

Contents

Preface.....	xi		
Acknowledgments.....	xv		
Editor.....	xvii		
List of Contributors.....	xix		
List of Abbreviations.....	xxv		
Section I		Chapter 6	Plant Aging and Developmental Stages: Reproductive and the Beginning of Flowering Stage..... 69
Soil–Plant–Water–Nutrients–Microorganisms Physiological Relations.....	1		<i>Mina Bayanati, Behnam Asgari Lajayer, and Mohammad Pessarakli</i>
Chapter 1	Evaluating the Recruitment of Soilborne Microbes to Seeds and Their Effects on Seed Germination of Crop Plants in Agricultural and Non-agricultural Soils..... 3	Chapter 7	Longan Fruit Tree Physiology and Its Flowering Induction..... 77
	<i>Aasiya Hamzazai, Ming-Min Lee, Kayla Garcia, Ellen Pat, Alejandra Ibarra, Emma H. Woytenko, and A. Elizabeth Arnold</i>		<i>Hong Li</i>
Chapter 2	Regulation of Phosphate Starvation in Higher Plants and Role of Mycorrhizae..... 17	Chapter 8	Senescence: The Final Phase of Plant Life..... 99
	<i>Rafia Mubarak, Marcel Bucher, and Muhammad Baqir Hussain</i>		<i>Mina Bayanati, Behnam Asgari Lajayer, and Mohammad Pessarakli</i>
Chapter 3	Effect of Potassium on Growth and Physiology of Alfalfa..... 29	Section III	Cellular and Molecular Aspects of Plant/Crop Physiology..... 111
	<i>M. Anowarul Islam and Michael M. Baidoo</i>	Chapter 9	Carbon Assimilation and Partitioning in Crop Plants: A Biochemical and Physiological View..... 113
Chapter 4	Evaluating and Managing Water Requirement of Crops: Theoretical Methods and Remote Sensing Technology..... 41		<i>Bruno E. Rojas, Carlos M. Figueroa, and Alberto A. Iglesias</i>
	<i>Zohrab Samani</i>	Chapter 10	Epitranscriptomics in Plant Physiology: m ⁶ A Modifications..... 135
Section II	Physiology of Plant/Crop Growth and Development Stages..... 55		<i>Fatemeh Aflaki and Arman Pazuki</i>
Chapter 5	Seed Dormancy and Germination in Medicinal Plants: Inhibitors and Promoters..... 57	Chapter 11	Characteristics of Grain Quality in Rice: Physiological and Molecular Aspects..... 147
	<i>Amir Hossein Saeidnejad</i>		<i>Mojtaba Kordrostami, Mohammad Mafakheri, and Maryam Hosseini Chaleshtori</i>
		Chapter 12	Role of Melatonin in Improving the Tolerance of Plants to Salinity Stress..... 159
			<i>Magdi T. Abdelhamid, Mohammad Pessarakli, Agnieszka Sekara, Gianluca Caruso, Mostafa M. Rady, and Ibrahim M. El-Metwally</i>

Chapter 13	Phytohormones and Abiotic Stresses: Roles of Phytohormones in Plants under Abiotic Stresses	175
-------------------	---	-----

*Hadi Salek Mearaji, Aida Ansari,
Nader Khadem Moghadam Igdelou,
Behnam Asgari Lajayer, and
Mohammad Pessarakli*

Chapter 14	Physiological Roles of Plant Nutrients, Ions, and Phytometabolites Homeostasis in Activating Antioxidative Defense Systems and Conferring Tolerance to Osmotic Stress.....	215
-------------------	--	-----

*Omid Askari-Khorasgani, and
Mohammad Pessarakli*

Section IV	Plant/Crop Physiology and Physiological Aspects of Plant/Crop Production Processes.....	245
-------------------	--	------------

Chapter 15	Physiology of Grain Development in Cereals.....	247
-------------------	---	-----

*Muhammad Farooq, Abdul Rehman,
Abdul Wahid, and Kadambot H.M.
Siddique*

Chapter 16	Plant Nutrition: Rates of Transport and Metabolism.....	261
-------------------	---	-----

Thomas W. Crawford, Jr.

Chapter 17	Plant Nutrition: Interactions of Mineral and Organic Substances	297
-------------------	---	-----

Thomas W. Crawford, Jr.

Chapter 18	Roles and Implications of Arbuscular Mycorrhizas in Plant Nutrition.....	321
-------------------	--	-----

*Catello Di Martino and Thomas
W. Crawford, Jr.*

Chapter 19	Turfgrass Nitrogen Management: A Review	343
-------------------	---	-----

*Haibo Liu, Mohammad Pessarakli, Hong
Luo, Nick Menchyk, Christian M. Baldwin,
and Derrick H. Taylor*

Section V	Plant Growth Regulators: The Natural Hormones (Growth Promoters and Inhibitors)	387
------------------	--	------------

Chapter 20	Plant Growth Regulators and Secondary Metabolites, Downregulation and Upregulation	389
-------------------	--	-----

Amir Hossein Saeidnejad

Section VI	Physiological Responses of Plants/ Crops Under Stressful (Salt, Drought, Heat, Nutrient Deficiency, and Other Environmental Stresses) Conditions	401
-------------------	---	------------

Chapter 21	Physiological Basis of Abiotic Stress Tolerance in Plants	403
-------------------	---	-----

*Tanveer Ul Haq, Muhammad Imran,
and Hafiz Shahzad Ahmad*

Chapter 22	Physiological Adaptations in Temperate Crops to Environmental Constraints during the Growing Season.....	427
-------------------	--	-----

*Klára Kosová, Pavel Vítámvás, and
Ilja Tom Prášil*

Chapter 23	Osmotic Stress: An Outcome of Drought and Salinity	445
-------------------	--	-----

*Omid Askari-Khorasgani, Muhammad
Ishaq Asif Rehmani, Shabir H. Wani,
and Anuj Kumar*

Chapter 24	Drought Stress Sensing-Signaling in Plants	465
-------------------	--	-----

*Omid Askari-Khorasgani, Francisco
Borja Flores Pardo, and
Mohammad Pessarakli*

Chapter 25	Plant Morphological and Physiological Responses to Drought Stress	483
-------------------	---	-----

*Omid Askari-Khorasgani,
Francisco Borja Flores Pardo, and
Mohammad Pessarakli*

- Chapter 26** Morphological, Physiological, and Biochemical Responses of Plants to Drought and Oxidative Stresses 517
Soheila Dastborhan, Andrzej Kalisz, Sajad Kordi, Behnam Asgari Lajayer, and Mohammad Pessarakli
- Chapter 27** Effects of Salinity Stress on Morpho-Physiology, Biochemistry, and Proteomic Responses of Plants 543
Zahra Dehghanian, Nasser Delangiz, Behnam Asgari Lajayer, and Mohammad Pessarakli
- Chapter 28** Metabolic Regulation of Cytokinins for Conferring Heat and Drought Tolerance in Perennial Grass Species..... 557
Yan Xu and Bingru Huang
- Chapter 29** Drought Physiology of Forage Crops 567
M. Anowarul Islam and Augustine K. Obour
- Chapter 30** Physiological Mechanisms of Nitrogen Absorption and Assimilation in Plants under Stressful Conditions 579
Rama Shanker Dubey, Rajneesh Kumar Srivastava, and Mohammad Pessarakli
- Chapter 31** Reactive Oxygen Species Generation, Hazards, and Defense Mechanisms in Plants under Environmental (Abiotic and Biotic) Stress Conditions 617
Pallavi Sharma, Ambuj Bhushan Jha, Rama Shanker Dubey, and Mohammad Pessarakli
- Chapter 32** Oxidative Stress: Repercussions for Crop Productivity 659
Abdul Wahid, Muhammad Farooq, Abdul Rehman, and Kadambot H.M. Siddique
- Chapter 33** Physiological and Biophysical Responses of Plants under Low and Ultralow Temperatures 669
Jiří Zámečník and Miloš Faltus
- Chapter 34** Physiological Responses of Cotton (*Gossypium hirsutum* L.) to Salt Stress 691
Mohammad Pessarakli
- Chapter 35** Growth and Physiological Responses of Turfgrasses under Stressful Conditions 713
Haibo Liu, Mohammad Pessarakli, Hong Luo, Nick Menchyk, Christian M. Baldwin, and Derrick H. Taylor
- Chapter 36** Urban Landscape: 'Trees' Physiological and Environmental Stresses, Challenges, and Solutions 777
Hamed Aalipour and Ali Nikbakht
- Chapter 37** Consequences of Water Stress and Salinity on Plants/ Crops: Physiobiochemical and Molecular Mitigation Approaches..... 789
Mojtaba Kordrostami and Mohammad Mafakheri
- Section VII Physiological Responses of Plants/Crops to Heavy Metal Concentrations and Agrichemicals..... 815**
- Chapter 38** Heavy Metals and Phytoremediation in Plants 817
Mohammad Mafakheri and Mojtaba Kordrostami
- Chapter 39** Arsenic Toxicity and Tolerance Mechanisms in Crop Plants..... 831
Pallavi Sharma, Ambuj Bhushan Jha, and Rama Shanker Dubey

Chapter 40	Interactions of Nanomaterials and Plants in Remediation of the Heavy Metal Contaminated Soils	875
	<i>Fouzieh Beigmohammadi, Eisa Solgi, Bhasha Sharma, Behnam Asgari Lajayer, and Mohammad Pessarakli</i>	

Section VIII Physiological Responses of Lower Plants (Algae) and Vascular Plants/Crops to Metal-based Nanoparticles 887

Chapter 41	Impact of Metal Nanoparticles on Marine and Freshwater Algae.....	889
	<i>Katarína Kráľová and Josef Jampilek</i>	

Chapter 42	Risks and Benefits of Metal-Based Nanoparticles for Vascular Plants.....	923
	<i>Katarína Kráľová, Elena Masarovičová, and Josef Jampilek</i>	

Section IX Physiology of Plant/Crop Genetics and Development 965

Chapter 43	Genotyping, Phenotyping, Genetic Engineering, and Screening Techniques Required for Developing Drought-Tolerant Plants	967
	<i>Omid Askari-Khorasgani, and Mohammad Pessarakli</i>	

Chapter 44	Genetic Diversity in Leaf Photosynthesis among Soybeans under the Field Environment	1027
	<i>Kazuma Sakoda, Yu Tanaka, and Wataru Yamori</i>	

Section X Plants/Crops Growth Responses to Climate Change and Environmental Factors 1041

Chapter 45	Climate Change and Secondary Metabolite Production: An Ecophysiological Perspective	1043
	<i>Amir Hossein Saeidnejad and Rooholla Moradi</i>	

Chapter 46	Regulation of Growth Factors in Plants by Artificial and Supplementary LED Light: An Integrated View on Morphology and Physiology	1053
-------------------	---	------

Ladan Ajdarian, Mehdi Babaei, Behnam Asgari Lajayer, and Mohammad Pessarakli

Section XI Future Promises: Plants and Crops Adaptation, and Biotechnological Aspects of Plants/Crops Improvement under Normal and Stressful Conditions 1063

Chapter 47	Management of Plant Stress Physiology to Improve Crop Production and Quality.....	1065
-------------------	---	------

Amanda K. Rico-Chávez, Nallely Solano-Alvarez, Diana Saenz de la O, Juan A. Valencia-Hernández, and Ramón Gerardo Guevara-González

Chapter 48	CAM Plants as Crops: Metabolically Flexible, Hardy Plants for a Changing World.....	1083
-------------------	---	------

Karina E.J. Trípodi, Bruno E. Rojas, Alberto A. Iglesias, and Florencio E. Podestá

Chapter 49	Digging Deeper to Define the Physiological Responses to Environmental Stress: The Case of Common Bean and Brachiaria Grasses.....	1099
-------------------	---	------

Idupulapati Madhusudana Rao

Chapter 50	New Approaches for Improving Turfgrass Nutrition: Usage of Humic Substances and Mycorrhizal Inoculation.....	1141
-------------------	--	------

Ali Nikbakht, Naghmeh Daneshvar Hakimi-Meybodi, and Mohammad Pessarakli

Index.....		1161
-------------------	--	------