

Influence Of Nanoparticles On Seed Germination And

This advanced textbook explores the intriguing flora and plant ecology of the Middle East, framed by a changing desert landscape, global climate change, and the arc of human history. This vast region has been largely under-recognized, under-studied, and certainly under-published, due in part to the challenges posed to research by political disputes and human conflict, and a treatise on the subject is now timely. The book integrates Middle Eastern plant geography and its major drivers (geo-tectonics, seed and fruit dispersal, plant functional types, etc.) with the principles of plant ecology. The authors include the many specialized adaptations to desert and dryland ecosystems including succulence, water-conserving photosynthesis, and a remarkable range of other life history strategies. They explore the formation of 'climate relicts', and describe the long history of domestication in the region together with the many reciprocal effects of agriculture on plant ecology. The book concludes by discussing conservation in the region, highlighting five regional biodiversity hotspots where the challenges of desertification, habitat loss, and other threats to plant biodiversity are particularly acute. Plant Ecology in the Middle East is a timely synthesis of the field, setting a new baseline for future research. It will be important reading for both undergraduate and graduate students taking courses in plant ecology, evolution, systematics, biodiversity, and conservation, and will also be of interest and use to a professional audience of botanists, conservation biologists, and practitioners working in dryland ecosystems.

Nanomaterials in Plants, Algae and Microorganisms: Concepts and Controversies: Volume One discusses the vast amount of nanomaterials that have been released into the environment in a relatively short amount of time. There is a need to understand what the implications to the health of our biota and ecosystems are as the earth is increasingly inundated with these materials. Not all of the effects are negative, but their impacts are increasing exponentially due to their size, quantity and other factors. Covers the issues of nanoparticles on more simple organisms and their ecosystems Presents issues that are specific to terrestrial ecosystems Contains contributions from global experts who help increase understanding at the physiological, biochemical, molecular, and even genomic and proteomic levels Provides a critical assessment of the progress taking place on this topic and sheds light on future research needs Refinement in sequencing technologies and potential of genomic research resulted in meteoric growth of biological information such as sequences of DNA, RNA and protein requiring databases for efficient storage, management and retrieval of the biological information. Also, computational algorithms for analysis of these colossal data became a vital aspect of biological sciences. The work aims to show the process of turning bioscience innovation into companies and products, covering the basic science, the translation of science into technology. Due to rapid developments, there seems to be no basic difference between the pharmaceutical industry and the biotechnological industry. However, approved products in the pipeline and renewed public confidence make it one of the most promising areas of economic growth in the near future. India offers a huge market for the products as well as cheap manufacturing base for export. The book is a sincere work of compilation of new and recent advances in the topic of concern through various innovative researches and scientific opinion therefrom. The book is dedicated to the readers who will definitely find it interesting and knowledgeable in carrying out their respective researches in different aspects of applied microbiology and biotechnology.

Updated to reflect changes in the industry during the last ten years, The Handbook of Food Analysis, Third Edition covers the new analysis systems, optimization of existing techniques, and automation and miniaturization methods. Under the editorial guidance of food science pioneer Leo M.L. Nollet and new editor Fidel Toldra, the chapters take an in

Plant Biotechnology

Recent Interventions, and Physiological and Biochemical Responses

4th International Conference on Nanotechnologies and Biomedical Engineering

Influence of Seed Treatment with Nanoparticles on Morpho Physiological and Biochemical Changes in Groundnut

Nano-enabled Agrochemicals in Agriculture

Plant Biotechnology: Progress in Genomic Era

This book summarises various aspects of plant biotechnology and is divided into 27 chapters. This edition discusses: plant cell culture and development, plant tissue culture, micropropagation, germplasm storage, haploid plants, triploid plants, in vitro pollination and fertilisation, protoplast isolation and culture, somatic cell hybridisation, synthetic seeds, plant breeding, plant derived vaccines, genetically modified foods, improving photosynthesis and crop yield, insect resistant plants, fungus resistant plants, virus resistant plants, ornamental plants, medicinal plants, recombinant DNA, molecular markers, intellectual property rights. Chapters on nanotechnology for micronutrients in soil-plant systems are a unique feature of the book. Pollutants are increasing day by day in the environment due to human interference. Thus, it has become necessary to find solutions to clean up these hazardous pollutants to improve human, animal, and plant health. Microbial Biotechnology in Environmental Monitoring and Cleanup is a critical scholarly resource that examines the toxic hazardous substances and their impact on the environment. Featuring coverage on a broad range of topics such as pollution of microorganisms, phytoremediation, and bioremediation, this book is geared towards academics, professionals, graduate students, and practitioners interested in emerging techniques for environmental decontamination.

This book highlights the implications of nanotechnology and the effects of nanoparticles on agricultural systems, their interactions with plants as well as their potential applications as fertilizers and pesticides. It also discusses how innovative, eco-friendly approaches to improve food and agricultural systems lead to increased plant productivity. Further, it offers insights into the current trends and future prospects of nanotechnology along with the benefits and risks and their impact on agricultural ecosystems. Nanomaterials in agriculture reduce the amount of chemical products sprayed by means of smart delivery of active ingredients; minimize nutrient losses in fertilization; and increase yields through optimized water and nutrient management. There is also huge potential for nanotechnology in the provision of state-of-the-art solutions

for various challenges faced by agriculture and society, both today and in the future.

Nanoscience and Plant–Soil Systems Springer

Inorganic Nanopesticides and Nanofertilizers

Nanomaterials and Plant Potential

Biogenic Nano-Particles and their Use in Agro-ecosystems

Principles and Practices

Toxicity of Nanoparticles in Plants

Nanoparticles and Their Impact on Plants

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

This book assesses the current challenges and opportunities for the next generation of agriculture and food science.

Examining the role of nanotechnology and the application of related tools and techniques to transform the future of food, it also discusses in detail nanotechnology in food production, processing and packaging, as well as the benefits of and concerns regarding nanofoods (nanotoxicity and food forensics). Considering the potential of IoT to revolutionize agriculture and the food industry by radically reducing costs and improving productivity and profits, the book highlights the necessity of integrating IoT and nanotechnology into the next generation of agriculture and food science. Further, it presents a detailed analysis of IoNT implementation, together with the goals that have to be met in order to achieve significant improvements in the agri-food sector. In addition it explores a range of challenges, risks, and concerns that have a direct or indirect impact on nanotechnology and IoNT implementation in agriculture and the food industry. In closing, it discusses the use of green nanotechnology and green IoNT in order to create smart, safe, and sustainable agriculture and healthy food.

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Agriculture has been an enduring human tradition key to survival and civilization. However, after the advent of industrialization and agricultural growth, the industry has been met with several challenges including pollution, land use, and food insecurity. With the agricultural industry contributing to pollution and emissions, many have found it imperative to investigate the causes and seek out solutions. The Research Anthology on Strategies for Achieving Agricultural Sustainability discusses the issues that the agricultural industry currently faces and the technological opportunities that can be explored to help protect and predict crop growth and achieve more resilient agricultural processes. It analyzes the impact of agricultural pollution and food insecurity on a global scale, but also proposes solutions to promote agricultural sustainability. Covering topics such as bio-farming, smart farming, and population growth, this book is an indispensable resource for government officials, agricultural scientists, farmers, students and professors of higher education, activist groups, researchers, and academicians.

Nanofood and Internet of Nano Things

XIII Narochanski Readings

Plant Responses to Nanomaterials

A View from the Mechanisms of Action to Field Applications

Role of Chitosan and Chitosan-Based Nanomaterials in Plant Sciences

Fruit Crops

This book gathers the proceedings of the 4th International Conference on Nanotechnologies and

Biomedical Engineering, held on September 18-21, 2019, in Chisinau, Republic of Moldova. It continues the tradition of the previous conference proceedings, thus reporting on both fundamental and applied research at the interface between nanotechnologies and biomedical engineering. Topics include: developments in bio-micro/nanotechnologies and devices; biomedical signal processing; biomedical imaging; biomaterials for biomedical applications; biomimetics; bioinformatics and e-health, and advances in a number of related areas. The book offers a timely snapshot of cutting-edge, multidisciplinary research and developments in the field of biomedical and nano-engineering.

Nano-Materials as Photocatalysts for Degradation of Environmental Pollutants: Challenges and Possibilities contains both practical and theoretical aspects of environmental management using the processes of photodegradation and various heterogeneous catalysts. The book's main focus is on the degradation of harmful pollutants, such as petrochemicals, crude oils, dyes, xenobiotic pharmaceutical waste, endocrine disrupting compounds, and other common pollutants. Chapters incorporate both theoretical and practical aspects. This book is useful for undergraduate or university students, teachers and researchers, especially those working in areas of photocatalysis through heterogeneous catalysts. The primary audience for this book includes Chemical Engineers, Environmental Engineers and scientists, scholars working on the management of hazardous waste, scientists working in fields of materials science, and Civil Engineers working on wastewater treatment. Reviews recent trends in the photodegradation of organic pollutants Offers a bibliometric analysis of photocatalysis for environmental abatement Includes many degradation mechanisms of organic pollutants using various catalysts Includes examples on the degradation of organic pollutants from various sources, e.g., pharmaceuticals, dyes, pesticides, etc. Discusses the effect of nanocatalysts on soil, plants and the ecosystem

Nanotechnology has shown great potential in all spheres of life. With the increasing pressure to meet the food demands of rapidly increasing population, thus, novel innovation and research are required in agriculture. The principles of nanotechnology can be implemented to meet the challenges faced by agricultural demands. Major challenges include the loss of nutrients in the soil and nutrient-deficient plants, which result in a lower crop yield and quality. Subsequently, consumption of such crops leads to malnourishment in humans, especially in underprivileged and rural populations. One convenient approach to tackle nutrient deficiency in plants is via the use of fertilizers; however, this method suffers from lower uptake efficiency in plants. Another approach to combat nutrient deficiency in humans is via the use of supplements and diet modifications; however, these approaches are less affordably viable in economically challenged communities and in rural areas. Therefore, the use of nano-fertilizers to combat this problem holds the greatest potential. Additionally, nanotechnology can be used to meet other challenges in agriculture including enhancing crop yield, protection from insect pests and animals, and by use of nano-pesticides and nano-biosensors to carry out the remediation of polluted soils. The future use of nanomaterials in soil ecosystems will be influenced by their capability to interact with soil constituents and the route of nanoparticles into the environment includes both natural and anthropogenic sources. The last decade has provided increasing research on the impact and use of nanoparticles in plants, animals, microbes, and soils, and yet these studies often lacked data involving the impact of nanoparticles on biotic and abiotic stress factors. This book provides significant recent research on the use of nano-fertilizers, which can have a major impact on components of an ecosystem. This work should provide a basis to further study these potential key areas in order to achieve sustainable and safe application of nanoparticles in agriculture.

Nano-enabled Agrochemicals in Agriculture presents a targeted overview of the safe implementation of nanotechnologies within horticultural and agricultural settings with the purpose of achieving enhanced production while maintaining ecological integrity. The growing global request for agricultural crops/products requires high standards of quality and safety, which has stimulated the search for new technologies that preserve their quality and delay their decomposition. It includes sections on the use of nano-chemicals in insect pest management, as nano-fungicides, nano-herbicides, micro-nutrient supply, and nano-sensors to monitor crop/soil health conditions. This book will be of interest to a wide range of plant scientists who have concerns about nanomaterial interactions with terrestrial and aquatic plants. Focuses on emerging important topics related to nanotechnology and nanomaterials on agricultural systems Emphasizes new applications of nanomaterials in the agricultural sciences, from fertilizers to irrigation systems Addresses concerns about nanomaterial interactions with terrestrial and aquatic plants

Concepts and Controversies:

An Evaluation of Cyto/Morpho-physiological, Biochemical and Molecular Responses From Synthesis to Application

Challenges and Possibilities

Advances in Nanotechnology Research and Application: 2012 Edition

Nanomaterial Biointeractions at the Cellular, Organismal and System Levels

This book provides relevant findings on nanoparticles' toxicity, their uptake, translocation and mechanisms of interaction with plants at cellular and sub-cellular level. The small size and large specific surface area of nanoparticles endow them with high chemical reactivity and

intrinsic toxicity. Such unique physicochemical properties draw global attention of scientists to study potential risks and adverse effects of nanoparticles in the environment. Their toxicity has pronounced effects and consequences for plants and ultimately the whole ecosystem. Plants growing in nanomaterials-polluted sites may exhibit altered metabolism, growth reduction, and lower biomass production. Nanoparticles can adhere to plant roots and exert physicochemical toxicity and subsequently cell death in plants. On the other hand, plants have developed various defense mechanisms against this induced toxicity. This book discusses recent findings as well as several unresolved issues and challenges regarding the interaction and biological effects of nanoparticles. Only detailed studies of these processes and mechanisms will allow researchers to understand the complex plant-nanomaterial interactions.

This book explores various nanotechnology applications and their effect on the food industry, innovation and environmental issues. Nanotechnology has had a major impact on the food industry and the environment in recent years - it has increased the nutritional and functional properties of a number of food products, food packaging, food quality, crop protection, plant nutrient management and aided the food industry through the introduction of food diagnostics. This book presents a holistic view of the complex and dynamic responses of plants to nanoparticles, the signal transduction mechanisms involved, and the regulation of gene expression. Further, it addresses the phytosynthesis of nanoparticles, the role of nanoparticles in the antioxidant systems of plants and agriculture, the beneficial and harmful effects of nanoparticles on plants, and the application of nanoparticles and nanotubes to mass spectrometry, aiming ultimately at an analysis of the metabolomics of plants. The growing numbers of inventions in the field of nanotechnology are producing novel applications in the fields of biotechnology and agriculture. Nanoparticles have received much attention because of the unique physico-chemical properties of these compounds. In the life sciences, nanoparticles are used as "smart" delivery systems, prompting the Nobel Prize winner P. Ehrlich to refer to these compounds as "magic bullets." Nanoparticles also play an important role in agriculture as compound fertilizers and nano-pesticides, acting as chemical delivery agents that target molecules to specific cellular organelles in plants. The influence of nanoparticles on plant growth and development, however, remains to be investigated. Lastly, this book reveals the research gaps that must be bridged in the years to come in order to achieve larger goals concerning the applications of nanotechnology in the plants sciences. In the 21st century, nanotechnology has become a rapidly emerging branch of science. In the world of physical sciences, nanotechnological tools have been exploited for a broad range of applications. In recent years, nanoparticles have also proven useful in several branches of the life sciences. In particular, nanotechnology has been employed in drug delivery and related applications in medicine.

The population of the world continues to increase at an alarming rate. The trouble linked with overpopulation ranges from food and water scarcity to inadequacy of space for organisms. Overpopulation is also linked with several other demographic hazards, for instance, population blooming will not only result in exhaustion of natural repositories, but it will also induce intense pressure on the world economy. Today nanotechnology is often discussed as a key discipline of research but it has positive and negative aspects. Also, due to industrialization and ever-increasing population, nano-pollution has been an emerging topic among scientists for investigation and debate. Nanotechnology measures any substance on a macromolecular scale, molecular scale, and even atomic scale. More importantly, nanotechnology deals with the manipulation and control of any matter at the dimension of a single nanometer. Nanotechnology and nanoparticles (NPs) play important roles in sustainable development and environmental challenges as well. NPs possess both harmful and beneficial effects on the environment and its harboring components, such as microbes, plants, and humans. There are many beneficial impacts exerted by nanoparticles, however, including their role in the management of waste water and soil treatment, cosmetics, food packaging, agriculture, biomedicines, pharmaceuticals, renewable energies, and environmental remedies. Conversely, NPs also show some toxic effects on microbes, plants, as well as human beings. It has been reported that use of nanotechnological products leads to the more accumulation of NPs in soil and aquatic ecosystems, which may be detrimental for living organisms. Further, toxic effects of NPs on microbes, invertebrates, and aquatic organisms including algae, has been measured. Scientists have also reported on the negative impact of NPs on plants by discussing the delivery of NPs in plants. Additionally, scientists have also showed that NPs interact with plant cells, which results in alterations in growth, biological function, gene expression, and development. Thus, there has been much investigated and reported on NPs and plant interactions in the last decade. This book discusses the most recent work on NPs and plant interaction, which should be useful for scientists working in nanotechnology across a wide variety of disciplines.

Research Anthology on Strategies for Achieving Agricultural Sustainability

Nanotechnology in Plant Growth Promotion and Protection

Nanotechnology for Agriculture: Crop Production & Protection

Nanoscience and Plant-Soil Systems

Microbial Biotechnology in Environmental Monitoring and Cleanup

Plant Proteomic Research 3.0

Miniaturized Analytical Devices An in-depth overview of integrating functionalized nanomaterials with mass spectrometry, spectroscopy, electrophoresis, and other important analytical techniques *Miniaturized Analytical Devices: Materials and Technology* is an up-to-date resource exploring the analytical applications of miniaturized technology in areas such as clinical microbiology, pharmaceuticals, agriculture, and environmental analysis. The book covers the integration of functional nanomaterials in mass spectrometry, microscopy, electrophoresis, and more—providing the state-of-the-art information required for successfully implementing a range of chemical analysis techniques on microchips. Featuring contributions from a panel of international experts in the field, the book begins with an introduction to selected miniaturized devices, nanomaterials, and analytical methods. Subsequent sections describe functionalized nanomaterials (FNMs) for miniaturized devices and discuss techniques such as miniaturized mass spectrometry for bioassays and miniaturized microscopy for cell imaging. The book concludes by exploring a variety of applications of miniaturized devices in areas including metal analysis, bioimaging, DNA separation and analysis, molecular biology, and more. This timely volume: Surveys the current state of the field and provides a starting point for developing faster, more reliable, and more selective analytical devices Focuses on the practical applications of miniaturized analytical devices in materials science, clinical microbiology, the pharmaceutical industry, and environmental analysis Covers a wide range of materials and analytical techniques such as microvolume UV-VIS spectroscopy, microchip and capillary electrophoresis, and matrix assisted laser desorption ionization-mass spectrometry (MALDI-MS) analysis Discusses the role of miniaturized analytical devices in securing a green and sustainable future *Miniaturized Analytical Devices: Materials and Technology* is essential reading for analytical chemists, analytical laboratories, materials scientists, biologists, life scientists, and advanced students in related fields.

Toxicity of Nanoparticles in Plants: An Evaluation of Cyto/Morpho-physiological, Biochemical and Molecular Responses, Volume Five in the *Nanomaterial-Plant Interactions* series, reviews the latest research on toxicological effects of using nanotechnology in plants. Key themes include analyzing plant exposure to nanomaterials, mechanisms of toxicity of nanoparticles to plants, and effects, uptake and translocation of various different nanoparticles. This will be an essential read for any scientist or researcher looking to assess and understand the potential toxicological risks associated with plant nanotechnology. To date, nanotechnology is considered one of the most promising areas of research due to the widespread applications of nanomaterials in plant science and agriculture. However, extensive use of nano-based products raises concerns regarding their toxicity in crop plants, their environmental impact and potential consequences to humans via the food chain. Discusses environmental concerns raised by the extensive use of nanotechnology Highlights the impact of plants treated with nanoparticles on nutritional status Reviews major challenges for assessing the toxicity of nanomaterials in plants

Nanotoxicity: Prevention, and Antibacterial Applications of Nanomaterials focuses on the fundamental concepts for cytotoxicity and genotoxicity of nanomaterials. It sheds more light on the underlying phenomena and fundamental mechanisms through which nanomaterials interact with organisms and physiological media. The book provides good guidance for toxic prevention methods and management in the manufacture/application/disposal. The book also discusses the potential applications of nanomaterials-based antibiotics. The potential toxic effects of nanomaterials result not only from the type of base materials, but also from their size/ligands/surface chemical modifications. This book discusses why different classes of nanomaterials display toxic properties, and what can be done to mitigate this toxicity. It also explores how nanomaterials are being used as antimicrobial agents, being used to purify air and water, and counteract a range of infectious diseases. This is an important reference for materials scientists, environmental scientists and biomedical scientists, who are seeking to gain a greater understanding of how nanomaterials can be used to combat toxic agents, and how the toxicity of nanomaterials themselves can best be mitigated. Explains the underlying phenomena and fundamental mechanisms through which nanomaterials interact with organisms and physiological media Outlines major methods for mitigating and prevention of nanotoxicity Discusses the applications of nanomaterials-based antibiotics

Several nano-scale devices have emerged that are capable of analysing plant diseases, nutrient deficiencies and any other ailments that may affect food security in agro-ecosystems. It has been envisioned that smart delivery systems can be developed and utilised for better management of agricultural ecosystems. These systems could exhibit beneficial, multi-functional characteristics, which could be used to assess and also control habitat-imposed stresses to crops. Nanoparticle-mediated smart delivery systems can control the delivery of nutrients or bioactive and/or pesticide molecules in plants. It has been suggested that nano-particles in plants might help determine their nutrient status and could also be used as cures in agro-ecosystems. Further, to enhance soil and crop productivity, nanotechnology has been used to create and deliver nano fertilizers, which can be defined as nano-particles that directly help supply nutrients for plant growth and soil productivity. Nano-particles can be absorbed onto clay networks, leading to improved soil health and more efficient nutrient use by crops. Additionally, fertilizer particles can be coated with nano-particles that facilitate slow and steady release of nutrients, reducing loss of nutrients and enhancing their efficiency in agri-crops. Although the use of nanotechnology in agro-ecosystems is still in its early stages and needs to be developed further, nano-particle-mediated delivery systems are promising solutions for the successful management of agri-ecosystems. In this context, the book offers insights into nanotechnology in agro-ecosystems with reference to biogenic nanoparticles. It highlights the: • occurrence and diversity of Biogenic Nanoparticles • mechanistic approach involved in the synthesis of biogenic nanoparticles • synthesis of nanoparticles using photo-activation, and their fate in the soil ecosystem • potential applications of nanoparticles in agricultural systems • application and biogenic synthesis of gold nanoparticles and their characterization • impact of biogenic nanoparticles on biotic stress to plants • mechanistic approaches involved in the antimicrobial effects and cytotoxicity of biogenic nanoparticles • role of biogenic nanoparticles in plant diseases management • relevance of biological synthesized nanoparticles in the longevity of agricultural crops • design and synthesis of nano-biosensors for monitoring pollutants in water, soil and plant systems • applications of nanotechnology in agriculture with special refer to soil, water and plant sciences A useful resource for postgraduate and research students in the field of plant and agricultural sciences, it is also of interest to researchers working in nano and biotechnology.

Miniaturized Analytical Devices

Plant Ecology in the Middle East

Modern Agriculture for a Sustainable Future

The Role of Nanoparticles in Plant Nutrition under Soil Pollution

Nanoscience in Nutrient Use Efficiency

Advances in Phytonanotechnology: From Synthesis to Application guides readers through various applications of nanomaterials on plants by presenting the latest research related to

nanotechnology and nanomaterials on plant systems. The book focuses on the effects of these applications on plant morphology, physiology, biochemistry, ecology and genetics. Sections cover the impact on plant yield, techniques, a review of positive and negative impacts, and an overview of current policies regarding the use of nanotechnology on plants. Additionally, the book offers insights into the appropriate application of nanoscience to plants and crops for improved outcome and an exploration of their bioavailability and toxicity in the environment. Discusses the morphological, physiological and biochemical responses of plants to nanomaterials and the ability of the nanomaterials in modifying the genetic constitution of plants Emphasizes new applications of nanomaterials, including nanosensors technology and nanomaterials as nanocarriers based antimicrobial phytochemicals Presents the role of nanotechnology as a novel technique for the remediation of heavy metals by plants

This book highlights the implications of nanotechnology in plant sciences, particularly its potential to improve food and agricultural systems, through innovative, eco-friendly approaches, and as a result to increase plant productivity. Topics include various aspects of nanomaterials: biophysical and biochemical properties; methods of treatment, detection and quantification; methods of quantifying the uptake of nanomaterials and their translocation and accumulation in plants. In addition, the effects on plant growth and development, the role of nanoparticles in changes in gene and protein expression, and delivery of genetic materials for genetic improvement are discussed. It also explores how nanotechnology can improve plant protection and plant nutrition, and addresses concerns about using nanoparticles and their compliances. This book provides a comprehensive overview of the application potential of nanoparticles in plant science and serves as a valuable resource for students, teachers, researchers and professionals working on nanotechnology.

The Special Issue "Plant Proteomics 3.0" was conceived in an attempt to address the recent advancements in as well as limitations of current proteomic techniques and their diverse applications to attain new insights into plant molecular responses to various biotic and abiotic stressors and the molecular bases of other processes. Proteomics' focus is also related to translational purposes, including food traceability and allergen detection. In addition, bioinformatic techniques are needed for more confident identification, quantitation, data analysis and networking, especially with non-model or orphan plants, including medicinal and meditational plants as well as forest tree species. This Special Issue contains 23 articles, including four reviews and 19 original papers.

Role of Chitosan and Chitosan-Based Nanomaterials in Plant Sciences explores the physiological, morphological, biochemical and molecular regulation of chitosan and chitosan-based nanoparticles in plants in normal conditions, as well as during different stresses, and their probable mechanism of operation in the tolerance mechanism. The book stimulates further research in the field of chitosan and will foster further interests for researchers, academicians and scientists worldwide. Nanotechnology is being used widely in all disciplines of science and technology, including plant sciences. Chitosan has widely been reported as a beneficial organic compound for the growth and developments of plants and it plays a protective role for the plants against abiotic and biotic stresses. Yet there are very few books available that deal exclusively with Chitosan and Chitosan based nanoparticles impacts on plants respectively. Analyzes the research on chitosan and chitosan-based nanomaterials in plant sciences Includes the latest information on toxicity and human exposure Reviews modifications and alterations in plant expressions and biochemical pathways

Recent Advances and Impacts

Plant Nanotechnology

Advances in Phytonanotechnology

Intelligent Biotechnologies of Natural and Synthetic Biologically Active Substances

Phytotoxicity of Nanoparticles

For the Next Generation of Agriculture and Food Sciences

Nanobiotechnology in agriculture is a new knowledge area that offers novel possibilities to achieve high productivity manageable costs during the production and merchandising of crops. This book shows us how we can use the current knowledge about agriculture, nanotechnology, and biotechnology to increase the agricultural productivity and shape a sustainable future in order to increase the social welfare in rural areas and preserve the environmental health. Several countries will provide their feedback on a range of relevant topics such as environment-friendly use of nanodevices, nano-food packaging, nanocoating and nanocarriers and their relationship with the modern agriculture. The range of nanomaterial applications has expanded recently from catalysis, electronics, and filtration to therapeutic diagnostics, agriculture, and food because of unique properties and potentials of different nanoparticles and nanomaterials. Research shows that these exquisite particles can interact with an organism at the cellular, physiological, biochemical and molecular levels. However, our knowledge of how they affect these changes, selectively or generally, in diverse organisms and ecosystems is very limited and far from satisfactory. Data indicate that the biological function largely depends on the size and surface characteristics of the nanoparticles used besides life cycle stages of an organism. Therefore, this book focuses on the body of work carried out by distinguished investigators using diverse nanomaterials and plant and animal systems. This book includes specific case studies as well as general review articles highlighting aspects of multilayered interactions with various targets not only research and academic scholars but also the concerned industry and policy makers as well.

Environmental nanotechnology is considered to play a key role in shaping of current environmental engineering and practices. This book titled "Environmental Nanotechnology" covers the advanced materials, devices, and system development in the environmental protection. The development of nano-based materials, understanding their chemistry and characterization using techniques like X-Ray diffraction, FT-IR, EDX, scanning electron microscope (SEM), transmission electron microscope (TEM), high resolution-TEM, etc is included. It also highlights the scope for their applications in environmental protection, environmental remediation and environmental biosensors for detection, monitoring and assessment. Key Features: Covers basic to advanced Nano-based materials, their synthesis, development, characterization and applications and all the updated information related to environmental nanotechnology. Discusses implications of nanomaterials in the environment and applications of nanotechnology to protect the environment. Illustrates specific topics such as environmental nanotechnology development, Nano-biotechnology, and application in wastewater technology. Includes applications of nanomaterials for combating global climate change and carbon sequestration. Gives examples of field applications of environmental nanotechnology. This book covers advanced materials, devices, and system developments for use in environmental protection. The development of nano-based materials, understanding its chemistry and characterization by the use of X-ray diffraction, FT-IR, EDX, scanning electron microscope (SEM), transmission electron microscope (TEM), and high resolution TEM give the scope for their application in environmental protection, environmental remediation, and environmental biosensors for detection, monitoring, and assessment. The green chemistry based on nano-based materials prevents pollution and environmental contaminants.

This book provides in-depth reviews of the effects of nanoparticles on the soil environment, their interactions with plants, and their potential applications as nanofertilizers and pesticides. It offers insights into the current trends and future prospects of nanotechnology, including the benefits and risks and the impact on agriculture and soil ecosystems. Individual chapters cover topics such as nanoparticle biosynthesis, engineered nanomaterials, the use of nanoclays for remediation of pollutants, nanomaterials in water desalination, their effect on seed germination, plant growth, and nutrient transformations, and the use of earthworms as bioremediating agents for nanoparticles. It is a valuable resource for researchers in the industry working in the field of agriculture, crop protection, plant sciences, applied microbiology, soil biology and environmental sciences.

Environmental Nanotechnology

Proceedings of ICNBME-2019, September 18-21, 2019, Chisinau, Moldova

Food and Environmental Paradigm

Nanotechnology

Nanotoxicity

Prevention and Antibacterial Applications of Nanomaterials

This book discusses the latest developments in plant-mediated fabrication of metal and metal-oxide nanoparticles, and their characterization by using a variety of modern techniques. It explores in detail the application of nanoparticles in drug delivery, cancer treatment, catalysis, and as antimicrobial agent, antioxidant and the promoter of plant production and protection. Application of these nanoparticles in plant systems has started only recently and information is still scanty about their possible effects on plant growth and development. Accumulation and translocation of nanoparticles in plants, and the consequent growth response and stress modulation are not well understood. Plants exposed to these particles exhibit both positive and negative effects, depending on the concentration, size, and shape of the nanoparticles. The impact on plant growth and yield is often positive at lower concentrations and negative at higher ones. Exposure to some nanoparticles may improve the free-radical scavenging potential and antioxidant enzymatic activities in plants and alter the micro-RNAs expression that regulate the different morphological, physiological and metabolic processes in plant system, leading to improved plant growth and yields. The nanoparticles also carry out genetic reforms by efficient transfer of DNA or complete plastid genome into the respective plant genome due to their miniscule size and improved site-specific penetration. Moreover, controlled application of nanomaterials in the form of nanofertilizer offers a more synchronized nutrient fluidity with the uptake by the plant exposed, ensuring an increased nutrient availability. This book addresses these issues and many more. It covers fabrication of different/specific nanomaterials and their wide-range application in agriculture sector, encompassing the controlled release of nutrients, nutrient-use efficiency, genetic exchange, production of secondary metabolites, defense mechanisms, and the growth and productivity of plants exposed to different manufactured nanomaterials. The role of nanofertilizers and nano-biosensors for improving plant production and protection and the possible toxicities caused by certain nanomaterials, the aspects that are little explored by now, have also been generously elucidated.

The emergence of nanotechnology and the development of new nanodevices and nanomaterials have opened up exciting opportunities for novel applications in agriculture and biotechnology. Nanotechnology has the potential to modernize agricultural research and practice, but although it has gained momentum in the agriculture sector over last decade, there are still knowledge gaps between scientific communities. This book presents a comprehensive overview of current developments in nanotechnology-based sustainable agriculture. Focusing on various aspects of nanotechnology in different sectors of agriculture, such as crop production, soil fertility management and crop improvement, it offers insights into the current trends and future prospects of nanotechnology, along with the benefits and risks and their impact on agricultural ecosystems. It also highlights the use of nanotechnology to reduce agrochemical usage, to increase nutrient uptake efficiency and to improve water and nutrient management, and the use of nano-biosensors to manage plant diseases. The book is a valuable reference resource for scientists, policymakers, students and researchers who are engaged in developing strategies to cope with current agricultural challenges.

Fruit Crops: Diagnosis and Management of Nutrient Constraints is the first and only resource to holistically relate fruits as a nutritional source for human health to the state-of-the-art methodologies currently used to diagnose and manage nutritional constraints placed on those fruits. This book explores a variety of advanced management techniques, including open field hydroponic, fertigation/bio-fertigation, the use of nanofertilizers, sensors-based nutrient management, climate-smart integrated soil fertility management, inoculation with microbial consortium, and endophytes backed up by ecophysiology of fruit crops. These intricate issues are effectively presented, including real-world applications and future insights. Presents the latest research, including issues with commercial application Details comprehensive insights into the diagnosis and management of nutrient constraints Includes contributions by world renowned researchers, providing global perspectives and experience

Nano-Materials as Photocatalysts for Degradation of Environmental Pollutants

Wildflowers of Saudi Arabia

Impact of Zinc Oxide Nanoparticles on Green Pea Plant and Seed Quality and Effects on Physiological Traits of Green Peas, Corn, and Zucchini by Silver Nanoparticles

Agricultural Nanobiotechnology
Diagnosis and Management of Nutrient Constraints
Handbook of Food Analysis - Two Volume Set