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Plant Abiotic Stress Physiology Apr 07 2021 This two-volume set highlights the various innovative and emerging techniques and molecular applications that are currently being used in plant abiotic stress physiology. Volume 1: Responses and Adaptations focuses on the responses and adaptations of plants to stress factors at the cellular and molecular levels and offers a variety of advanced management strategies and technologies. Volume 2: Molecular Advancements introduces a range of state-of-the-art molecular advances for the mitigation of abiotic stress in plants. With contributions from specialists in the field, Volume 1 first discusses the physiology and defense mechanisms of plants and the various kinds of stress, such as from challenging environments, climate change, and nutritional deficiencies. It goes on to discuss trailblazing management techniques that include genetics approaches for improving abiotic stress tolerance in crop plants along with CRISPR/CAS-mediated genome editing technologies. Volume 2 discusses how plants have developed diverse physiological and molecular adjustments to safeguard themselves under challenging conditions and how emerging new technologies can utilize these plant adaptations to enhance plant resistance. These include using plant-environment interactions to develop crop species that are resilient to climate change, applying genomics and phenomics approaches from the study of abiotic stress tolerance and more. Agriculture today faces countless challenges to meet the rising need for sustainable food supplies and guarantees of high-quality nourishment for a quickly increasing population. To ensure sufficient food production, it is necessary to address the difficult environmental circumstances that are causing cellular oxidative stress in plants due to abiotic factors, which play a defining role in shaping yield of crop plants. These two volumes help to meet these challenges by providing a rich source of information on plant abiotic stress physiology and effective management techniques.

Salt and Drought Stress Tolerance in Plants Jan 16 2022 This book presents various aspects of salt and drought stress signaling in crops, combining physiological, biochemical, and molecular studies. Salt and drought stress are two major constraints on crop production worldwide. Plants possess several mechanisms to cope with the adverse effects of salt and drought. Among these mechanisms, stress signaling is very important, because it integrates and regulates nuclear gene expression and other cellular activities, which can help to restore cellular homeostasis. Accordingly, understanding the signaling cascades will help plant biologists to grasp the tolerance mechanisms that allow breeders to develop tolerant crop varieties. This book is an essential resource for researchers and graduate students working on salt and drought stress physiology and plant breeding.

Abiotic and Biotic Stress in Plants Jul 22 2022 Plants are subjected to numerous environmental stresses, which can be classified into two broad areas: abiotic and biotic stresses. While the first is considered the damage done to an organism by other living organisms, the latter occurs as a result of a negative impact of non-living factors on the organisms. In this scenario, the current most accepted opinion of scientists is that both biotic and abiotic factors in nature and agroecosystems are affected by climate change, which may lead to significant crop yield decreases worldwide. We should take into consideration not only this environmental concern but also the fact that 20 years from now the earth's population will need 55% more food than it can produce now. Therefore, it is crucial to address such concerns and bring about possible solutions to future plant stress-related outcomes that might affect global agriculture. This book intends to provide the reader with a comprehensive overview of both biotic and abiotic stresses through 10 chapters that include case studies and literature reviews about these topics. There will be a particular focus on understanding the physiological, biochemical, and molecular changes observed in stressed plants as well as the mechanisms underlying stress tolerance in plants.

Plant Responses to Abiotic Stress Aug 19 2019 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.

Water Stress in Plants May 20 2022 Water stress in plants is caused by the water deficit, as induced possibly by drought or high soil salinity. The prime consequence of water stress in plants is the disruption in the agricultural production, resulting in food shortage. The plants, however, try to adapt to the stress conditions using biochemical and physiological interventions. The edited compilation is an attempt to provide new insights into the mechanism and adaptation aspects of water stress in plants through a thoughtful mixture of viewpoints. We hope that the content of the book will be useful for the researchers working with the plant diversity-related environmental aspects and also provide suggestions for the strategists.

Plant-Environment Interaction Sep 12 2021 The increase in global population, urbanization and industrialization is resulting in the conversion of cultivated land into wasteland. Providing food from these limited resources to an ever-increasing population is one of the biggest challenges that present agriculturalists and plant scientists are facing. Environmental stresses make this situation even graver. Plants on which mankind is directly or indirectly dependent

exhibit various mechanisms for their survival. Adaptability of the plants to changing environment is a matter of concern for plant biologists trying to reach the goal of food security. Despite the induction of several tolerance mechanisms, sensitive plants often fail to withstand these environmental extremes. Using new technological approaches has become essential and imperative. Plant-Environment Interaction: Responses and Approaches to Mitigate Stress throws light on the changing environment and the sustainability of plants under these conditions. It contains the most up-to-date research and comprehensive detailed discussions in plant physiology, climate change, agronomy and forestry, sometimes from a molecular point of view, to convey in-depth understanding of the effects of environmental stress in plants, their responses to the environment, how to mitigate the negative effects and improve yield under stress. This edited volume is written by expert plant biologists from around the world, providing invaluable knowledge to graduate and undergraduate students in plant biochemistry, food chemistry, plant physiology, molecular biology, plant biotechnology, and environmental sciences. This book updates scientists and researchers with the very latest information and sustainable methods used for stress tolerance, which will also be of considerable interest to plant based companies and institutions concerned with the campaign of food security.

Abiotic and Biotic Stress in Plants Sep 24 2022 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.

Oxidative Stress in Plants Mar 26 2020 Plants depend on physiological mechanisms to combat adverse environmental conditions, such as pathogen attack, wounding, drought, cold, freezing, salt, UV, intense light, heavy metals and SO2. Many of these cause excess production of active oxygen species in plant cells. Plants have evolved complex defense systems against such oxidative stress. The study of these mechanisms has become a fast-moving, important field to many biologists. Written and edited by world-leading scientists, Oxidative Stress in Plants explores the current knowledge of the mechanisms by which various biotic and abiotic environmental stress conditions produce oxygen radicals. The text considers the biochemistry and molecular biology of both non-enzymatic (vitamin C, glutathione) and enzymatic systems which eliminate active oxygen species. In addition, the book discusses evidence that active oxygen species and antioxidants act as signals which trigger defense reactions.

Abiotic & Biotic Stress Management in Plants Apr 26 2020 This book deals with an array of topics in the broad area of abiotic stress responses in plants focusing "problems and their management" by selecting some of the widely investigated themes. Such as, Cell signalling in Plants during abiotic and biotic stress, Salinity stress induced metabolic changes and its management, High temperature stress: responses, mechanism and management, Low temperature stress induced changes in plants and their management, Biotechnological approaches to improve abiotic stress tolerance, Nutritional poverty in wheat under abiotic stress scenario, Strategies for improving soil health under current climate change scenario, Abiotic stress management in Pulse crops, Mitigation strategies of abiotic stress in fruit

crops, Impacts of abiotic stress and possible management option in vegetable crops, and Abiotic stress: impact and management in ornamental crops. This book is useful for under-graduate and post-graduate students in Plant Physiology, Biochemistry, agronomy, horticulture, Botany, Environmental sciences and other cognate disciplines of agriculture and allied sciences and other research workers. We fervently believe that this book will provide good information and understanding of abiotic stress problems and their management in plants. Note: T& F does not sell or distribute the Hardback in India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka. This title is co-published with NIPA.

Abiotic Stress Tolerance in Plants Aug 31 2020 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.

Plants, Stress & Proteins Nov 14 2021 Biotic and abiotic stress factors deliver a huge impact on plant life. Biotic stress factors such as damage through pathogens or herbivore attack, as well as abiotic stress factors like variation in temperature, rainfall and salinity, have placed the plant kingdom under constant challenges for survival. As a consequence, global agricultural and horticultural productivity has been disturbed to a large extent. Being sessile in nature, plants cannot escape from the stress, and instead adapt changes within their system to overcome the adverse conditions. These changes include physiological, developmental and biochemical alterations within the plant body which influences the genome, proteome and metabolome profiles of the plant. Since proteins are the ultimate players of cellular behavior, proteome level alterations during and recovery period of stress provide direct implications of plant responses towards stress factors. With current advancement of modern high-throughput technologies, much research has been carried out in this field. This e-book highlights the research and review articles that cover proteome level changes during the course or recovery period of various stress factors in plant life. Overall, the chapters in this e-book has provided a wealth of information on how plants deal with stress from a proteomics perspective.

Abiotic Stress Tolerance in Crop Plants Feb 17 2022 Abiotic stresses have become an integral part of crop production. One or other persist either in soil, water or in atmosphere. The information in the areas of injury and tolerant mechanisms, variability for tolerance, breeding and biotechnology for improvement of crop plants against abiotic stresses are lying unorganized in different articles of journals and edited books. This information is presented in this book in organized way with up-to-date citations, which will provide comprehensive literatures of recent advances. More emphasis has been given to elaborate the injury and tolerance mechanisms, and development of improved genotypes against stress environments. This book also deals with the plants' symptoms of particular abiotic stress, reclamation of soil and crop/cropping pattern to over come the effect of adverse condition(s). Each has been laid out with systematic approaches to develop abiotic stress tolerant genotypes using biotechnological tools. Use of molecular markers in stress tolerance and development of transgenic also have been detailed. Air pollution and climate change are the hot topic of the days. Thus, the effect of air pollution and climate change on crop plants have been detailed in the final three s of this book. Under abiotic stress, plant produces a large quantity of free radicals (oxidants), which have been elaborated in a separate 'Oxidative Stress'. This book has been divided into seven major parts- physical stress (salt), water stresses (drought and waterlogging), temperature stresses (heat and cold), metal toxicities (aluminium, iron, cadmium, lead, nickel, chromium, copper, zinc etc) and non-metal toxicities (boron and arsenic), oxidative stress, and finally atmospheric stresses (air

pollution, radiation and climate change). Hope, this book will be of greater use for the students and researchers, particularly Plant Breeders and Biotechnologists as well as the Botanists, to understand the injury and tolerance mechanisms, and subsequently improvement of crop genotypes for abiotic stresses.

Abiotic Stress Tolerance in Crop Plants Jun 16 2019 The negative effect of non-living factors on various living organisms in a particular environment is known as abiotic stress. It can affect the growth and productivity of crops. Salt stress, drought stress, phosphate starvation in plants and serpentine soils are some of the sources of abiotic stress in plants. Chemical priming is one of the methods used to increase the tolerance of abiotic stress in crop plants. In this method, stress-inducing chemical vaccinations are given to plants to help them prepare defense mechanisms to fight when the actual abiotic stress occurs. This book provides comprehensive insights into the field of abiotic stress tolerance in plants. It discusses the fundamentals as well as modern approaches of this discipline. Through this book, we attempt to further enlighten the readers about the new concepts in this field.

Abiotic Stress Responses in Plants Jan 04 2021 Abiotic stress cause changes in soil-plant-atmosphere continuum and is responsible for reduced yield in several major crops. Therefore, the subject of abiotic stress response in plants - metabolism, productivity and sustainability - is gaining considerable significance in the contemporary world. Abiotic stress is an integral part of "climate change," a complex phenomenon with a wide range of unpredictable impacts on the environment. Prolonged exposure to these abiotic stresses results in altered metabolism and damage to biomolecules. Plants evolve defense mechanisms to tolerate these stresses by upregulation of osmolytes, osmoprotectants, and enzymatic and non-enzymatic antioxidants, etc. This volume deals with abiotic stress-induced morphological and anatomical changes, abberations in metabolism, strategies and approaches to increase salt tolerance, managing the drought stress, sustainable fruit production and postharvest stress treatments, role of glutathione reductase, flavonoids as antioxidants in plants, the role of salicylic acid and trehalose in plants, stress-induced flowering. The role of soil organic matter in mineral nutrition and fatty acid profile in response to heavy metal stress are also dealt with. Proteomic markers for oxidative stress as a new tools for reactive oxygen species and photosynthesis research, abscisic acid signaling in plants are covered with chosen examples. Stress responsive genes and gene products including expressed proteins that are implicated in conferring tolerance to the plant are presented. Thus, this volume would provides the reader with a wide spectrum of information including key references and with a large number of illustrations and tables. Dr. Parvaiz is Assistant Professor in Botany at A.S. College, Srinagar, Jammu and Kashmir, India. He has completed his post-graduation in Botany in 2000 from Jamia Hamdard New Delhi India. After his Ph.D from the Indian Institute of Technology (IIT) Delhi, India in 2007 he joined the International Centre for Genetic Engineering and Biotechnology, New Delhi. He has published more than 20 research papers in peer reviewed journals and 4 book chapters. He has also edited a volume which is in press with Studium Press Pvt. India Ltd., New Delhi, India. Dr. Parvaiz is actively engaged in studying the molecular and physio-biochemical responses of different plants (mulberry, pea, Indian mustard) under environmental stress. Prof. M.N.V. Prasad is a Professor in the Department of Plant Sciences at the University of Hyderabad, India. He received B.Sc. (1973) and M.Sc. (1975) degrees from Andhra University, India, and the Ph.D. degree (1979) in botany from the University of Lucknow, India. Prasad has published 216 articles in peer reviewed journals and 82 book chapters and conference proceedings in the broad area of environmental botany and heavy metal stress in plants. He is the author, co-author, editor, or co-editor for eight books. He is the recipient of Pitamber Pant National Environment Fellowship of 2007 awarded by the Ministry of Environment and Forests, Government of India.

Environmental Stress in Plants Oct 25 2022

Plant Stress Mitigators Jul 10 2021 This edited compilation explores role of climate change in plant stresses, their mitigators, their role, mode of action and, application. The book discusses molecular and physiological mechanisms involved in plant stress physiology and the working mechanism of stress mitigators. It collates information from latest research conducted on plant stress mitigators, and highlights new strategies related to beneficial microorganisms that support plants under various stresses. These mitigators have gained attention of both farmers and industry for their application in organic farming. Plant stress mitigators have a huge global market. They follow different action mechanism for enhancing plant growth and stress tolerance capacity including nutrient solubilizing and mobilizing, bicontrol activity against plant pathogens, phytohormone production, soil conditioning and many more unrevealed mechanisms. This book elaborates stress alleviation action of different plant stress mitigators on crops grown under optimal and sub-optimal growing conditions. It addresses mainly three subthemes -- (1) Climate change impacts on plant and soil health (2) Microbe mediated plant stress mitigation and (3) Advances in plant stress mitigation. The book is a relevant reading for Post graduate students, researchers in the field of plant stress physiology, Plant-microbe interaction, biochemistry and plant molecular biology and industries related to seed production, biofertilizer and biopesticides.

Mechanisms of Environmental Stress Resistance in Plants Jul 18 2019 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.

Plant Abiotic Stress Jun 28 2020 A fully revised review of the latest research in molecularbasis of plant abiotic stress response and adaptation Abiotic stressors are non-living environmental stressors thatcan have a negative impact on a plants ability to grow and thrivein 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 plantabiotic stressors and plants molecular responses and adaptations toadverse environmental conditions. The new edition of Plant Abiotic Stress providesup-to-date coverage of the latest research advances in plantabiotic stress adaptation, with special emphasis on the associatedand integrative aspects of physiology, signaling, andmolecular-genetics. Since the last edition, major advances inwhole genome analysis have revealed previously unknown linkagesbetween genes, genomes, and phenotypes, and new biological and—omics approaches have elucidated previously unknown cellularmechanisms underlying stress tolerance. Chapters are organized by topic, but highlight processes thatare integrative among diverse stress responses. As with the firstedition, Plant Abiotic Stress will have broad appeal toscientists in fields of applied agriculture, ecology, plantsciences, and biology.

Oxidative Stress in Plants Jun 21 2022 Plants depend on physiological mechanisms to combat adverse environmental conditions, such as pathogen attack, wounding, drought, cold, freezing, salt, UV, intense light, heavy metals and SO2. Many of these cause excess production of active oxygen species in plant cells. Plants have evolved complex defense systems against such oxidative stress. The

Plant Growth Regulators Nov 21 2019 Agriculture faces many challenges to fulfil the growing demand for sustainable food production and ensure high-quality nutrition for a rapidly growing population. To guarantee adequate food production, it is necessary to increase the yield per area of arable land. A method for achieving this goal has been the application of growth regulators to modulate plant growth. Plant growth regulators (PGRs) are substances in specific formulations which, when applied to plants or seeds, have the capacity to promote, inhibit, or modify physiological traits, development and/or stress responses. They maintain

proper balance between source and sink for enhancing crop yield. PGRs are used to maximize productivity and quality, improve consistency in production, and overcome genetic and abiotic limitations to plant productivity. Suitable PGRs include hormones such as cytokinins and auxins, and hormone-like compounds such as mepiquat chloride and paclobutrazol. The use of PGRs in mainstream agriculture has steadily increased within the last 20 years as their benefits have become better understood by growers. Unfortunately, the growth of the PGR market may be constrained by a lack of innovation at a time when an increase in demand for new products will require steady innovation and discovery of novel, cost-competitive, specific, and effective PGRs. A plant bio-stimulant is any substance or microorganism applied to plants with the aim to enhance nutrition efficiency, abiotic stress tolerance and/or crop quality traits, regardless of its nutrients content. Apart from traditional PGRs, which are mostly plant hormones, there are a number of substances/molecules such as nitric oxide, methyl jasmonate, brassinosteroids, seaweed extracts, strigolactones, plant growth promoting rhizobacteria etc. which act as PGRs. These novel PGRs or bio-stimulants have been reported to play important roles in stress responses and adaptation. They can protect plants against various stresses, including water deficit, chilling and high temperatures, salinity and flooding. This book includes chapters ranging from sensing and signalling in plants to translational research. In addition, the cross-talk operative in plants in response to varied signals of biotic and abiotic nature is also presented. Ultimately the objective of this book is to present the current scenario and the future plan of action for the management of stresses through traditional as well as novel PGRs. We believe that this book will initiate and introduce readers to state-of-the-art developments and trends in this field of study.

Physiology of Salt Stress in Plants Mar 18 2022 PHYSIOLOGY OF SALT STRESS IN PLANTS Discover how soil salinity affects plants and other organisms and the techniques used to remedy the issue In Physiology of Salt Stress in Plants, an editorial team of internationally renowned researchers delivers an extensive exploration of the problem of soil salinity in modern agricultural practices. It also discusses the social and environmental issues caused by salt stress. The book covers the impact of salt on soil microorganisms, crops, and other plants, and presents that information alongside examinations of salt's effects on other organisms, including aquatic fauna, terrestrial animals, and human beings. Physiology of Salt Stress in Plants describes the morphological, anatomical, physiological, and biochemical dimensions of increasing soil salinity. It also discusses potential remedies and encourages further thought and exploration of this issue. Readers are encouraged to consider less hazardous fertilizers and pesticides, to use safer doses, and to explore and work upon salt resistant varieties of plants. Readers will also benefit from the inclusion of: Thorough introductions to salt stress perception and toxicity levels and the effects of salt stress on the physiology of crop plants at a cellular level Explorations of the effects of salt stress on the biochemistry of crop plants and salt ion transporters in crop plants at a cellular level Practical discussions of salt ion and nutrient interactions in crop plants, including prospective signalling, and the effects of salt stress on the morphology, anatomy, and gene expression of crop plants An examination of salt stress on soil chemistry and the plant-atmosphere continuum Perfect for researchers, academics, and students working and studying in the fields of agriculture, botany, entomology, biotechnology, soil science, and plant physiology, Physiology of Salt Stress in Plants will also earn a place on the bookshelves of agronomists, crop scientists, and plant biochemists.

Phytohormones and Abiotic Stress Tolerance in Plants Mar 06 2021 Plants are sessile and prone to multiple stresses in the changing environmental conditions. Of the several strategies adopted by plants to counteract the adverse effects of abiotic stress, phytohormones provide signals to allow plants to survive under

stress conditions. They are one of the key systems integrating metabolic and developmental events in the whole plant and the response of plants to external factors and are essential for many processes throughout the life of a plant and influence the yield and quality of crops. The book 'Phytohormones and Abiotic Stress Tolerance in Plants' summarizes the current body of knowledge on crosstalk between plant stresses under the influence of phytohormones, and provides state-of-the-art knowledge of recent developments in understanding the role of phytohormones and abiotic stress tolerance in plants. This book presents information on how modulation in phytohormone levels affect regulation of biochemical and molecular mechanisms.

Handbook of Plant and Crop Stress, Fourth Edition Oct 13 2021 Since the publication of the third edition of the Handbook of Plant and Crop Stress, continuous discoveries in the fields of plant and crop environmental stresses and their effects on plants and crops have resulted in the compilation of a large volume of the latest discoveries. Following its predecessors, this fourth edition offers a unique and comprehensive collection of topics in the fields of plant and crop stress. This new edition contains more than 80% new material, and the remaining 20% has been updated and revised substantially. This volume presents 10 comprehensive sections that include information on soil salinity and sodicity problems; tolerance mechanisms and stressful conditions; plant/crop responses; plant/crop responses under pollution and heavy metal; plant/crop responses under biotic stress; genetic factors and plant/crop genomics under stress conditions; plant/crop breeding under stress conditions; empirical investigations; improving tolerance; and beneficial aspects of stressors. Features: Provides exhaustive coverage written by an international panel of experts in the field of agriculture, particularly in plant/crop stress areas Contains 40 new chapters and 10 extensively revised and expanded chapters Includes three new sections on plant breeding, stress exerted to weeds by plants, and beneficial aspects of stress on plants/crops Numerous case studies With contributions from 100 scientists and experts from 20 countries, this Handbook provides a comprehensive resource for research and for university courses, covering soil salinity/sodicity issues and plant/crop physiological responses under environmental stress conditions ranging from cellular aspects to whole plants. The content can be used to plan, implement, and evaluate strategies to mitigate plant/crop stress problems. This new edition includes numerous tables, figures, and illustrations to facilitate comprehension of the material as well as thousands of index words to further increase accessibility to the desired information.

Osmoprotectant-Mediated Abiotic Stress Tolerance in Plants May 28 2020 In nature, plants are constantly challenged by various abiotic and biotic stresses that can restrict their growth, development and yields. In the course of their evolution, plants have evolved a variety of sophisticated and efficient mechanisms to sense, respond to, and adapt to changes in the surrounding environment. A common defensive mechanism activated by plants in response to abiotic stress is the production and accumulation of compatible solutes (also called osmolytes). This include amino acids (mainly proline), amines (such as glycinebetaine and polyamines), and sugars (such as trehalose and sugar alcohols), all of which are readily soluble in water and non-toxic at high concentrations. The metabolic pathways involved in the biosynthesis and catabolism of compatible solutes, and the mechanisms that regulate their cellular concentrations and compartmentalization are well characterized in many important plant species. Numerous studies have provided evidence that enhanced accumulation of compatible solutes in plants correlates with increased resistance to abiotic stresses. New insights into the mechanisms associated with osmolyte accumulation in transgenic plants and the responses of plants to exogenous application of osmolyte, will further enhance our understanding of the mechanisms by which compatible solutes help to protect plants from damage due to abiotic

stress and the potential roles compatible solutes could play in improving plants growth and development under optimal conditions for growth. Although there has been significant progress made in understanding the multiple roles of compatible solute in abiotic stress tolerance, many aspects associated with compatible solute-mediated abiotic stress responses and stress tolerance still require more research. As well as providing basic up-to-date information on the biosynthesis, compartmentalization and transport of compatible solute in plants, this book will also give insights into the direct or indirect involvement of these key compatible solutes in many important metabolic processes and physiological functions, including their antioxidant and signaling functions, and roles in modulating plant growth, development and abiotic stress tolerance. In this book, Osmoprotectant-mediated abiotic stress tolerance in plants: recent advances and future perspectives, we present a collection of 16 chapters written by leading experts engaged with compatible solute-induced abiotic stress tolerance in plants. The main objective of this volume is to promote the important roles of these compatible solutes in plant biology, by providing an integrated and comprehensive mix of basic and advanced information for students, scholars and scientists interested in, or already engaged in, research involving osmoprotectant. Finally, this book will be a valuable resource for future environmental stress-related research, and can be considered as a textbook for graduate students and as a reference book for front-line researchers working on the relationships between osmoprotectant and abiotic stress responses and tolerance in plants.

Approaches for Enhancing Abiotic Stress Tolerance in Plants Jan 24 2020 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.

Handbook of Plant and Crop Stress, Third Edition Sep 19 2019 The dynamic and expanding knowledge of environmental stresses and their effects on plants and crops have resulted in the compilation of a large volume of information in the last ten years since the publication of the second edition of the Handbook of Plant and Crop Stress. With 90 percent new material and a new organization that reflects this increased knowledge base, this new edition, like the first two, provides comprehensive and complete coverage of the issues on stress imposed on plants and crops. Accessibility of knowledge is among the most critical of factors involved with plant/crop stress problems. Without due consideration of all the factors contributing to a specific plant/crop stress problem, it is unlikely that a permanent solution can be found. Facilitating the accessibility of the desired information, the volume is divided into ten sections. Each section consists of one or more chapters that discuss as many aspects of stress as possible. While many references cover soil salinity, sodicity, specific plant/crop salt and water stress, pollution, and other environmental stresses, they exist relatively in isolation, focusing mainly on one specific topic. Prepared with input from more than a hundred contributors from twenty seven countries, this book combines information on these interrelated areas into a single resource. Packed with illustrations, figures, and tables, covering plant/crop stress problems from the soil to the atmosphere, this book puts this expanded environmental stressors knowledge base within easy reach.

Molecular Stress Physiology of Plants Aug 23 2022 Crop growth and production is dependent on various climatic factors. Both abiotic and biotic stresses have become

an integral part of plant growth and development. There are several factors involved in plant stress mechanism. The information in the area of plant growth and molecular mechanism against abiotic and biotic stresses is scattered. The up-to-date information with cited references is provided in this book in an organized way. More emphasis has been given to elaborate the injury and tolerance mechanisms and growth behavior in plants against abiotic and biotic stresses. This book also deals with abiotic and biotic stress tolerance in plants, molecular mechanism of stress resistance of photosynthetic machinery, stress tolerance in plants: special reference to salt stress - a biochemical and physiological adaptation of some Indian halophytes, PSII fluorescence techniques for measurement of drought and high temperature stress signal in crop plants: protocols and applications, salicylic acid: role in plant physiology & stress tolerance, salinity induced genes and molecular basis of salt tolerance mechanism in mangroves, reproductive stage abiotic stress tolerance in cereals, calorimetry and Raman spectrometry to study response of plant to biotic and abiotic stresses, molecular physiology of osmotic stress in plants and mechanisms, functions and toxicity of heavy metals stress in plants, submergence stress tolerance in plants and adoptive mechanism, Brassinosteroid modulated stress responses under temperature stress, stress tolerant in plants: a proteomics approach, Marker-assisted breeding for stress resistance in crop plants, DNA methylation associated epigenetic changes in stress tolerance of plants and role of calcium-mediated CBL-CIPK network in plant mineral nutrition & abiotic stress. Each chapter has been laid out with introduction, up-to-date literature, possible stress mechanism, and applications. Under abiotic stress, plant produces a large quantity of free radicals, which have been elaborated. We hope that this book will be of greater use for the post-graduate students, researchers, physiologist and biotechnologist to sustain the plant growth and development.

Water Stress and Crop Plants May 08 2021 Plants are subjected to a variety of abiotic stresses such as drought, temperature, salinity, air pollution, heavy metals, UV radiations, etc. To survive under these harsh conditions plants are equipped with different resistance mechanisms which vary from species to species. Due to the environmental fluctuations agricultural and horticultural crops are often exposed to different environmental stresses leading to decreased yield and problems in the growth and development of the crops. Drought stress has been found to decrease the yield to an alarming rate of some important crops throughout the globe. During last few decades, lots of physiological and molecular works have been conducted under water stress in crop plants. Water Stress and Crop Plants: A Sustainable Approach presents an up-to-date in-depth coverage of drought and flooding stress in plants, including the types, causes and consequences on plant growth and development. It discusses the physiobiochemical, molecular and omic approaches, and responses of crop plants towards water stress. Topics include nutritional stress, oxidative stress, hormonal regulation, transgenic approaches, mitigation of water stress, approaches to sustainability, and modern tools and techniques to alleviate the water stress on crop yields. This practical book offers pragmatic guidance for scientists and researchers in plant biology, and agribusinesses and biotechnology companies dealing with agronomy and environment, to mitigate the negative effects of stress and improve yield under stress. The broad coverage also makes this a valuable guide enabling students to understand the physiological, biochemical, and molecular mechanisms of environmental stress in plants.

Ecophysiology and Responses of Plants under Salt Stress Oct 21 2019 This book will shed light on the effect of salt stress on plants development, proteomics, genomics, genetic engineering, and plant adaptations, among other topics. Understanding the molecular basis will be helpful in developing selection strategies for improving salinity tolerance. The book will cover around 25 chapters

with contributors from all over the world.

Plant Abiotic Stress Physiology Dec 03 2020 This two-volume set highlights the various innovative and emerging techniques and molecular applications that are currently being used in plant abiotic stress physiology. Volume 1: Responses and Adaptations focuses on the responses and adaptations of plants to stress factors at the cellular and molecular levels and offers a variety of advanced management strategies and technologies. Volume 2: Molecular Advancements introduces a range of state-of-the-art molecular advances for the mitigation of abiotic stress in plants. With contributions from specialists in the field, Volume 1 first discusses the physiology and defense mechanisms of plants and the various kinds of stress, such as from challenging environments, climate change, and nutritional deficiencies. It goes on to discuss trailblazing management techniques that include genetics approaches for improving abiotic stress tolerance in crop plants along with CRISPR/CAS-mediated genome editing technologies. Volume 2 discusses how plants have developed diverse physiological and molecular adjustments to safeguard themselves under challenging conditions and how emerging new technologies can utilize these plant adaptations to enhance plant resistance. These include using plant-environment interactions to develop crop species that are resilient to climate change, applying genomics and phenomics approaches from the study of abiotic stress tolerance and more. Agriculture today faces countless challenges to meet the rising need for sustainable food supplies and guarantees of high-quality nourishment for a quickly increasing population. To ensure sufficient food production, it is necessary to address the difficult environmental circumstances that are causing cellular oxidative stress in plants due to abiotic factors, which play a defining role in shaping yield of crop plants. These two volumes help to meet these challenges by providing a rich source of information on plant abiotic stress physiology and effective management techniques.

Heat Stress Tolerance in Plants Apr 19 2022 Demystifies the genetic, biochemical, physiological, and molecular mechanisms underlying heat stress tolerance in plants Heat stress—when high temperatures cause irreversible damage to plant function or development—severely impairs the growth and yield of agriculturally important crops. As the global population mounts and temperatures continue to rise, it is crucial to understand the biochemical, physiological, and molecular mechanisms of thermotolerance to develop 'climate-smart' crops. Heat Stress Tolerance in Plants provides a holistic, cross-disciplinary survey of the latest science in this important field. Presenting contributions from an international team of plant scientists and researchers, this text examines heat stress, its impact on crop plants, and various mechanisms to modulate tolerance levels. Topics include recent advances in molecular genetic approaches to increasing heat tolerance, the potential role of biochemical and molecular markers in screening germplasm for thermotolerance, and the use of next-generation sequencing to unravel the novel genes associated with defense and metabolite pathways. This insightful book: Places contemporary research on heat stress in plants within the context of global climate change and population growth Includes diverse analyses from physiological, biochemical, molecular, and genetic perspectives Explores various approaches to increasing heat tolerance in crops of high commercial value, such as cotton Discusses the applications of plant genomics in the development of thermotolerant 'designer crops' An important contribution to the field, Heat Stress Tolerance in Plants is an invaluable resource for scientists, academics, students, and researchers working in fields of pulse crop biochemistry, physiology, genetics, breeding, and biotechnology.

Mechanisms of Environmental Stress Resistance in Plants Aug 11 2021 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.

Plant Microbiome: Stress Response Dec 15 2021 This book presents state-of-the-art research on the many facets of the plant microbiome, including diversity, ecology, physiology and genomics, as well as molecular mechanisms of plant-microbe interactions. Topics considered include the importance of microbial secondary metabolites in stimulating plant growth, induced systemic resistance, tolerance to abiotic stress, and biological control of plant pathogens. The respective contributions show how microbes help plants to cope with abiotic stresses, and represent significant progress toward understanding the complex regulatory networks critical to host-microbe interaction and plant adaptation in extreme environments. New insights into the mechanisms of microbial actions in inducing plant stress tolerance open new doors for improving the efficacy of microbial strategies, and could produce new ways of economically increasing crop yields without harming the environment. As such, this book offers an essential resource for students and researchers with an interest in plant-microbe interaction, as well as several possibilities for employing the plant microbiome in the enhancement of crop productivity under future climate change scenarios.

Abiotic Stress Response in Plants Nov 02 2020 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.

Genes for Plant Abiotic Stress Feb 05 2021 Abiotic stresses caused by drought, salinity, toxic metals, temperature extremes, and nutrient poor soils are among the major constraints to plant growth and crop production worldwide. While crop breeding strategies to improve yields have progressed, a better understanding of the genetic and biological mechanisms underpinning stress adaptation is needed. Genes For Plant Abiotic Stress presents the latest research on recently examined genes and alleles and guides discussion of the genetic and physiological determinants that will be important for crop improvement in the future.

Abiotic Stress-Mediated Sensing and Signaling in Plants: An Omics Perspective Dec 23 2019 The natural environment for plants is composed of a complex set of abiotic and biotic stresses; plant responses to these stresses are equally complex. Systems biology allows us to identify regulatory hubs in complex networks. It also examines the molecular "parts" (transcripts, proteins and metabolites) of an organism and attempts to combine them into functional networks or models that effectively describe and predict the dynamic activities of that organism in different environments. This book focuses on research advances regarding plant responses to abiotic stresses, from the physiological level to the molecular level. It highlights new insights gained from the integration of omics datasets and identifies remaining gaps in our knowledge, outlining additional focus areas for future crop improvement research. Plants have evolved a wide range of mechanisms for coping with various abiotic stresses. In many crop plants, the molecular mechanisms involved in a single type of stress tolerance have since been

identified; however, in order to arrive at a holistic understanding of major and common events concerning abiotic stresses, the signaling pathways involved must also be elucidated. To date several molecules, like transcription factors and kinases, have been identified as promising candidates that are involved in crosstalk between stress signalling pathways. However, there is a need to better understand the tolerance mechanisms for different abiotic stresses by thoroughly grasping the signalling and sensing mechanisms involved. Accordingly, this book covers a range of topics, including the impacts of different abiotic stresses on plants, the molecular mechanisms leading to tolerance for different abiotic stresses, signaling cascades revealing cross-talk among various abiotic stresses, and elucidation of major candidate molecules that may provide abiotic stress tolerance in plants.

Salt Stress in Plants Oct 01 2020 Environmental conditions and changes, irrespective of source, cause a variety of stresses, one of the most prevalent of which is salt stress. Excess amount of salt in the soil adversely affects plant growth and development, and impairs production. Nearly 20% of the world's cultivated area and nearly half of the world's irrigated lands are affected by salinity. Processes such as seed germination, seedling growth and vigour, vegetative growth, flowering and fruit set are adversely affected by high salt concentration, ultimately causing diminished economic yield and also quality of produce. Most plants cannot tolerate salt-stress. High salt concentrations decrease the osmotic potential of soil solution, creating a water stress in plants and severe ion toxicity. The interactions of salts with mineral nutrition may result in nutrient imbalances and deficiencies. The consequence of all these can ultimately lead to plant death as a result of growth arrest and molecular damage. To achieve salt-tolerance, the foremost task is either to prevent or alleviate the damage, or to re-establish homeostatic conditions in the new stressful environment. Barring a few exceptions, the conventional breeding techniques have been unsuccessful in transferring the salt-tolerance trait to the target species. A host of genes encoding different structural and regulatory proteins have been used over the past 5–6 years for the development of a range of abiotic stress-tolerant plants. It has been shown that using regulatory genes is a more effective approach for developing stress-tolerant plants. Thus, understanding the molecular basis will be helpful in developing selection strategies for improving salinity tolerance. This book will shed light on the effect of salt stress on plants development, proteomics, genomics, genetic engineering, and plant adaptations, among other topics. The book will cover around 25 chapters with contributors from all over the world.

Plant Stress Biology Jul 30 2020 Plants growing in the natural environment battle with a variety of biotic (pathogens infection) and abiotic (salinity, drought, heat and cold stresses etc.) stresses. These physiological stresses drastically affect plant growth and productivity under field conditions. These challenges are likely to grow as a consequences of global climate change and pose a threat to the food security. Therefore, acquaintance with underlying signalling pathways, physiological, biochemical and molecular mechanisms in plants and the role of beneficial soil microorganisms in plant's stress tolerance are pivotal for sustainable crop production. This volume written by the experts in the stress physiology and covers latest research on plant's tolerance to abiotic and biotic stresses. It elaborates on the potential of plant-microbe interactions to avoid the damage caused by these stresses. With comprehensive information on theoretical, technical and experimental aspects of plant stress biology, this extensive volume is a valuable resource for researchers, academician and students in the broad field of plant stress biology, physiology, microbiology, environmental and agricultural science.

Nanobiotechnology Jun 09 2021 This book provides up-to-date knowledge of the promising field of Nanobiotechnology with emphasis on the mitigation approaches to

combat plant abiotic stress factors, including drought, salinity, waterlog, temperature extremes, mineral nutrients, and heavy metals. These factors adversely affect the growth as well as yield of crop plants worldwide, especially under the global climate change. Nanobiotechnology is viewed to revolutionize crop productivity in future. The chapters discuss the status and prospects of this cutting-edge technology toward understanding tolerance mechanisms, including signaling molecules and enzymes regulation in addition to the applications of Nanobiotechnology to combat individual abiotic stress factors.

Managing Plant Stress Using Salicylic Acid Feb 23 2020 MANAGING PLANT STRESS USING SALICYLIC ACID Enables readers to understand the ability of salicylic acid in reducing the effects of abiotic stresses in different crop species Salicylic acid is an important plant hormone which acts as a multifunctional molecule and regulates key physiological and biochemical processes in plants. This book highlights the tremendous potential of treating plants with salicylic acid, either prior to or during stress. It focuses on the specific challenges and opportunities related to exogenous application or priming technology, such as the mode of application, new methodologies, and the potential impacts of salicylic acid on the environment. Sample topics covered in the book include: The latest research on the ability of salicylic acid in reducing the effects of abiotic stresses in different crop species The mechanism of action of salicylic acid at the biochemical and molecular level Salicylic acid and its crosstalk with other plant hormones under stressful environments Regulation of abiotic stress by salicylic acid at the gene level The role of salicylic acid on the postharvest physiology of plants This book will be of significant interest to researchers, academics, and scientists working in the field of salicylic acid mediated responses in plants under challenging environments and with abiotic stress tolerance.