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Mitigating Environmental Stresses for Agricultural Sustainability in Egypt

 Springer

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Preface

The subject of mitigating environmental stresses for sustainable agriculture is essential not only for Egypt but for almost all countries having a similar situation. The book has been produced via wide collaboration of teamwork of 30 distinguished researchers and scientists from different institutions, academic, and research centers with significant concerns regarding environmental stresses, field crops, drought tolerance, heat stress, pollution tolerance, salt stress, natural resources, biotic stresses, laser, seed technology, and molecular tools mycorrhizae.

This volume consists of 21 chapters in 6 parts. The first part is an introduction and contains one chapter which is written by the editors with inputs from the authors to introduce the book to the audiences.

The second part of the volume deals with the improvement of crop tolerance for abiotic stresses. This part consists of 7 chapters. Chapter 2 is titled “Drought Tolerance in Some Field Crops.” The authors address the genetic diversity among genotypes, related traits to drought tolerance, genetic behavior, breeding efforts, and biotechnology in rice, maize, barley, and sunflower. While Chapter 3 is dealing with “Performance and Genetic Diversity in Water Stress Tolerance and Relation to Wheat Productivity under Rural Regions.” The author addresses breeding efforts and biotechnology to improve drought tolerance. The attention will also be paid to some agricultural procedures that improve water stress tolerance in relation to wheat productivity. On the other hand, Chapter 4 presents the “Heat Stress Tolerance, Challenges and Solutions.” The chapter casts light on some concepts related to heat stress, breeding achievements and presents several practical adapting options to the increased temperatures. Moreover, Chapter 5 is titled “Environmental Pollution Tolerance in Crop Plants.” The author addresses the source of pollutants and their damages, how can crop plants tolerate air and heavy metal pollutants, resistance mechanisms of crop plants to environmental pollution through morpho-physiological and biochemical characters, the role of plant breeding and biotechnology, besides procedures for pollution control. Furthermore, Chapter 6 is titled “Rapid Screening Wheat Genotypes for Tolerance to Heavy Metals.” This chapter highlights the influence of heavy metals on wheat characteristics, and how to screen the tolerance of genotypes to heavy metals, also help to understand the level of tolerance and sensitivity of wheat genotypes for establishing breeding program to improve tolerance

in wheat. While, Chapter 7 is titled “Performance, Adaptability and Stability of Promising Bread Wheat Lines across Different Environments.” This chapter highlights the performance of wheat genotypes for economic traits, determines their adaptability and stability, employs joint regression and the AMMI method, and copes with environmental changes under the Mediterranean region of Egypt. However, Chapter 8 is titled “Effect of Salt Stress on Physiological and Biochemical Parameters of African Locust Bean {*Parkia biglobosa* (Jacq.) Benth} Cell Suspension Culture.” This chapter presents unique informations on *Parkia biglobosa*, salt stress adaptive mechanism, antioxidant activity and phenolic compounds, and establishment protocol for cell suspension culture. The authors also address on electrophoretic, isozyme, and HPLC analyses and also utilized molecular characterization in *Parkia biglobosa* plant.

Part III consists of 5 chapters under the theme “Recent Approaches for Biotic Stress Tolerance.” Chapter 9 presents the “Varietal Differences and Their Relation to Brown Rot Disease Resistance in Potato.” The authors address on survey, isolation, and identification the causal organism of potato brown rot disease, *Ralstonia solanacearum* in weeds, molecular biology techniques, varietal differences in resistance to the disease, and effect of plant extracts on *R. solanacearum* growth *in vitro*. Chapter 10 is integrated with Chapter 9 where it is titled “Effect of Soil Type and Crop Rotation on Activity of *Ralstonia solanacearum* the Causal Agent of Brown Rot Disease in Potato under Egyptian Condition.” This chapter focuses on the biotic abilities of *R. solanacearum* in relation to dispersion and survival, the effect of soil type, soil pH, and crop rotation on potato brown rot disease, and also be paid into designing effective management against the pathogen.

Moreover, Chapter 11 is titled “Advanced Methods in Controlling Late Blight in Potato.” This chapter goes to resistant cultivars, alternative control methods, i.e., plant oils and extracts, use of nanotechnology and biocontrol compared to chemical fungicides to reduce the environmental problems on the plants, animals, and then humans. Meanwhile, Chapter 12 is devoted to “Developing Rust Resistance of Wheat Genotypes under Egyptian Conditions.” The current chapter provides detailed information about yield losses percentage caused by wheat rusts and genetic variability, seeking for new sources of resistance, genes conferring resistance, breeding efforts, and biotechnology as a foundation for developing durable rust-resistant wheat cultivars. In the meantime, Chapter 13 presents the “Importance of Faba Bean (*Vicia fabae* L.) Diseases in Egypt.” This chapter provides knowledge about the impact of the major plant diseases affecting faba bean yield production, yield loss, some control measures for minimizing the diseases, i.e., resistant cultivars, fungicides treatment, and inducing disease resistance, biological control, plant extracts, and growth regulators besides agricultural practices.

Part IV consists of 4 chapters and all are devoted to discussing the “Advanced Procedures in Improving Crop Productivity.” Chapter 14 presents and discusses the “Role of He-Ne LASER in Improving Wheat Grain Yield Potentiality.” This chapter highlights the application of laser technology as a sustainable, secure, and clean means in agriculture, advantages, and applications on crop plants, especially wheat in improving biotic and abiotic stresses, yield and quality characteristics. While

Chapter 15 is titled “Seed Technology and Improvement Productivity of Field Crops.” This chapter focuses on the new technology of seed production from the perspective of seed quality, seed treatments, seed processing, seed storage, seed propagation, seed inspection, and testing seed quality. However, Chapter 16 is about the “Identification of Salt Tolerance Genotypes among Egyptian and Nigerian Peanut (*Arachis hypogaea* L.) Using Biochemical and Molecular Tools.” This chapter has been proposed in order to provide information concerning salt tolerance of Egyptian and Nigerian peanut at morphological, biochemical, and molecular levels and application of polymerase chain reaction to amplify the KAT1 gene, while Chapter 17 is about the “Importance of Mycorrhizae in Crop Productivity.” The author addresses on background about the arbuscular mycorrhizal fungi, its importance in plant nutrient and improving crop productivity under water deficit and salinity stress environments.

Part V is devoted to the “Sustainability of Environmental Resources from a Crop Production Perspective” and consists of 3 chapters. Chapter 18 is presented to discuss the “Optimizing Inputs Management for Sustainable Agricultural productivity.” In this chapter, information is reviewed about the importance of sustainable agriculture for protecting environment and humans, and potential risks of some agricultural practices such as excessive synthetic fertilizer, toxic chemical pesticides, or herbicides in crop production. Also, the importance of organic and bio-fertilizers in the agricultural system is discussed. The attention will also be paid to the advantages of cropping rotation systems for better health of soil, environment, and human. Chapter 19 is about “Maize Productivity in the New Millennium.” This chapter summarizes the historical trend of maize production in the world, and in developing countries (Egypt), the challenges faced in maize agriculture must be met to increase productivity, quality, and increase in resource use efficiency and the protection of environmental quality using traditional, modern, and advanced breeding methods. Finally, Chapter 20 is dealing with “Quinoa and Cassava Crops to Increase Food Security in Egypt.” The chapter presents a state-of-the-art review on quinoa and cassava internationally and nationally from perspectives of the effect of salinity, water stress, insects and diseases, uses and introduction of Quinoa and Cassava Crops in Egypt to help researchers in Egypt to expand and improve their work with these two important crops.

The book ends with the conclusion chapter where the editors present an update of the book topics and present the most important conclusions and recommendations from all chapters.

The editors want to acknowledge the partial support of the Science and Technology Development Fund (STDF) of Egypt in the framework of the grant no. 30771 for the project titled “A Novel Standalone Solar-Driven Agriculture Greenhouse - Desalination System: That Grows Its Energy And Irrigation Water” via the Newton-Musharafa funding scheme.

The editors want to express their thanks to all who contributed in one way or another to make this high-quality volume a reality and a unique source of knowledge and latest findings in the field of mitigating environmental stresses for sustainable agriculture. We want to appreciate and thank all the authors for their contributions. Their patience and efforts in writing and revising the different versions of the chapters to satisfy the high-quality standards of Springer make it possible to produce this

volume and make it a reality. Acknowledgments must be extended to include all members of the Springer team who have worked long and hard to produce this volume and make it a reality for the researchers, graduate students, and scientists around the world.

The editors appreciate too much the efforts done by Dr. Elsayed Mansour, Assistant Professor, Crop Science Department, Faculty of Agriculture, Zagazig University, in increasing the resolution of the figures included in the chapters of the book.

The volume editors would be happy to receive the comments for all the audiences to improve future editions. Comments, feedback, suggestions for improvement, or new chapters for next editions are welcomed and should be sent directly to the volume editors. The emails of the editors can be found inside the books at the footnote of their chapters.

Zagazig, Egypt
April 2019

Abdelazim Negm
Mohamed Abu-hashim
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environment, and pharmacology. 543865-TEMPUS-1-2013-1-EG-TEMPUS-JPCR. Dr. Abu-hashim published several papers related using remote sensing and GIS technique in fields of climate changes and water resource management in Egypt.

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