

SOIL, FERTILIZER, AND PLANT SILICON RESEARCH IN JAPAN



[Rural Village, Nara, the Katsura-Takatsuki area]

Soil Fertilizer And Plant Silicon Research In Japan

Andrew A. Meharg, Fang-Jie Zhao



Soil Fertilizer And Plant Silicon Research In Japan:

Soil, Fertilizer, and Plant Silicon Research in Japan Jian Feng Ma, Eiichi Takahashi, 2002-08-09 Silicon Si plays a significant role in the resistance of plants to multiple stresses including biotic and abiotic stresses Silicon is also the only element that does not damage plants when accumulated in excess However the contribution of Si to plant growth has been largely ignored due to its universal existence in the earth's crust From numerous intensive studies on Si initiated in Japan about 80 years ago Japanese scientists realized that Si was important for the healthy growth of rice and for stability of rice production In a worldwide first silicon was recognized as a valuable fertilizer in Japan The beneficial effects of Si on rice growth in particular are largely attributable to the characteristics of a silica gel that is accumulated on the epidermal tissues in rice These effects are expressed most clearly under high density cultivation systems with heavy applications of nitrogen Si is therefore recognized now as an agronomically essential element in Japan Recently Si has become globally important because it generates resistance in many plants to diseases and pests and may contribute to reduced rates of application of pesticides and fungicides Silicon is also now considered as an environment friendly element The achievements of Si research in Japan are introduced in this book in relation to soils fertilizers and plant nutrition

Silicon in Agriculture Yongchao Liang, Miroslav Nikolic, Richard Bélanger, Haijun Gong, Alin Song, 2015-06-18 This book mainly presents the current state of knowledge on the use of Silicon Si in agriculture including plants soils and fertilizers At the same time it discusses the future interdisciplinary research that will be needed to further our knowledge and potential applications of Si in agriculture and in the environmental sciences in general As the second most abundant element both on the surface of the Earth's crust and in soils Si is an agronomically essential or quasi essential element for improving the yield and quality of crops Addressing the use of Si in agriculture in both theory and practice the book is primarily intended for graduate students and researchers in various fields of the agricultural biological and environmental sciences as well as for agronomic and fertilizer industry experts and advisors Dr Yongchao Liang is a full professor at the College of Environmental and Resource Sciences of the Zhejiang University Hangzhou China Dr Miroslav Nikolic is a research professor at the Institute for Multidisciplinary Research of the University of Belgrade Serbia Dr Richard Bélanger is a full professor at the Department of Plant Pathology of the Laval University Canada and holder of a Canada Research Chair in plant protection Dr Haijun Gong is a full professor at College of Horticulture Northwest A F University China Dr Alin Song is an associate professor at Institute of Agricultural Resources and Regional Planning Chinese Academy of Agricultural Sciences Beijing China

Silicon Advances for Sustainable Agriculture and Human Health Renato de Mello Prado, Hassan Etesami, Anoop Kumar Srivastava, 2024-11-07 This book addresses the most innovative topics on silicon to ensure sustainability in agriculture including advances in nanotechnology and the impact on human health It provides innovative information on the mineral nutrition of plants with a focus on the beneficial element silicon that has attracted the attention and interest of researchers This is happening because

silicon is the only element in plant nutrition that is capable of mitigating the greatest number of stressful events during plant cultivation Faced with climate change associated with disease pressure due to the use of transgenic cultivars that decreases genetic variability and increases the occurrence of stress in crops Associated with this there is a need to reduce the use of chemical pesticides in crops to favor agro environmental sustainability and thus increases the need for the use of silicon in agriculture This is important because the main goal of plant mineral nutrition is to meet the demand of the plant and consequently of man and his nutritional requirements but there is a lack of work to integrate the benefits of Si in plants and consequently its reflections on human health The information in this work will drive further research to expand knowledge and the benefits of Si in sustainable agriculture and human health and therefore the target audience would be researchers professors students from universities and research institutes as well as company technicians

Silicon in Plants Durgesh Kumar Tripathi,Vijay Pratap Singh,Parvaiz Ahmad,Devendra Kumar Chauhan,Sheo Mohan Prasad,2016-12-08 In the present era rapid industrialization and urbanization has resulted in unwanted physiological chemical and biological changes in the environment that have harmful effects on crop quality and productivity This situation is further worsened by the growing demand for food due to an ever increasing population This forces plant scientists and agronomists to look forward for alternative strategies to enhance crop production and produce safer healthier foods Biotic and abiotic stresses are major constraints to crop productivity and have become an important challenge to agricultural scientists and agronomists due to the fact that both stress factors considerably reduce agriculture production worldwide per year Silicon has various effects on plant growth and development as well as crop yields It increases photosynthetic activity creates better disease resistance reduces heavy metal toxicity improves nutrient imbalance and enhances drought tolerance Silicon in Plants Advances and Future Prospects presents the beneficial effects of silicon in improving productivity in plants and enhancing the capacity of plants to resist stresses from environmental factors It compiles recent advances made worldwide in different leading laboratories concerning the role of silicon in plant biology in order to make these outcomes easily accessible to academicians researchers industrialists and students Nineteen chapters summarize information regarding the role of silicon in plants their growth and development physiological and molecular responses and responses against the various abiotic stresses

Silicon Biomineralization Werner E. G. Müller,2012-12-06 During evolution silica deposition has been used in Protozoa Metazoa and in plants as skeletal elements It appears that the mechanisms for the formation of biogenic silica have evolved independently in these three taxa In Protozoa and plants biosilicification appears to be primarily driven by non enzymatic processes and proceeds on organic matrices In contrast in sponges phylum Porifera this process is mediated by enzymes the initiation of this process is likewise dependent on organic matrices In this monograph the role of biosilica as stabilizing structures in different organisms is reviewed and their role for morphogenetic processes is outlined It provides an up to date summary of the mechanisms by which polymeric biosilica is formed The volume is intended for biologists biochemists and

molecular biologists involved in the understanding of structure formation in living organisms and will also be very useful for scientists working in the field of applied Nanotechnology and Nanobiotechnology

Benefits of Silicon in the Nutrition of Plants

Renato de Mello Prado, 2023-06-22 This book aims to describe the role of silicon in the environment from the biogeochemical cycle of terrestrial ecosystems uptake to cellular and tissue bioaccumulation and its effects in mitigating abiotic and biotic stresses From an agronomic point of view this knowledge is essential to boost agricultural production and improve its quality and the sustainability of crops in the face of the growing pressure of different stresses on crop systems of different natures Si is the only multi stress mitigator in plant nutrition It plays an important role in mitigating nutritional deficiency by increasing nutrient use efficiency something that will be very important in the future producing more with less nutrient accumulated in the plant The book focuses on the effects of Si on plant mineral nutrition exploring nutritional deficiencies and toxicity of Al and potentially toxic heavy metals such as Cd as well as important stresses such as salinity water deficit and high temperature The book will also discuss the Si extractors in the soil and criteria for recommending Si in crops and the sources of the element for its application in soil and leaves as well as the role of Si in the activity of microorganisms and in plant diseases and pests S o Paulo Research Foundation FAPESP 2022 10092 9

Arsenic & Rice
Andrew A. Meharg, Fang-Jie Zhao, 2012-03-01 Rice is the staple food for half of the world's population Consumption of rice is the major exposure route globally to the class one non threshold carcinogen inorganic arsenic This book explains the sources of arsenic to paddy soils and the biogeochemical processes and plant physiological attributes of paddy soil rice ecosystems that lead to high concentrations of arsenic in rice grain It presents the global pattern of arsenic concentration and speciation in rice discusses human exposures to inorganic arsenic from rice and the resulting health risks It also highlights particular populations that have the highest rice consumptions which include Southern and South East Asians weaning babies gluten intolerance sufferers and those consuming rice milk The book also presents the information of arsenic concentration and speciation in other major crops and outlines approaches for lowering arsenic in rice grain and in the human diet through agronomic management

Metalloids in Biology Geetika Sirhindi, Renu Bhardwaj, Nitika Kapoor, Chandra Shekhar Seth, 2025-03-26 Metalloids belong to class of elements that exhibit physiochemical characteristics intermediating between those of metals and non metals Some are quasi essential for the overall growth and development of plants Silicon for instance enhances plant structural integrity while boron is crucial for cell wall formation and selenium acts as an antioxidant but some are toxic like germanium Ge and arsenic As as they threaten the soil ecosystem and human health Metalloid toxicity hinges on their cellular concentrations where low levels aid plant development whereas high levels cause harmful effects Thus it is crucial to encompass the underlying detoxification mechanisms behind metalloid uptake by root system their transport to other tissues and their redistribution within and between cells This book provides a comprehensive elucidation of the valuable insights of metalloids in green agriculture emphasizing management strategies to mitigate their adverse effects

through various detoxification pathways including cell complexation cell wall binding efflux vacuolar sequestration and ultimately redistribution

Key features

- 1 Explores databases of metalloid distribution in plants and other habitats
- 2 Deliberates about metalloid transporters and detoxification strategies in plants
- 3 Describes interaction of metalloids with microbes and their impact on ecophysiology
- 4 Unravels the mysteries of metalloid stress in plants by using multi omics approaches
- 5 Covers biological applications of metalloids in sustainable agricultural practices and in human health

This book is aimed to give updated and scientific insights to readers and researchers associated with plant stress physiology agricultural sciences and environmentalists working for the well being of the environment

Apart from these the present book will also be boon for scientists farmers teachers and undergraduate and post graduate students as it provides a detailed account of distribution biochemistry detoxification mechanisms and biological applications of metalloids

Soil Science: Agricultural and Environmental Prospectives Khalid Rehman Hakeem,Javaid Akhtar,Muhammad Sabir,2016-08-01

Soil is the most important natural non renewable resource developed over a longer period of time due to weathering of rocks and subsequently enrichment of organic matter

Soil provides habitat for numerous microorganisms and serves as a natural medium for plant growth thereby providing the plants with anchorage nutrients and water to sustain the growth

Soil also serves as a universal sink for all types of pollutants purifies ground water and is a major reserve of carbon in the universe

The role of soils to provide ecosystem services maintenance of environmental human health and ensuring the food security makes it as the most important and basic natural resource

Soil Science helps us to elaborate and understand how the soils provide all these services

Soil Science also provides us the basic knowledge dealing with the origin of the soil parent material weathering of parent material and the formation of soils morphological physico chemical and biological features of soils classification of soils and role of soils in the provision and maintenance of ecosystem services food security and environmental quality

This book encompasses the various processes functions and behaviour of soils very comprehensively to acquaint the students of soil plant and environmental sciences about their role to perform different agricultural and environmental functions

Handbook of Ecological and Ecosystem Engineering Majeti Narasimha Vara Prasad,2021-05-25

Learn from this integrated approach to the management and restoration of ecosystems edited by an international leader in the field

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The material in the Handbook of Ecological and Ecosystem Engineering is particularly relevant at a time when the human

population is dramatically rising and the exploitation of natural resources is putting increasing pressure on planetary ecosystems. The book demonstrates how modern scientific ecology can contribute to the greening of the environment through the inclusion of concrete examples of successful applied management. The book also includes a thorough discussion of ecological engineering and ecosystem services theory and practice. An exploration of ecological and ecosystem engineering economic and environmental revitalization. An examination of the role of soil meso and macrofauna indicators for restoration assessment success in a rehabilitated mine site. A treatment of the mitigation of urban environmental issues by applying ecological and ecosystem engineering. A discussion of soil fertility restoration theory and practice. Perfect for academic researchers, industry scientists and environmental engineers working in the fields of ecological engineering, environmental science and biotechnology. The *Handbook of Ecological and Ecosystem Engineering* also belongs on the bookshelves of environmental regulators and consultants, policy makers and employees of non governmental organizations working on sustainable development.

Metal and Nutrient Transporters in Abiotic Stress Aryadeep Roychoudhury, Durgesh Kumar Tripathi, Rupesh Deshmukh, 2021-04-08. *Metal and Nutrient Transporters in Abiotic Stress* focuses on the different forms of environmental stress related to heavy metal, metalloid and nutrient deficiency that have the potential to inflict major damages to crop plants leading to a massive decrease in crop yield and productivity. The book presents the current state of knowledge of the biochemical and molecular regulation of several classes of membrane transporters related to the uptake of metals, metalloids and nutrient elements during different stresses and their probable mechanisms of operation in plant stress tolerance. *Metal and Nutrient Transporters in Abiotic Stress* provides a comprehensive discussion that will help in mitigating multiple forms of stresses utilizing transporter proteins. Edited by leading experts and written by a global team of knowledgeable contributors, this book will further stimulate research in the field of transporter proteins and will foster further interests for researchers, academicians and scientists worldwide. It is complimented by its companion book titled *Transporters and Plant Osmotic Stress*. *Focuses exclusively on metal and nutrient transporters involved in multiple environmental stresses in plants. Explains exploiting transporters in crop improvement programs through transgenic technology against different stresses such as heavy metal, metalloid and nutrient deficiency. Serves as an important source of information in the field of abiotic stress.*

Plant Tolerance to Environmental Stress Mirza Hasanuzzaman, Masayuki Fujita, Hirosuke Oku, M. Tofazzal Islam, 2019-01-10. Global climate change affects crop production through altered weather patterns and increased environmental stresses. Such stresses include soil salinity, drought, flooding, metal, metalloid toxicity, pollution and extreme temperatures. The variability of these environmental conditions paired with the sessile lifestyle of plants contribute to high exposure to these stress factors. Increasing tolerance of crop plants to abiotic stresses is needed to fulfill increased food needs of the population. This book focuses on methods of improving plants tolerance to abiotic stresses. It provides information on how protective agents including exogenous phytoprotectants can mitigate abiotic stressors affecting

plants The application of various phytoprotectants has become one of the most effective approaches in enhancing the tolerance of plants to these stresses Phytoprotectants are discussed in detail including information on osmoprotectants antioxidants phytohormones nitric oxide polyamines amino acids and nutrient elements of plants Providing a valuable resource of information on phytoprotectants this book is useful in diverse areas of life sciences including agronomy plant physiology cell biology environmental sciences and biotechnology

Molecular Approaches for Sustainable Insect Pest Management Omkar,2022-01-01 This book offers a range of environmentally benign molecular mechanisms which are safer alternative strategies for effective insect pest management In modern era of biotechnology there has been much advancement in the field of molecular biology where many more techniques have evolved which can be helpful in the field of pest management too Plant resistance development of transgenic plants and many more techniques are being considered the panacea to pest problems On the other hand there are wide spread concerns of the safety of biotechnological interventions with nontarget organisms including humans While the world stands divided on the ethical issues of these approaches and the many safety concerns scientists believe that well thought of biotechnological interventions are probably the only safest ways possible for reducing pest attacks on crops It explores various techniques and aspects related to molecular pathways for crop pest control This book is a useful resource for postgraduate students and researchers of agriculture sciences plant pathology and plant physiology It is also useful for policy planners in agriculture

Plant Stress Mitigators Mansour Ghorbanpour,Muhammad Adnan Shahid,2022-12-06 Plant Stress Mitigators Types Techniques and Functions presents a detailed contextual discussion of various stressors on plant health and yield with accompanying insights into options for limiting impacts using chemical elicitors bio stimulants breeding techniques and agronomical techniques such as seed priming cold plasma treatment and nanotechnology amongst others The book explores the various action mechanisms for enhancing plant growth and stress tolerance capacity including nutrient solubilizing and mobilizing biocontrol activity against plant pathogens phytohormone production soil conditioners and many more unrevealed mechanisms This book combines research methods opinion perspectives and reviews dissecting the stress alleviation action of different plant stress mitigators on crops grown under optimal and sub optimal growing conditions abiotic and biotic stresses Explores the various action mechanisms of mitigators Highlights the relationship between mitigator and nutrient efficiency product quality and microbial population Includes both biotic and abiotic stressors and their mitigation options

Natural Enemies of Insect Pests in Neotropical Agroecosystems Brígida Souza,Luis L. Vázquez,Rosangela C. Marucci,2019-12-18 This book aims to address the importance of natural enemies and functional diversity for biological control in Neotropical agroecosystems Several aspects related to the conservation of natural enemies such as vegetation design and climate change are discussed in Part 1 and the bioecology of several insects groups used in biological control in Latin America is presented in Part 2 Part 3 is devoted to mass production of natural enemies while Part 4 describes how these insects have been used to control of pests in

major crops forests pasture weeds and plant diseases Lastly Part 5 reports Latin American experiences of integration of biological in pest management programs

Environmental Crime and Corruption in Russia Sally Stoecker, Ramziya Shakirova, 2013-10-08 Environmental devastation a significant consequence of industrial activity in Soviet times continues to be a major problem in Russia Specific problems include radioactive pollutants from inadequately monitored nuclear plants illegal logging and wildlife poaching which have grown into hugely profitable businesses for criminal gangs and toxic waste from unsanctioned and poorly controlled metallurgical petroleum and agricultural chemical industries This book presents a wide ranging assessment of the environmental problems faced by Russia and of the crime and corruption which contribute to them It also discusses the attitude of the Russian government which seems to view environmental protection as something for rich countries something to be postponed until Russia is on the same economic footing as wealthier Scandinavian and western European countries It concludes gloomily that the problems are getting worse and that little is being done to tackle them

Encyclopedia of Soil Science Rattan Lal, 2006 Upholding the high standard of quality set by the previous edition this two volume second edition offers a vast array of recent peer reviewed articles It showcases research and practices with added sections on ISTIC World Soil Information root growth and agricultural management nitrate leaching management podzols paramos soils water repellent soils rare earth elements and more With hundreds of entries covering tillage irrigation erosion control ground water and soil degradation the book offers quick access to all branches of soil science from mineralogy and physics to soil management restoration and global warming Publisher's website

Biochar from Biomass and Waste Yong Sik Ok, Daniel C.W. Tsang, Nanthi Bolan, Jeffrey M. Novak, 2018-11-02 Biochar from Biomass and Waste Fundamentals and Applications provides the fundamentals of biochar such as its basic concepts production technology and characterization methods also including comprehensive examples for readers This book includes information on state of art biochar application technologies in the fields of agriculture energy and environmental sciences with step by step case studies Biochar has received worldwide interests in the past decade because it encompasses high priority research areas including bioenergy production global warming mitigation and sustainable agriculture Offers comprehensive coverage of biochar production characterization and modification methods Provides global case studies covering a wide range of application fields including environmental agricultural syngas and bio oil Covers the sustainability and future of biochar

Biostimulants in Agriculture II: Towards a Sustainable Future Maurizio Ruzzi, Giuseppe Colla, Youssef Rouphael, 2024-06-11 Modern agriculture needs to review and broaden its practices and business models by integrating opportunities coming from different adjacent sectors and value chains including the bio based industry in a fully circular economy strategy Searching for new tools and technologies to increase crop productivity under optimal and sub optimal conditions and to improve resources use efficiency is crucial to ensure food security while preserving soil quality microbial biodiversity and providing business opportunities for farmers Biostimulants based on microorganisms or organic substances

obtained from renewable materials represent a sustainable efficient technology or complement to synthetic counterparts to improve nutrient use efficiency and secure crop yield stability Under the new European Union Regulation 2019 1009 plant biostimulants were defined based on four agricultural functional claims as follows Plant biostimulants are products that stimulate plant nutrition processes independently of the product s nutrient content with the sole aim of improving one or more of the following characteristics of the plant and or the plant rhizosphere 1 nutrient use efficiency 2 tolerance resistance to a biotic stress 3 quality characteristics or 4 availability of confined nutrients in the soil or rhizosphere Many diverse natural substances and chemical derivatives of natural or synthetic compounds as well as beneficial microorganisms are cataloged as plant biostimulants including i humic substances ii plant or animal based protein hydrolysates iii macro and micro algal extracts iv silicon v arbuscular mycorrhizal fungi AMF and vi plant growth promoting rhizobacteria PGPR belonging to the Azotobacter Azospirillum and Rhizobium genera Rice Genomics, Genetics and Breeding Takuji Sasaki,Motoyuki Ashikari,2018-02-14 This book presents the latest advances in rice genomics genetics and breeding with a special focus on their importance for rice biology and how they are breathing new life into traditional genetics Rice is the main staple food for more than half of the world s population Accordingly sustainable rice production is a crucial issue particularly in Asia and Africa where the population continues to grow at an alarming rate The book s respective chapters offer new and timely perspectives on the synergistic effects of genomics and genetics in novel rice breeding approaches which can help address the urgent issue of providing enough food for a global population that is expected to reach 9 billion by 2050

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showed levels of research instrument validity arikunto 2010 211 degradation of accuracy between data which was happen on research object and capacity which can be reported by researcher sugiyono 2014 267 high and low validity of instrument showed how far data were collected didn t diverge from validity itself

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according sugiyono 2009 38 understanding of the research object is an attribute or the nature or value of a person object or activity that has certain variations which are set by the researchers to be learned and then drawn conclusions here the

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