding stress to which plants react differently: O₂ escape strategy, production of ATP and regeneration of NAD⁺, anaerobic respiration, use of saccharides, *etc.* are discussed. Aquaporins are channel proteins that facilitate transport of water and neutral solutes or gases in various plant tissues; their regulation properties allow functioning in plant development and adaptation to environmental conditions as shown next. Tolerance to osmotic and ionic components of salinity is an important problem of plant production. Salinity inhibits plant growth and accelerates leaf senescence and this is why many papers on this topic, especially on its mechanism, are published and reviewed.

Root physiology is represented by a review on nitrogen transformations with respect to soil cycles, rhizosphere processes, functions of soil microorganisms, and ecosystem balance. Another topic is genetic regulation of trichome and root hair formation; here

again *Arabidopsis* mutants served as a useful model plant. Nodule morphogenesis related to rhizobial infection in legumes is explained in another article; the perception of rhizobial nodulation factors, role of phytohormones, control of cell division, and process coordination are explained.

Metabolic flux of substances as a method of understanding and quantification of plant metabolism is modelled from both the kinetic and predictive aspects; isotopes and labelled substances may be used for analysis. Ionomics is a fairly new term for mineral nutrient composition of cellular systems and its studying is called ionomics. The respective mechanisms and their genetic basis are explained in one of the reviews. Another review explains alkaloid biosynthesis, the related enzymes, application of genomics in this field, *etc.*

Pollen tube structure, polarity, growth and development, and Ca²⁺ and H⁺ concentration gradients are explained in a special review. Enzymatic research is represented by a review on plant proteases encoded by many genes and having often unknown functions in plants: this enables further research. Among the known regulatory functions are, *e.g.*, stomata development, chloroplast biogenesis, and defence responses. Anatomy of plants is further represented by a review on cuticular wax formation by epidermal cells and biochemical mechanisms that control this process.

Seed physiology is the topic of a review on oil mobilization during seed storage and seed germination, and mechanisms of substance conversion in these processes. Abscisic acid and sugars inhibit the mobilization. In another review seed dormancy is explained from the molecular point of view. Abscisic acid and gibberellin balance play an important role in the dormancy status.

Another review topic is plant pathology. Insect herbivores use diverse feeding strategies and plants produce toxins and defensive proteins to overcome their activities. The strategies of plants and arthropodes in this battle are described because of importance for understanding crop production.

Very basic from the point of view of science application in everyday life is the review on genetically engineered plants and foods that explains food safety, possible risks, tolerance to herbicides and pests, *etc.* – the present review is the first part of the study, the second one will appear next year.

All papers are accompanied by figures, schemes, and tables (mostly presented in colour) and by long lists of full references. A cumulative index lists authors of reviews published in volumes 49 - 59. It is certainly not necessary to add that this book is a must for the library of every laboratory dealing with plant sciences.

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