# Molecular Improvement of Cereal Crops

Edited by Indra K. Vasil



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# **Molecular Improvement Of Cereal Crops**

Mallana Gowdra Mallikarjuna,S. Chandra Nayaka,Tanushri Kaul

#### **Molecular Improvement Of Cereal Crops:**

Molecular improvement of cereal crops I. K. Vasil,1999-03-31 From the pre historic era to modern times cereal grains have been the most important source of human nutrition and have helped sustain the increasing population and the development of human civilization In order to meet the food needs of the 21st century food production must be doubled by the year 2025 and nearly tripled by 2050 Such enormous increases in food productivity cannot be brought about by relying entirely on conventional breeding methods especially on less land per capita with poor quality and quantity of water and under rapidly deteriorating environmental conditions Complementing and supplementing the breeding of major food crops such as the cereals which together account for 66% of the world food supply with molecular breeding and genetic manipulation may well provide a grace period of about 50 years in which to control population growth and achieve sustainable development In this volume leading world experts on cereal biotechnology describe the production and commercialization of the first generation of transgenic cereals designed to substantially reduce or prevent the enormous losses to cereal productivity caused by competition with weeds and by various pests and pathogens which is an important first step in that direction Molecular improvement of cereal crops Indra K. Vasil, 2012-12-06 From the pre historic era to modern times cereal grains have been the most important source of human nutrition and have helped sustain the increasing population and the development of human civilization In order to meet the food needs of the 21st century food production must be doubled by the year 2025 and nearly tripled by 2050 Such enormous increases in food productivity cannot be brought about by relying entirely on conventional breeding methods especially on less land per capita with poor quality and quantity of water and under rapidly deteriorating environmental conditions Complementing and supplementing the breeding of major food crops such as the cereals which together account for 66% of the world food supply with molecular breeding and genetic manipulation may well provide a grace period of about 50 years in which to control population growth and achieve sustainable development In this volume leading world experts on cereal biotechnology describe the production and commercialization of the first generation of transgenic cereals designed to substantially reduce or prevent the enormous losses to cereal productivity caused by competition with weeds and by various pests and pathogens which is an important first step in that direction **Molecular Improvement of Cereal Crops** Indra K Vasil, 1999-03-31 Genomics of Cereal Crops Shabir Hussain Wani, Anuj Kumar, 2022-06-13 This volume details different genomic methods and resources to explore cereal genomics Chapters guide readers through crop genomes Next Generation Sequencing NGS technologies protocol for CRISPR editing transgenic wheat NGS approach virus induced gene silencing VIGS genomic tools computational prediction of ncRNAs miRNAs ceRNAs in cereal crops genotyping by sequencing GBS Bayesian method single cell sequencing genome wide association study GWAS QTL interval mapping whole genome bisulfite sequencing genome imprinting and methods for study the receptor metabolite interaction Authoritative and cutting edge Genomics of Cereal

Crops aims to be a useful and practical guide to new researchers and experts looking to expand their knowledge Molecular Approaches for the Genetic Improvement of Cereals for Stable Production in Water-limited Environments Jean-Marcel Ribaut, 2000 Plants as Bioreactors for Industrial Molecules Santosh Kumar Upadhyay, Sudhir Pratap Singh, 2023-02-03 PLANTS AS BIOREACTORS FOR INDUSTRIAL MOLECULES An incisive and practical discussion of how to use plants as bioreactors In Plants as Bioreactors for Industrial Molecules a team of distinguished researchers delivers an insightful and global perspective on the use of plants as bioreactors In the book you ll find coverage of the basic applied biosynthetic and translational approaches to the exploitation of plant technology in the production of high value biomolecules The authors focus on the yield and quality of amino acids vitamins and carbohydrates The authors explain how high value biomolecules enable developers to create cost effective biological systems for the production of biomolecules useful in a variety of sectors They provide a holistic approach to plant based biological devices to produce natural molecules of relevance to the health and agriculture industries Readers will also find A thorough overview of plants as bioreactors and discussions of molecular farming for the production of pharmaceutical proteins in plants Comprehensive explorations of plants as edible vaccines and plant cell culture for biopharmaceuticals Practical discussions of the production of attenuated viral particles as vaccines in plants and insecticidal protein production in transgenic plants Extensive treatment of the regulatory challenges involved in using plants as bioreactors Perfect for academics scientists and researchers in industrial microbiology and biotechnology Plants as Bioreactors for Industrial Molecules will also earn a place in the libraries of biotechnology company professionals in applied product development **Genetics and Molecular Breeding in Cereal** Crops Hongwei Wang, Han Zhao, Hongxiang Ma, Sung Don Lim, Colin W. Hiebert, 2023-11-09 Transgenic Crops of the World Ian S. Curtis, 2012-08-10 Since the first transgenic plants were produced back in the early 1980s there have been substantial developments towards the genetic engineering of most crops of our world Initial studies using isolated plant cells and removing their cell walls to form protoplasts offered the possibility of transferring genetic material by Agrobacterium mediated gene transfer chemical agents or electrical charges However in those cases were isolated protoplasts could be transformed often a shoot regeneration system was not available to induce the production of transgenic plants and any such regenerated plants were subject to mutation or chromosomal of cultured plant organs such as leaf abnormalities By the mid 1980s the use disks offered the convenience of combining gene transfer plant regeneration and selection of transformants in a single system This approach enabled the production of stable phenotypically normal transgenic potato and tomato plants in culture By the late 1980s the use of biolistics offered a means of inserting foreign genes into plant cells which where inaccessible to Agrobacterium infection Even today this technology is now standard practice for the production of some transgenic plants Transgenic Plants and Crops George C. Khachatourians, Y. H. Hui, Ralph Scorza, Wai-Kit Nip, 2002-03-26 This work details the advances in transgenic plant construction and explores the social political and legal aspects of genetic

plant manipulation Using the Agricultural, Environmental, and Food Literature Barbara S. Hutchinson, Antoinette Paris-Greider, 2002-07-17 This reference provides the groundwork tools and terminology required when conducting specialized searches for information and resources pertaining to traditional and emerging fields of agriculture The editors present 16 contributions from librarians and other information workers that offer information on research resources across **Drought Adaptation in Cereals** Jean-Marcel Ribaut, 2024-11-01 Learn how to best improve yield in cereal plants even in dry conditions The impact of drought on crop production can be economically devastating Drought Adaptation in Cereals provides a comprehensive review of the latest research on the tolerance of cereal crops to water limited conditions Renowned experts extensively describe basic concepts and cutting edge research results to clearly reveal all facets of drought adaptation in cereals More than simply a fine reference for plant biology and plant improvement under water limited conditions this book spotlights the most relevant biological approaches from plant phenotyping to functional genomics The need to understand plant response to the lack of water is integral to forming strategies to best manage crops Drought Adaptation in Cereals starts by offering an overview of the biological basis and defines the adaptive mechanisms found in plants under water limited conditions Different approaches are presented to provide understanding of plant genetics basics and plant breeding including phenotyping physiology and biotechnology The book details drought adaptation mechanisms at the cellular organ and entire plant levels focusing on plant metabolism and gene functions. This resource is extensively referenced and contains tables charts and figures to clearly present data and enhance understanding After a foreword by J O Toole and a prologue by A Blum Drought Adaptation in Cereals presents a full spectrum of informative topics from other internationally respected scientists These include drought's economic impact P Heisey genotype by environment interactions M Cooper secondary traits for drought adaptation P Monneveux leaf growth F Tardieu carbon isotope discrimination T Condon drought adaptation in barley M Sorrells maize M Sawkins rice R Lafitte sorghum A Borrell and wheat M Reynolds carbohydrate metabolism A Tiessen the role of abscisic acid T Setter protection mechanisms and stress proteins L Mtwisha genetic basis of ion homeostasis and water deficit H Bohnert transcriptional factors K Yamaguchi Shinozaki resurrection plants D Bartels Drought Adaptation in Cereals is a unique vital reference for scientists educators and students in plant biology agronomy and natural resources management Cereal Crops Tariq Shah, Lixiao Nie, Marcelo Teixeira Filho, Rabia Amir, 2023-06-21 Cereal Crops Genetic Resources and Breeding Techniques provides the reader practical tools for understanding relationships and challenges of successful farming improvements to genetic modifications and environmentally sound methods of production of bulk and quality cereals including wheat maize rice barley and millets It explores the trait mapping cropping systems genome engineering and identification of specific germplasms needed for the more effective development of biotic and abiotic stress resistant cereals within the framework of ensuring future food supplies around the world Features Focuses on cropping systems genetics and genome engineering for higher crop

production at a global level Features information on specific prebiotic formulas to ward off adverse effects of antibiotics Covers mechanistic as well as practical approaches for enhancing crop production in a sustainable way Includes further in depth analysis of various topics following each chapter This is a vital resource for researchers crop biologists and students working with crop production and climate changes that have a significant impact on crop production spanning basic to advanced level discussions of plant breeding molecular genetics and agronomy Covering mechanistic and practical approaches for enhancing crop production in a sustainable way this text is beneficial to intensive farmers and stakeholders in the field of crop production Synthetic Biology Handbook Darren N. Nesbeth, 2016-04-06 The Synthetic Biology Handbook explains the major goals of the field of synthetic biology and presents the technical details of the latest advances made in achieving those goals Offering a comprehensive overview of the current areas of focus in synthetic biology this handbook Explores the standardisation of classic molecular bioscience approaches **Next-Generation Plant Breeding** Approaches for Stress Resilience in Cereal Crops Mallana Gowdra Mallikarjuna, S. Chandra Nayaka, Tanushri Kaul, 2022-09-15 This edited book highlights the gravity and efficacy of next generation breeding tools for the enhancement of stress resilience in cereals especially in the context of climate change pests diseases and abiotic stresses The content of the book helps in understanding the application of emerging genetic concepts and neoteric genomic approaches in cereal breeding It collates all the latest information about enhancing the stress resilience in cereal crops for overcoming food security issues Cereals have predominantly been used as a staple food since time immemorial and contribute more than 50% of the caloric requirement of the global population However in cereals the yield losses due to various stresses are very high considering the crop growth stage and stress sensitivity Therefore to feed and nourish the generations in the era of climate change it is imperative to develop stress resilient cereal cultivars. This book explores newly developed next generation breeding tools viz genome wide association studies genomic prediction genome editing and accelerated generation advancement methodologies which revealed promising outcomes by enhancing the stress resilience in cereals with yield potential This book is useful for postgraduate students specializing in plant breeding plant stress physiology plant genomics agriculture and agronomy It is of immense value to scientific community involved in teaching research and extension activities related to cereal cultivation Corn Sergio O. Serna-Saldivar, 2018-11-09 Corn Chemistry and Technology Third Edition provides a broad perspective on corn from expert agronomists food scientists and geneticists This encyclopedic storehouse of comprehensive information on all aspects of the world's largest crop in metric tons includes extensive coverage of recent development in genetic modification for the generation of new hybrids and genotypes New chapters highlight the importance of corn as a raw material for the production of fuel bioethanol and the emerging topic of phytochemicals or nutraceutical compounds associated to different types of corns and their effect on human health especially in the prevention of chronic diseases and cancer Written by international experts on corn and edited by a highly respected academics this new

edition will remain the industry standard on the topic Presents new chapters that deal with specialty corns the production of first generation bioethanol and the important relationship of corn phytochemicals or nutraceuticals with human health Provides contributions from a new editor and a number of new contributors who bring a fresh take on this highly successful volume Includes vastly increased content relating to recent developments in genetic modification for the generation of new hybrids and genotypes Contains encyclopedic coverage of grain chemistry and nutritional quality of this extensively farmed product Covers the production and handling of corn with both food and non food applications Advances in breeding techniques for cereal crops Prof Frank Ordon, Prof. Wolfgang Friedt, 2019-06-28 Assesses performance of conventional techniques such as backcross and hybrid breeding in introducing new traits Maps current progress in methods to identify quantitative trait loci QTL linking phenotypic traits with genetic information for selection Shows comparative strengths and weaknesses of marker assisted selection MAS techniques such as genome wide association studies GWAS and nested association mapping NAM Plant Cell and Tissue Culture - A Tool in Biotechnology Karl-Hermann Neumann, Ashwani Kumar, Jafargholi Imani, 2020-10-01 This textbook is clearly structured with fourteen richly illustrated chapters and practical examples for easy understanding and direct implementation. The methods and findings developed in the authors group are presented in detailed revised chapters Readers will find valuable updates on the molecular basis of biotechnological processes secondary metabolite production and genetic engineering In addition the basic principles of important biotechnologies as well as examples of specially designed crops that deliver improved productivity under stress conditions are presented This second edition sets the direction for future research on the basic aspects of plant tissue culture and its applications in the fields of secondary metabolite production and genetic engineering It provides both general and specific information for students teachers academic researchers and industrial teams who are interested in new developments in plant tissue culture and its applications The Future of Rice Demand: Quality Beyond Productivity Antonio Costa de Oliveira, Camila Pegoraro, Vívian Ebeling Viana, 2020-03-27 This book aims to provide an overview of the challenges and available technologies to improve rice and provide a response to the challenge posed by increasing world population and the resultant food shortages Nutritional aspects of rice products and omics and the molecular technologies currently being used are covered in depth As a staple food for over 50% of the world's population an estimated 9 billion people will need to be fed by 2050 and healthy and uncontaminated foods need to reach consumers in developed and developing countries This makes quality beyond productivity incredibly important and is one of the overriding themes of this work The Future of Rice Demand Quality Beyond Productivity offers researchers a better understanding of the nutritional aspects of rice Omics technologies applied to cereal grain quality have been scarce in the literature published to date making this text an excellent single source for researchers in regions where rice is a major crop The first section of the book focuses on the major aspects of the industrial processing of all rice types Further sections look at contamination prevention and

biofortification special rice types and omics and other molecular tools used in the mass production and processing of healthy rice products Genomic Designing of Climate-Smart Cereal Crops Chittaranjan Kole, 2020-02-28 This book highlights modern methods and strategies to improve cereal crops in the era of climate change presenting the latest advances in plant molecular mapping and genome sequencing Spectacular achievements in the fields of molecular breeding transgenics and genomics in the last three decades have facilitated revolutionary changes in cereal crop improvement strategies and techniques Since the genome sequencing of rice in 2002 the genomes of over eight cereal crops have been sequenced and more are to follow This has made it possible to decipher the exact nucleotide sequence and chromosomal positions of agroeconomic genes Most importantly comparative genomics and genotyping by sequencing have opened up new vistas for exploring available biodiversity particularly of wild crop relatives for identifying useful donor genes Food Systems for Improved Human Nutrition Palit Kataki, Suresh Chandra Babu, 2024-11-01 Learn to produce crops with improved nutrition to alleviate malnourishment using sustainable agriculture techniques Utilizing complete food systems to improve nutrition has become a priority in the fight against malnutrition This book examines all aspects of food systems drawing on examples from various countries and geographical regions Bringing together the most recent work of international experts Food Systems for Improved Human Nutrition provides an important overview of the food systems approach It also explores the extent of malnourishment in different areas presents case studies from South Asia China India Bangladesh and East Africa points to ways to improve food production and nutrient quality and suggests directions for future research Helpful charts and tables make the information in this well referenced book easy to access and understand Food Systems for Improved Human Nutrition brings you state of the art information on the potential benefits of agroforestry systems how to fortify food with micronutrients how to design population appropriate nutrition interventions the ways that rapid economic change can affect human nutrition in a given area biotech approaches to improve nutrition in rice and maize crops crossbred cow technologies in the East African highlands and much more

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