Abiotic Stresses Plant Resistance Through Breeding And Molecular Approaches

Crop Science | 14008c90ccccfc7bfbb7f6dd2f195d42f

Plant Transcription Factors

This book highlights some of the most important biochemical, physiological and molecular aspects of plant stress, together with the latest updates. It is divided into 14 chapters, written by eminent experts from around the globe and highlighting the effects of plant stress (biotic and abiotic) on the photosynthetic apparatus, metabolites, programmed cell death, germination etc. In turn, the role of beneficial elements, glutathione-S-transferase, phosphite and nitric oxide in the adaptive response of plants under stress and as a stimulator of better plant performance is also discussed. A dedicated chapter addresses research advances in connection with Capsicum, a commercially important plant, and stress tolerance, from classical breeding to the recent use of large-scale transcriptome and genome sequencing technologies. The book also explores the significance of the liliputians of the plant kingdom (Bryophytes) as biomonitors/bioindicators, and general and specialized bioinformatics resources that can benefit anyone working in the field of plant stress biology. Given the information compiled here, the book will offer a valuable guide for students and researchers of plant molecular biology and stress physiology alike.

Resistance to Salinity and Water Scarcity in Higher Plants. Insights From Extremophiles and Stress-Adapted Plants: Tools, Discoveries and Future Prospects
Plant Tolerance to Abiotic Stresses in Agriculture: Role of Genetic Engineering

Biologists worldwide now speak the scientific language of molecular biology and use the same molecular tools. Interest is growing in the molecular biology of abiotic stress tolerance and modes of installing better tolerant mechanisms in crop plants. Current studies make plants capable of sustaining their yields even under stressful conditions. Further, this information may form the basis for its application in biotechnology and bioinformatics.

Plant Abiotic Stress

This book is based to a great extent on the biochemical and molecular mechanisms of tolerance of commonly encountered abiotic stresses in nature. This book will deal with increasing temperature, water, salinity, and heavy metals and ozone, and how these abiotic stresses can be managed by microbes through their alleviation mechanisms. Water stress includes both drought and flooding. 1st section outlines the relevance of abiotic stresses in present day environmental conditions. The 2nd section deals with three major stresses - temperature, water and salinity and the metabolic changes and protective adjustments in plants for withstanding these stresses. The 3rd section deals with the role of heavy metals and ozone. The final section is devoted to general abiotic stresses and their alleviation by microbes. These offer a cost-effective and eco-friendly means of combating different stresses.

Applied Plant Biotechnology for Improving Resistance to Biotic Stress

Plants are frequently exposed to unfavorable and adverse environmental conditions known as abiotic stressors. These factors can include salinity, drought, heat, cold, flooding, heavy metals, and UV radiation which pose serious threats to the sustainability of crop yields. Since abiotic stresses are major constraints for crop production, finding the approaches to enhance stress tolerance is crucial to increase crop production and increase food security. This book discusses approaches to enhance abiotic stress tolerance in crop plants on a global scale. Plants scientists and breeders will learn how to further mitigate plant responses and develop new crop varieties for the changing climate.

Plant Genomics

Plants have to manage a series of environmental stresses throughout their entire lifespan. Among these, abiotic stress is the most detrimental; one that is responsible for nearly 50% of crop yield reduction and appears to be a potential threat to global food security in coming decades. Plant growth and development reduces drastically due to adverse effects of abiotic stresses. It has been estimated that crop can exhibit only 30% of their genetic potentiality under abiotic stress condition. So, this is a fundamental need to understand the stress responses to facilitate breeders to develop stress resistant and stress tolerant cultivars along with good management practices to withstand abiotic stresses. Also, a holistic approach to understanding the molecular and biochemical interactions of plants is important to implement the knowledge of resistance mechanisms under abiotic stresses. Agronomic practices like selecting cultivars that is tolerant to wide range of climatic condition, planting date, irrigation scheduling, fertilizer management could be some of the effective short-term adaptive
tools to fight against abiotic stresses. In addition, “system biology” and “omics approaches” in recent studies offer a long-term opportunity at the molecular level in dealing with abiotic stresses. The genetic approach, for example, selection and identification of major conditioning genes by linkage mapping and quantitative trait loci (QTL), production of mutant genes and transgenic introduction of novel genes, has imparted some tolerant characteristics in crop varieties from their wild ancestors. Recently research has revealed the interactions between micro-RNAs (miRNAs) and plant stress responses exposed to salinity, freezing stress and dehydration. Accordingly transgenic approaches to generate stress-tolerant plant are one of the most interesting researches to date. This book presents the recent development of agronomic and molecular approaches in conferring plant abiotic stress tolerance in an organized way. The present volume will be of great interest among research students and teaching community, and can also be used as reference material by professional researchers.

**Protective Chemical Agents in the Amelioration of Plant Abiotic Stress**

Environmental stresses represent the most limiting factors for agricultural productivity. Apart from biotic stress caused by plant pathogens, there are a number of abiotic stresses such as extremes in temperature, drought, salinity, heavy metals and radiation which all have detrimental effects on plant growth and yield. However, certain plant species and ecotypes have developed various mechanisms to adapt to such stress conditions. Recent advances in the understanding of these abiotic stress responses provided the impetus for compiling up-to-date reviews discussing all relevant topics in abiotic stress signaling of plants in a single volume. Topical reviews were prepared by selected experts and contain an introduction, discussion of the state of the art and important future tasks of the particular fields.

**Advances in Plant Breeding Strategies: Agronomic, Abiotic and Biotic Stress Traits**

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.

**Sustainable Food Production**

Gathering some 90 entries from the Encyclopedia of Sustainability Science and Technology, this book covers animal breeding and genetics for food, crop science and technology, ocean farming and sustainable aquaculture, transgenic livestock for food and more.
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

Molecular Plant Abiotic Stress

Plant Life under Changing Environment: Responses and Management presents the latest insights, reflecting the significant progress that has been made in understanding plant responses to various changing environmental impacts, as well as strategies for alleviating their adverse effects, including abiotic stresses. Growing from a focus on plants and their ability to respond, adapt, and survive, Plant Life under Changing Environment: Responses and Management addresses options for mitigating those responses to ensure maximum health and growth. Researchers and advanced students in environmental sciences, plant ecophysiology, biochemistry, molecular biology, nano-pollution climate change, and soil pollution will find this an important foundational resource. Covers both responses and adaptation of plants to altered environmental states Illustrates the current impact of climate change on plant productivity, along with mitigation strategies Includes transcriptomic, proteomic, metabolomic and ionomic approaches

Abiotic Stress Adaptation in Plants

Plant Transcription Factors: Evolutionary, Structural and Functional Aspects is the only publication that provides a comprehensive compilation of plant transcription factor families and their complex roles in plant biology. While the majority of information about transcription factors is based on mammalian systems, this publication discusses plant transcription factors, including the important aspects and unifying themes to understanding transcription factors and the important roles of particular families in specific processes. Provides an entry point for transcription factor literature Offers compilation of information into one single resource for rapid consultation on different plant transcription factor features Integrates the knowledge about different transcription factors, along with cross-referencing Provides information on the unique aspects surrounding plant transcription factors

The Role of Light in Abiotic Stress Acclimation

Plant Abiotic Stress Tolerance
Molecular Approaches in Plant Abiotic Stress

The rapid population growth and the increase in the per capita income, especially in the group of emerging countries referred to as BRIC countries (Brazil, Russia, India, China and South Africa) has created huge pressure for the expansion of the agricultural growing area and the crop yields to meet the rising demand. As a result, many areas that have been considered marginal for growing crops, due to their low fertility, drought, salinity, and many other abiotic stresses, have now been incorporated in the production system. Additionally, climate change has brought new challenges to agriculture to produce food, feed, fiber and biofuels. To cope with these new challenges, many plant breeding programs have reoriented their breeding scope to stress tolerance in the last years. The authors of this book have collected the most recent advances and discoveries applied to breeding for abiotic stresses in this book, starting with new physiological concepts and breeding methods, and moving on to discuss modern molecular biological approaches geared to the development of improved cultivars tolerant to most sorts of abiotic stress. Written in an easy to understand style, this book is an excellent reference work for students, scientists and farmers interested in learning how to breed for abiotic stresses scenarios, presenting the state-of-the-art in plant stresses and allowing the reader to develop a greater understanding of the basic mechanisms of tolerance to abiotic stresses and how to breed for them.

Mechanisms of Environmental Stress Resistance in Plants

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.

Plant Life under Changing Environment

Applied Plant Biotechnology for Improvement of Resistance to Biotic Stress applies biotechnology insights that seek to
improve plant genomes, thus helping them achieve higher resistance and optimal hormone signaling to increase crop yield. The book provides an analysis of the current state-of-the-art in plant biotechnology as applied to improving resistance to biotic stress. In recent years, significant progress has been made towards understanding the interplay between plants and their hosts, particularly the role of plant immunity in regulating, attenuating or neutralizing invading pathogens. As a result, there is a great need to integrate these insights with methods from biotechnology. Applies biotechnology insights towards improving plant genomes, achieving higher resistance and optimizing hormone signaling to increase crop yield. Presents the most modern techniques, investigations, diagnostic tools and assays to monitor and detect contaminating agents in crops, such as grape, tomato, coffee and stone fruit. Provides encyclopedic coverage of genes, proteins, interaction networks and mechanisms by which plants and hosts seek survival. Discusses the methods available to make crops resistant and tolerant to disease without decreased yield or food production. Provides insights for policymakers into the difficulties faced by scientific researchers in the use of biotechnology intervention, transgenes and genetically modified sequences.

**Plant Breeding for Abiotic Stress Tolerance**

Environmental stresses represent the most limiting factors for agricultural productivity worldwide. These stresses impact not only current crop species, they are also significant barriers to the introduction of crop plants into areas that are not currently being used for agriculture. Stresses associated with temperature, salinity and drought, singly or in combination, are likely to enhance the severity of problems to which plants will be exposed in the coming decades. The present book brings together contributions from many laboratories around the world to discuss and compare our current knowledge of the role stress genes play in plant stress tolerance. In addition, strategies are discussed to introduce these genes and the processes that they encode into economically important crops, and the effect this will have on plant productivity.

**Improving Abiotic Stress Tolerance in Plants**

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 Nutrients and Abiotic Stress Tolerance**

The impact of global climate change on crop production has emerged as a major research priority during the past decade. Understanding abiotic stress factors such as temperature and drought tolerance and biotic stress tolerance traits such as insect pest and pathogen resistance in combination with high yield in plants is of paramount importance to counter climate change related adverse effects on the productivity of crops. In this multi-authored book, we present synthesis of information for developing strategies to combat plant stress. Our effort here is to present a judicious mixture of basic as well as applied research outlooks so as to interest workers in all areas of plant science. We trust that the information covered in this book would bridge the much-researched area of stress in plants with the much-needed information for evolving climate-ready crop cultivars to ensure food security in the future.

**Transcription Factors for Abiotic Stress Tolerance in Plants**

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.

**Approaches for Enhancing Abiotic Stress Tolerance in Plants**

Primed-Mediated Stress and Cross-Stress Tolerance in Crop Plants provides the latest, in-depth understanding of the molecular mechanisms associated with the development of stress and cross-stress tolerance in plants. Plants growing under field conditions are constantly exposed, either sequentially or simultaneously, to many abiotic or biotic stress factors. As a result, many plants have developed unique strategies to respond to ever-changing environmental conditions, enabling them to monitor their surroundings and adjust their metabolic systems to maintain homeostasis. Recently, priming mediated stress and cross-stress tolerance (i.e., greater tolerance to a second, stronger stress after exposure to a different, milder primary stress) have attracted considerable interest within the scientific community as potential means of stress management and for producing stress-resistant crops to aid global food security. Primed-Mediated Stress and Cross-Stress Tolerance in Crop Plants comprehensively reviews the physiological, biochemical, and molecular basis of cross-tolerance phenomena, allowing researchers to develop strategies to enhance crop productivity under stressful conditions and to utilize natural resources more efficiently. The book is a valuable asset for plant and agricultural scientists in corporate or government environments, as well as educators and advanced students looking to promote future research into plant stress tolerance. Provides comprehensive information for developing multiple stress-tolerant crop varieties Includes in-depth physiological, biochemical, and molecular information associated with cross-tolerance Includes contribution from world-leading cross-tolerance research group Presents color images and diagrams for effective communication of key concepts
Omics and Plant Abiotic Stress Tolerance

Global climate change affects crop production through altered weather patterns and increased environmental stresses. Such stresses include soil salinity, drought, flooding, metal/metalloid toxicity, pollution, and extreme temperatures. The variability of these environmental conditions paired with the sessile lifestyle of plants contribute to high exposure to these stress factors. Increasing tolerance of crop plants to abiotic stresses is needed to fulfill increased food needs of the population. This book focuses on methods of improving plants tolerance to abiotic stresses. It provides information on how protective agents, including exogenous phytoprotectants, can mitigate abiotic stressors affecting plants. The application of various phytoprotectants has become one of the most effective approaches in enhancing the tolerance of plants to these stresses. Phytoprotectants are discussed in detail including information on osmoprotectants, antioxidants, phytohormones, nitric oxide, polyamines, amino acids, and nutrient elements of plants. Providing a valuable resource of information on phytoprotectants, this book is useful in diverse areas of life sciences including agronomy, plant physiology, cell biology, environmental sciences, and biotechnology.

Advances in Rice Research for Abiotic Stress Tolerance

We are currently experiencing a climate crisis that is associated with extreme weather events worldwide. Some of its most noticeable effects are increases in temperatures, droughts, and desertification. These effects are already making whole regions unsuitable for agriculture. Therefore, we urgently need global measures to mitigate the effects of climate breakdown as well as crop alternatives that are more stress-resilient. These crop alternatives can come from breeding new varieties of well-established crops, such as wheat and barley. They can also come from promoting underutilized crop species that are naturally tolerant to some stresses, such as quinoa. Either way, we need to gather more knowledge on how plants respond to stresses related to climate breakdown, such as heat, water-deficit, flooding high salinity, nitrogen, and heavy metal stress. This Special Issue provides a timely collection of recent advances in the understanding of plant responses to these stresses. This information will definitely be useful to the design of new strategies to prevent the loss of more cultivable land and to reclaim the land that has already been declared unsuitable.

Abiotic Stress Tolerance in Plants

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.

Molecular Mechanisms and Genetics of Plant Resistance to Abiotic Stress

Abiotic stresses such as drought, flooding, high or low temperatures, metal toxicity and salinity can hamper plant growth and development. Improving Abiotic Stress Tolerance in Plants explains the physiological and molecular mechanisms plants naturally exhibit to withstand abiotic stresses and outlines the potential approaches to enhance plant abiotic stress tolerance to extreme conditions. Synthesising developments in plant stress biology, the book offers strategies that can be used in breeding, genomic, molecular, physiological and biotechnological approaches that hold the potential to develop resilient plants and improve crop productivity worldwide. Features · Comprehensively explains molecular and physiological mechanism of multiple abiotic stress tolerance in plants · Discusses recent advancements in crop abiotic stress tolerance mechanism and highlights strategies to develop abiotic stress tolerant genotypes for sustainability · Stimulates synthesis of information for plant stress biology for biotechnological applications · Presents essential information for large scale breeding and agricultural biotechnological programs for crop improvement Written by a team of expert scientists, this book benefits researchers in the field of plant stress biology and is essential reading for graduate students and researchers generating stress tolerant crops through genetic engineering and plant breeding. It appeals to individuals developing sustainable agriculture through physiological and biotechnological applications.

Abiotic Stress Physiology of Horticultural Crops

Improving Crop Resistance to Abiotic Stress

A fully revised review of the latest research in molecular basis of plant abiotic stress response and adaptation Abiotic stressors are non-living environmental stressors that can have a negative impact on a plant's ability to grow and thrive in a given environment. Stressors can range from temperature stress (both extreme heat and extreme cold) water stress, aridity, salinity among others. This book explores the full gamut of plant abiotic stressors and plants molecular responses and adaptations to diverse environmental conditions. The new edition of Plant Abiotic Stress provides up-to-date coverage of the latest research advances in plant abiotic stress adaptation, with special emphasis on the associated and integrative aspects of physiology, signaling, and molecular genetics. Since the last edition, major advances in whole genome analysis have revealed previously unknown linkages between genes, genomes, and phenotypes, and new biological and -omics approaches have elucidated previously unknown cellular mechanisms underlying stress tolerance. Chapters are organized by topic, but highlight processes that are integrative among diverse stress responses. As with the first edition, Plant Abiotic Stress will have broad appeal to scientists in fields of applied agriculture, ecology, plant sciences, and biology.
Plant growth and productivity are limited in many areas of the world by a wide variety of environmental stresses. This book discusses progress made toward the major goal of uncovering the plant resistance mechanisms to biotic and abiotic stresses; the purpose being to utilise this knowledge in genetic modification of plants for achieving improved stress resistance. This volume achieves a new synthesis in considering the mechanisms of resistance at various levels of organisation -- from individual cells and tissues, through whole plants, to communities. Chapters are written by internationally acknowledged experts, who have a wealth of research and teaching experience. With comprehensive and up-to-date coverage, this book analyses many outstanding problems and poses important questions for future research.

**Abiotic Stress Management for Resilient Agriculture**

Plants under abiotic stress are those suffering from drought, extreme temperatures, flood and other natural—but non-living—factors. Abiotic stress is responsible for reduced yields in several major crops, and climate change is focusing research in this area. To minimize cellular damage cause by such stresses, plants have evolved complex, well-coordinated adaptive responses that operate at the transcriptional level. Understanding these processes is key to manipulating plant performance to withstand stress. This book deals with the role of gene silencing in the adaptation of plants to these stresses, and documents the molecular regulatory systems for the abiotic response.

**Climate Change and Plant Abiotic Stress Tolerance**

A state-of-the-art guide to recent developments in the understanding of plant response to abiotic stresses. Each chapter reflects how new techniques have helped physiologists, biochemists and molecular biologists to understand the basic problems of abiotic stress in plant species. The book supplies extensive bibliographies at the end of each chapter, as well as tables and figures that illustrate the research findings.

**Plant Responses to Abiotic Stress**

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.

**Emerging Technologies and Management of Crop Stress Tolerance**
This book brings together recent advances in the area of abiotic stress tolerance in various vegetables, fruit crops, plantation crops and tuber crops. The main challenges to improving the productivity of horticultural crops are the different types of abiotic stresses generally caused by climate change at the regional and global level. Heat, drought, cold and salinity are the major abiotic stresses that adversely affect growth and productivity and can trigger a series of morphological, physiological, biochemical and molecular changes in various horticultural crops. To date, there are no books covering horticultural crop-specific abiotic stress tolerance mechanisms and their management. Addressing that gap, the book is divided into 2 sections, the first of which highlights recent advances in the general aspects of abiotic stress tolerance like the role of hormones, reactive oxygen species, seed treatments, molecular mechanisms of heat tolerance and heavy metal toxicity, while the second focuses on the abiotic stress tolerance mechanisms of various vegetables, fruit crops, plantation crops and tuber crops. It includes comprehensive discussions of fruit crops like mango, grapes, banana, litchi and arid zone fruits; vegetables crops like tomato, capsicum, onion and tuber crops; and plantation crops like coconut, areca nut, oil palm and black pepper. Among the strategies for plant stress survival, examples of both avoidance and tolerance relevant to particular crops are examined in detail, supported by selected comprehensive case studies of progress. As such, the book offers a valuable resource suited for scientists and graduate students working in the fields of crop improvement, genetic engineering, and the abiotic stress tolerance of horticultural crops.

**Physiology and Molecular Biology of Stress Tolerance in Plants**

Plant genomics aims to sequence, characterize, and study the genetic compositions, structures, organizations, functions, and interactions/networks of an entire plant genome. Its development and advances are tightly interconnected with proteomics, metabolomics, metagenomics, transgenomics, genomic selection, bioinformatics, epigenomics, phenomics, system biology, modern instrumentation, and robotics sciences. Plant genomics has significantly advanced over the past three decades in the land of inexpensive, high-throughput sequencing technologies and fully sequenced over 100 plant genomes. These advances have broad implications in every aspect of plant biology and breeding, powered with novel genomic selection and manipulation tools while generating many grand challenges and tasks ahead. This Plant genomics provides some updated discussions on current advances, challenges, and future perspectives of plant genome studies and applications.

**Biotic and Abiotic Stress Tolerance in Plants**

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.

**Abiotic Stresses in Crop Plants**

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.

**Abiotic Stress Response in Plants**

In this ready reference, a global team of experts comprehensively cover molecular and cell biology-based approaches to the impact of increasing global temperatures on crop productivity. The work is divided into four parts. Following an introduction to the general challenges for agriculture around the globe due to climate change, part two discusses how the resulting increase of abiotic stress factors can be dealt with. The third part then outlines the different strategies and approaches to address the challenge of climate change, and the whole is rounded off by a number of specific examples of improvements to crop productivity. With its forward-looking focus on solutions, this book is an indispensable help for the agro-industry, policy makers and academia.

**Plant Tolerance to Environmental Stress**

Gain a better understanding of the genetic and physiological bases of stress response and stress tolerance as part of crop improvement programs. Abiotic Stresses: Plant Resistance Through Breeding and Molecular Approaches explores innovative methods for breeding new varieties of major crops with resistance to environmental stresses that limit crop production worldwide. 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. This book supplies extensive bibliographies at the end of each chapter, as well as tables and figures that illustrate the research findings. Abiotic Stresses is divided into two sections. In the first section, you will find: the general principles of breeding crops for stress resistance genetic engineering and molecular biology procedures for crop improvement for stress environments data on genome mapping and its implications for improving stress resistance in plants information about breeding for resistance/tolerance to salinity, drought, flooding, metals, low nutrient availability, high/low temperatures. The second section of this timely resource focuses on the efforts of acknowledged specialists who concentrated their efforts on important individual crops, such as: wheat, barley, rice, maize, oilseed crops, cotton, tomato. This book fills a niche and interface in the available literature as it deals with all of the major stresses from a perspective of crop breeding, covering the latest advances in molecular breeding technology. Abiotic Stresses will help scientists and academics in botany, plant breeding, plant environmental stress studies, agriculture, and horticulture modify and improve breeding programs globally.
"Multiple biotic and abiotic environmental factors may constitute stresses that affect plant growth and yield in crop species. Advances in plant physiology, genetics, and molecular biology have greatly improved our understanding of plant responses to stress."

**Abiotic and Biotic Stress in Plants**

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.

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