




Crop Improvement For Sustainable Agriculture



**Rajib Roychowdhury, Shuvasish
Choudhury, Mirza
Hasanuzzaman, Sangeeta Srivastava**

Crop Improvement For Sustainable Agriculture:

Crop Improvement for Sustainable Agriculture Mitchell Brett Callaway, Charles A. Francis, 1993-01-01 Crop improvement for future farming systems History of crop improvement in sustainable agriculture Choosing germplasm for breeding program success The role of seed companies in crop improvement Crop breeding objectives and methods Breeding for resistance to insects and plant pathogens Crop tolerance to weeds Tree improvement for agroforestry systems Contributions of biotechnology to crop improvement Genotype by environment interaction in crop improvement Statistical design and analysis of intercropping experiments Improving Crop Productivity in Sustainable Agriculture Narendra Tuteja, Sarvajeet S. Gill, Renu Tuteja, 2012-10-11 An up to date overview of current progress in improving crop quality and quantity using modern methods With a particular emphasis on genetic engineering this text focusses on crop improvement under adverse conditions paying special attention to such staple crops as rice maize and pulses It includes an excellent mix of specific examples such as the creation of nutritionally fortified rice and a discussion of the political and economic implications of genetically engineered food The result is a must have hands on guide ideally suited for the biotech and agro industries

Plant Genome Editing Technologies Jen-Tsung Chen, Sunny Ahmar, 2024-03-21 This book reviews all important aspects of plant genome editing to shed new light on these genome editing technologies together in crop improvement and sustainable agriculture The book is divided into three areas the first of which reinterprets plant genome studies from an overview perspective examining the safety and risk assessment of plants as well as breeding related outcomes The second area discusses recent advances in the understanding of crop improvement A wide range of plant stress tolerance in relation to plant genome editing is then addressed before turning attention to specific species approaches including rice maize wheat and soybean The entire book is devoted to an updated knowledge of plant genome editing technologies from all aspects of plant biology and agronomy as we move toward advancements in sustainable life research The book will be highly recommended for agriculture biologists agronomists plant pathologists and all related research areas

Crop Improvement Siti Nor Akmar Abdullah, Ho Chai-Ling, Carol Wagstaff, 2017-10-17 The book covers the latest development in the biosciences field covering key topics in crop improvement including omic approaches to improving sustainable crop production advancement in marker technology strategies in genetic manipulation crop quality and sustainability and plant microbe interaction detailing on proven technologies to address critical issue for agricultural sustainability which are beneficial for researchers and students The book also includes aspects of preserving crops after harvest as this is a key factor in promoting sustainable crop quality in terms of addressing waste choosing the appropriate packaging and moving crops through the food and industrial supply chain An important strategy to overcome the challenges in providing food for the world population in a sustainable manner is through concerted efforts by crop scientists to embrace new technologies in increasing yield quality and improving food safety while minimizing adverse environmental impact of the

agricultural activities Most of the proven molecular and genetic technologies in crop science have been tested and verified in model plants such as Arabidopsis and tomato The technologies when deployed on various plant species of importance for human nutrition and industrial applications including cereals vegetables fruits herbs fibre and oil crops face many challenges not only due to their longer life cycle but many other physiological and environmental factors affecting yield and quality of plant products Furthermore major impacts on crop production due to catastrophic diseases and global climate change needs urgent and innovative solutions Therefore a systematic approach employing various leading edge technologies that enable the functional elucidation of key pathway genes via omics tools genome wide association with desired phenotypes and development of cost effective and practicable molecular tools for selection is vital The International Conference on Crop Improvement was held to address these and other pressing issues This volume summarizes the keynote presentations from the meeting and highlights addition discussions that are critical to crop improvement in a challenging time

Next-Generation Strategies for Crop Improvement Yogesh Ahlawat,Darshna Chaudhary,Pawan K. Jaiwal,2025-09-30 This edited volume serves as a comprehensive collection of methodologies paradigms and case studies explaining novel approaches for crop improvement programs It summarizes the collective knowledge of leading experts in agronomy genetics biotechnology and related fields offering a holistic perspective on the multifaceted aspects of modern crop enhancement In an era of climate change increasing population and environmental degradation the need for revolutionary advancements in agriculture has never been more urgent This book delves into the transformative potential of emerging methodologies from precision breeding and genetic engineering to computational biology and synthetic biology Through compelling case studies and insightful analyses readers discover how novel approaches are revolutionizing crop breeding cultivation and resilience The central theme of the book is the promotion of sustainable agricultural practices and the development of resilient crop varieties capable of withstanding environmental stressors pests and diseases The book fosters interdisciplinary collaboration crucial for tackling complex agricultural challenges by combining insights from diverse disciplines including bioinformatics computational biology and ecological sciences From disease resistant crops to stress tolerant varieties the advanced strategies of crop improvement offer avenues for sustainable agriculture and global food security This book is essential reading for students academics researchers scientists and policymakers interested in and working in the fields of agriculture or biotechnology

Improvement of Crops in the Era of Climatic Changes Parvaiz Ahmad,Mohd Rafiq Wani,Mohamed Mahgoub Azooz,Lam-Son Phan Tran,2014-07-28 Abiotic stress drastically limits agricultural crop productivity worldwide Climate change threatens the sustainable agriculture with its rapid and unpredictable effects making it difficult for agriculturists and farmers to respond to the challenges cropping up from environmental stresses In light of population growth and climate changes investment in agriculture is the only way to avert wide scale food shortages This challenge comes at a time when plant sciences are witnessing remarkable progress in understanding the fundamental processes of

plant growth and development Plant researchers have identified genes controlling different aspects of plant growth and development but many challenges still exist in creating an apt infrastructure access to bioinformatics and good crop results Improvement of Crops in the Era of Climatic Changes Volume 2 focuses on many existing opportunities that can be applied methodically through conventional breeding without touching upon the latest discoveries such as the power of genomics to applied breeding in plant biology Written by a diverse faction of internationally famed scholars this volume adds new horizons in the field of crop improvement genetic engineering and abiotic stress tolerance Comprehensive and lavishly illustrated Improvement of Crops in the Era of Climatic Changes Volume 2 is a state of the art guide to recent developments vis vis various aspects of plant responses in molecular and biochemical ways to create strong yields and overall crop improvement Molecular Breeding for Sustainable Crop Improvement Vijay Rani Rajpal,S. Rama Rao,S.N.

Raina,2016-02-02 The world population is estimated to reach to more than 10 billion by the year 2050 These projections pose a challenging situation for the agricultural scientists to increase crops productivity to meet the growing food demands The unavailability and or inaccessibility to appropriate gene pools with desired traits required to carry out genetic improvement of various crop species make this task formidable for the plant breeders Incidentally most of the desired genes reside in the wild genetic relatives of the crop species Therefore exploration and characterization of wild genetic resources of important crop species is vital for the efficient utilization of these gene pools for sustainable genetic improvements to assure food security Further understanding the myriad complexities of genic and genomic interactions among species more particularly of wild relatives of crop species and or phylogenetically distant germplasm can provide the necessary inputs to increase the effectiveness of genetic improvement through traditional and or genetic engineering methods This book provides comprehensive and latest insights on the evolutionary genesis of diversity access and its utilization in the evolution of various crop species A comprehensive account of various crops origin exploitation of the primary secondary and tertiary gene pools through breeding biosystematical cytogenetical and molecular phylogenetical relationships and genetic enhancement through biotechnological interventions among others have been provided as the necessary underpinnings to consolidate information on the effective and sustainable utilization of the related genetic resources The book stresses upon the importance of wild germplasm exploration characterization and exploitation in the assimilation of important crop species The book is especially intended for students and scientists working on the genetic improvement of crop species Plant Breeders Geneticists Taxonomists Molecular Biologists and Plant Biotechnologists working on crop species are going to find this book very useful **Mutations, In Vitro and Molecular Techniques for Environmentally Sustainable Crop Improvement**

M. Maluszynski,Kenneth Kasha,2013-03-09 During the last thirty years most increases in agricultural production were achieved through high input agriculture in areas with fertile soils and sufficient water Intensive methods of production with high levels of nitrogen fertilizer and pesticides were often accompanied by environmental degradation and in some instances

by pollution of the food supply However rapid population growth has also led to increasing use of marginal lands where adverse soil and climatic conditions are serious constraints to food production These areas are even more sensitive to ecological destabilization Environmentally sound systems of food production and land use are essential for meeting the food security needs of developing countries To do this greater genetic variability is needed within the best crop genotypes available for the areas in need coupled with better management practices and crop rotations These requirements can only be realized if suitable crop varieties are bred These should be varieties with a much shorter growing period suitable for rotation increased tolerance or resistance to diseases and pests as well as to drought and salinity and other adverse soil and climatic conditions

Omics and Genome Editing Kartika Sharma, 2025-03-15 This book offers up to date research on genome editing and omics technologies from renowned academics with established backgrounds from throughout the globe The world population is expected to touch 9 10 billion by 2050 and to feed the growing population 50% more food must be produced globally than is currently produced Nonetheless it is a difficult challenge to increase the food output of the currently existing crops on available land Over the past few decades traditional crop enhancement techniques like plant breeding and other agricultural technology have made a significant contribution to food and nutritional security With the use of strong technologies genome editing strategies can significantly improve the productivity and efficiency of current agricultural practices Discovering the underlying mechanisms influencing features of economic value has been made possible through genome editing through CRISPR Cas9 primer and base editing and OMICs through genomics proteomics metabolomics transcriptomics and phenomics This book provides a wealth of information on omics and genome editing approaches and their application to develop abiotic biotic and climate tolerant crops as well as RNA interference next generation sequencing and metabolomics for sustainable crop production Researchers are actively using both genome editing and omics for crop improvement however there is limited literature offered in a single source Undergraduate and postgraduate students researchers policymakers and stakeholders will find this book to be an invaluable resource

Contributions to Crop Improvement and Sustainable Agriculture in Tropical and Subtropical Australia Robert John Lawn, 2004

Sustainable Agriculture in the Era of Climate Change Rajib Roychowdhury, Shuvasish Choudhury, Mirza Hasanuzzaman, Sangeeta Srivastava, 2020-07-06 Under ongoing climate changes natural and cultivated habitats of major crops are being continuously disturbed Such conditions impose and exacerbate abiotic and biotic stressors Drought salinity flood cold heat heavy metals metalloids oxidants irradiation etc are important abiotic stressors while diseases and infections caused by plant pathogens such as fungal agents bacteria and viruses are major biotic stresses In many instances stresses have become the major limiting factor for agricultural productivity and exert detrimental role on growth and yield of the crops To help feed an ever increasing world population and to ensure global food security concerted efforts from scientists and researchers have identified strategies to manage and mitigate the impacts of climate induced stresses This book

summarizing their findings is aimed at crop improvement beyond such kind of barriers by agronomic practices genetics breeding phenotyping etc and biotechnological applications including molecular markers QTL mapping genetic engineering transgenesis tissue culture various omics technologies and gene editing It will cover a wide range of topics under environmental challenges agronomy and agriculture processes and biotechnological approaches Additionally fundamental mechanisms and applied information on stress responses and tolerance will be discussed This book highlights problems and offers proper solutions for crop stress management with recent information and up to date citations We believe this book is suitable for scientists researchers and students working in the fields of agriculture plant science environmental biology and biotechnology

Sustainable Agriculture in Egypt Hassan Auda Awaad, 2021-09-08 This book consists of 10 Chapters in 4 Parts The first Part is an introduction and contains Chapter 1 to introduce the book chapters to the audiences The second Part consists of two chapters under the name Impact of Climate Change on Crop Production and the Physiological and Biochemical Basis for Crops Tolerance The Chapter 2 focus on critical periods of crop plants to stress conditions and the expected impacts of climate changes mainly on the productivity and quality of field crops While Chapter 3 highlights the foundations of crop tolerance to environmental stress and plant traits relevant to stress tolerance It is devoted to explain and discuss mechanisms of adaptation to environmental stress conditions and addresses various plant traits related to stress environmental tolerance i e phenological morpho physiological and biochemical traits which could be used as selection criteria for crops improvement The third Part consists of 5 Chapters under the theme Improve Crop Adaptability and Stability to Climate Change and Modern Technology Chapter 4 highlights the most important strategic food grain crop wheat Chapter 5 focuses the important staple food crop rice while Chapter 6 deals with one of the most important food legume crops faba bean Chapter 7 and 8 discuss two important oil crops sesame and sunflower However Chapter 9 focuses on cotton as one of the most important fiber crops The author addresses these crops under the following headings genotype x environment interaction and its relation to climatic change on yield production performance of genotypes in response to environmental changes adaptability and yield stability to environmental conditions additive main effects and multiplicative interaction model gene action genetic behavior and heritability for traits related to environmental stress tolerance role of recent approaches biotechnology and nanotechnology This is besides how can measure sensitivity of genotypes to environmental stress and finally the appropriate agricultural practices to mitigate environmental stress on crops under attention The book ends with Chapter No 10 where the author presents an update of the book topics present the most important conclusions and recommendations from all chapters This book has been prepared and supported by recent references and statistics with coloured tables and illustrations for audiences interested in crop science environment plant breeding genetics and biotechnology as well as postgraduate students and researchers in universities and research centres

Mutation Breeding for Sustainable Food Production and Climate Resilience Suprasanna Penna, S. Mohan Jain, 2023-04-04 This book highlights

the recent progress on the applications of mutation breeding technology in crop plants Plant breeders and agriculturists are faced with the new challenges of climate change human population growth and dwindling arable land and water resources which threaten to sustain food production worldwide Genetic variation is the basis which plant breeders require to produce new and improved cultivars The understanding of mutation induction and exploring its applications has paved the way for enhancing genetic variability for various plant and agronomic characters and led to advances in gene discovery for various traits Induced mutagenesis has played a significant role in crop improvement and currently the technology has resulted in the development and release of more than 3600 mutant varieties in most of the crop plants with great economic impact The field of mutation breeding has come long way to become an important approach for crop improvement This book covers various methodologies of mutation induction screening of mutants genome editing and genomics advances and mutant gene discovery The book further discusses success stories in different countries and applications of mutation breeding in food crops horticultural plants and plantation crops This informative book is very useful to plant breeders students and researchers in the field of agriculture plant sciences food science and genetics

Sustainable Agriculture in the Era of the OMICs Revolution Channa S. Prakash, Sajid Fiaz, Muhammad Azhar Nadeem, Faheem Shehzad Baloch, Abdul Qayyum, 2023-01-01 Access to food with enough calories and nutrients is a fundamental right of every human The global population has exceeded 7.8 billion and is expected to pass 10 billion by 2055 Such rapid population increase presents a great challenge for food supply More grain production is needed to provide basic calories for humans Thus it is crucial to produce 60-110% more food to fill the gap between food production and the demand of future generations Meanwhile food nutritional values are of increasing interest to accommodate industrialized modern lives The instability of food production caused by global climate change presents another great challenge The global warming rate has become more rapid in recent decades with more frequent extreme climate change including higher temperatures drought and floods Our world faces various unprecedented scenarios such as rising temperatures which causes melting glaciers and the resulting various biotic and abiotic stresses ultimately leading to food scarcity In these circumstances it is of utmost importance to examine the genetic basis and extensive utilization of germplasm to develop climate resilient cultivars through the application of plant breeding and biotechnological tools Future crops must adapt to these new and unpredictable environments Crop varieties resistant to biotic and abiotic stresses are also needed as plant disease insects drought high and low temperature stresses are expected to be impacted by climate change Thus we need a food production system that can simultaneously satisfy societal demands and long term development Since the Green Revolution in the 1960s farming has been heavily dependent on high input of nitrogen and pesticides This leads to environmental pollution which is not sustainable in the long run Therefore a new breeding scheme is urgently needed to enable sustainable agriculture including new strategies to develop varieties and crops that have high yield potential high yield stability and superior grain quality and nutrition while also using

less consumption of water fertilizer and chemicals in light of environmental protection While we face these challenges we also have great opportunities especially with flourishing developments in omics technologies High quality reference genomes are becoming available for a larger number of species with some species having more than one reference genome The genome wide re sequencing of diverse varieties enables the identification of core and pan genomes An integration of omics data will enable a rapid and high throughput identification of many genes simultaneously for a relevant trait This will change our current research paradigm fundamentally from single gene analysis to pathway or network analysis This will also expand our understanding of crop domestication and improvement In addition with the knowledge gained from omics data in combination with new technologies like targeted gene editing we can breed new varieties and crops for sustainable agriculture

Sustainable Agriculture Vishnu D. Rajput, Abhishek Singh, Karen Ghazaryan, Tatiana M. Minkina, Abdel Rahman M. Al-Tawaha, 2024-04-22 The agricultural food system needs to provide access to enough healthy and affordable food for the growing population and mitigate its impact on the planet for future generations Emerging technologies can help farmers increase yields The book presents theoretical and applied aspects of nanotechnology biotechnology plant breeding and smart farming to increase plant productivity crop yield soil fertility and crop soil monitoring

Crop Improvement S. K. Sandhu (ed), N. Sidhu (ed), A. Rang (ed), 2012

Crop Improvement for Sustainability Pawan Kumar Yadav, 2018 The present book covers the latest development in the field of crop improvement which includes Use of crop wild relatives Underutilized Plants Diversification of Agriculture Biofortification Organic farming using Vermicompost Peri urban farming Integrated pest management Post harvest management Value addition Omic approaches for improving crop production Energy Sustainability Advancement in bio nanotechnology with Computational and Statistical tools which address critical issue for agricultural sustainability for the benefit of researchers policy makers and government agencies An important strategy to overcome the challenges in providing food for the world population in a sustainable manner is through concerted efforts by crop scientists to embrace new technologies in increasing yield quality and improving food safety while minimizing adverse environmental impact of the agricultural activities Thirty noted researchers currently working in crop improvement and related fields bring together the best thinking about achieving crop improvement especially the development of new genetic combinations to create a sustainable agriculture

Omics Technologies for Sustainable Agriculture and Global Food Security (Vol II) Anirudh Kumar, Rakesh Kumar, Pawan Shukla, Hitendra K. Patel, 2021-08-05 This edited book brings out a comprehensive collection of information on the modern omics based research The main focus of this book is to educate researchers about utility of omics based technologies in rapid crop improvement In last two decades omics technologies have been utilized significantly in the area of plant sciences and has shown promising results Omics technology has potential to address the challenge of food security in the near future The comprehensive use of omics technology occurred in last two decades and helped greatly in the understanding of complex biological problems improve crop

productivity and ensure sustainable use of ecosystem services This book is of interest to researchers and students of life sciences biotechnology plant biotechnology agriculture forestry and environmental sciences It is also a useful knowledge resource for national and international agricultural scientists

Ecological Consequences of Increasing Crop

Productivity Anatoly I. Opalko, Larissa I. Weisfeld, Sarra A. Bekuzarova, Nina A. Bome, Gennady E. Zaikov, 2014-09-25 With contributions from leading scientists in agricultural biology and young researchers this book examines the ecological consequences that sometimes arise with various methods of increasing crop productivity It also presents agroecological approaches to crop improvement and productivity from several perspectives examines alternative energy sources and discusses other problems related to sustainable agriculture

Genomics Data Analysis for Crop Improvement Priyanka Anjoy, Kuldeep Kumar, Girish Chandra, Kishor Gaikwad, 2024-01-18 This book addresses complex problems associated with crop improvement programs using a wide range of programming solutions for genomics data handling and sustainable agriculture It describes important concepts in genomics data analysis and sequence based mapping approaches along with references The book contains 16 chapters on recent developments in several methods of genomic data analysis for crop improvements and sustainable agriculture all authored by eminent researchers who are experts in their fields These chapters focus on applications of a wide range of key bioinformatics topics including assembly annotation and visualization of next generation sequencing NGS data expression profiles of coding and noncoding RNA statistical and quantitative genetics trait based association analysis quantitative trait loci QTL mapping and artificial intelligence in genomic studies Real examples and case studies in the book will come in handy when applying the techniques The relative scarcity of reference materials covering bioinformatics applications as compared with the readily available books also enhances the utility of this book The targeted readers of the book are scientists researchers and bioinformaticians from genomics and advanced breeding in different areas The book will appeal to the applied researchers engaged in crop improvements and sustainable agriculture by using bioinformatics tools students research project leaders and practitioners from the various marginal disciplines and interdisciplinary research

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