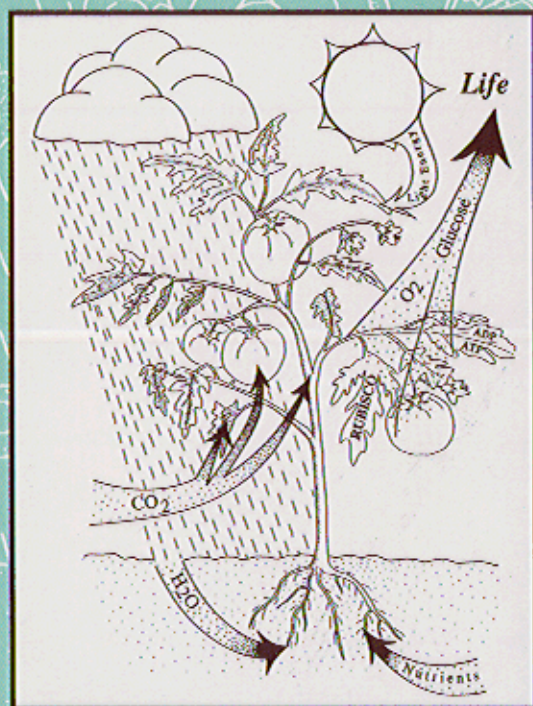


Handbook of Photosynthesis

Second Edition



edited by
Mohammad Pessarakli

Table of Contents

Section I Principles of Photosynthesis

- 1 Mechanisms of Photosynthetic Oxygen Evolution and Fundamental Hypotheses of Photosynthesis 3
Yuzeir Zeinalov
- 2 Thermoluminescence as a Tool in the Study of Photosynthesis 21
Anil S. Bhagwat and Swapan K. Bhattacharjee

Section II Biochemistry of Photosynthesis

- 3 Chlorophyll Biosynthesis — A Review 37
Benoît Schoefs and Martine Bertrand
- 4 Probing the Relationship between Chlorophyll Biosynthetic Routes and the Topography of Chloroplast Biogenesis by Resonance Excitation Energy Transfer Determinations 55
Constantin A. Rebeiz, Karen J. Kopetz, and Vladimir L. Kolosov
- 5 Protochlorophyllide Photoreduction — A Review 97
Martine Bertrand and Benoît Schoefs
- 6 Formation and Demolition of Chloroplast during Leaf Ontogeny 109
Basanti Biswal
- 7 Role of Phosphorus in Photosynthetic Carbon Metabolism 123
Anna M. Rychter and I. M. Rao
- 8 Inhibition or Inactivation of Higher-Plant Chloroplast Electron Transport 149
Rita Barr and Frederick L. Crane

Section III Molecular Aspects of Photosynthesis: Photosystems, Photosynthetic Enzymes and Genes

- 9 Photosystem I: Structures and Functions 169
Tetsuo Hiyama
- 10 Covalent Modification of Photosystem II Reaction Center Polypeptides 193
Julian P. Whitelegge
- 11 Reactive Oxygen Species as Signaling Molecules Controlling Stress Adaptation in Plants 209
Tsanko Gechev, Ilya Gadjev, Stefan Dukiandjiev, and Ivan Minkov
- 12 Plastid Morphogenesis 221
Ján Hudák, Eliška Gálová, and Lenka Zemanová
- 13 Plastid Proteases 247
Dennis E. Buetow
- 14 Supramolecular Organization of Water-Soluble Photosynthetic Enzymes along the Thylakoid Membranes in Chloroplasts 259
Jayashree K. Sainis and Michael Melzer
- 15 Cytochrome c_6 Genes in Cyanobacteria and Higher Plants 273
Ho Kwok Ki

Section IV Atmospheric and Environmental Factors Affecting Photosynthesis

16	External and Internal Factors Responsible for Midday Depression of Photosynthesis	287
	<i>Da-Quan Xu and Yun-Kang Shen</i>	
17	Root Oxygen Deprivation and the Reduction of Leaf Stomatal Aperture and Gas Exchange	299
	<i>Robert E. Sojka, Derrick M. Oosterhuis, and H. Dan Scott</i>	
18	Rising Atmospheric CO ₂ and C ₄ Photosynthesis	315
	<i>Joseph C.V. Vu</i>	
19	Influence of High Light Intensity on Photosynthesis: Photoinhibition and Energy Dissipation	327
	<i>Robert Carpentier</i>	
20	Development of Functional Thylakoid Membranes: Regulation by Light and Hormones	343
	<i>Peter Nyitrai</i>	

Section V Photosynthetic Pathways in Various Crop Plants

21	Photosynthetic Carbon Assimilation of C ₃ , C ₄ , and CAM Pathways	367
	<i>Anil S. Bhagwat</i>	
22	Photosynthesis in Nontypical C ₄ Species	391
	<i>Maria Valeria Lara and Carlos Santiago Andreo</i>	

Section VI Photosynthesis in Lower and Monocellular Plants

23	Regulation of Phycobilisome Biosynthesis and Degradation in Cyanobacteria	425
	<i>Johannes Geiselman, Jean Houmard, and Benoît Schoefs</i>	

Section VII Photosynthesis in Higher Plants

24	Short-Term and Long-Term Regulation of Photosynthesis during Leaf Development	441
	<i>Dan Stessman, Martin Spalding, and Steve Rodermel</i>	
25	Recent Advances in Chloroplast Development in Higher Plants	451
	<i>Iliya D. Denev, Galina T. Yahubian, and Ivan N. Minkov</i>	

Section VIII Photosynthesis in Different Plant Parts

26	Photosynthesis in Leaf, Stem, Flower, and Fruit	479
	<i>Abdul Wahid and Ejaz Rasul</i>	

Section IX Photosynthesis and Plant/Crop Productivity and Photosynthetic Products

27	Photosynthetic Plant Productivity	501
	<i>Lubomír Nátr and David W. Lawlor</i>	
28	Photosynthate Formation and Partitioning in Crop Plants	525
	<i>Alberto A. Iglesias and Florencio E. Podestá</i>	

Section X Photosynthesis and Plant Genetics

29	Crop Radiation Use Efficiency and Photosynthate Formation — Avenues for Genetic Improvement	549
	<i>G.V. Subbarao, O. Ito, and W. Berry</i>	
30	Physiological Perspectives on Improving Crop Adaptation to Drought — Justification for a Systemic Component-Based Approach	577
	<i>G.V. Subbarao, O. Ito, R. Serraj, J. J. Crouch, S. Tobita, K. Okada, C. T. Hash, R. Ortiz, and W. L. Berry</i>	

Section XI Photosynthetic Activity Measurements and Analysis of Photosynthetic Pigments

- 31 Whole-Plant CO₂ Exchange as a Noninvasive Tool for Measuring Growth..... 597
Evangelos D. Leonardos and Bernard Grodzinski
- 32 Approaches to Measuring Plant Photosynthetic Activity..... 617
Elena Masarovičová and Katarina Král'ová
- 33 Analysis of Photosynthetic Pigments: An Update 657
Martine Bertrand, José L. Garrido, and Benoît Schoefs

Section XII Photosynthesis and Its Relationship with Other Plant Physiological Processes

- 34 Photosynthesis, Respiration, and Growth 671
Bruce N. Smith
- 35 Nitrogen Assimilation and Carbon Metabolism..... 679
Alberto A. Iglesias, Maria J. Estrella, and Fernando Pieckenstein
- 36 Leaf Senescence and Photosynthesis 691
Agnieszka Mostowska

Section XIII Photosynthesis under Environmental Stress Conditions

- 37 Photosynthesis in Plants under Stressful Conditions 717
Rama Shanker Dubey
- 38 Photosynthetic Response of Green Plants to Environmental Stress:
Inhibition of Photosynthesis and Adaptational Mechanisms 739
Basanti Biswal
- 39 Salt and Drought Stress Effects on Photosynthesis 751
B. Huchzermeyer and H. W. Koyro
- 40 Photosynthetic Carbon Metabolism of Crops under Salt Stress..... 779
Bruria Heuer
- 41 Photosynthesis under Drought Stress 793
Habib-ur-Rehman Athar and Muhammad Ashraf
- 42 Role of Plant Growth Regulators in Stomatal Limitation to Photosynthesis
during Water Stress..... 811
Jana Pospíšilová and Ian C. Dodd
- 43 Adverse Effects of UV-B Light on the Structure and Function of the
Photosynthetic Apparatus..... 827
Imre Vass, András Szilárd, and Cosmin Sicora
- 44 Heavy Metal Toxicity Induced Alterations in Photosynthetic Metabolism in Plants..... 845
Shruti Mishra and R. S. Dubey
- 45 Effects of Heavy Metals on Chlorophyll-Protein Complexes in Higher Plants:
Causes and Consequences..... 865
Éva Sárvári

Section XIV Photosynthesis in the Past, Present, and Future

- 46 Origin and Evolution of C₄ Photosynthesis 891
Bruce N. Smith
- Index..... 899