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Biotic and Abiotic Stress Responses in Crop Plants Wiley-Blackwell

During the past 15 years, cellular and molecular approaches have emerged as valuable adjuncts to supplement and complement conventional breeding methods for a wide variety of crop plants. Biotechnology increasingly plays a role in the creation, conservation, characterization and utilization of genetic variability for germplasm enhancement. For instance, anther/microspore culture, somaclonal variation, embryo culture and somatic hybridization are being exploited for obtaining incremental improvement in the existing cultivars. In addition, genes that confer insect- and disease-resistance, abiotic stress tolerance, herbicide tolerance and quality traits have been isolated and re-introduced into otherwise sensitive or susceptible species by a variety of transgenic techniques. Together these transformative methodologies grant access to a greater repertoire of genetic diversity as the gene(s) may come from viruses, bacteria, fungi, insects, animals, human beings, unrelated plants or even be artificially derived. Remarkable achievements have been made in the production, characterization, field evaluation and commercialization of transgenic crop varieties worldwide. Likewise, significant advances have been made towards increasing crop yields, improving nutritional quality, enabling crops to be raised under adverse conditions and developing resistance to pests and diseases for sustaining global food and nutritional security. The overarching

purpose of this 3-volume work is to summarize the history of crop improvement from a technological perspective but to do so with a forward outlook on further advancement and adaptability to a changing world. Our carefully chosen "case studies of important plant crops" intend to serve a diverse spectrum of audience looking for the right tools to tackle complicated local and global issues.

Abiotic Stress Management for Resilient Agriculture Academic Press

Biochemical, Physiological and Molecular Avenues for Combating Abiotic Stress in Plants is a must-have reference for researchers and professionals in agronomy, plant science and horticulture. As abiotic stress tolerance is a constant challenge for researchers and professionals working on improving crop production, this book combines recent advances with foundational content, thus offering in-depth coverage on a variety of abiotic stress tolerance mechanisms that help us better understand and improve plant response and growth under stress conditions. The mechanisms explored in this book include stress perception, signal transduction and synthesis of stress-related proteins and other molecules. In addition, the book provides a critical understanding of the networks of genes responsible for abiotic stress tolerance and their utilization in the development of stress tolerance in plants. Practical breeding techniques and modern genetic analyses are also discussed. - Unlocks the physiological, biochemical and molecular basis of abiotic stress response and tolerance in crop plants - Presents comprehensive information on abiotic stress tolerance, from gene to whole plant level - Includes content on antioxidant metabolism, marker-assisted selection, microarrays, next-generation sequencing and genome editing techniques
[Approaches for Enhancing Abiotic Stress Tolerance in Plants](#) Wiley-Blackwell

Understanding abiotic stress responses in plants is critical for the development of new varieties of crops, which are better adapted to harsh climate conditions. The new book by the well-known editor team Narendra Tuteja and Sarvajeet Gill provides a comprehensive overview on the molecular basis of plant responses to external stress like drought or heavy metals, to aid in the engineering of stress resistant crops. After a general introduction into the topic, the following sections deal with specific signaling pathways mediating plant stress response. The last part covers translational plant physiology, describing several examples of the development of more stress-resistant crop varieties.

Advances in Rice Research for Abiotic Stress Tolerance New India Publishing

This book discusses many aspects of plant-nutrient-induced abiotic stress tolerance. It consists of 22 informative chapters on the basic role of plant nutrients and the latest research advances in the field of plant nutrients in abiotic stress tolerance as well as their practical applications. Today, plant nutrients are not only considered as food for plants, but also as regulators of numerous physiological processes including stress tolerance. They also interact with a number of biological molecules and signaling cascades. Although research work and review articles on the role of plant nutrients in abiotic stress tolerance have been published in a range of journals, annual reviews and book chapters, to date there has been no comprehensive book on this topic. As such, this timely book is a valuable resource for a wide audience, including plant scientists, agronomists, soil scientists, botanists, molecular biologists and environmental scientists.

Abiotic and Biotic Stress in Plants CRC Press

This book presents abiotic stresses that cause crop damage in the range of 6-20%. Understanding the interaction of crop plants to the abiotic stresses caused by heat, cold, drought, flooding, submergence, salinity, acidity, etc., is important to develop resistant crop varieties. Knowledge on the advanced genetic and genomic crop improvement strategies including molecular breeding, transgenics, genomic-assisted breeding, and the recently emerging genome editing for developing resistant varieties in cereal crops is imperative for addressing FPNEE (food, health, nutrition, energy, and environment) security. Whole genome sequencing of these crops followed by genotyping-by-sequencing has facilitated precise information about the genes conferring resistance useful for gene discovery, allele mining, and shuttle breeding which in turn opened up the scope for 'designing' crop genomes with resistance to abiotic stresses. The nine chapters each dedicated to a cereal crop in this volume are deliberate on different types of abiotic stresses and their effects on and interaction with crop plants; enumerate on the available genetic diversity with regard to abiotic stress resistance among available cultivars; illuminate on the potential gene pools for utilization in interspecific gene transfer; are brief on the classical genetics of stress resistance and traditional breeding for transferring them to their cultivated counterparts; elucidate on the success stories of genetic engineering for developing abiotic stress-resistant crop varieties; discuss on molecular mapping of genes and QTLs underlying stress resistance and their marker-assisted introgression into elite varieties; enunciate on different emerging genomics-aided techniques including genomic selection, allele mining, gene discovery, and gene pyramiding for developing adaptive crop varieties with higher quantity and quality, and also elaborate some case studies on genome editing focusing on specific genes for generating abiotic stress-resistant crops.

Genomic Designing for Abiotic Stress Resistant Cereal Crops Academic Press

This book provides a comprehensive review of all aspects of the molecular and cell biology of abscisic acid (ABA) metabolism, transport and signal transduction, covering our current understanding of ABA as well as research trends. The agricultural significance of ABA metabolism, transport and signal transduction is also discussed. The phytohormone ABA regulates many aspects of plant development and plays a central role in plant adaptation to environmental stresses. Over the past few decades, considerable advances have been made in the study of ABA metabolism, transport and signal transduction, greatly deepening our understanding of the underlying mechanisms of ABA function at the molecular, cell and whole-plant level and helping us improve crops' environmental tolerance. This book provides a valuable resource for researchers and advanced students interested in plant biology and agriculture.

Abiotic Stress Physiology of Horticultural Crops Frontiers Media SA

Abiotic Stresses explores innovative methods for breeding new varieties of major crops with resistance to environmental stresses that limit crop production worldwide, such as drought, salinity, flooding, and mineral deficiency. Experts provide you with basic principles and techniques of plant breeding as well as work done in relation to improving resistance in specific important world food crops. The book supplies extensive bibliographies at the end of each chapter, as well as tables and figures that illustrate the research findings. This timely resource will help scientists and academics in botany, plant breeding, plant environmental stress studies, agriculture, and horticulture modify and improve breeding programs globally. To view an excerpt online, find the book on our QuickSearch catalog at www.HaworthPress.com.

Drought Stress Tolerance in Plants, Vol 1 Springer Science & Business Media

A close examination of current research on abiotic stresses in various plant species The unpredictable environmental stress conditions associated with climate change are significant challenges to global food security, crop productivity, and agricultural sustainability. Rapid population growth and diminishing resources necessitate the development of crops that can adapt to environmental extremities. Although significant advancements have been made in developing plants through improved crop breeding practices and genetic manipulation, further research is necessary to understand how genes and metabolites for stress tolerance are modulated, and how cross-talk and regulators can be tuned to achieve stress tolerance. *Molecular Plant Abiotic Stress: Biology and Biotechnology* is an extensive investigation of the various forms of abiotic stresses encountered in plants, and susceptibility or tolerance mechanisms found in different plant species. In-depth examination of morphological, anatomical, biochemical, molecular and gene expression levels enables plant scientists to identify the different pathways and signaling cascades involved in stress response. This timely book: Covers a wide range of abiotic stresses in multiple plant species Provides researchers and scientists with transgenic strategies to overcome stress tolerances in several plant species Compiles the most recent research and up-to-date data on stress tolerance Examines both selective breeding and genetic engineering approaches to improving plant stress tolerances Written and edited by prominent scientists and researchers from across the globe *Molecular Plant Abiotic Stress: Biology and Biotechnology* is a valuable source of information for students, academics, scientists, researchers, and industry professionals in fields including agriculture, botany, molecular biology, biochemistry and biotechnology, and plant physiology.

Plant Tolerance to Environmental Stress Springer

A guide to the chemical agents that protect plants from various environmental stressors Protective Chemical Agents in the Amelioration of Plant Abiotic Stress offers a guide to the diverse chemical agents that have the potential to mitigate different forms of abiotic stresses in plants. Edited by two experts on the topic, the book explores the role of novel chemicals and shows how using such unique chemical agents can tackle the oxidative damages caused by environmental stresses. Exogenous application of different chemical agents or chemical priming of seeds presents opportunities for crop stress management. The use of chemical compounds as protective agents has been found to improve plant tolerance significantly in various crop and non-crop species against a range of different individually applied abiotic stresses by regulating the endogenous levels of the protective agents within plants. This important book: Explores the efficacy of various chemical agents to eliminate abiotic stress Offers a groundbreaking look at the topic and reviews the most recent advances in the field Includes information from noted authorities on the subject Promises to benefit agriculture under stress conditions at the ground level Written for researchers, academicians, and scientists, Protective Chemical Agents in the Amelioration of Plant Abiotic Stress details the wide range of protective chemical agents, their applications, and their intricate biochemical and molecular mechanism of action within the plant systems during adverse situations.

Plant Signaling Molecules MDPI

Since recent years, the population across the globe is increasing expeditiously; hence increasing the agricultural productivity to meet the food demands of the thriving population becomes a challenging task. Abiotic stresses pose as a major threat to agricultural productivity. Having an adequate knowledge and apprehension of the physiology and molecular biology of stress tolerance in plants is a prerequisite for counteracting the adverse effect of such stresses to a wider range. This book deals with the responses and tolerance mechanisms of plants towards various abiotic stresses. The advent of molecular biology and biotechnology has shifted the interest of researchers towards unraveling the genes involved in stress tolerance. More effort is being made to understand and pave ways for developing stress tolerance mechanisms in crop plants. Several technologies including Microarray technology, functional genomics, on gel and off gel proteomic approaches have proved to be of utmost importance by helping the physiologists, molecular biologists and biotechnologists in identifying and exploiting various stress tolerance genes and factors for enhancing stress tolerance in plants. This book would serve as an exemplary source of scientific information pertaining to abiotic stress responses and tolerance mechanisms towards various abiotic stresses. Note: T&F does not sell or distribute the Hardback in India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka.

Abiotic Stress Tolerance in Crop Plants Springer

Abscisic Acid in Plants, Volume 92, the latest release in the *Advances in Botanical Research* series, is a compilation of the current state-of-the-art on the topic. Chapters in this new release comprehensively describe latest knowledge on how ABA functions as a plant hormone. They cover topics related to molecular mechanisms as well as the biochemical and chemical aspects of ABA action: hormone biosynthesis, catabolism, transport, perception, signaling in plants, seeds and in response to biotic and abiotic stresses, hormone evolution and chemical biology, and much more. - Presents the latest release in the *Advances in Botanical Research* series - Provides an Ideal resource for post-graduates and researchers in the plant sciences, including plant physiology, plant genetics, plant biochemistry, plant pathology, and plant evolution - Contains contributions from internationally recognized authorities in their respective fields

Abiotic Stress in Plants MDPI

Emerging Technologies and Management of Crop Stress Tolerance: Volume 1 - Biological Techniques presents the latest technologies used by scientists for improvement the crop production and explores the various roles of these technologies for the enhancement of crop productivity and inhibition of pathogenic bacteria that can cause disease. This resource provides a comprehensive review of how proteomics, genomics, transcriptomics, ionomics, and micromics are a pathway to improve plant stress tolerance to increase productivity and meet the agricultural needs of the growing human population. This valuable resource will help any scientist have a better understanding of environmental stresses to improve resource management within a world of limited resources. - Includes the most recent advances methods and applications of biotechnology to crop science - Discusses different techniques of genomics, proteomics, transcriptomics and nanotechnology - Promotes the prevention of potential diseases to inhibit bacteria postharvest quality of fruits and vegetable crops by advancing application and research - Presents a thorough account of research results and critical reviews

Stress Tolerance in Horticultural Crops Springer

This book is a printed edition of the Special Issue *Abiotic Stress Effects on Performance of Horticultural Crops* that was published in *Horticulturae* *Abiotic Stresses* Woodhead Publishing

Environmental insults such as extremes of temperature, extremes of water status as well as deteriorating soil conditions pose major threats to agriculture and food security. Employing contemporary tools and techniques from all branches of science, attempts are being made worldwide to understand how plants respond to abiotic stresses with the aim to help manipulate plant performance that will be better suited to withstand these stresses. This book on abiotic stress attempts to search for possible answers to several basic questions related to plant responses towards abiotic stresses. Presented in this book is a holistic view of the general principles of stress perception, signal transduction and regulation of gene expression. Further, chapters analyze not only model systems but extrapolate interpretations obtained from models to crops. Lastly, discusses how stress-tolerant crop or model plants have been or are being raised through plant breeding and genetic engineering approaches. Twenty three chapters, written by international authorities, integrate molecular details with overall plant structure and physiology, in a text-book style, including key references.

Improving Crop Resistance to Abiotic Stress Woodhead Publishing

Advances in Rice Research for Abiotic Stress Tolerance provides an important guide to recognizing, assessing and addressing the broad range of environmental factors that can inhibit rice yield. As a staple food for nearly half of the world's population, and in light of projected population growth, improving and increasing rice yield is imperative. This book presents current research on abiotic stresses including extreme temperature variance, drought, hypoxia, salinity, heavy metal, nutrient deficiency and toxicity stresses. Going further, it identifies a variety of approaches to alleviate the

damaging effects and improving the stress tolerance of rice. *Advances in Rice Research for Abiotic Stress Tolerance* provides an important reference for those ensuring optimal yields from this globally important food crop. - Covers aspects of abiotic stress, from research, history, practical field problems faced by rice, and the possible remedies to the adverse effects of abiotic stresses - Provides practical insights into a wide range of management and crop improvement practices - Presents a valuable, single-volume sourcebook for rice scientists dealing with agronomy, physiology, molecular biology and biotechnology

Abiotic Stress Adaptation in Plants John Wiley & Sons

Despite significant progress in increasing agricultural production, meeting the changing dietary preferences and increasing food demands of future populations remains a significant challenge. Salinity, drought, water logging, high temperature and toxicity are abiotic stresses that affect the crop yield and production. Tolerance for stress is a important characteristic that plants need to have in order to survive. Identification of proper techniques at a proper time can make it easy for scientists to increase crop productivity and yield. In *Engineering Tolerance in Crop Plants against Abiotic Stress* we have discussed the possible stresses and their impact on crops and portrayed distinctive abiotic stress tolerance in response to different techniques that can improve the performance of crops. Features of the Book: Provide a state-of-the-art description of the physiological, biochemical, and molecular status of the understanding of abiotic stress in plants. Address factors that threaten future food production and provide potential solution to these factors. Designed to cater to the needs of the students engaged in the field of environmental sciences, soil sciences, agricultural microbiology, plant pathology, and agronomy. New strategies for better crop productivity and yield. Understanding new techniques pointed out in this book will open the possibility of genetic engineering in crop plants with the concomitant improved stress tolerance.

Root Adaptations to Multiple Stress Factors John Wiley & Sons

Over the past decade, our understanding of plant adaptation to environmental stress has grown considerably. This book focuses on stress caused by the inanimate components of the environment associated with climatic, edaphic and physiographic factors that substantially limit plant growth and survival. Categorically these are abiotic stresses, which include drought, salinity, non-optimal temperatures and poor soil nutrition. Another stress, herbicides, is covered in this book to highlight how plants are impacted by abiotic stress originating from anthropogenic sources. The book also addresses the high degree to which plant responses to quite diverse forms of environmental stress are interconnected, describing the ways in which the plant utilizes and integrates many common signals and subsequent pathways to cope with less favorable conditions. The book is directed at researchers and professionals in plant physiology, cell biology and molecular biology, in both the academic and industrial sectors.

Protective Chemical Agents in the Amelioration of Plant Abiotic Stress CRC Press

Transcription Factors for Abiotic Stress Tolerance in Plants highlights advances in the understanding of the regulatory network that impacts plant health and production, providing important insights for improving plant resistance. Plant production worldwide is suffering serious losses due to widespread abiotic stresses increasing as a result of global climate change. Frequently more than one abiotic stress can occur at once, for example extreme temperature and osmotic stress, which increases the complexity of these environmental stresses. Modern genetic engineering technologies are one of the promising tools for development of plants with efficient yields and resilience to abiotic stresses. Hence deciphering the molecular mechanisms and identifying the abiotic stress associated genes that control plant response to abiotic stresses is a vital requirement in developing

plants with increased abiotic stress resilience. Addressing the various complexities of transcriptional regulation, this book includes chapters on cross talk and central regulation, regulatory networks, the role of DOF, WRKY and NAC transcription factors, zinc finger proteins, CRISPR/CAS9-based genome editing, C-Repeat (CRT) binding factors (CBFs)/Dehydration responsive element binding factors (DREBs) and factors impacting salt, cold and phosphorous stress levels, as well as transcriptional modulation of genes involved in nanomaterial-plant interactions. *Transcription Factors for Abiotic Stress Tolerance in Plants* provides a useful reference by unravelling the transcriptional regulatory networks in plants. Researchers and advanced students will find this book a valuable reference for understanding this vital area. - Discusses abiotic stress tolerance and adaptive mechanisms based on the findings generated by unlocking the transcriptional regulatory network in plants - Presents various kinds of regulatory gene networks identified for drought, salinity, cold and heat stress in plants - Highlights urgent climate change issues in plants and their mitigation using modern biotechnological tools including genome editing

Plant Abiotic Stress Springer Nature

The basic concept of this book is to examine the use of innovative methods augmenting traditional plant breeding towards the development of new crop varieties under different environmental conditions to achieve sustainable food production. This book consists of two volumes: Volume 1 subtitled *Breeding, Biotechnology and Molecular Tools* and Volume 2 subtitled *Agronomic, Abiotic and Biotic Stress Traits*. This is volume 2 which contains 18 chapters highlighting breeding strategies for specific plant traits including improved nutritional and pharmaceutical properties as well as enhanced tolerance to insects, diseases, drought, salinity and temperature extremes expected under predicted global climate change.

Emerging Technologies and Management of Crop Stress Tolerance Academic Press

Discover the role of nanotechnology in promoting plant growth and protection through the management of microbial pathogens In *Nanotechnology in Plant Growth Promotion and Protection*, distinguished researcher and author Dr. Avinash P. Ingle delivers a rigorous and insightful collection of some of the latest developments in nanotechnology particularly related to plant growth promotion and protection. The book focuses broadly on the role played by nanotechnology in growth promotion of plants and their protection through the management of different microbial pathogens. You'll learn about a wide variety of topics, including the role of nanomaterials in sustainable agriculture, how nano-fertilizers behave as soil feed, and the dual role of nanoparticles in plant growth promotion and phytopathogen management. You'll also discover why nanotechnology has the potential to revolutionize the current agricultural landscape through the development of nano-based products, like plant growth promoters, nano-fertilizers, nano-pesticides, and nano-insecticides. Find out why nano-based products promise to be a cost-effective, economically viable, and eco-friendly approach to tackling some of the most intractable problems in agriculture today. You'll also benefit from the inclusion of: A thorough introduction to the prospects and impacts of using nanotechnology to promote the growth of plants and control plant diseases An exploration of the effects of titanium dioxide nanomaterials on plant growth and the emerging applications of zinc-based nanoparticles in plant growth promotion Practical discussions of nano-fertilizer in enhancing the production potentials of crops and the potential applications of nanotechnology in plant nutrition and protection for sustainable agriculture A concise treatment of nanotechnology in seed science and soil feed Toxicological concerns of nanomaterials used in agriculture Perfect for undergraduate, graduate, and research students of nanotechnology, agriculture, plant science, plant physiology, and crops, *Nanotechnology in Plant Growth Promotion and Protection* will also earn a place in the libraries of professors and researchers in these areas, as well as regulators and policymakers.

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