



# Genomics-Assisted Crop Improvement

*Volume 2*  
*Genomics Applications in Crops*

Rajeev K. Varshney  
Roberto Tuberosa  
*Editors*



Springer



# Genomics Assisted Crop Improvement Vol 2 Genomics Applications In Crops

**Irwin Goldman**





## **Genomics Assisted Crop Improvement Vol 2 Genomics Applications In Crops:**

**Genomics-Assisted Crop Improvement** R.K. Varshney, Roberto Tuberosa, 2007-12-12 Genomics research has great potential to revolutionize the discipline of plant breeding This two volume set provides a critical assessment of genomics tools and approaches for crop breeding Volume 1 entitled Genomics Approaches and Platforms illustrates state of the art genomics approaches and platforms presently available for crop improvement Volume 2 entitled Genomics Applications in Crops compiles crop specific studies that summarize both the achievements and limitations of genomics research for crop improvement We hope that these two volumes while providing new ideas and opportunities to those working in crop breeding will help graduate students and teachers to develop a better understanding of the applications of crop genomics to plant research and breeding

**Genomics-Assisted Crop Improvement** Rajeev K. Varshney, Roberto Tuberosa, 2007-12-13 This superb volume provides a critical assessment of genomics tools and approaches for crop breeding Volume 1 presents the status and availability of genomic resources and platforms and also devises strategies and approaches for effectively exploiting genomics research Volume 2 goes into detail on a number of case studies of several important crop and plant species that summarize both the achievements and limitations of genomics research for crop improvement

Genomics-Assisted Crop Improvement Rajeev K. Varshney, Roberto Tuberosa, 2007-12-20 This superb volume provides a critical assessment of genomics tools and approaches for crop breeding Volume 1 presents the status and availability of genomic resources and platforms and also devises strategies and approaches for effectively exploiting genomics research Volume 2 goes into detail on a number of case studies of several important crop and plant species that summarize both the achievements and limitations of genomics research for crop improvement

*Genomics Assisted Breeding of Crops for Abiotic Stress Tolerance, Vol. II* Vijay Rani Rajpal, Deepmala Sehgal, Avinash Kumar, S.N. Raina, 2019-07-01 The abiotic stresses like drought temperature cold salinity heavy metals etc affect a great deal on the yield performance of the agricultural crops To cope up with these challenges plant breeding programs world wide are focussing on the development of stress tolerant varieties in all crop species Significant genomic advances have been made for abiotic stress tolerance in various crop species in terms of availability of molecular markers QTL mapping genome wide association studies GWAS genomic selection GS strategies and transcriptome profiling The broad range of articles involving genomics and breeding approaches deepens our existing knowledge about complex traits The chapters are written by authorities in their respective fields This book provides comprehensive and consolidated account on the applications of the most recent findings and the progress made in genomics assisted breeding for tolerance to abiotic stresses in many important major crop species with a focus on applications of modern strategies for sustainable agriculture The book is especially intended for students molecular breeders and scientists working on the genomics assisted genetic improvement of crop species for abiotic stress tolerance

**Cereal Genomics II** Pushpendra K. Gupta, Rajeev Varshney, 2013-05-29 Cereal Genomics published in 2004 served the



purpose of collecting all information on cereal genomics at one place and was well received by the cereal workers throughout the world. The last eight years have witnessed significant advancement in the field of cereal genomics. For instance, high density genetic maps, physical maps, QTL maps, and even draft genome sequence have become available for several cereal species. Furthermore, the next generation sequencing (NGS) technologies have revolutionized genomics research so that it is possible now to sequence genomes of hundreds or thousands of accessions of an individual cereal crop. Significant amounts of data generated using these NGS technologies created a demand for computational tools to analyse this massive data. In view of these developments, the Editors realised that there was a need to have an updated volume on the present status and future prospects of cereal genomics. These developments related to technology and the tools have been documented in this volume, thus supplementing our earlier edited volume *Cereal Genomics*. *Cereal Genomics II* discusses advances in cereal genomics research made during the last eight years and presents state of art cereal genomics and its utilization involving both basic research such as comparative genomics and functional genomics and applied research like QTL mapping and molecular breeding.

**Plant Breeding Reviews** Jules Janick, 2011-02-02 *Plant Breeding Reviews* presents state of the art reviews on plant breeding and genetics covering horticultural, agronomic and forestry crops incorporating both traditional and molecular methods. The contributions are authored by world authorities, anonymously reviewed and edited by Professor Jules Janick of Purdue University, USA. The series is an indispensable resource for crop breeders, plant scientists and teachers involved in crop improvement and genetic resources.

Genomics and Society Dhavendra Kumar, Ruth Chadwick, 2015-10-29 *Genomics and Society: Ethical, Legal, Cultural and Socioeconomic Implications* is the first book to address the vast and thorny web of ELSI topics identified as core priorities of the NHGRI in 2011. The work addresses fundamental issues of biosociety and bioeconomy as the revolution in biology moves from research lab to healthcare system. Of particular interest to healthcare practitioners, bioethicists and health economists and of tangential interest to the gamut of applied social scientists investigating the societal impact of new medical paradigms, the work describes a myriad of issues around consent, confidentiality, rights, patenting, regulation and legality in the new era of genomic medicine. Addresses the vast and thorny web of ELSI topics identified as core priorities of the NHGRI in 2011. Presents the core fundamental issues of biosociety and bioeconomy as the revolution in biology moves from research lab to healthcare system. Describes a myriad of issues around consent, including confidentiality, rights, patenting, regulation and more.

*Plant Breeding Reviews, Volume 41* Irwin Goldman, 2018-01-17 *Plant Breeding Reviews* presents state of the art reviews on plant genetics and the breeding of all types of crops by both traditional means and molecular methods. Many of the crops widely grown today stem from a very narrow genetic base. Understanding and preserving crop genetic resources is vital to the security of food systems worldwide. The emphasis of the series is on methodology, a fundamental understanding of crop genetics and applications to major crops.

**Plant Breeding Technology** Zeba Khan, 2024-12-26 This book highlights the latest and most exciting technological tools



for plant breeding that are becoming the staple of all crop improvement programs Using case studies and an evidence based approach to examine the current status of each technique the book discusses the challenges so far uncovered and future trends The book presents a systematic guide to various genomics approaches deployed for trait discovery and improvement in crop species The chapters comprehensively cover each application its advantages and disadvantages and its potential for improvement supported by illustrative examples

**Advances in Plant Breeding Strategies: Legumes** Jameel M. Al-Khayri, Shri Mohan Jain, Dennis V. Johnson, 2019-10-08 This book examines the development of innovative modern methodologies towards augmenting conventional plant breeding in individual crops for the production of new crop varieties under the increasingly limiting environmental and cultivation factors to achieve sustainable agricultural production enhanced food security in addition to providing raw materials for innovative industrial products and pharmaceuticals This is Vol 7 subtitled Legumes focuses on advances in breeding strategies using both traditional and modern approaches for the improvement of individual legume crops Included in this volume are Adzuki bean Black gram Chickpea Cluster bean Common bean Cowpea Faba bean Hyacinth bean Lentil Mung bean Pigeonpea and Soybean This volume is contributed by 57 internationally reputable scientists from 9 countries Each chapter comprehensively reviews the modern literature on the subject and reflects the authors own experience

Plant Breeding Reviews Jules Janick, 2010-05-05 Plant Breeding Reviews presents state of the art reviews on plant genetics and the breeding of all types of crops by both traditional means and molecular methods Many of the crops widely grown today stem from a very narrow genetic base understanding and preserving crop genetic resources is vital to the security of food systems worldwide The emphasis of the series is on methodology a fundamental understanding of crop genetics and applications to major crops

*Translational Genomics for Crop Breeding, 2 Volume Set* Rajeev Varshney, Roberto Tuberosa, 2013-12-04 The Genomics Applications in Crop Improvement two volume set brings together a diverse field of international experts in plant breeding genomics to share their experiences in the field from success stories to lessons learnt In recent years advances in genetics and genomics have greatly enhanced our understanding of the structural and functional aspects of plant genomes Several novel genetic and genomics approaches such as association genetics advanced back cross QTL analysis allele mining comparative and functional genomics transcriptomics proteomics etc offer unprecedented opportunities to examine crop genetic variation and utilize this variability for breeding purposes Enhancing the prediction of the phenotype from a genotype using genomics tools is referred to as genomics assisted breeding To date genomics assisted breeding has shown its potential for crop improvement in several crops however these successes have been largely restricted to temperate cereal and legume crops and others such as Eucalyptus sugarcane tomato and other vegetables crops Moreover while success stories are available for improving resistance to biotic stresses only a few examples are available on development of superior lines for abiotic stresses These volumes will allow researchers the tools to begin to apply these technologies more broadly and will hopefully lead to



lasting improvements in a wide variety of economically important crops Volume One Biotic Stress focuses on genomic assisted advances for improving economically important crops against biotic stressors such as viruses fungi nematodes and bacteria Looking at key advances in crops such as rice barley wheat and potato amongst others Volume Two Abiotic Stress Quality and Yield Improvement focuses on advances improving crop resistance to abiotic stresses such as extreme heat drought flooding as well as advances made in quality and yield improvement Chapters examine advances in such key crops as rice maize and sugarcane among others Two volumes covering important topics in crop genomics and applying that information to breeding improved varieties of economically important crops Volumes cover improving resistance to abiotic and biotic stressors as well as breeding efforts to improve yield and quality Includes chapters on current challenges for plant breeders such as fusarium disease in wheat and cyst nematodes in soybean crops Organized by crop with chapters covering a variety of topics for each including disease resistance drought tolerance salinity tolerance and overall improvement of yield Written by an international team of experts This book is intended for crop science researchers plant biologists geneticists physiologists cellular and molecular biologists and advanced students in related fields will also find this set useful

**Nitrogen Fixation in Crop Production** ,2009      **Journal of the National Research Council of Thailand** ,2009

*Pre-breeding and Gene Discovery for Food and Renewable Energy Security* Muhammad Sabran,2016      *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

*Custom-Designed Crop Breeding, 2 Volume Set* Shri Mohan Jain,Jameel M. Al-Khayri,Sudhir K. Sopory,Muneeb Ahmad Wani,2025-11-11 Discover strategies to develop crop plants with specific traits needed to meet the specific challenges Climate change poses an existential threat to global food supplies with even modest increases in global temperature potentially spelling disaster for crop productivity Plant breeders have applied traditional methods and developed new crop varieties to maintain productivity under specific conditions but there is an urgent need to go much further We must harness the broadest possible range of genomic data and crop breeding practices to create the next generation of resilient food crops Custom Designed Crop Breeding highlights the use of omics based knowledge precision genetics and molecular techniques to breed new climate resistant crops Beginning with an overview of both present and future scenarios in which functional genomics is applied to crops it moves through crop breeding techniques design of crops for stress tolerance and more The result is an essential tool in the fight for a sustainable food supply Custom Designed Crop Breeding Volume 1 Advanced Technologies offers a comprehensive exploration of cutting edge advancements driving modern crop improvement This volume highlights innovative methodologies in genomics climate resilient breeding strategies and the transformative role of artificial intelligence AI and machine learning ML in precision agriculture Spanning diverse topics including genomic tools high throughput phenotyping bioinformatics integration and next gen AI driven predictions this book serves as an essential resource for researchers breeders and professionals seeking to revolutionize agricultural practices for sustainability and productivity Custom Designed Crop Breeding Volume 2 Improved Traits delves into innovative strategies for engineering crops with enhanced traits to address global agricultural challenges This volume is structured around three critical themes abiotic stress tolerance biotic stress resistance and improved nutritional and pharmaceutical quality Edited by leading experts it offers a thorough exploration of advanced techniques like haplotype based breeding genomic selection and root system optimization along with the development of designer crops for resilience sustainability and functional applications Custom Designed Crop Breeding readers will also find Designer crop solutions for abiotic and biotic stresses including drought salinity insects and fungal diseases Highlights on the development of crops tailored for functional foods herbal and aromatic applications Presents the latest methodologies such as haplotype based breeding genomic selection and root architecture optimization for improved yield and resilience Custom Designed Crop Breeding is ideal for professionals and researchers interested in genetic improvements of crop plants based on innovative breeding technologies Molecular Techniques in Crop Improvement Shri Mohan Jain,D.S. Brar,2013-10-14 Plant breeding aims at the genetic enhancement of crops through the application of principles of Mendelian Genetics and modern tools and techniques of cell and molecular biology Many breeding programs focus on the improvement of traits such as high yield multiple resistance to major diseases



insect pests and tolerance to abiotic stresses and improved quality The improved varieties must also fit into the crop rotation systems of different eco agricultural regions for the production of feed fiber food and industrial products The value of new plant varieties in increasing food production has been demonstrated time and again and perhaps the best of all in the Green revolution which was based on the semi dwarf rice and wheat varieties in Asia Recent advances in molecular genetics have opened new opportunities to speed up plant breeding Molecular markers have become important tools in the hands of plant breeders for enhancing the selection efficiency for various agronomic traits Plant breeding has in fact entered in an era of genomics The isolation cloning and moving of genes from diverse biological sources into plant genomes holds promise to broaden the gene pool of crops and tailor plant varieties for specific traits that determine yield quality and resistance to biotic and abiotic stresses This book is a sequel to our previous one on Somaclonal Variation and Induced Mutations in Crop Improvement Heredity ,1947 *Translational Genomics for Crop Breeding, Volume 2* Rajeev Varshney,Roberto Tuberosa,2013-09-13 Genomic Applications for Crop Breeding Abiotic Stress Quality and Yield Improvement is the second of two volumes looking at the latest advances in genomic applications to crop breeding This volume focuses on advances improving crop resistance to abiotic stresses such as extreme heat drought flooding as well as advances made in quality and yield improvement Chapters examine advances in such key crops as rice maize and sugarcane among others Genomic Applications for Crop Breeding Abiotic Stress Quality and Yield Improvement complements the earlier volume on biotic stressors and will be an essential purchase for those interested in crop science and food production



Eventually, you will completely discover a further experience and skill by spending more cash. nevertheless when? pull off you give a positive response that you require to get those all needs next having significantly cash? Why dont you try to get something basic in the beginning? Thats something that will lead you to understand even more a propos the globe, experience, some places, with history, amusement, and a lot more?

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