Stress Biology Of Cyanobacteria Molecular Mechanisms To Cellular Responses By Crc Press 2013 03 01

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Physical Stresses in Plants Stefania Grillo 2012-12-06 The workshop "Genes and their products for tolerance to physical stresses in plants" was held in Maratea, Italy, from 24-27 September 1995. As one of a series of activity launched by the European Science Foundation (ESF) Network "Cell Stress Genes and their Protein Products", the workshop was the only one entirely devoted to research in the plant field. Around one hundred participants from fourteen different countries enjoyed a lively meeting in an atmosphere of sunny Mediterranean weather. A total of twenty-eight speakers from universities and research institutes were invited to present the most recent results of their research. The workshop was divided into eight sessions, namely heat, cold, salt, drought, oxidative stress, light stress, a conclusive session for recommendations and a poster session. The results reported in this

workshop broadly showed the rapid progress made in the understanding of the molecular mechanisms underlying basic aspects of the plant response to environmental stresses.

Abiotic Stress and Legumes Vijay Pratap Singh 2021-08-22 Abiotic Stress and Legumes: Tolerance and Management is the first book to focus on the ability of legume plants to adapt effectively to environmental challenges. Using the -omic approach, this book takes a targeted approach to understanding the methods and means of ensuring survival and maximizing the productivity of the legume plant by improving tolerance to environmental /abiotic stress factors including drought, temperature change, and other challenges. The book presents a comprehensive overview of the progress that has been made in identifying means of managing abiotic stress effects, specifically in legumes, including the development of several varieties which exhibit tolerance through high yield using transcriptomic, proteomic, metabolomic and ionomic approaches. Further, exogenous application of various stimulants such as plant hormones, nutrients, sugars, and polyamines has emerged as an alternative strategy to improve productivity under

these environmental challenges. Abiotic Stress and Legumes: Tolerance and Management examines these emerging strategies and serves as an important resource for researchers, academicians and scientists, enhancing their knowledge and aiding further research. Explores the progress made in managing abiotic stress, specifically with high yield legumes Highlights the molecular mechanisms related to acclimation Presents proven strategies and emerging approaches to guide additional research

Molecular Mechanisms of Copper Homeostasis in Gram-negative Bacteria Alayna Michelle George Thompson 2014 Copper is a trace element utilized by organisms as a cofactor involved in redox chemistry, electron transport, photosynthesis, and oxidation reactions. In excess, copper is toxic; it can generate reactive oxygen species causing cellular damage, or poison other metalloproteins by replacing native metal cofactors. Gram-negative bacteria have developed homeostatic mechanisms to maintain the intracellular copper concentration in the face of changing environmental conditions. For Gram-negative enteric bacteria, like Esherichiacoli and Salmonella enterica serovar typhimurium, copper

is encountered in industrial and institutional settings, where the metal is used as a broad-spectrum biocide. For environmental bacteria, such as the marine cyanobacterium Synechococcus sp. WH8102, copper stress occurs because human activity changes the concentration of copper in the ocean. This dissertation contains six chapters, relating four stories of our investigations into the molecular mechanisms of copper homeostasis in Gram-negative bacteria. Chapter I contains literature review and background on the implications of bacterial copper homeostasis. Chapter II reports our work investigating the expression of two E. coli proteins, CusF and CusB, upon copper stress; we show that CusF expresses at a ~10-fold molar excess over CusB. Chapter III describes a collaboration between our lab and Jose Argüello's lab at Worcester Polytechnic Institute, and we show that CusF can acquire Cu(I) from CopA. Our results from Chapters II and III show that CusF functions as a major copper chaperone in the periplasm of E. coli. Chapter IV details our work characterizing a novel protein from marine cyanobacteria, Synw_0921. Although Synw_0921 is believed to be involved in

copper homeostasis, we show that it is an iron-sulfur cluster protein. Bioinformatic analysis suggests that Synw_0921 represents a new family of proteins that help marine cyanobacteria adapt to copper changes in their unique environment. Chapter V relates our work on CueR and GolS, two homologous sensor proteins with distinct metal-dependent transcriptional activation; we find that the activity cannot be explained by binding affinity differences. Chapter VI concludes with final thoughts on the intersection of biochemistry and molecular biology in the important process of understanding copper homeostasis.

Advances in Cyanobacterial Biology Prashant Kumar Singh 2020-02-28 Advances in Cyanobacterial Biology presents the novel, practical, and theoretical aspects of cyanobacteria, providing a better understanding of basic and advanced biotechnological application in the field of sustainable agriculture. Chapters have been designed to deal with the different aspects of cyanobacteria including their role in the evolution of life, cyanobacterial diversity and classification, isolation, and characterization of cyanobacteria through biochemical and molecular

approaches, phylogeny and biogeography of cyanobacteria, symbiosis, Cyanobacterial photosynthesis, morphological and physiological adaptation to abiotic stresses, stress-tolerant cyanobacterium, biological nitrogen fixation. Other topics include circadian rhythms, genetics and molecular biology of abiotic stress responses, application of cyanobacteria and cyanobacterial mats in wastewater treatments, use as a source of novel stress-responsive genes for development of stress tolerance and as a source of biofuels, industrial application, as biofertilizer, cyanobacterial blooms, use in Nano-technology and nanomedicines as well as potential applications. This book will be important for academics and researchers working in cyanobacteria, cyanobacterial environmental biology, cyanobacterial agriculture and cyanobacterial molecular biologists. Summarizes the various aspects of cyanobacterial research, from primary nitrogen fixation, to advanced nano-technology applications Addresses both practical and theoretical aspects of the cyanobacterial application Includes coverage of biochemical and molecular approaches for the identification, use and management of cyanobacteria

Ecophysiology and Biochemistry of Cyanobacteria Rajesh Prasad Rastogi 2022-01-30 This book emphasizes and presents the latest information on eco-physiology and biochemistry of cyanobacteria with special emphasis on their biodiversity, molecular mechanisms of some important biological processes and survival mechanisms under myriad of environmental conditions as well as bioremediation. Cyanobacteria are the most dominant prokaryotic floras on the Earth's surface, and are of great importance in terms of ecological, economical and evolutionary perspectives. They are oldest groups of photosynthetic autotrophs, which create oxygenic atmosphere for the development and sustainability of ecosystems with different life forms. The book presents an integrative approach to their possible biotechnological application in the field of bio-energy and various aspects of biochemistry, biophysics and structural biology of photosynthesis. The various chapters describe the different applications of cyanobacteria as bio-energy sources and in phycoremediation. The contents incorporated in this book can be used as a textbook by undergraduate and post-graduate students, teachers, and researchers in the most

interesting fields of physicochemical ecology and biochemistry of cyanobacteria.

Abiotic Stress Adaptation in Plants 2010

Non-Photochemical Quenching and Energy Dissipation in Plants, Algae and Cyanobacteria Barbara Demmig-Adams 2014-11-22 Harnessing the sun's energy via photosynthesis is at the core of sustainable production of food, fuel, and materials by plants, algae, and cyanobacteria. Photosynthesis depends on photoprotection against intense sunlight, starting with the safe removal of excess excitation energy from the light-harvesting system, which can be quickly and non-destructively assessed via non-photochemical quenching of chlorophyll fluorescence (NPQ). By placing NPQ into the context of whole-organism function, this book aims to contribute towards identification of plant and algal lines with superior stress resistance and productivity. By addressing agreements and open questions concerning photoprotection's molecular mechanisms, this book contributes towards development of artificial photosynthetic systems. A comprehensive picture –from single molecules to organisms in ecosystems, and from leading expert's views to practical information for non-specialists on NPQ

measurement and terminology – is presented.

Cellular and Molecular Strategies in Cyanobacterial Survival Khaled Selim 2021-10-18 In this Special Issue of Life, we invited researchers from all over the world to share advances in their understanding of ecological, cellular, and molecular mechanisms of cyanobacterial survival. This includes original work and review articles dealing with signaling pathways, strategies of gene and protein regulation, global studies, and new discoveries related to the differentiation of spore-like akinetes, motile hormogonia, and nitrogen-fixing heterocysts.

Stress Tolerance in Horticultural Crops Ajay Kumar 2021-05-28 Stress Tolerance in Horticultural Crops: Challenges and Mitigation Strategies explores concepts, strategies and recent advancements in the area of abiotic stress tolerance in horticultural crops, highlighting the latest advances in molecular breeding, genome sequencing and functional genomics approaches. Further sections present specific insights on different aspects of abiotic stress tolerance from classical breeding, hybrid breeding, speed breeding, epigenetics, gene/quantitative trait loci

(QTL) mapping, transgenics, physiological and biochemical approaches to OMICS approaches, including functional genomics, proteomics and genomics assisted breeding. Due to constantly changing environmental conditions, abiotic stress such as high temperature, salinity and drought are being understood as an imminent threat to horticultural crops, including their detrimental effects on plant growth, development, reproduction, and ultimately, on yield. This book offers a comprehensive resource on new developments that is ideal for anyone working in the field of abiotic stress management in horticultural crops, including researchers, students and educators. Describes advances in whole genome and next generation sequencing approaches for breeding climate smart horticultural crops Details advanced germplasm tolerance to abiotic stresses screened in the recent past and their performance Includes advancements in OMICS approaches in horticultural crops

Interdisciplinary Research and Training Program in the Plant Sciences. Technical Progress Report, February 1, 1991--November 30, 1992 1992

Research on plants continued. Topics include:

Molecular basis of symbiotic plant-microbe interations; enzymatic mechanisms and regulation of plant cell wall biosynthesis; molecular mechanisms that regulate the expression of genes in plants; resistance of plants to environmental stress; studies on hormone biosynthesis and action; plant cell wall proteins; interaction of nuclear and organelle genomes; sensor transduction in plants; molecular mechanisms of trafficking in the plant cell; regulation of lipid metabolism; molecular bases of plant disease resistance mechanisms; biochemical and molecular aspects of plant pathogenesis; developmental biology of nitrogen-fixing cyanobacteria; environmental control of plant development and its relation to plant hormones.

Cyanobacteria in Symbiosis A.N. Rai 2007-05-08

Cyanobacterial symbioses are no longer regarded as mere oddities but as important components of the biosphere, occurring both in terrestrial and aquatic habitats worldwide. It is becoming apparent that they can enter into symbiosis with a wider variety of organisms than hitherto known, and there are many more still to be discovered, particularly in marine environments. The chapters

cover cyanobacterial symbioses with plants (algae, bryophytes, Azolla, cycads, Gunnera), cyanobacterial symbioses in marine environments, lichens, Nostoc-Geosiphon (a fungus closely related to arbuscular mycorrhiza fungi) symbiosis, and artificial associations of cyanobacteria with economically important plants. In addition, cyanobiont diversity, sensing-signalling, and evolutionary aspects of the symbiosis are dealt with. Renowned experts actively involved in research on cyanobacterial symbioses deal with ecological, physiological, biochemical, molecular, and applied aspects of all known cyanobacterial symbioses. This volume on cyanobacteria in symbiosis complements the two earlier volumes on cyanobacteria published by Kluwer (Molecular Biology of Cyanobacteria, edited by D.A. Bryant and Ecology of Cyanobacteria, edited by B.A. Whitton and M. Potts). Together, the three volumes provide the most comprehensive treatment of cyanobacterial literature as a whole. The book will serve as a valuable reference work and text for teaching and research in the field of plant-microbe interactions and nitrogen fixation.

Plant Abiotic Stress Tolerance Mirza

Hasanuzzaman 2019-04-04 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.

Molecular Mechanisms Underlying Acclimatin Responses of Cyanobactgeria to Nutrient Stress Eleonora Sendersky 2008

Molecular Biology of the Cell Bruce Alberts 2004

Physiology and Molecular Biology of Stress Tolerance in Plants K.V. Madhava Rao 2006-02-10 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.

Cyanobacterial Physiology Hakuto Kageyama 2022-05-31 Cyanobacteria are ancient, primordial oxygenic phototrophs, and probably the progenitor of oxygen-evolving photosynthesis. They are a prolific source of natural products and metabolites and vitally important for environmental biology and biotechnology. Cyanobacterial Physiology presents foundational knowledge alongside the most recent advances in cyanobacterial biology. The title examines the challenges of industrial application through an understanding of the basic molecular machinery of cyanobacteria. Sixteen chapters are organized into three sections. The first part covers basic

cyanobacterial biology, emphasizing environmental biology such as photosynthesis, nitrogen fixation, circadian rhythm, and programmed cell death. The second part includes the chapters that discuss cyanobacterial extremophiles, adaptations, secondary metabolites, osmoprotectants, and toxins. The third part covers aspects of cyanobacterial application that are based on environmental biology. Leading scientists contribute chapters on cyanobacteria. Cyanobacterial Physiology presents a comprehensive and vibrant solution for researchers and engineers in biotechnology interested in cyanobacteria and their applications. Topics include the cyanobacterial cell and fundamental physiological processes; the biotechnological potential of cyanobacteria with their versatile metabolism; and advanced applications of cyanobacterial products. At each stage the book is informed by basic and applied research. Examines industrial applications of cyanobacteria through their basic molecular machinery Presents foundational knowledge about cyanobacteria alongside the latest research Leading scientists present basic and applied research on cyanobacteria Covers cyanobacterial

biology and applications in environmental biotechnology Give researchers and engineers a comprehensive solution for working with cyanobacteria in relation to environmental biology and biotechnology

The Cyanobacteria Antonia Herrero 2008 The expertise and enthusiasm of an international panel of leading cyanobacterial researchers provides a state-of-the art overview of the field.

Photosynthesis Dmitry Shevela 2018-11-09 Photosynthesis has been an important field of research for more than a century, but the present concerns about energy, environment and climate have greatly intensified interest in and research on this topic. Research has progressed rapidly in recent years, and this book is an interesting read for an audience who is concerned with various ways of harnessing solar energy. Our understanding of photosynthesis can now be said to have reached encyclopedic dimensions. There have been, in the past, many good books at various levels. Our book is expected to fulfill the needs of advanced undergraduate and beginning graduate students in branches of biology, biochemistry, biophysics, and bioengineering because photosynthesis is the basis of future

advances in producing more food, more biomass, more fuel, and new chemicals for our expanding global human population. Further, the basics of photosynthesis are and will be used not only for the above, but in artificial photosynthesis, an important emerging field where chemists, researchers and engineers of solar energy systems will play a major role.

Abiotic Stress in Plants Arun Shanker 2011-09-22 World population is growing at an alarming rate and is anticipated to reach about six billion by the end of year 2050. On the other hand, agricultural productivity is not increasing at a required rate to keep up with the food demand. The reasons for this are water shortages, depleting soil fertility and mainly various abiotic stresses. The fast pace at which developments and novel findings that are recently taking place in the cutting edge areas of molecular biology and basic genetics, have reinforced and augmented the efficiency of science outputs in dealing with plant abiotic stresses. In depth understanding of the stresses and their effects on plants is of paramount importance to evolve effective strategies to counter them. This book is broadly dived into sections on the stresses, their mechanisms and

tolerance, genetics and adaptation, and focuses on the mechanic aspects in addition to touching some adaptation features. The chief objective of the book hence is to deliver state of the art information for comprehending the nature of abiotic stress in plants. We attempted here to present a judicious mixture of outlooks in order to interest workers in all areas of plant sciences.

Cyanobacteria A.K. Mishra 2018-11-30

Cyanobacteria constitute the most widely distributed group of photosynthetic prokaryotes found in almost all realms of the earth and play an important role in Earth's nitrogen and carbon cycle. The gradual transformation from reducing atmosphere to oxidizing atmosphere was a turning point in the evolutionary history of the earth and made conditions for present life forms possible. Cyanobacteria: From Basic Science to Applications is the first reference volume that comprehensively discusses all aspects of cyanobacteria, including the diverse mechanisms of cyanobacteria for the advancement of cyanobacterial abilities, towards higher biofuel productivity, enhanced tolerance to environmental stress and bioactive compounds and potential for biofertilizers. Describes cyanobacterial diversity,

stress biology, and biotechnological aspects of cyanobacteria Explores the global importance of cyanobacteria Provides a broad compilation of research that deals with cyanobacterial stress responses in both controlled laboratory conditions as well as in their natural environment

Handbook of Cyanobacteria T. A. Sarma 2012-12-18 This handbook acquaints readers with the exciting developments in various areas of cyanobacterial research in the backdrop of the publication of complete genome sequence of the cyanobacterium Synechocystis sp. strain PCC 6803 in 1996. It begins with a summary of the current knowledge on the taxonomy, phylogeny and evolution of cyanobacteria followed by the sequenced genomes, differentiation of akinetes and heterocyst. The book considers mechanisms of cellular movements (gliding, swimming and twitching motions) exhibited by various cyanobacteria in order to adjust to their environmental niches and the operation of the circadian rhythms. It covers cyanobacterial symbiosis, cyanophages and cyanobacterial toxins, followed by a discussion on stress responses (salinity, temperature, desiccation and oxidation). A comprehensive account on the

developments in all these spheres has been presented in a lucid style with the required background information, molecular techniques employed and models proposed. This handbook constitutes the first such book written by a single author at a level and depth for graduate and research students in botany and microbiology.

Response of Cyanobacteria to Herbicides: A Biochemical and Molecular Approach Prof. Dr. Nirmal Kumar, J.I. Cyanobacteria, formerly called blue-green algae, are the most primitive form of algae under plant kingdom. These are called blue-green algae because they contain the photosynthetic pigments-phycocyanin (dominant pigment), phycoerythryin and chlorophyll a, which are responsible for their characteristic blue-green colour. They are known by different names such as, Blue-Green Algae or Cyanobacteria, Schizobacteria or Myxobacteria, Myxophyceae and Cyanophyceae. These are the first plant forms, which got the power of chlorophyll in their thylakoids and started the life supporting process of photosynthesis on the earth. Inoculation of crop plants with nitrogen fixing microbes (in the form of biofertilizers) has become an accepted biotechnology in US, Germany, Brazil, Israel,

Egypt, China, India and some other parts of the world also. The paddy field ecosystem provides a favorable environment for the growth of cyanobacteria (blue green algae) with respect to their requirements for light, water, high temperature, and nutrient availability. Cyanobacteria produce and secrete a variety of biological substances such as auxins (Indole Acetic Acid, Indole Butyric Acid, Naphthalene Acetic Acid), gibberellins (GA1 to GA3) and vitamins, which promote the crop growth. Cyanobacteria can also reduce the oxidizable matter of the soil, remove soil compaction, narrow the C:N ratio and facilitate the aeration in the rhizosphere zone. Environmental stresses influence a plethora of physiological activities in living organisms. Cellular adaptation to environmental stress is the major process that protects organism from deleterious effects of various stresses like pesticide, salt, temperature, heavy metals etc. Being cosmopolitan in distribution, cyanobacteria are thought to have been exposed to different levels and types of stressors during their development, thus providing a suitable system for analyzing the adaptive mechanisms developed in response to changing

stress conditions. Looking into the enormous potentiality of cyabobacteria, the authors have presented their intensive investigation in the form of a book Response of Cyanobacteria to Herbicides: A Biochemical and Molecular Approach to explore morphological changes such as color of the cells, cell shape and heterocyst frequency of herbicide-treated cyanobacterial species such as Anabaena fertilissima Rao, Aulosira fertilissima Ghose and Westiellopsis prolifica Janet., variations in pigment contents like chlorophyll a, total carotenoids, phycobilin pigments - phycocyanin, phycoerythrin and allophycocyanin of herbicide-treated cyanobacterial species, response of metabolites like carbohydrates, amino acids, proteins, phenols and activity of enzymes like nitrate reductase, glutamine synthatase and succinate dehydrogenase of herbicide-treated cyanobacterial species, functional group variation and detoxicants of herbicide-treated cyanobacterial species, protein profiling by Soduim Dodecyl Sulfate - Polyacrylamide Gel Electrophoresis (SDS-PAGE), genomic DNA profiling by Random Amplified Polymorphic DNA (RAPD), and molecular characterization by 16S

rDNA amplification of all three selected species of cyanobacteria. The present book would be helpful in enriching the knowledge of readers about herbicidal toxicology, biochemical response, and molecular aspects of cyanobacteria at lab scale as well as field studies.

Proceedings of the Indian National Science Academy Indian National Science Academy 2001

Photosynthesis: Structures, Mechanisms, and Applications Harvey J.M. Hou 2017-05-16 To address the environmental, socioeconomic, and geopolitical issues associated with increasing global human energy consumption, technologies for utilizing renewable carbon-free or carbon-neutral energy sources must be identified and developed. Among renewable sources, solar energy is quite promising as it alone is sufficient to meet global human demands well into the foreseeable future. However, it is diffuse and diurnal. Thus effective strategies must be developed for its capture, conversion and storage. In this context, photosynthesis provides a paradigm for large-scale deployment. Photosynthesis occurs in plants, algae, and cyanobacteria and has evolved over 3 billion years. The process of photosynthesis currently

produces more than 100 billion tons of dry biomass annually, which equates to a global energy storage rate of ~100 TW. Recently, detailed structural information on the natural photosynthetic systems has been acquired at the molecular level, providing a foundation for comprehensive functional studies of the photosynthetic process. Likewise, sophisticated spectroscopic techniques have revealed important mechanistic details. Such accomplishments have made it possible for scientists and engineers to construct artificial systems for solar energy transduction that are inspired by their biological counterparts. The book contains articles written by experts and world leaders in their respective fields and summarizes the exciting breakthroughs toward understanding the structures and mechanisms of the photosynthetic apparatus as well as efforts toward developing revolutionary new energy conversion technologies. The topics/chapters will be organized in terms of the natural sequence of events occurring in the process of photosynthesis, while keeping a higher-order organization of structure and mechanism as well as the notion that biology can inspire human technologies. For example, the

topic of light harvesting, will be followed by charge separation at reaction centers, followed by charge stabilization, followed by chemical reactions, followed by protection mechanisms, followed by other more specialized topics and finally ending with artificial systems and looking forward. As shown in the table of contents (TOC), the book includes and integrates topics on the structures and mechanisms of photosynthesis, and provides relevant information on applications to bioenergy and solar energy transduction.

Stress Responses of Photosynthetic Organisms Kimiyuki Satoh 2012-12-02 Sixteen topics from the results of the research project "Molecular Mechanisms for Responses of the Photosynthetic Apparatus to the Environment," are documented in this excellent and timely work. Photosynthesis research has a long history in Japan, and many Japanese laboratories working in this field have been very active and productive. Based on the foundation established by these laboratories, the research reflected in this book focuses on elucidating the interactions between photosynthesis and the environment, with special emphasis on the molecular aspects of these interactions. The major purpose of the research

was to identify specific genes required for (a) repair of the organisms from stress-induced damage to the photosynthetic machinery and (b) acclimation of photosynthetic processes to specific changes in environmental conditions. Once specific genes were identified, the effects of expression (and overexpression) of these genes in transgenic plants on acclimation processes were analyzed. Through the analysis of transgenic plants and cyanobacteria, the volume clarifies a number of molecular mechanisms by which plants acclimate to environmental variations, and the factors that govern recovery from stress-induced damage, especially with respect to the photosynthetic apparatus. A treatize on stress physiology and photosynthesis, the book also indicates the agricultural usefulness of transgenic plants and microalgae which are produced to study the molecular mechanisms of the tolerance of plants to changes in their environment.

Cyanobacteria Biotechnology Paul Hudson 2021-04-20 Unites a biological and a biotechnological perspective on cyanobacteria, and includes the industrial aspects and applications of cyanobacteria Cyanobacteria

Biotechnology offers a guide to the interesting and useful features of cyanobacteria metabolism that keeps true to a biotechnology vision. In one volume the book brings together both biology and biotechnology to illuminate the core acpects and principles of cyanobacteria metabolism. Designed to offer a practical approach to the metabolic engineering of cyanobacteria, the book contains relevant examples of how this metabolic "module" is currently being engineered and how it could be engineered in the future. The author includes information on the requirements and real-world experiences of the industrial applications of cyanobacteria. This important book: Brings together biology and biotechnology in order to gain insight into the industrial relevant topic of cyanobacteria Introduces the key aspects of the metabolism of cyanobacteria Presents a grounded, practical approach to the metabolic engineering of cyanobacteria Offers an analysis of the requirements and experiences for industrial cyanobacteria Provides a framework for readers to design their own processes Written for biotechnologists, microbiologists, biologists, biochemists, Cyanobacteria Biotechnology provides a systematic and clear volume that

brings together the biological and biotechnological perspective on cyanobacteria.

Natural and Artificial Photosynthesis Reza Razeghifard 2013-08-23 This technical book explores current and future applications ofsolar power as an unlimited source of energy that earth receivesevery day. Photosynthetic organisms have learned to utilizethis abundant source of energy by converting it into high-energybiochemical compounds. Inspired by the efficient conversionof solar energy into an electron flow, attempts have been made toconstruct artificial photosynthetic systems capable of establishinga charge separation state for generating electricity or drivingchemical reactions. Another important aspect ofphotosynthesis is the CO2 fixation and the production of highenergy compounds. Photosynthesis can produce biomass usingsolar energy while reducing the CO2 level in air. Biomass canbe converted into biofuels such as biodiesel and bioethanol. Undercertain conditions, photosynthetic organisms can also producehydrogen gas which is one of the cleanest sources of energy.

Molecular Mechanisms Underlying Acclimation

Responses of Cyanobacteria to Nutrient Stress Eleonora Sendersky 2008

The Algae World Dinabandhu Sahoo 2015-12-16 Algal World has been carefully written and edited with an interdisciplinary appeal and aims to bring all aspects of Algae together in one volume. The 22 chapters are divided into two different parts which have been authored by eminent researchers from across the world. The first part, Biology of Algae, contains 10 chapters dealing with the general characteristics, classification and description of different groups such as Blue Green Algae, Green Algae, Brown Algae, Red Algae, Diatoms, Xanthophyceae, Dinophyceae, etc. In , it has two important chapters covering Algae in Extreme Environments and Life Histories and Growth Forms in Green Algae. The second part, Applied Phycology, contains 12 chapters dealing with the more applied aspects ranging from Algal Biotechnology, Biofuel, Phycoremediation, Bioactive Compounds, Biofertilizer, Fatty Acids, Harmful Algal Blooms, Industrial Applications of Seaweeds, Nanotechnology, Phylogenomics and Algal culture Techniques, etc.

Plant Life under Changing Environment Durgesh

Kumar Tripathi 2020-04-10 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 and Legumes Durgesh Kumar Tripathi 2021-09-10 Abiotic Stress and Legumes: Tolerance and Management is the first book to

focus on these important factors in legume productivity. As a primary and increasingly important food source, efficient legume productivity relies on the plant's ability to effectively adapt to environmental challenges. The book takes a targeted approach to understanding the methods and means of ensuring survival and productivity of the legume plant. It illustrates the progress that has been made in managing abiotic stress effects in legumes, including the development of several varieties that show tolerance against abiotic stress with high yield using transcriptomic, proteomic, metabolomic and ionomic approaches. Further, exogenous application of various stimulants, such as plant hormones, nutrients, sugars and polyamines has emerged as an alternative strategy to induce capability within legume plants to manage their productivity under abiotic stresses. This book thoroughly examines these emerging strategies and serves as an important resource for researchers, academicians, scientists, and those interested in enhancing their knowledge and aiding further research. Explores the progress made in managing abiotic stress, specifically with high yield legumes Highlights the molecular

mechanisms related to acclimation Presents proven strategies and emerging approaches to guide additional research

Secondary Metabolites Ramasamy Vijayakumar 2018-09-05 This book consists of an introductory overview of secondary metabolites, which are classified into four main sections: microbial secondary metabolites, plant secondary metabolites, secondary metabolites through tissue culture technique, and regulation of secondary metabolite production. This book provides a comprehensive account on the secondary metabolites of microorganisms, plants, and the production of secondary metabolites through biotechnological approach like the plant tissue culture method. The regulatory mechanisms of secondary metabolite production in plants and the pharmaceutical and other applications of various secondary metabolites are also highlighted. This book is considered as necessary reading for microbiologists, biotechnologists, biochemists, pharmacologists, and botanists who are doing research in secondary metabolites. It should also be useful to MSc students, MPhil and PhD scholars, scientists, and faculty members of various science disciplines.

Algal Green Chemistry Rajesh Prasad Rastogi 2017-04-14 Algal Green Chemistry: Recent Progress in Biotechnology presents emerging information on green algal technology for the production of diverse chemicals, metabolites, and other products of commercial value. This book describes and emphasizes the emerging information on green algal technology, with a special emphasis on the production of diverse chemicals, metabolites, and products from algae and cyanobacteria. Topics featured in the book are exceedingly valuable for researchers and scientists in the field of algal green chemistry, with many not covered in current academic studies. It is a unique source of information for scientists, researchers, and biotechnologists who are looking for the development of new technologies in bioremediation, eco-friendly and alternative biofuels, biofertilizers, biogenic biocides, bioplastics, cosmeceuticals, sunscreens, antibiotics, anti-aging, and an array of other biotechnologically important chemicals for human life and their contiguous environment. This book is a great asset for students, researchers, and biotechnologists. Discusses high-value chemicals from algae and their industrial applications

Explores the potential of algae as a renewable source of bioenergy and biofuels Considers the potential of algae as feed and super-food Presents the role of triggers and cues to algal metabolic pathways Includes developments in the use of algae as bio-filters

Stress Responses in Plants Bhumi Nath Tripathi 2015-05-27 This collection discusses the variety of specific molecular reactions by means of which plants respond to physiological and toxic stress conditions. It focuses on the characterization of the molecular mechanisms that underlie the induction of toxicity and the triggered responses and resistances. The nine chapters, all written by prominent researchers, examine heavy metal toxicity, aluminum toxicity, arsenic toxicity, salt toxicity, drought stress, light stress, temperature stress, flood stress and UV-B stress. In addition, information on the fundamentals of stress responses and resistance mechanisms is provided. The book addresses researchers and students working in the fields of plant physiology and biochemistry.

Plant Growth-Promoting Microbes for Sustainable Biotic and Abiotic Stress Management Heba I. Mohamed 2021-05-02 Abiotic and biotic stress

factors, including drought, salinity, waterlog, temperature extremes, mineral nutrients, heavy metals, plant diseases, nematodes, viruses, and diseases, adversely affect growth as well as yield of crop plants worldwide. Plant growth-promoting microorganisms (PGPM) are receiving increasing attention from agronomists and environmentalists as candidates to develop an effective, eco-friendly, and sustainable alternative to conventional agricultural (e.g., chemical fertilizers and pesticide) and remediation (e.g., chelators-enhanced phytoremediation) methods employed to deal with climate change-induced stresses. Recent studies have shown that plant growth-promoting bacteria (PGPB), rhizobia, arbuscular mycorrhizal fungi (AMF), cyanobacteria have great potentials in the management of various agricultural and environmental problems. This book provides current research of biofertilizers and the role of microorganisms in plant health, with specific emphasis on the mitigating strategies to combat plant stresses.

Algal Adaptation to Environmental Stresses L.C. Rai 2012-12-06 Algae, generally held as the principal primary producers of aquatic systems, inhabit all conceivable habitats. They have great

ability to cope with a harsh environment, e.g. extremely high and low temperatures, suboptimal and supraoptimal light intensities, low availability of essential nutrients and other resources, and high concentrations of toxic chemicals, etc. A multitude of physiological, biochemical, and molecular strategies enable them to survive and grow in stressful habitats. This book presents a critical account of various mechanisms of stress tolerance in algae, many of which may occur in microbes and plants as well.

Stress and Environmental Regulation of Gene Expression and Adaptation in Bacteria Frans J. de Bruijn 2016-07-13 Bacteria in various habitats are subject to continuously changing environmental conditions, such as nutrient deprivation, heat and cold stress, UV radiation, oxidative stress, dessication, acid stress, nitrosative stress, cell envelope stress, heavy metal exposure, osmotic stress, and others. In order to survive, they have to respond to these conditions by adapting their physiology through sometimes drastic changes in gene expression. In addition they may adapt by changing their morphology, forming biofilms, fruiting bodies or spores, filaments, Viable But Not Culturable

(VBNC) cells or moving away from stress compounds via chemotaxis. Changes in gene expression constitute the main component of the bacterial response to stress and environmental changes, and involve a myriad of different mechanisms, including (alternative) sigma factors, bi- or tri-component regulatory systems, small non-coding RNA's, chaperones, CHRIS-Cas systems, DNA repair, toxin-antitoxin systems, the stringent response, efflux pumps, alarmones, and modulation of the cell envelope or membranes, to name a few. Many regulatory elements are conserved in different bacteria; however there are endless variations on the theme and novel elements of gene regulation in bacteria inhabiting particular environments are constantly being discovered. Especially in (pathogenic) bacteria colonizing the human body a plethora of bacterial responses to innate stresses such as pH, reactive nitrogen and oxygen species and antibiotic stress are being described. An attempt is made to not only cover model systems but give a broad overview of the stress-responsive regulatory systems in a variety of bacteria, including medically important bacteria, where elucidation of certain aspects of these systems could lead to

treatment strategies of the pathogens. Many of the regulatory systems being uncovered are specific, but there is also considerable “cross-talk” between different circuits. Stress and Environmental Regulation of Gene Expression and Adaptation in Bacteria is a comprehensive two-volume work bringing together both review and original research articles on key topics in stress and environmental control of gene expression in bacteria. Volume One contains key overview chapters, as well as content on one/two/three component regulatory systems and stress responses, sigma factors and stress responses, small non-coding RNAs and stress responses, toxin-antitoxin systems and stress responses, stringent response to stress, responses to UV irradiation, SOS and double stranded systems repair systems and stress, adaptation to both oxidative and osmotic stress, and desiccation tolerance and drought stress. Volume Two covers heat shock responses, chaperonins and stress, cold shock responses, adaptation to acid stress, nitrosative stress, and envelope stress, as well as iron homeostasis, metal resistance, quorum sensing, chemotaxis and biofilm formation, and viable but not

culturable (VBNC) cells. Covering the full breadth of current stress and environmental control of gene expression studies and expanding it towards future advances in the field, these two volumes are a one-stop reference for (non) medical molecular geneticists interested in gene regulation under stress.

Interdisciplinary Research and Training Program in the Plant Sciences 1992 Research on plants continued. Topics include: Molecular basis of symbiotic plant-microbe interations; enzymatic mechanisms and regulation of plant cell wall biosynthesis; molecular mechanisms that regulate the expression of genes in plants; resistance of plants to environmental stress; studies on hormone biosynthesis and action; plant cell wall proteins; interaction of nuclear and organelle genomes; sensor transduction in plants; molecular mechanisms of trafficking in the plant cell; regulation of lipid metabolism; molecular bases of plant disease resistance mechanisms; biochemical and molecular aspects of plant pathogenesis; developmental biology of nitrogen-fixing cyanobacteria; environmental control of plant development and its relation to plant hormones.

Stress Biology of Cyanobacteria Ashish Kumar Srivastava 2013-03-01 A significant component of many different ecosystems, cyanobacteria occupy almost every niche of the earth, including fresh and salt waters, rice fields, hot springs, arid deserts, and polar regions. Cyanobacteria, along with algae, produce nearly half the global oxygen, making assessment of their ecophysiologies important for understanding climate impacts and potential remediation. Stress Biology of Cyanobacteria: Molecular Mechanisms to Cellular Responses is a compilation of holistic responses of cyanobacteria, ranging from ecological and physiological to the modern aspects of their molecular biology, genomics, and biochemistry. Covering almost every aspect of cyanobacterial stress biology, this book is divided into two parts: Bioenergetics and Molecular Mechanisms of Stress Tolerance and Cellular Responses and Ecophysiology. The first few chapters focus on the molecular bioenergetics of photosynthesis and respiration in cyanobacteria, and provide a clear perspective on different stress tolerance mechanisms. Part I also covers the effect of specific stresses—including heavy metal, high and low temperature, salt, osmotic, and UV-B

stress—on a wide range of vital physiological, biochemical, and molecular processes of cyanobacteria. Part II describes mechanisms of symbiosis, stress-induced bioproducts, and the role of environmental factors on nitrogen fixation, which along with photosynthesis is a major contributor to the current geochemical status of the planet. The text also covers mutation and cyanobacterial adaptation, and the most widely studied cyanotoxin, microcystin, which has effects on both human and animal health. With contributions from experts around the world, representing the global importance of cyanobacteria, this book provides a broad compilation of research that deals with cyanobacterial stress responses in both controlled laboratory conditions as well as in their natural environment.

Cyanobacterial Lifestyle and its Applications in Biotechnology Prashant Kumar Singh 2021-09-30 Environmental change is affecting the world's agricultural productivity. This is coupled with an increase in population: according to the United Nations Department for Economic and Social Affairs, the global population is estimated to reach 9.7 billion by 2050. Therefore, the current

situation requires that we develop climate-smart technologies to improve crop productivity to sustain the ever-rising global population. Current-day farmers are introducing a considerable amount of agrochemicals to enhance crop productivity. Indiscriminate agrochemical application has altered not only the soil's physic-chemical and biological properties but also affected human health through food chain contamination. Cyanobacteria, under these changing environmental conditions, may help to resolve the problem significantly without changing the natural soil properties. In spite of their well-known stress tolerance potential, most of the cyanobacterial stress management and signaling pathways are yet to be fully characterized. Therefore, there is an urgent need to explore cyanobacterial metabolism under stress as well as their regulatory pathways to exploit them for sustainable agriculture. In recent decades, the application of cyanobacteria has attracted scientists because of uniqueness, better adaptability, and synthetic products. Diverse cyanobacterial communities with the ability to fix atmospheric nitrogen, together with their photosynthetic properties, have demonstrated

their application under field conditions. Several cyanobacterial species have thus been exploited to enhance soil fertility, mitigate biotic and abiotic stress, and contamination management. Cyanobacterial Lifestyle and its Applications in Biotechnology has been designed to discuss different aspects of cyanobacterial physiology with the aim of helping to provide a better understanding of advanced cyanobacterial molecular biology and their metabolism to uncover the potential of cyanobacteria in the tailoring of stress smart crops for sustainable agriculture. Chapters include valuable information about the role of cyanobacteria in the evolution of life, cyanobacterial photosynthesis, stress-tolerant cyanobacterium, biological nitrogen fixation, circadian rhythms, genetics and molecular biology of abiotic stress responses. Summarizes various aspects of cyanobacterial research. Includes comprehensive coverage of molecular approaches for the identification of cyanobacteria and their evolution. Identifies an expanding horizon of cyanobacterial lifestyle: stress management in cyanobacteria. Examines cyanobacteria synthetic biology, genetic engineering, photosynthesis and metabolic

engineering.