

HEITEFUSS, R., WILLIAMS, P. H. (ed.): **Physiological Plant Pathology**. — Encyclopedia of Plant Physiology, New Series, Volume 4 (A. Pirson and M. H. Zimmermann ed.), Springer-Verlag Berlin, Heidelberg, New York 1976, 890 pp., DM 194.00 (US \$ 79.60).

The work compiled by 36 contributors contains eight main chapters reviewing the past and evaluating the present knowledge of physiological and biochemical activities of pathogens (esp. fungi, bacteria, viruses, mycoplasma-like organisms, and nematodes) and the responses of higher plants. Disorders and diseases of plants caused by non-parasitic agents were not included.

The first general chapter refers to the history of physiological plant pathology and its importance for the present research, which is forewarned against unconscious generalization of results. It is worth mentioning that two papers by A. C. J. Corda issued in Prague in 1839 and 1840 and dealing with germination of rust spores and entrance of germ tubes into plants are cited among others. The chapter reports briefly some aspects of host-pathogen interactions.

The second chapter "Spore germination and its regulation" concerns the control of germination and infection structure formation in the fungi, including esp. endogenous and exogenous inhibition factors, self inhibition and sensitivity to soil fungistasis. Protein and nucleic acid metabolism during germination is surveyed together with differences between obligate parasites and saprophytic fungi. (In obligate parasites the growth-dependent synthesis of protein is absent and their spores develop a competent machinery for the synthesis of protein required for germination.) Finally, the effect of roots on the activity of soil-borne plant pathogens is dealt with.

Cytology and physiology of penetration and establishment is the topic of the third chapter, divided into five independent parts: "Cytology of virus infection and virus transport" clarifies steps hypothesized as existing in replication of phytoviruses and contributes significantly to erecting schemes for the development of virus infection. The part "Plant mycoplasma diseases" concerns yellows and proliferation agents multiplying in invertebrate vectors and considered as viruses until 1967. However, it is an ill-defined group at present; by January 1, 1975 the only plant-associated mycoplasma-like organism (MLO) has been properly isolated, characterized and deposited in Type Culture Collections, namely the causal agent of the citrus stubborn disease, *Spiroplasma citri* Saglio et al. Besides MLOs resembling microorganisms in Class *Mollicutes*, rickettsia-like organisms (RLO) are discussed as well, but there is no evidence to support their classification as *Rickettsiales*. Many open problems must be solved with phytopathogenic MLOs and RLOs in future. The part "Physiological and cytological aspects of the bacterial infection process" concerns esp. primary determinants in the infection process; features of environment may serve either to accentuate the aggressiveness of the pathogen or conversely favor the resistance of the host. The next part deals with cytology of penetration and infection by fungi. The last part on nematode parasites of plants, their ecology and the process of infection contains the most important records on physiology of nematodes, cyto- and histopathology, biochemical changes in invaded tissues and remarks on breeding for resistance.

Chapter 4 "Forces by which the pathogen attacks the host plant" is divided into five parts: The first one "Host specific toxins in relation to pathogenesis and disease resistance" deals esp. with low mol. wt. compounds that are toxic only to the host plant; host resistance to each fungus is the same property as tolerance to its toxin, as shown by genetic and other data. Some results indicate that toxins have receptors or sensitive sites in plasma or cellular membranes of the susceptible plant, while resistant cells appear to lack such sites; that is resistance to toxin may be constitutive rather than induced. The second part concerns non-specific toxins. Up to 120 phytotoxic compounds or toxin preparations have been described here which are produced by 115 different phytopathogens. Their chemistry is very diverse (organic acids, amino acids derivatives, complicated heterocyclic compounds, very high molecular weight polysaccharides and glycopeptides), as well as their modes of action (inhibition of enzymes or synthesis of NAs, proteins and of chlorophyll; other show effects on phenol metabolism or on growth regulation; many toxins affects water balance and water flow). The part includes a list of phytopathogens which produce phytotoxic compounds. The third part "Degradation of plant cell walls and membranes by microbial enzymes" deals with pathogens capable of producing enzymes that degrade the structural components of plants, many of them possessing the ability to produce toxins, organic acids and/or growth regulators. Particularly pectic enzymes play a key role in pathogenesis by soft rot pathogens. The fourth part refers to morphogenic determinants as exemplified by the crown gall disease induced in higher plants on infection with bacteria of the genus *Agrobacterium*; the tumor inducing principle is discussed. Especially alterations in the stability of the lysosomal system are dealt with in the fifth part on sub-cellular organization in host-parasite interactions.

Chapter 5 "Physiology of host response to infection" contains ten parts: Permeability alterations in diseased plants, Water status and imbalance, The carbon balance of diseased plants, incl. changes in respiration, photosynthesis and translocation, Nucleic acids in host — parasite interactions (there are discussed biochemical symptoms, nonspecific stimulation in RNA —

synthesis etc.), Protein metabolism, Natural growth regulators (endogenous cytokinins and auxins in healthy and diseased plants, the involvement of ethylene in plant pathogenesis, exogenous gibberellins and inhibitors), Oxidative enzymes (their role in the defense reactions of plants), Phytoalexins (which are not produced as a specific response to infection and may be a part of a general tissue repair mechanism, apparently playing a role in resistance), Preformed substances as potential protectants (present in almost every plant mostly as glycosides constituting considerable antimicrobial barriers and having a role in defense mechanism), and Metabolic regulation in host — parasite interactions.

The next chapter "Modifications of the host response — predisposition" refers to conditions which predispose plants to diseases. Chapter 7 "Biotrophic parasites in culture" contains recent data on growth of obligate fungi in axenic culture (culture of rust fungi from uredospores nutritional studies, pathogenicity of axenic cultures etc.) and on growth of obligate parasites (incl. *Nematodes* and fungi) in tissue culture. The last chapter "Genetics of host — parasite interactions" illustrates the principal pattern of inhoritance of interactions between host and parasite. It is shown how to make use of genetic arguments in studies on the physiology, biochemistry and esp. the molecular biology of interactions.

The book represents an indispensable survey for research worker, students, teacher and others who aspire to a modern recent level of plant pathology. All authors strived to select only reliable data which could serve as a basis for further research in some trends of phytopathology. Many questions have been elucidated enough at present to be utilized as new insights into the control of plant diseases. The book anticipates a lot of new problems which may be expected to grow.

J. BRČÁK (Praž)

KINZEL, H.: *Grundlagen der Stoffwechselphysiologie*. Uni-Taschenbücher 618. — Verlag Eugen Ulmer Stuttgart 1977. 276 pp., 65 figures, 14 tables. DM 22.80.

The little book on the principles of the physiology of metabolism is for the biologist an extremely readable text focussing on simple kinetics and thermodynamics. At the given level of sophistication, it is probably the best treatise presently available. The concepts of free energy, entropy, useful work, etc., are explained in a lucid way and are skillfully applied to biochemical pathways, such as glycolysis and respiration. A wealth of quantitative data is presented and the volume is in many respects a true reference book. It is well printed, with several two-colour illustrations, and a brief index. There are two minor points that make the perusal of the book less effective than desirable. One is the scattered references to the literature with no proper bibliography attached, the other the use of Roman letters for algebraic symbols of variables where italics are generally employed.

Notwithstanding this, Kinzel's book is a paperback from which one can derive both information and enjoyment.

A. KOTYK (Praž)

BERGMANN, W., CÖRLING, V. V., GÖLLMICK, F., HUNDT, I., NEUBEERT, P., SCHUBICHT, W., VAMSELOW, G., VIELEMEYER, H.-P., WRAZIDLO, W.: *Pflanzendiagnose und Pflanzenanalyse*. — Gustav Fischer Verlag, Jena 1976. 711 pp., 28 Figs., 619 color Figs., 137 Tabs., 110 DM.

A harmonious nutrition is the fundamental presumption for a successful plant growth and plant development. Both deficiency and surplus of some or all nutrients lead to various disorders and manifestation of more or less typical morphological changes. The right diagnostics of plant nutrition i.e. identification of nutrient deficiency or surplus symptoms together with the plant analysis are two basic supplemental proceedings in the appreciation of the nutritional status of the plants. All problems associated with this topic are involved in the comprehensive reviewed book.

The 395 pages of the first part of the book present detailed descriptions enabling to determine, distinguish and prevent the plants from harmful symptoms evoked by mineral salts. The nutrition problems must be always considered in connection with all conditions affecting plant growth and not only in relation to the available nutrient contents in soils or to their enrichment by fertilizers. The factors interfering with the visual symptom diagnostics are surveyed and analysed. The fourth chapter of the first part describes in an exhaustive form the physiology of macro- and micronutrient elements and the development of visual deficiency and surplus symptoms. A simple clue for the estimation of nutrient deficiency and surplus symptoms of agricultural plants with excellent 619 color photographs make the reviewed book a practical and

indispensable manual for all specialists in the related field. The illustrations are of top quality as to the objects and the reproduction technique. The figure captions are extensive in three languages, in German, English and Russian. The collection of color photographs alone designated by the authors as color plates represents practically an atlas of plant disorders caused by mineral nutrient deficiency or surplus.

The following 297 pages (400—697) of the second part of the book deal with the plant analysis problems. The mineral nutrient contents in agricultural plants indicate the mineral uptake from soil by the plants and the nutritional status of these plants. These relations are not simple and many interfering factors are described in detail in two chapters. We can distinguish between the internal factors i.e. factors peculiar to the plants and external ones. The internal factors include the differences in the behavior of various plant species and cultivars, the mineral uptake differences in various growth and development periods and the differences between individual plant tissues. The external factors as interrelations among the elements, soil factors, climatic factors, rainfall, temperature, light intensity, diseases, application of growth regulators etc. are very important too and must be taken into consideration. The estimation of plant nutritional status is the basis for soil enrichment with the respective elements and for practical advises in fertilizer application. The reviewed book is concluded by an extensive table set compiling nutritional requirements for mineral macro- and microelements by agricultural plants and trees.

The book can be recommended as very important comprehensive source and practical guide in mineral nutrition problems. It provides fundamental information leading to a successful crop production. It will be of great use to all specialists in agricultural sciences.

MARIE ULRYCHOVÁ (Pražka)

LANGE, O. L., KAPPEN, L., SCHULZE, E.-D.: *Water and Plant Life. Problems and Modern Approaches.* — Ecological Studies, volume 19. Springer-Verlag, Berlin—Heidelberg—New York 1976. 536 pp., in English. DM 120,—.

General interest in water relations of plants is accentuated by the fact that the increase in food production of the world is to a great extent limited by the lack of water. The immense bulk of information has been presently accumulated in this field (more than 1000 papers appear every year) and reviewing them into a monograph of a high scientific level must be greatly appreciated. 49 specialists collaborated in producing this book. It deals with the importance of water for plant life throughout the different levels of plant existence, from the molecular level of the cytoplasm to cells and tissues, and from the entire plant organism to ecosystems and vegetation zones.

The text is organised into seven parts. Each part starts with a short introduction summarizing the main ideas from the individual papers and showing the interrelationships between them. The first part "Fundamentals of Plant Water Relations", after a brief description of general properties of water, is focused on theoretical consideration about the water status in the plants and about the transport of water in the soil — plant — atmosphere continuum. It is supplied by a survey of methods for the determination of total water potential and its components. The second part "Water Uptake and Soil Water Relations" deals with water flow into the roots and in the roots and dependence of these processes on properties of the soils, properties of the roots (especially the root extension) and the evapotranspiration rate. Water uptake by perennial plants, annual crops as well as water exchange in forest communities are considered. "Transpiration and its Regulation" is the name of third part. It starts with fundamental biophysical aspects of the water loss, continues by the water permeability through cuticula, the mechanism of guard cell movement and the responses of stomata to environmental factors such as humidity, temperature and irradiation and ends by the mathematical model of water relations in conifers. The following fourth part "Direct and Indirect Water Stress" is primarily dedicated to critical conditions of water supply and the influence of developing water stress on metabolic activity of the plants in respect to ultrastructural, biochemical and hormonal aspects. The physiological basis of drought resistance is also included. The subjects of the fifth part "Water Relations and CO₂ Fixation Types" are the different photosynthetic pathways. Special attention is paid to the biochemical and physiological principles of the C₄ "syndrome" and Crassulacean acid metabolism, which are known to be special adaptations to the hot arid and semi-arid regions. The sixth part "Water Relations and Productivity" deals with the role of water status in the productivity of plants and plant communities. The simulation models for prediction of primary productivity not only under optimal growth conditions but also under water stress are also comprehended. One chapter in this part is devoted to irrigation. In the last seventh part "Water and Vegetation Patterns" the importance of water for geographical distribution of plants is discussed.

The book is well printed and arranged and the text is illustrated with 178 figures and 64 tables. Each chapter contains a detailed list of references. Index of Plant Species and Subject Index are also included.

I am sure that the book will be favourably accepted as it is an excellent up to date summary of the current knowledge on the topics it covers.

JANA POSPÍŠILOVÁ (Praha)

BONNER, J., VARNER, J. E. (ed.): **Plant Biochemistry**. Academic Press, New York, San Francisco, London, 1976, 925 pp., 24,50 \$.

This is the third edition of the well known *Plant Biochemistry*. It is written for advanced students and research workers in biochemistry and related plant sciences. Similarly as in the first edition the book deals especially with those aspects of biochemistry in which plants differ from other organisms. This treatise is divided into three parts: Substructures and subfunctions (9 chapters), Basic metabolism (14 chapters) and Autotrophy (3 chapters). When compared with the first edition (1969), more attention is paid to the biochemical functions of various plant substructures where new chapters dealing with microbodies (R. W. Breidenbach), plant microtubules (P. K. Hepler) and vacuoles (Ph. Matile) are incorporated. In addition to the up-to-date information about the functions of the substructures a short description of methods of their isolation and fractionation is involved. The significant extension of the first part corresponds to the rapid progress which plant biochemistry has achieved in this field in recent years.

The second part (Basic metabolism) contains an extended chapter on enzymology, which is focused on the regulation of enzyme activity in metabolic pathways (J. Preiss and T. Kosuge), and new chapters Nucleic acid metabolism (J. L. Key), Phytochrome (P. H. Quail), Hormones (J. E. Varner and D. Tuan-Hua Ho) and Senescence (L. Beavers) are added. These additions reflect the present effort of plant biochemists to explain the mechanisms of regulation of physiological processes on a molecular level. Plant physiologists find here a comprehensive account of the most important up-to-date information about the discovery, occurrence, biosynthesis, degradation, physiological effects and possible mode of action of ethylene, cytokinins, auxins, abscisic acid and gibberellins and about some processes which seem to be under control of these plant hormones.

Thanks to the experience of the editors the text is well balanced and repetition of facts in closely related chapters is avoided. The book is well edited, clearly written and well illustrated. The literature contains separately references for students and original literature for research workers. There is no need to make any recommendation: Bonner and Varner's *Plant Biochemistry* is well known and one can only appreciate that the third edition is already available.

M. KAMÍNEK (Praha)

RAGHAVAN, V.: **Experimental Embryogenesis in Vascular Plants**. — Academic Press, London — New York — San Francisco, 1976, 603 pp., 21.00 £.

This is the 10th volume of *An International Series of Monographs in Experimental Botany* appearing under consulting editorship of J. E. Suteliffe. It is a very important contribution to the literature on plant embryology in that it provides a detailed, up-to-date review on physiology of embryogenesis.

The main section of the book is devoted to embryo formation from the zygote. It opens with a concise description of the structure and organization of the egg, zygote and embryo. This is followed by four chapters concerned with biochemical, nutritional and growth aspects of embryogenesis. The vast body of results obtained by the modern methods of tissue culture in embryology is brought together in the next seven chapters. The results are classed and discussed to show especially the relationships between nutrition and metabolism and between the structure and function of the embryos. Particular attention is also paid to applied aspects of embryo culture.

The second section on adventive embryogenesis is divided into two parts dealing with the induction of diploid and haploid embryoids. The theme of the last section is somewhat beyond the scope of the book, being concerned with seed dormancy and germination.

Technically, the book is well produced. It is divided by frequent subheadings and contains a number of illustrations, a detailed subject index with extensive literature citations (more than 100 pages) and an appendix describing the composition of 18 media used for embryo culture. This volume will certainly prove of great interest especially for research workers of many branches of theoretical and applied botany.

J. TUPÝ (Praha)