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

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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 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.

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

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. 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. 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 Abiotic Stress Tolerance in Plants Ashwani K. Rai 2006-01-19 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.

The Pharmacological Potential of Cyanobacteria

Graciliana Lopes 2022-02-01 The Pharmacological Potential of Cyanobacteria explores the bioactive compounds isolated from cyanobacteria and their relationship to human health and biotechnological applications. The book presents an overview of the chemistry and ecology of cyanobacteria, focusing on culture needs and techniques of biomass production. It is organized according to the different biological activities and biotechnological applications of compounds discovered in recent years. Besides biological activity, the mechanism of action of compounds is explained, along with molecular structure. Finally, compounds already used in therapeutics and biotechnology, as well as those in phases of approval or clinical trials are explored. Each chapter is written by a different research group with expertise in the field and publications in peer reviewed journals. Researchers and students in pharmaceutical academic research, pharmaceutical industrial sector personnel, health professionals, and nutritionists will find this book to be very useful. Covers all the bioactive compounds of cyanobacteria discovered thus far Includes chapters by experts in the field, covering the chemistry and mechanisms of action of cyanobacteria-bioactive compounds Provides a general overview of organisms, from biomass production to compound isolation and evaluation of bioactivities in different cell and cell-free systems 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.
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.

Peterson's Guide to Graduate Programs in the Biological Sciences 1997 Peterson's Guides Staff 1997-01-05 Graduate students depend on this series and ask for it by name. Why? For over 30 years, it's been the only one-stop source that supplies all of their information needs. The new editions of this six-volume set contain the most comprehensive information available on more than 1,500 colleges offering over 31,000 master's, doctoral, and professional-degree programs in more than 350 disciplines. New for 1997 -- Non-degree-granting research centers, institutes, and training programs that are part of a graduate degree program. Five discipline-specific volumes detail

entrance and program requirements, deadlines, costs, contacts, and special options, such as distance learning, for each program, if available. Each Guide features "The Graduate Adviser", which discusses entrance exams, financial aid, accreditation, and more. The only source that covers nearly 4,000 programs in such areas as oncology, conservation biology, pharmacology, and zoology.

Brinkman's catalogus van boeken en tijdschriften 1996 With 1901/1910-1956/1960 Repertoium is bound: Brinkman's Titel-catalohus van de gedurende 1901/1910-1956/1960 (Title varies slightly).

Nitric Oxide in Plant Biology Vijay Pratap Singh 2021-09-19 Nitric Oxide in Plant Biology: An Ancient Molecule with Emerging Roles is an extensive volume which provides a broad and detailed overview of Nitric Oxide (NO) in plant biology. The book covers the entirety of the crucial role NO plays in the plant lifecycle, from the regulation of seed germination and growth to synthesis, nitrogen fixation and stress response. Beginning with NO production and NO homeostasis, Nitric Oxide in Plant Biology goes on to cover a variety of NO roles, with a focus on NO signalling, crosstalk and stress responses. Edited by leading experts in the field and featuring the latest research from laboratories from across the globe, it is a comprehensive resource of interest to students and researchers working in plant physiology, agriculture, biotechnology, and the pharmaceutical and food

industries. Provides a broad and detailed overview on NO in plant biology, including NO production, NO signaling, NO homeostasis, crosstalk and stress responses Edited by leading experts in the field Features the latest research from laboratories from across the globe

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.
Hydrogen Sulfide in Plant Biology Samiksha Singh 2021-06-12 Hydrogen Sulfide in Plant Biology: Past and Present includes 17 chapters, with topics from cross-talk and lateral root development under stress, to post-translational modifications and disease resistance. With emerging research on the different roles and applications of H2S, this title compiles the latest advances of this key signaling molecule. The development of a plant requires complex signaling of various molecules like H2S in order to achieve regulated and proper development, hence hydrogen sulfide (H2S) has emerged as an important signaling molecule that regulates nearly each and every stage of a plant's lifecycle. Edited by leading experts in the field, this is a must-read for scientists and researchers interested in plant physiology, biochemistry and ecology. Discusses the emerging roles of H2S in plant biology Presents the latest research from leading laboratories across the globe Edited by a team of experts in plant signaling
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.

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.

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.

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
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.?
Molecular Mechanisms Underlying Acclimation Responses of Cyanobacteria to Nutrient Stress Eleonora Sendersky 2008
Advances in Cyanobacterial Biology Prashant Kumar Singh 2020-02-15 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
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.
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

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

Response of Cyanobacteria to Pesticides: A Biochemical and Molecular Approach Prof. Dr. Nirmal Kumar, J.I. Cyanobacteria 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. 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. 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. 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. 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 cyanobacteria, the authors have presented an in-depth investigation in the book Response of Cyanobacteria to Pesticides: A Biochemical and Molecular Approach to explore the effect of administered doses of pesticides (Endosulfan and Tebuconazole) on three different cyanobacterial species (Anabaena fertilissima Rao, Aulosira fertilissima Ghose, Westiellopsis prolifica Janet), morphological changes such as color of the cells, cell shape and heterocyst frequency, variations in pigment contents like chlorophyll a, total carotenoids, phycobilin pigments (phycocyanin, phycoerythrin, allophycocyanin), response of metabolites like carbohydrates, amino acids, proteins, phenols, activity of enzymes like nitrate reductase, glutamine synthatase and succinate dehydrogenase, protein profiling by Soduim Dodecyl Sulfate - Polyacrylamide Gel Electrophoresis (SDS-PAGE), genomic DNA profiling by Random Amplified Polymorphic DNA (RAPD-PCR), and molecular characterization by 16S rDNA amplification of all three cyanobacterial species. This book would certainly be helpful to students, faculties, researchers, academicians, and molecular

biologists in enhancing the knowledge about pesticide toxicology, biochemical response, and molecular aspects of cyanobacteria at microcosm as well as macrocosm scales.

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.

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
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.
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.
Concepts in Photobiology G.S. Singhal 2012-12-06 Photobiology is an important area of biological research since a very large number of living processes are either dependent on or governed by light that we receive from the Sun. Among various subjects, photosynthesis is one of the most important, and thus a popular topic in both molecular and organismic biology, and one which has made a considerable impact throughout the world since almost all life on Earth depends upon it as a source of food, fuel and oxygen. However, for growth of plants, light is equally essential, and research on photomorphogenesis has revealed exciting new developments with the application of newer molecular biological approaches.

The present book brings together and integrates various aspects of photosynthesis, biology of pigments, light regulation of chloroplast development, nuclear and chloroplast gene expression, light signal transduction, other photomorphogenetic processes and some photoecological aspects under one cover. The chapters cover biochemical and molecular discussions of most of the above topics in a comprehensive manner and include a wide range of `hot topics' that are currently under investigation in the field of photobiology of cyanobacteria, algae and plants. The authors of this book are selected international authorities in their fields from USA, Europe, Australia and Asia. The book is designed primarily to be used as a text book by graduates and post-graduates. It is, however, also intended to be a resource book for new researchers in plant photobiology. Several introductory chapters are designed as suitable reading for undergraduate courses in integrative and molecular biology, biochemistry and biophysics.

Expanding Horizon of Cyanobacterial Biology Prashant Kumar Singh 2022-07-01 Expanding Horizon of Cyanobacterial Biology discusses the different aspects of cyanobacteria cyanobacterial application, providing a better understanding of cyanobacterial metabolism. Chapters deal with cyanobacteria applications and explore how to exploit cyanobacterial metabolism for industrial applications. Sections cover cyanobacterial

applications for the production of nanoparticles, cyanobacterial diversity, and the characterization of different assemblages such as cyanolichens and cyanobacterial endophytes, along with their ecological, morphological and physiological aspects. In addition, bioactive compounds and their applications are explored. Increasing attention has been paid by scientists across the globe to Cyanobacteria as they are ubiquitous microbes and, undoubtedly, an important organism in terms of carbon as well as nitrogen fixation. However, the research on these organisms is limited in terms of their diversity and distribution across the globe. Provides background knowledge for researchers concerned with cyanobacterial diversity and characterization of different assemblages Describes the exploitation possibility of cyanobacterial species for human welfare Discusses the different aspects of cyanobacteria, cyanobacterial application and better understanding of cyanobacterial metabolism Deals with the exploitation of cyanobacteria and their mats for bioremediation purposes Includes cyanobacterial nanotechnology and its applications in industry and allied sectors
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.

Proteomic and Metabolomic Analysis of the Effects of UV-A Radiation on the Cyanobacterium Nostoc Punctiforme ATCC 29133

Nishikant V. Wase 2010 Over the last two decades, thinning of the ozone layer has raised serious concerns throughout the world, since it allows penetration of harmful ultraviolet radiation (UV-R) onto the Earth. Ultraviolet radiation (UV-R, 280-400 nm) has both direct and indirect effects on living organism. Both UV-A and UV-B have deleterious effect on living organisms. Numerous studies were undertaken in the past that have attempted to elucidate the biological effect of UV-B on photosynthetic organisms such as higher plants and microbes such as green algae and cyanobacteria, but there is only very limited knowledge about the effect of UV-A radiation on photosynthetic organisms. In the context of climate change and ozone depletion, it is clearly beneficial to understand the physiological and underlying molecular mechanism of UV-A response of cyanobacteria. This thesis primarily serves to generate understanding of response of cyanobacterium at the proteome and metabolome level in response to UV-A radiation. During this PhD project, a cyanobacterium was selected as an organism of choice because it has a geological past that can traced back to the Precambrian era, long before the production of the present ozone layer. Because of their geological past, cyanobacteria were thought to be well equipped in sustaining UV-R. In the present study, the filamentous cyanobacterium Nostoc punctiforme ATCC 29133 was used as a model organism to understand the effect of UV-A radiation on

the physiology and the underlying molecular response. In order to assess the effects that environmental UV-A perturbation has on regulatory networks and pathways of N. punctiforme, a quantitative proteomics investigation was performed using soluble proteome sample. A total of 572 unique proteins were found in both studies constituting 8.41 % of the total proteome. Effect of short-term exposure (4h, 12h, 24h) and long-term exposure (20 days) was elucidated with the recent and powerful mass spectrometry based approach using iTRAQ (isobaric tag for relative and absolute quantification) methodology. Approximately, 32 and 61 proteins were found significantly changed in abundance during short-term and long-term exposure respectively. Abundance of some of the metabolically important proteins (13) were assessed using pSRM (pseudo selected reaction monitoring) and a strong correlation with the iTRAQ dataset was observed. Further, using HPLC, it was observed that UV-A has strong effect on photosynthetic accessory pigments (UV-A treatment period 4, 8, 12, 24 hours, 3, 5, and 7 days). An initial increase in carotenoids, ~-carotene, astaxanthin, and zeaxanthin was observed which later on decreased. An induction of scytonemin production during an acclimatization phase (4 hrs) was also observed. Using GC-MS, 62 compounds of known chemical structures were identified. Statistically significant elevated levels of glycine, alanine, tyrosine, proline, malate and succinic acid was observed

(treatment interval periods 1, 3, 5, 7, 9, and 11 days), indicating a possible role of these metabolites during UV-A stress. Under prolonged exposure, UV-A not only substantially retarded the growth of N. punctiforme but a lowered abundance of photosynthetic apparatus and phycobilisomes was also observed. A number of targets (3 proteins) that are believed to have a strong role in the UV-sensing and signal transduction were also identified. Additionally, it was observed that long-term exposure causes the induction of increased protein scaffolding, redox rebalancing, and DNA repairing. In contrast, short-term exposure causes an immediate response from both the primary photosynthetic machineries, and also the secondary pigmentation apparatus. Additiona"y increased abundance of heat shock proteins was observed in both short-term and long-term treatment condition. Fina"y, a comparison of iTRAQ and pSRM data reaffirms the caveat regarding underestimation of quantitative measurements using iTRAQ. As a thesis closure, a comprehensive proteomics and metabolomics characterization of effect of UV-A stress in a model cyanobacterium N. puncfiforme ATCC 29133 is presented. The compilations of established analytical tools used to infer both qualitative and quantitative biological observations can also be adapted to other systems. Suggestions for future work are made.

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.

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

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Journal of Molecular Microbiology and Biotechnology 1999

Lipids in Cyanobacteria, Algae, and Plants - From Biology to Biotechnology Eric Marechal 2022-02-17

Plant Metabolites and Regulation under Environmental Stress Parvaiz Ahmad 2018-03-19 Plant Metabolites

and Regulation Under Environmental Stress presents the latest research on both primary and secondary metabolites. The book sheds light on the metabolic pathways of primary and secondary metabolites, the role of these metabolites in plants, and the environmental impact on the regulation of these metabolites. Users will find a comprehensive, practical reference that aids researchers in their understanding of the role of plant metabolites in stress tolerance. Highlights new advances in the understanding of plant metabolism Features 17 protocols and methods for analysis of important plant secondary metabolites Includes sections on environmental adaptations and plant metabolites, plant metabolites and breeding, plant microbiome and metabolites, and plant metabolism under non-stress conditions