OMICS

Applications in Crop Science

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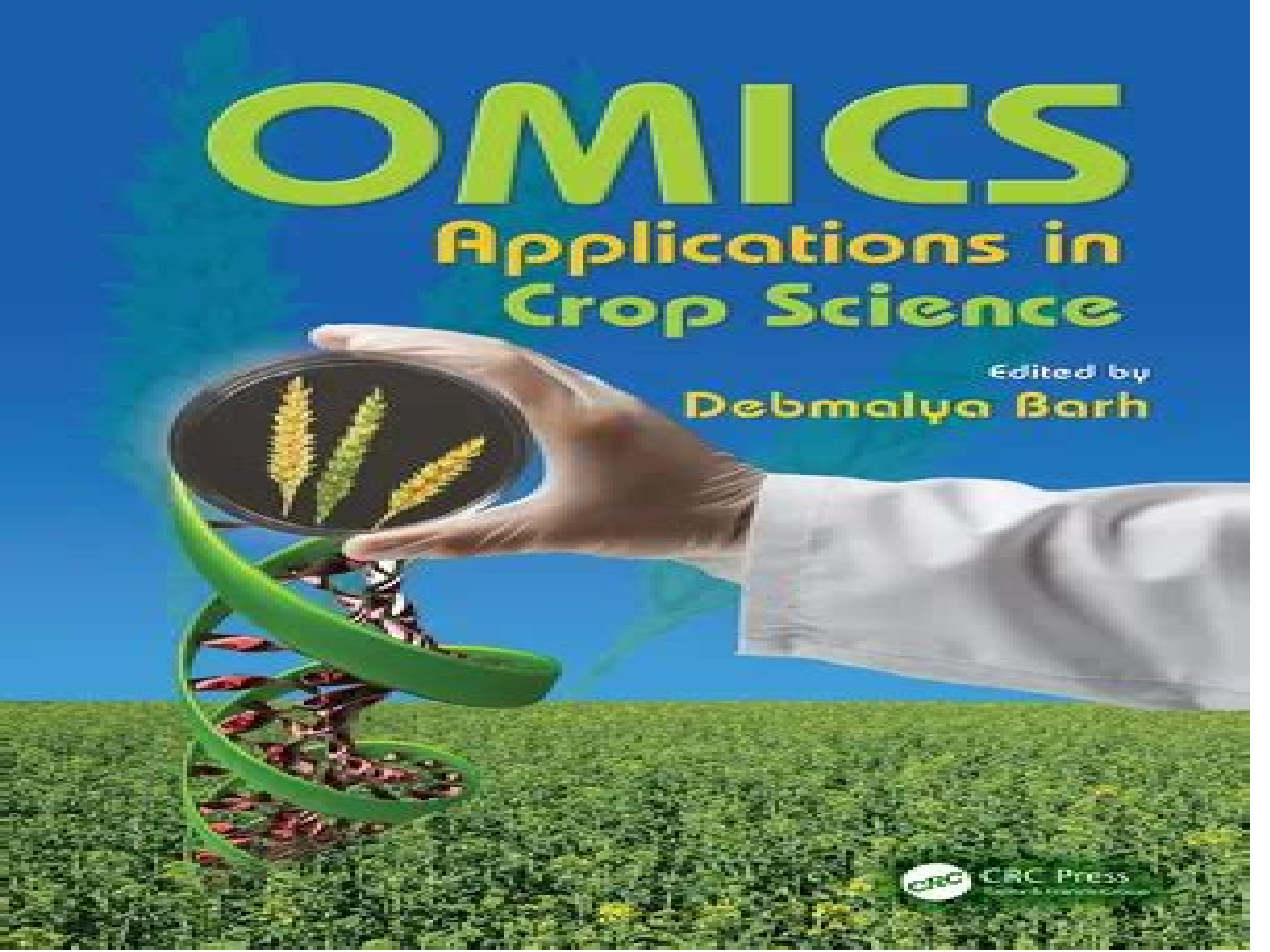

CRC Press

Omics Applications In Crop Science

Ajaya Kumar Rout,Ram Kewal Singh,Arvind Kumar Shukla,Bijay Kumar Behera

Omics Applications In Crop Science:

OMICS Applications in Crop Science ,2018-05 Omics is a collective wide range discipline chiefly referring to analysis of the interactions of biological information obtained from the profiling of the genome transcriptome proteome metabolome and several other relevant omes Essentially the omics science is enabled by a host of diverse high throughput technologies and platforms The full range of omics technologies can now be applied to understand the same fundamental biological processes Mapping and defining the relationships among genes proteins and metabolites require relative comparison of the networks that eventually help in understanding the regulatory mechanisms These new strategies have begun to piece together the physiological and phenotypic observations with information on transcription and transcript regulation the behavior of proteins protein complexes and pathways and the metabolites and metabolite fluxes finally shedding light on evolutionary adaptive diversifications of organisms OMICS Applications in Crop Science is a compilation of several omics studies such as genomics proteomics or metabolomics to illustrate the applications of these studies in crop productivity discussing the strengths and weaknesses of omics technologies and the limitations of current techniques in the perspective of plant biology The contributed chapters are written by subject matter experts and wide known researchers with years of research experience in this field Integration of knowledge from omics based research is an emerging issue as researchers seek to identify importance increase biological insights and promote translational research From these viewpoints it aims to provide the evolving aspects of plant systems research based on omics and bioinformatics analyses plus their associated resources and technological advances The present book covers a wide range of omics topics and discusses the latest trends and application area of crop science OMICS Applications in Crop Science Debmalya Barh,2013-12-16 Merging topical data from recently published review and research articles as well as the knowledge and insight of industry experts Omics Applications in Crop Science delves into plant science and various technologies that use omics in agriculture This book concentrates on crop breeding and environmental applications and examines the applications of various omics technologies including genomics transcriptomics proteomics metabolomics to important agronomic horticultural medicinal plantation fiber forage and bioenergy crops It covers the application of omics technologies in several important crops including cereal and pulse It explores the brassica species drought tolerance in rice and genetic engineering of the potato The book discusses temperate fruits and omics of medicinal plants the metabolomics of Catharanthus roseus and how the medicinally important alkaloids of the plant are produced as well as the omics of another important medicinal plant Withania somnifera It examines floriculture the omics advances in tea and omics strategies in improving the fiber qualities of cotton It provides omics related information on forest trees and forage crops and offers a detailed account on how omics technologies are applicable in molecular farming along with associated issues such as commercial aspects of molecular farming clinical trials of plant produced pharmaceuticals regulatory issues and intellectual property rights Written as a resource for plant biologists plant

breeders agriculture scientists researchers and college students studying various fields in agriculture and the agri industries OMICS Applications in Crop Science compiles the latest research in this essential field of modern crop and plant science utilizing various omics technologies and their applications in a number of important crops plants from agronomy pomology olericulture floriculture medicinal plants plantation and energy crops agro forestry and more *OMICS* Debmalya Barh,Vasudeo Zambare,Vasco Azevedo,2013-03-26 With the advent of new technologies and acquired knowledge the number of fields in omics and their applications in diverse areas are rapidly increasing in the postgenomics era Such emerging fields including pharmacogenomics toxicogenomics regulomics spliceomics metagenomics and environomics present budding solutions to combat global challeng *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 **Omics Technologies and Crop Improvement** Noureddine 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

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 an 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 **Advances in Omics Technologies** Ajaya Kumar Rout,Ram Kewal Singh,Arvind Kumar Shukla,Bijay Kumar Behera,2025-08-29 This comprehensive volume offers an in depth exploration of the latest advancements in omics technologies and their practical applications across environmental science agriculture healthcare and biotechnology Covering key topics such as metagenomics for identifying beneficial microbes bioremediation for environmental cleanup bacteriophages proteomics epigenomics and CRISPR Cas9 genome editing the book provides valuable insights into cutting edge tools and methodologies It also delves into next generation sequencing biosensor technology bioinformatics tools mass spectrometry based metabolomics as well as emerging fields like nutrigenomics and microarrays technology With clear explanations and practical perspectives this authoritative resource is ideal for students researchers and professionals striving to stay abreast of innovations in life sciences and contribute to the rapidly evolving landscape of omics sciences **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 *Plant Omics and Crop*

Breeding Taylor & Francis Group,2021-03-31 Due to the advent of state of the art technologies in the field of biotechnology much progress has been achieved since the last decade OMICS technologies are being extensively used to address various issues pertaining to agriculture Recent advances in genomics transcriptomics proteomics and metabolomics techniques have revolutionized the understanding of genetic response of plants to various biotic and abiotic stresses Strategic application of this revolutionary technology will eventually lead towards attaining sustainability in agriculture This new book Plant OMICS and Crop Breeding addresses this important issue *Omics in Plant Breeding* Aluízio Borém,Roberto Fritsche-Neto,2014-06-03 Computational and high throughput methods such as genomics proteomics and transcriptomics known collectively as omics have been used to study plant biology for well over a decade now As these technologies mature plant and crop scientists have started using these methods to improve crop varieties Omics in Plant Breeding provides a timely introduction to key omicsbased methods and their application in plant breeding Omics in Plant Breeding is a practical and accessible overview of specific omics based methods ranging from metabolomics to phenomics Covering a single methodology within each chapter this book provides thorough coverage that ensures a strong understanding of each methodology both in its application to and improvement of plant breeding Accessible to advanced students researchers and professionals Omics in Plant Breeding will be an essential entry point into this innovative and exciting field A valuable overview of high throughput genomics based technologies and their applications to plant breeding Each chapter explores a single methodology allowing for detailed and thorough coverage Coverage ranges from well established methodologies such as genomics and proteomics to emerging technologies including phenomics and physionomics Alu zio Bor m is a Professor of Plant Breeding at the University of Vi osa in Brazil Roberto Fritsche Neto is a Professor of Genetics and Plant Breeding at the University of S o Paulo in Brazil *Plant Omics and Crop Breeding* Sajad Majeed Zargar,Vandna Rai,2017 **PlantOmics: The Omics of Plant Science** Debmalya Barh,Muhammad Sarwar Khan,Eric Davies,2015-03-18 PlantOmics The Omics of Plant Science provides a comprehensive account of the latest trends and developments of omics technologies or approaches and their applications in plant science Thirty chapters written by 90 experts from 15 countries are included in this state of the art book Each chapter describes one topic omics such as omics in model plants spectroscopy for plants next generation sequencing functional genomics cyto metagenomics epigenomics miRNAomics proteomics metabolomics glycomics lipidomics secretomics phenomics cytomics physiomics signalomics thiolomics organelle omics micro morphomics microbiomics cryobionomics nanotechnology pharmacogenomics and computational systems biology for plants It provides up to date information technologies and their applications that can be adopted and applied easily for deeper understanding plant biology and therefore will be helpful in developing the strategy for generating cost effective superior plants for various purposes In the last chapter the editors have proposed several new areas in plant omics that may be explored in order to develop an integrated meta omics strategy to ensure the world and earth s health and related issues This book will be a

valuable resource to students and researchers in the field of cutting edge plant omics Meta-omics in Crop Improvement Renu,,Sanjeev Gupta,Tilak Raj Sharma,2025-10-31 This book is the first of the two volumes and it focuses on exploring the meta omics integrative techniques to enhance crop productivity resilience and quality With information on metagenomics metatranscriptomics metaproteomics and metabolomics this volume provides an understanding of soil microbial communities and their interactions with crops The chapters delve into specific techniques and tools within each meta omics discipline offering insights into their roles in crop improvement From detecting plant pathogens to enhancing traits like stress resistance and nutritional quality the book addresses modern agricultural challenges It also tackles issues such as data integration and accessibility while exploring future directions and real world case studies that illustrate the impact of meta omics on agriculture Particular attention is given to deciphering microbiomes for various applications with dedicated chapters on the core plant microbiome and tools and techniques of meta transcriptomic studies Readers will find details of methodologies that contribute to understanding complex microbial communities and their interaction with crops This essential resource is designed for researchers scholars and practitioners in the fields of agriculture microbiology and biotechnology 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 Meta-omics in Crop Improvement Renu,,Sanjeev Gupta,Tilak Raj Sharma,2026-02-22 This second volume on meta omics technologies brings together the rapidly growing facets of this discipline focusing on its application in crop improvement By integrating metagenomics metatranscriptomics metaproteomics and metabolomics it aims to document progress and the integration of meta omics technologies in crop research showcasing case studies and applications while examining wider consequences of implementing meta omics in agriculture This book features chapters discussing a range of applications of these methods across diffenet crops including rice wheat legumes fibre crops tobacco soybean horticultural crops microalgae and cyanobacteria A chapter focused on the integration of machine learning in metagenomics highlights the possibilities and obstacle es in predictive modeling big data analysis and functional annotation Collectively these chapters demonstrate both the scientific diversity of these approaches applications across various crops and settings as well as the forward thinking consequences for enhancing crop development Researchers in the field of agricultural science as well as practitioners interested in sustainable crop production will find this volume invaluable It offers a comprehensive understanding of how meta omics can be harnessed to address pressing agricultural challenges making it a must read for anyone committed to advancing global food security and sustainable agriculture *Omics Applications for Systems Biology* Wan Mohd Aizat,Hoe-Han Goh,Syarul Nataqain Baharum,2018-10-31 This book explains omics at the most basic level including how this new concept can be properly utilized in molecular and systems biology research Most reviews and books on this topic have mainly focused on the technicalities and complexity of each omics platform impeding readers to wholly understand its fundamentals and applications This book tackles such gap and will be most beneficial to novice in this area university students and even researchers Basic workflow and practical guidance in each omics are also described such that scientists can properly design their experimentation effectively Furthermore how each omics platform has been conducted in our institute INBIOSIS is also detailed a comprehensive example on this topic to further enhance readers understanding The contributors of each chapter have utilized the platforms in various manner within their own research and beyond The contributors have also been interactively integrated and combined these different omics approaches in their research being able to systematically write each chapter with the conscious knowledge of other inter relating topics of omics The potential readers and audience of this book can come from undergraduate and postgraduate students who wish to extend their comprehension in the topics of molecular biology and big data analysis using omics platforms Furthermore researchers and scientists whom may have expertise in basic molecular biology can extend their experimentation using the omics technologies and workflow outlined in this book benefiting their research in the long run **Omics and Genome Editing** Kartika Sharma,2025-03-18 *Omics Applications and Avenues* Prachi Srivastava,Prekshi Garg,2024-10-29 Dive into the rapidly evolving world of omics sciences with Omics Applications and Avenues This comprehensive guide explores the

interdisciplinary realm of genomics proteomics metabolomics and beyond delving into the latest advancements and applications across diverse fields such as medicine agriculture microbial toxicology nanotechnology forensic sciences chemistry metabolome aquatic life evolution and environmental science Through insightful discussions applications and case studies readers will uncover the transformative potential of omics technologies in understanding complex biological systems unravelling disease mechanisms enhancing crop yields and mitigating environmental challenges Whether you re a seasoned researcher or a curious novice this book offers a captivating journey into the forefront of modern scientific inquiry illuminating the limitless possibilities that omics methodologies offer for shaping the future of science and society

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 *Meta-omics in Crop Improvement* Renu,,Sanjeev Gupta,Tilak Raj Sharma,2025-11-26 This book is the first of the two volumes and it focuses on exploring the meta omics integrative techniques to enhance crop productivity resilience and quality With information on metagenomics metatranscriptomics metaproteomics and metabolomics this volume provides an understanding of soil microbial communities and their interactions with crops The chapters delve into specific techniques and tools within each meta omics discipline offering insights into their roles in crop improvement From detecting plant pathogens to enhancing traits like stress resistance and nutritional quality the book addresses modern agricultural challenges It also tackles issues such as data integration and accessibility while exploring future directions and real world case studies that illustrate the impact of meta omics on agriculture Particular attention is given to deciphering microbiomes for various applications with dedicated chapters on the core plant microbiome and tools and techniques of meta transcriptomic studies Readers will find details of methodologies that contribute to understanding complex microbial communities and their interaction with crops This essential resource is designed for researchers scholars and practitioners in the fields of agriculture microbiology and biotechnology

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