



Stefano Mancuso
Sergey Shabala
Editors

Waterlogging Signalling and Tolerance in Plants



Springer

Waterlogging Signalling And Tolerance In Plants

Robert R. Redfield



Waterlogging Signalling And Tolerance In Plants:

Waterlogging Signalling and Tolerance in Plants Stefano Mancuso, Sergey Shabala, 2010-03-10 In the last half century because of the raising world population and because of the many environmental issues posed by the industrialization the amount of arable land per person has declined from 0.32 ha in 1961 to 0.21 ha in 1997 and is expected to drop further to 0.16 ha by 2030 and therefore is a severe menace to food security FAO 2006 At the same time about 12 million ha of irrigated land in the developing world has lost its productivity due to waterlogging and salinity Waterlogging is a major problem for plant cultivation in many regions of the world The reasons are in part due to climatic change that leads to the increased number of precipitations of great intensity in part to land degradation Considering India alone the total area suffering from waterlogging is estimated to be about 3.3 million ha Bhattacharya 1992 the major causes of waterlogging include superfluous irrigation supplies seepage losses from canal impeded sub surface drainage and lack of proper land development In addition many irrigated areas are subjected to yield decline because of waterlogging due to inadequate drainage systems Worldwide it has been estimated that at least one tenth of the irrigated cropland suffers from waterlogging

Microbes and Signaling Biomolecules Against Plant Stress Anita Sharma, 2020-11-06 This book sheds new light on ways to alleviate biotic and abiotic stress in plants using signaling molecules of plant growth promotory rhizobacteria Further it elaborates on the different types of stress and strategies used by plants under various stress conditions The respective sections describe the importance of the microbiome for the overall health of plants and how exploring plant microbe communication and signaling pathways could offer a promising avenue for future research The book also discusses how rhizobacteria could be exploited in stress alleviation and sustainable agriculture and addresses omics strategies for stress response and mitigation Thanks to clearly annotated references the book also supports and encourages readers to further explore the topics discussed *Abiotic Stress Adaptation in Plants*, 2010 Managing Reactive Oxygen Species In Sports Turf Jeff Haag, 2019-02-07 Reactive oxygen species can have detrimental effects on sports turf This book describes the causes of reactive oxygen species its photosynthetic targets and nutrients and compounds that can manage and prevent them

Plant Responses to Hypoxia Elena Loreti, Gustavo Striker, 2021-03-02 Molecular oxygen deficiency leads to altered cellular metabolism and can dramatically reduce crop productivity Nearly all crops are negatively affected by a lack of oxygen hypoxia due to adverse environmental conditions such as excessive rain and soil waterlogging Extensive efforts to fully understand how plants sense oxygen deficiency and their ability to respond using different strategies are crucial to increase hypoxia tolerance Progress in our understanding has been significant in recent years This topic certainly deserves more attention from the academic community therefore we have compiled a series of articles reflecting the advancements made thus far **Reactive Oxygen Species and Antioxidant Systems in Plants: Role and Regulation under Abiotic Stress** M. Iqbal R. Khan, Nafees A. Khan, 2017-08-02 The present edited book is an attempt to update the state of art of the

knowledge on metabolism of ROS and antioxidants and their relationship in plant adaptation to abiotic stresses involving physiological biochemical and molecular processes The chapters are much focused on the current climate issues and how ROS metabolism can manipulate with antioxidant system to accelerate detoxification mechanism It will enhance the mechanistic understanding on ROS and antioxidants system and will pave the path for agricultural scientists in developing tolerant crops to achieve sustainability under the changing environmental conditions The increase in abiotic stress factors has become a major threat to sustainability of crop production This situation has led to think ways which can help to come out with potential measures for which it is necessary to understand the influence of abiotic stress factors on crops performance and the mechanisms by which these factors impact plants It has now become evident that abiotic stress impacts negatively on plant growth and development at every stage of plant's life Plants adapt to the changing environment with the adjustment at physiological biochemical and molecular levels The possible mechanisms involved in the negative effects of abiotic stress factors are excess production of reactive oxygen species ROS They alter physiological and molecular mechanisms leading to poor performance of plants Plants however are able to cope with these adverse effects by inducing antioxidant systems as the priority Nevertheless the dual role of ROS has now been ascertained which provides an evidence for regulation of plant metabolism positively on a concentration dependent manner Under conditions of high ROS production the antioxidant system plays a major role in diminishing the effects of ROS Thus ROS production and antioxidant system are interwoven with abiotic stress conditions The antioxidants have the capacity to hold the stability in metabolism in order to avoid disruption due to environmental disturbances

Genetic Manipulation in Plants for Mitigation of Climate Change

Pawan Kumar Jaiwal, Rana Pratap Singh, Om Parkash Dhankher, 2016-01-07 This book presents a detailed overview and critical evaluation of the state of the art and latest approaches in genetic manipulation studies on plants to mitigate the impact of climate change on growth and productivity Each chapter has been written by experts in plant stress biology and highlights the involvement of a variety of genes pathways and their regulation in abiotic stress recent advances in molecular breeding identification of tightly linked markers QTLs genes transgenesis introduction of exogenous genes or changing the expression of endogenous stress responsive genes and genomics approaches that have made it easier to identify and isolate several key genes involved in abiotic stress such as drought water lodging flooding extreme temperatures salinity and heavy metal toxicity Food and nutritional security has emerged as a major global challenge due to expanding populations and cultivated areas becoming less productive as a result of extreme climatic changes adversely affecting the quantity and quality of plants Hence there is an urgent need to develop crop varieties resilient to abiotic stress to ensure food security and combat increased input costs low yields and the marginalization of land The role of GM crops in poverty alleviation nutrition and health in developing countries and their feasibility in times of climate change are also discussed Recent advances in gene technologies have shown the potential for faster more targeted crop improvements by transferring genes across the sexual

barriers The book is a valuable resource for scientists researchers students planners and industrialists working in the area of biotechnology plant agriculture agronomy horticulture plant physiology molecular biology plant sciences and environmental sciences

Anoxia Alexander Altenbach,Joan M. Bernhard,Joseph Seckbach,2011-10-20 ANOXIA defines the lack of free molecular oxygen in an environment In the presence of organic matter anaerobic prokaryotes produce compounds such as free radicals hydrogen sulfide or methane that are typically toxic to aerobes The concomitance of suppressed respiration and presence of toxic substances suggests these habitats are inhospitable to Eukaryota Ecologists sometimes term such environments Death Zones This book presents however a collection of remarkable adaptations to anoxia observed in Eukaryotes such as protists animals plants and fungi Case studies provide evidence for controlled beneficial use of anoxia by for example modification of free radicals use of alternative electron donors for anaerobic metabolic pathways and employment of anaerobic symbionts The complex interwoven existence of oxic and anoxic conditions in space and time is also highlighted as is the idea that eukaryotic inhabitation of anoxic habitats was established early in Earth history

Biochar in Mitigating Abiotic Stress in Plants Arafat Abdel Hamed Abdel Latef,2024-10-31 Biochar for Mitigating Abiotic Stress in Plants provides a unique and leading resource for utilizing biochar to address specific plant health challenges including osmotic ionic and oxidative stress With a focus on crop yielding plants the book provides targeted application insights to improve plant health and resulting crop production Readers will find important tools toward the identification treatment and management of a variety of abiotic stressors through the effective and appropriate application of biochar This is an important reference for those seeking to apply current knowledge and an inspiration for further research in the area Biochar is a carbon rich organic substance produced by the pyrolysis of organic materials in the absence or presence of oxygen It is an organic matter conditioner that can boost carbon sequestration and organic and inorganic pollutant immobilization It is a crucial method for soil regeneration Additionally biochar facilitates increasing mineral supply and soil organic matter resulting in soils with increased nutritional content Covers the latest evidence based approach in the diagnosis and management of plants under abiotic stress Includes easy to follow algorithms and key points Proposes options for sustaining crop production under the effects of climate change

Arbuscular Mycorrhizal Fungi in Sustainable Agriculture: Nutrient and Crop Management Manoj Parihar,Amitava Rakshit,Alok Adholeya,Yinglong Chen,2024-06-03 This 2 volume book is an up to date overview of current progress in Arbuscular Mycorrhizal Fungal AMF technique development inoculum production and its quality regulations application in agriculture horticulture agroforestry and other ecosystems along with nutrient management for sustainable food production It offers new insight and cutting edge information for novices and experts such as students academicians researchers environmentalists industrialists and other individuals interested in the field of mycorrhiza AMF provides favorable rhizospheric environment to the plant with numerous direct and indirect mechanisms in exchange of soil nutrients and photosynthetically fixed carbon Other than the species composition and

diversity determination of natural ecosystem AMF play a vital role in maintaining the soil quality agricultural sustainability and environmental integrity The second volume provide comprehensive knowledge on AMF role in nutrient cycling nutrient exchange and their acquisition under normal and stress condition *The Biology of Aquatic and Wetland Plants* Gary N. Ervin, 2023-04-26 Aquatic plants play a critically important role in maintaining ecosystem health They are natural biological filters in freshwater and estuarine wetlands they contribute to the reproductive success of many organisms some of which are harvested for food they assist in flood control and they are prominent elements in the aesthetics and recreational use of freshwater and estuarine habitats Despite this globally recognized importance wetlands have faced and continue to face threats from the encroachment of human activities The Biology of Aquatic and Wetland Plants is a thorough and up to date textbook devoted to these plants and their interactions with the environment The focus is on botanical diversity from the perspective of evolutionary relationships emphasizing the role of evolution in shaping adaptations to the aquatic environment By incorporating recent findings on the phylogeny of green plants with special emphasis on the angiosperms the text is broadly useful for courses in plant biology physiology and ecology Additionally a chapter on population biology and evolutionary ecology complements the evolutionary backdrop of hydrophyte biology by examining the details of speciation and applications of modern genetic approaches to aquatic plant conservation Key Features Synthesizes recent and seminal literature on aquatic and wetland plants Emphasizes evolutionary history as a factor influencing adaptations to the wetland environment Provides a global perspective on plant diversity and threats facing wetland ecosystems Highlights research needs in the field of aquatic and wetland plant biology Includes 280 figures with more than 300 color photographs and 41 tables to provide ease of access to important concepts and information **Managing Plant Production Under Changing Environment** Mirza Hasanuzzaman, Golam Jalal Ahammed, Kamrun Nahar, 2022-02-22 This comprehensive edited volume collects the most recent information with up to date citations on the decrease in plant productivity under climatic changes and its link with global food security The book emphasis on the crop management practices and recent advancement in the techniques for mitigating the negative effects of climate induced biotic and abiotic stress It brings together 19 chapters developed by eminent researchers in the area of plant and environmental sciences Global climate change is increasingly becoming a concern for future of agriculture High levels of inorganic and organic pollutants and climatic stress adversely affects the sensitive and complex equation of natural resources and ecosystem services To meet the increased food demand plant productivity needs to be enhanced therefore this book fills in the gap and brings together information on the physiological and molecular approaches for improving crop productivity The book is resourceful reading material for researchers faculty members graduate and post graduate students of plant science agriculture agronomy soil science botany Molecular biology and environmental science **Biostimulants for Crop Production and Sustainable Agriculture** Mirza Hasanuzzaman, Barbara Hawrylak-Nowak, Tofazzal Islam, Masayuki Fujita, 2022-09-14 Agricultural biostimulants are a

group of substances or microorganisms based on natural resources that are applied to plants or soils to improve nutrient uptake and plant growth and provide better tolerance to various stresses Their function is to stimulate the natural processes of plants or to enrich the soil microbiome to improve plant growth nutrition abiotic and or biotic stress tolerance yield and quality of crop plants Interest in plant biostimulants has been on the rise over the past 10 years driven by the growing interest of researchers and farmers in environmentally friendly tools for improved crop performance Improved crop production technologies are urgently needed to meet the growing demand for food for the ever increasing global population by addressing the impacts of changing climate on agriculture This book is of interest to researchers in agriculture agronomy crop and plant science soil science and environmental science

Plant Roots Amram Eshel, Tom Beeckman, 2013-04-17 The decade since the publication of the third edition of this volume has been an era of great progress in biology in general and the plant sciences in particular This is especially true with the advancements brought on by the sequencing of whole genomes of model organisms and the development of omics techniques This fourth edition of Plant Root

Elucidation of Abiotic Stress Signaling in Plants Girdhar K. Pandey, 2015-05-30 Abiotic stresses such as high temperature low temperature drought and salinity limit crop productivity worldwide Understanding plant responses to these stresses is essential for rational engineering of crop plants In Arabidopsis the signal transduction pathways for abiotic stresses light several phytohormones and pathogenesis have been elucidated A significant portion of plant genomes most studies are Arabidopsis and rice genome encodes for proteins involved in signaling such as receptor sensors kinases phosphatases transcription factors and transporters channels Despite decades of physiological and molecular effort knowledge pertaining to how plants sense and transduce low and high temperature low water availability drought water submergence and salinity signals is still a major question before plant biologists One major constraint hampering our understanding of these signal transduction processes in plants has been the lack or slow pace of application of molecular genomic and genetics knowledge in the form of gene function In the post genomic era one of the major challenges is investigation and understanding of multiple genes and gene families regulating a particular physiological and developmental aspect of plant life cycle One of the important physiological processes is regulation of stress response which leads to adaptation or adjustment in response to adverse stimuli With the holistic understanding of the signaling pathways involving not only one gene family but multiple genes or gene families plant biologists can lay a foundation for designing and generating future crops that can withstand the higher degree of environmental stresses especially abiotic stresses which are the major cause of crop loss throughout the world without losing crop yield and productivity Therefore in this proposed book we intend to incorporate the contribution from leading plant biologists to elucidate several aspects of stress signaling by functional genomic approaches

Plant Electrophysiology Alexander G. Volkov, 2012-05-03 This book compiles new findings from the work of internationally renowned experts in plant electrophysiology biophysics bioelectrochemistry ion channels membrane transport imaging of

water transport photosynthesis mechanosensors osmotic motors sensing and actuation in plants First volume covers modern methods in plant electrophysiology and cell electrophysiology Second volume deals with signal transduction and responses in plants

Essential Minerals in Plant-Soil Systems Azamal Husen, 2024-04-29 Essential Minerals in Plant Soil Systems Coordination Signaling and Interaction Under Adverse Conditions is the first book to encompass these key aspects of plant science biochemistry soil science and fertilizer development in a single volume Describing the micro and macronutrients in the plant soil system with the help of suitable illustrations the book connects all the pieces enabling comprehensive and connected understanding Terrestrial plants are sessile in nature They face various adverse environmental conditions including soil nutrient deficiency signals which influence overall plant growth and development Some of the essential nutrients are unreachable to roots due to their low solubility and relative immobilization Thus the soil plant system has evolved signaling communication and coordination responses for survival under multiple adverse situations By evolving highly sophisticated mechanisms at the cellular as well as whole plant scale these plants have developed ways to co regulate these stresses in order to maintain homeostasis Essential Minerals in Plant Soil Systems covers recent advances in the understanding of how plants coordinate the acquisition transport signaling and interaction cross talks between macro and micro nutrients in adverse environmental situations These points are key to understanding the significance of essential as well as beneficial elements for sustainable plant growth and production This book is a valuable reference for those putting research into practice in addressing stress situations as well as providing important foundational insights for further research Provides a comprehensive overview of micro and macronutrients and their interaction with phytohormones under stress conditions Explores proteomic and genomic research into deficiencies and toxicities in plant systems Highlights the use of nanobiotechnology for controlled release of micro and macronutrients in the plant soil systems

Disaster Risk Reduction in Agriculture Mukhtar Ahmed, Shakeel Ahmad, 2023-11-02 This book is related to disaster risk reduction in agriculture particularly under changing climate Climate change refers to significant long term changes in the global climate There is unequivocal evidence that Earth is warming at an unprecedented rate Human activity is the principal cause The planets average surface temperature has risen to about 1oC since the late 19th century and most of the warming occurred in the past 40 years The years 2016 and 2020 are tied for the warmest year on the record Similarly other evidence of rapid climate change includes warming of oceans shrinking of ice sheets retreating glaciers decreasing snow cover rising of sea level declining arctic sea ice increased frequency of extreme events ocean acidification and loss of biodiversity Hence climate change impacts both extreme weather and slow onset events have impacted several sectors of the national economies and activities in particular agriculture and food production augmented by other challenges be it geopolitical cost of finance or supply chain related and in a time of increased food insecurity Without CO2 fertilization effective adaptation and genetic improvement each degree Celsius increase in global mean temperature would on average reduce global yields of wheat by 6

0% rice by 3 2% maize by 7 4% and soybean by 3 1% Hence this book is useful as a study material to teach in the field of agriculture and climate change The book is useful for instructors and postgraduate as well as undergraduate students involved in the study of climate change The book also provide guidance to multiple stakeholders to design mitigation and adaptation efforts to climate change and ensure food security in the developing world *Marschner's Mineral Nutrition of Higher Plants* Horst Marschner,2012 Respected and known worldwide in the field for his research in plant nutrition Dr Horst Marschner authored two editions of Mineral Nutrition of Higher Plants His research greatly advanced the understanding of plant nutrition ranging from rhizosphere processes to nutrient uptake and utilization by plants in the field While visiting field experiments in West Africa in 1996 Dr Marschner contracted malaria and passed away and until now this legacy title went unrevised Despite the passage of time it remains the definitive reference on plant mineral nutrition Since the last edition great progress has been made in the understanding of various aspects of plant nutrition In recent years the perspective on the mode of action of nutrients in plant metabolism and yield formation has shifted Much progress has been made in the molecular aspects of nutrient uptake and transport within plants as well as the responses of plants to nutrient deficiency or toxicity These and many other developments are covered in this long awaited new edition P 4 of cover *Adaptation of Plants to Waterlogging and Hypoxia* Najeeb Ullah,Silvia Pampana,Waqar Ahmad ,Daniel Kean Yuen Tan,2024-06-03 Plants like other living organisms require oxygen and water supplies for sustaining their normal growth and development The water requirement is generally met through a coordinated system of root to shoot communication However excessive soil moisture in the rhizosphere can impact normal functioning of plants by restricting oxygen supplies to the roots To survive under hypoxic conditions plants show cellular molecular and functional level adaptations One temporary response could be switching to anaerobic respiration and maintain energy production to some extent via glycolysis and ethanol fermentation However root respiration water and nutrient uptake and hormonal synthesis are severely impacted under sustained periods of oxygen deficiency These belowground changes in turn affect shoot performance and yield formation by interfering with the key physiological processes

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