



Omics Technologies *and* Crop Improvement

EDITED BY **Noureddine Benkeblia**



CRC Press
Taylor & Francis Group

Omics Technologies And Crop Improvement

**Khalid Rehman Hakeem, Parvaiz
Ahmad, Munir Ozturk**



Omics Technologies And Crop Improvement:

Omics Technologies and Crop Improvement Nouredine Benkeblia, 2014-10-14 Increased world population decreased water supply and climate change all put stresses on the global food supply An exploration of the challenges and possible solutions to improve yields of the main crops such as cereals roots tubers and grasses Omics Technologies and Crop Improvement reviews data on food sciences and omics The book covers **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 **Omics Technologies and Crop Improvement** Nouredine Benkeblia, 2014-10-14 Increased world population decreased water supply and climate change all put stresses on the global food supply An exploration of the challenges and possible solutions to improve yields of the main crops such as cereals roots tubers and grasses Omics Technologies and Crop Improvement reviews data on food sciences and omics The book covers modern omic technologies such as nutrigenomics and metagenomics It provides a detailed examination of how omics can help crop science and horticulture and introduces the benefits of using these technologies to increase crop yields and other features such as resistance and nutritional values The book highlights crop improvements such as increased yield drought resistance disease resistance and value added performance through a non transgenic format It explores how the different omics technologies especially the most recent ones proteomics metabolomics nutrigenomics ionomics and metagenomics would be used to improve the quantitative and qualitative features of crop plants Topics covered include Advances in omics for improved fresh crops Transcriptome analyses on the drought response using drought tolerant near isogenic lines Metabolite profiling that reveals different effects of nitrogen amendments on vegetables Omics technology application to forage crops improvement Secondary metabolites and plant tissue culture RNAi technology and crop improvement Gene expression analysis methods with NGS data Web database resources and crops improvement Gene Expression Networks GEN in crops Specific crop improvement papaya wheat coffee potato and more With contributions from pioneering researchers from twelve countries the book presents a broad view of how omics would help crop science and horticulture meet the challenges of a shrinking global food supply for a burgeoning global population Omics and Genome

Editing Kartika Sharma,2025-03-18

Principles and Practices of OMICS and Genome Editing for Crop

Improvement Channa S. Prakash,Sajid Fiaz,Shah Fahad,2022-07-18 Global food security is increasingly challenging in light of population increase the impact of climate change on crop production and limited land available for agricultural expansion Plant breeding and other agricultural technologies have contributed considerably for food and nutritional security over the last few decades Genetic engineering approaches are powerful tools that we have at our disposal to overcome substantial obstacles in the way of efficiency and productivity of current agricultural practices Genome engineering via CRISPR Cas9 Cpf1 base editing and prime editing and OMICs through genomics transcriptomics proteomics phenomics and metabolomics have helped to discover underlying mechanisms controlling traits of economic importance Principle and Practices of OMICs and Genome Editing for Crop Improvement provides recent research from eminent scholars from around the world from various geographical regions with established expertise on genome editing and OMICs technologies This book offers a wide range of information on OMICs techniques and their applications to develop biotic abiotic and climate resilient crops metabolomics and next generation sequencing for sustainable crop production integration bioinformatics and multi omics for precision plant breeding Other topics include application of genome editing technologies for food and nutritional security speed breeding hybrid seed production resource use efficiency epigenetic modifications transgene free breeding database and bioinformatics for genome editing and regulations adopted by various countries around globe for genome edited crops Both OMICs and genome editing are vigorously utilized by researchers for crop improvement programs however there is limited literature available in a single source This book provides a valuable resource not only for students at undergraduate and postgraduate level but also for researchers stakeholders policy makers and practitioners interested in the potential of genome editing and OMICs for crop improvement programs

Omics Technologies for Sustainable Agriculture and

Global Food Security (Vol II) Anirudh Kumar,Rakesh Kumar,Pawan Shukla,Hitendra K. Patel,2021 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

OMICS-Based Approaches in Plant Biotechnology

Rintu Banerjee,Garlapati Vijay Kumar,S.P. Jeevan Kumar,2019-02-13 Burgeoning world population decreased water supply and land resources coupled with climate change result in severe stress conditions and a great threat to the global food supply To meet these challenges

exploring Omics Technologies could lead to improved yields of cereals tubers and grasses that may ensure food security Improvement of yields through crop improvement and biotechnological means are the need of the hour and the current book OMICS Based Approaches in Plant Biotechnology reviews the advanced concepts on breeding strategies OMICS technologies genomics transcriptomics and metabolomics and bioinformatics that help to glean the potential candidate genes molecules to address unsolved problems related to plant and agricultural crops The first six chapters of the book are focused on genomics and cover sequencing functional genomics with examples on insecticide resistant genes mutation breeding and miRNA technologies Recent advances in metabolomics studies are elucidated in the next 3 chapters followed by 5 chapters on bioinformatics and advanced techniques in plant biotechnology and crop breeding The information contained in the volume will help plant breeders plant biotechnologists plant biochemists agriculture scientists and researchers in using this applied research to focus on better crop breeding and stress adaptation strategies

Omics Technologies for Sustainable Agriculture and Global Food Security Volume 1 Anirudh Kumar, Rakesh Kumar, Pawan Shukla, Manish K. Pandey, 2021-05-13

Increasing world population unpredictable climate and various kind of biotic and abiotic stresses necessitate the sustainable increase in crop production through developing improved cultivars possessing enhanced genetic resilience against all odds An exploration of these challenges and near possible solution to improve yield is addressed in this book It comprehensively and coherently reviews the application of various aspect of rapidly growing omics technology including genomics proteomics transcriptomics and metabolomics for crop development It provides detailed examination of how omics can help crop science and introduces the benefits of using these technologies to enhance crop production resistance and other values It also provides platform to ponder upon the integrative approach of omics to deal with complex biological problems The book highlights crop improvement such as yield enhancement biotic and abiotic resistance genetic modification bioremediation food security etc It explores how the different omics technology independently and collectively would be used to improve the quantitative and qualitative traits of crop plants The book is useful for graduate and post graduate students of life science including researchers who are keen to know about the application of omics technologies in the different area of plant science This book is also an asset to the modern plant breeders and agriculture biotechnologist

Seed Development: OMICS Technologies toward Improvement of Seed Quality and Crop Yield Ganesh K.

Agrawal, Randeep Rakwal, 2012-12-09 The book is about the seed development in the model and crop plants Seed development is a key step of the plant life cycle that determines the nutrient value of seeds the life for human civilization growth and development The nutrient value of seeds is mainly due to storage reserve products such as carbohydrates lipids triacylglycerols and proteins The book primarily focuses on application of the 21st century high throughput technologies transcriptomics proteomics metabolomics and systems biology in near complete understanding of the various processes involved in seed development in different crop plants The book reveals how such technologies have revolutionized our

understanding of the multilayer processes and regulations involved therein by generating large scale datasets Accumulated datasets provide basic knowledge to develop integrated strategies to eventually improve the nutritional value of plant seed and crop yield a critical goal in food security issues around the globe *OMICs-based Techniques for Global Food Security* Sajid Fiaz, Channapatna S. Prakash, 2024-03-22 *OMICs based Techniques for Global Food Security* Forward thinking resource discussing how to integrate OMICs and novel genome editing technologies for sustainable crop production *OMICs based Techniques for Global Food Security* provides an in depth understanding of the mechanisms of OMICs techniques for crop improvement details how OMICs techniques can contribute to identifying genes and traits with economic benefits and explains how to develop crop plants with improved yield quality and resistance to stresses through genome editing technologies providing evidence on the developments of climate resilient crops via applications of genome editing techniques throughout The text covers the application of OMICs in crop plants the integration of bioinformatics and multi OMICs for precision breeding de novo domestication CRISPR Cas system for crop improvement hybrid seed production transgene free breeding regulation for genome edit crops bioinformatics and genome editing and other topics related to OMICs and genome editing The text also includes a chapter on global regulations for genome edited crops and explains how these regulations influence novel plant breeding techniques in their adopted countries Edited by two highly qualified academics *OMICs based Techniques for Global Food Security* covers topics such as Crops genome sequencing and their application for crop improvement and functional characterization of cereal genome The role of OMICs based technologies in plant sciences and utilization of different multi OMICs approaches for crop improvement Genomic database and genetic resource of cereals speed breeding for rapid crop improvement and evolution of genome editing technologies CRISPR system discovery history and future perspective and CRISPR Cas system for biotic and abiotic stress resistance in cereals Providing a collection of recent literature focusing on developments and applications of OMICs based technologies for crop improvement *OMICs based Techniques for Global Food Security* is an important read for plant breeders molecular biologists researchers postdoctoral fellows and students in disciplines for developing crops with high yield and nutritional potential

Bioinformatics for Plant Research and Crop Breeding Jen-Tsung Chen, 2024-07-22 Explore and advance bioinformatics and systems biology tools for crop breeding programs in this practical resource for researchers Plant biology and crop breeding have produced an immense amount of data in recent years from genomics to interactome and beyond Bioinformatics tools which aim at analyzing the vast quantities of data produced by biological research and processes have developed at a rapid pace to meet the challenges of this vast data trove The resulting field of bioinformatics and systems biology is producing increasingly rich and transformative research *Bioinformatics for Plant Research and Crop Breeding* offers an overview of this field its recent advances and its wider applications Drawing on a range of analytical and data science tools its foundation on an in silico platform acquired multi omics makes it indispensable for scientists and

researchers alike It promises to become ever more relevant as new techniques for generating and organizing data continue to transform the field Bioinformatics for Plant Research and Crop Breeding readers will also find A focus on emerging trends in plant science sustainable agriculture and global food security Detailed discussion of topics including plant diversity plant stresses nanotechnology in agriculture and many others Applications incorporating artificial intelligence machine learning deep learning and more Bioinformatics for Plant Research and Crop Breeding is ideal for researchers and scientists interested in the potential of OMICs and bioinformatic tools to aid and develop crop improvement programs **Omics**

Approaches for Sugarcane Crop Improvement Rajarshi Kumar Gaur,2022-12-30 In this book the information encompasses various researchable biotechnology aspects of sugarcane its genomic structure diversity comparative and structural genomics data mining etc This book explores both the theoretical and practical aspects of sugarcane crops focusing on innovative processes This book argues in favor of developing an integrated research and development system to strengthen the research and development capabilities of all the areas of sugarcane Further it covers the recent trends of sugarcane biotechnology especially in the next generation sequencing NGS era This book will be very useful for professors and scientists who are working in the area of sugarcane crops by using molecular biology and bioinformatics It is also useful for students to use as a reference for their classes or thesis projects Key features Discusses an integral part of molecular biology and pivotal tools for molecular breeding enables breeders to design cost effective and efficient breeding strategies for sugarcane Discusses the harnessing genomics technologies for genetic engineering and pathogen characterization and diagnosis of sugarcane Provides new examples and problems added where needed Provides insight from contributors drawn from around the globe **Integrative Omics** Manish Kumar Gupta,Pramod Katara,Sukanta Mondal,Ram Lakhan

Singh,2024-05-03 Integrative Omics Concepts Methodology and Applications provides a holistic and integrated view of defining and applying network approaches integrative tools and methods to solve problems for the rationalization of genotype to phenotype relationships The reference includes a range of chapters in a systemic step by step manner which begins with the basic concepts from Omic to Multi Integrative Omics approaches followed by their full range of approaches applications emerging trends and future trends All key areas of Omics are covered including biological databases sequence alignment pharmacogenomics nutrigenomics and microbial omics integrated omics for Food Science and Identification of genes associated with disease clinical data integration and data warehousing translational omics as well as omics technology policy and society research Integrative Omics Concepts Methodology and Applications highlights the recent concepts methodologies advancements in technologies and is also well suited for researchers from both academic and industry background undergraduate and graduate students who are mainly working in the area of computational systems biology integrative omics and translational science The book bridges the gap between biological sciences physical sciences computer science statistics data science information technology and mathematics by presenting content specifically dedicated to

mathematical models of biological systems Provides a holistic integrated view of a defining and applying network approach integrative tools and methods to solve problems for rationalization of genotype to phenotype relationships Offers an interdisciplinary approach to Databases data analytics techniques biological tools network construction analysis modeling prediction and simulation of biological systems leading to translational research i e drug discovery drug target prediction and precision medicine Covers worldwide methods concepts databases and tools used in the construction of integrated pathways

OMICs-based Techniques for Global Food Security Sajid Fiaz, Channapatna S. Prakash, 2024-03-25 OMICs based Techniques for Global Food Security Forward thinking resource discussing how to integrate OMICs and novel genome editing technologies for sustainable crop production OMICS based Techniques for Global Food Security provides an in depth understanding of the mechanisms of OMICs techniques for crop improvement details how OMICs techniques can contribute to identifying genes and traits with economic benefits and explains how to develop crop plants with improved yield quality and resistance to stresses through genome editing technologies providing evidence on the developments of climate resilient crops via applications of genome editing techniques throughout The text covers the application of OMICs in crop plants the integration of bioinformatics and multi OMICs for precision breeding de novo domestication CRISPR Cas system for crop improvement hybrid seed production transgene free breeding regulation for genome edit crops bioinformatics and genome editing and other topics related to OMICs and genome editing The text also includes a chapter on global regulations for genome edited crops and explains how these regulations influence novel plant breeding techniques in their adopted countries Edited by two highly qualified academics OMICs based Techniques for Global Food Security covers topics such as Crops genome sequencing and their application for crop improvement and functional characterization of cereal genome The role of OMICs based technologies in plant sciences and utilization of different multi OMICs approaches for crop improvement Genomic database and genetic resource of cereals speed breeding for rapid crop improvement and evolution of genome editing technologies CRISPR system discovery history and future perspective and CRISPR Cas system for biotic and abiotic stress resistance in cereals Providing a collection of recent literature focusing on developments and applications of OMICs based technologies for crop improvement OMICs based Techniques for Global Food Security is an important read for plant breeders molecular biologists researchers postdoctoral fellows and students in disciplines for developing crops with high yield and nutritional potential **Sorghum and Pearl Millet as Climate Resilient Crops for Food and Nutrition**

Security Mahalingam Govindaraj, Wolfram Weckwerth, Palak Chaturvedi, Velu Govindan, 2022-10-03 Omics in Horticultural Crops Gyana Ranjan Rout, K.V. Peter, 2022-07-16 Omics in Horticulture Crops presents a comprehensive view of germplasm diversity genetic evolution genomics proteomics and transcriptomics of fruit crops temperate tropical and subtropical fruits fruit nuts berries vegetables tuberous crops ornamental and floricultural crops and medicinal aromatic plants Information covering phenomics genetic diversity phylogenetic studies genome sequencing and genome barcoding

through the utilization of molecular markers plays an imperative role in the characterization and effective utilization of diverse germplasm are included in the book This is a valuable reference for researchers and academics seeking to improve cultivar productivity through enhanced genetic diversity while also retaining optimal traits and protecting the growing environment Highlights perspectives progress and promises of omics application Provides a systematic overview of origin progenitor and domestication process as well as genetic insights Includes full range of horticultural crops *Extremophiles for Sustainable Agriculture and Soil Health Improvement* Anuj Ranjan,Vishnu D. Rajput,Abhishek Chauhan,Evgeniya Valer'evna Prazdnova,Tatiana Minkina,Sajad Majeed Zargar,2024-11-15 This volume presents recent biotechnological advances in the application of extremophiles in sustainable agricultural production plant health and soil remediation It highlights the physiology and biochemistry of extremophiles to ensure their survival and adaptation under stressful agricultural conditions as well as their ecological diversity and taxonomical attributes that allow them to be useful in improving abiotic and biotic tolerance among crops The chapters cover genomic metagenomic and metabolomic approaches for improving crop production biocontrol nutrient solubilization and soil health to ensure food and nutrition security in a sustainable manner in difficult growing environments The book will be useful for students and researchers studying soil and plant management sustainable agriculture microbiology and biochemistry *Crop Improvement* Khalid Rehman Hakeem,Parvaiz Ahmad,Munir Ozturk,2013-06-13 The improvement of crop species has been a basic pursuit since cultivation began thousands of years ago To feed an ever increasing world population will require a great increase in food production Wheat corn rice potato and few others are expected to lead as the most important crops in the world Enormous efforts are made all over the world to document as well as use these resources Everybody knows that the introgression of genes in wheat provided the foundation for the Green Revolution Later also demonstrated the great impact that genetic resources have on production Several factors are contributing to high plant performance under different environmental conditions therefore an effective and complementary use of all available technological tools and resources is needed to meet the challenge *Food and Agriculture COST Action FA1101* ,2015 *Industrial Crops Improvement* Nitish Kumar,2025-01-24 This book explores the different conventional and biotechnological techniques for enhancing the productivity of industrial crops The growth of the industrial crop sector has become a widespread global phenomenon that helps rural livelihoods and propels economic development Contrary to staple crops industrial crops are cultivated with the intention of being sold for a high profit Industrial crops are a crucial component of plans to increase food security because they offer the required stability during periods of economic or climatic crises In order to maintain their livelihood and food security many farm households balance the advantages and disadvantages of producing food crops and industrial crops Avoiding land use rivalry with crops grown for food and feed production is crucial when considering growing industrial crops on agricultural soils The past several years have seen a rise in the awareness of scholars and decision makers regarding the immediate and long term

effects of climatic variables on economic food security social and political results In order to sustain food production with more climate resilient crops for future generations genetic variety both natural and artificial is crucial Therefore addressing the problem of finding a compromise between increasing crop production under a specific set of conditions and reducing the chance of crop failure when conditions change is important and difficult An assortment of meteorological conditions is used to grow industrial crops Many are subsistence farmers who run extremely tiny farms with very little agricultural input to produce products that can be sold It is a significant problem to preserve the variety of these crops and handle all crop culture related difficulties By offering the knowledge required to minimize the dangers of industrial crop breeding through managing genetic diversity the author believe that this book will primarily address a need that has not yet been met in this and other grower groups

Omics Technologies And Crop Improvement: Bestsellers in 2023 The year 2023 has witnessed a remarkable surge in literary brilliance, with numerous compelling novels captivating the hearts of readers worldwide. Lets delve into the realm of popular books, exploring the fascinating narratives that have enthralled audiences this year. The Must-Read : Colleen Hoover's "It Ends with Us" This poignant tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover masterfully weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can prevail. Omics Technologies And Crop Improvement : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This intriguing historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids compelling storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Discover the Magic : Delia Owens "Where the Crawdads Sing" This evocative coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens weaves a tale of resilience, survival, and the transformative power of nature, captivating readers with its evocative prose and mesmerizing setting. These bestselling novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of compelling stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a masterful and thrilling novel that will keep you wondering until the very end. The novel is a warning tale about the dangers of obsession and the power of evil.

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