

## Genetics Genomics And Breeding Of Sorghum Genetics Genomics And Breeding Of Crop Plants

This Special Issue on molecular genetics, genomics, and biotechnology in crop plant breeding seeks to encourage the use of the tools currently available. It features nine research papers that address quality traits, grain yield, and mutations by exploring cytoplasmic male sterility, the delicate control of flowering in rice, the removal of anti-nutritional factors, the use and development of new technologies for non-model species marker technology, site-directed mutagenesis and GMO regulation, genomics selection and genome-wide association studies, how to cope with abiotic stress, and an exploration of fruit trees adapted to harsh environments for breeding purposes. A further four papers review the genetics of pre-harvest spouting, readiness for climate-smart crop development, genomic selection in the breeding of cereal crops, and the large numbers of mutants in straw lignin biosynthesis and deposition.

The sequencing of the mouse genome has placed the mouse front and center as the most important mammalian genetics model. However, no recent volume has detailed the genetic contributions the mouse has made across the spectrum of the life sciences; this book aims to fill that vacuum. Mouse genetics research has made enormous contributions to the understanding of basic genetics, human genetics, and livestock genetics and breeding. The wide-ranging topics in the book include the mouse genome sequencing effort, molecular dissection of quantitative traits, embryo biotechnology, ENU mutagenesis, and genetics of disease resistance, and have been written by experts in their respective fields.

Chapter 1: The Beginnings - Ode To A Wee Mouse (58 KB) Contents: The Beginnings: Ode to a Wee Mouse (E J Eisen) Testing Quantitative Genetic Selection Theory (E J Eisen) Maternal Effects, Genomic Imprinting and Evolution (J Funk-Keenan & W R Atchley) Inbreeding and Crossbreeding (G A Brockmann) Genotype by Environment Interaction: Lessons From the Mouse (W D Hohenboken) Genetics of Growth in the Mouse (J M Cheverud) Genetics of Body Composition and Metabolic Rate (L Bünger & W G Hill) Genetics of Reproduction (M K Nielsen) Genetics of Behavior (R J Hitzemann) Genetics of Disease Resistance (S L Ewart & R A Ramadas) Genomic Dissection of Complex Trait Predisposition (D Pomp) Mouse Mutagenesis (D R Beier) Embryo Biotechnologies (C A Pinkert & M J Martin) Transgenics (J D Murray & E A Maga) The Mouse in Biomedical Research (R B Roberts & D W Threadgill) The Mouse Genome Sequencing Project: An Overview (M C Wendl et al.)

Readership: Researchers, teachers, graduate students and advanced undergraduates in genetics, genomics, biotechnology, bioinformatics, animal breeding and zoology. Key Features: Covers the methods used to find genes in the mouse that affect complex genetic traits Cuts across biomedical and bioagricultural applications No competing titles available Keywords: Genetics; Mouse; Biotechnology; Genome

Sequencing;Quantitative Genetics;Transgenics;Growth;Reproduction;Biomedical Genetics;Biomedical Genetics;Behavior;Maternal Genetics;ENU Mutagenesis  
Cool season grain legumes including pea, faba bean, lentil, chickpea, and grass pea are extensively grown in many parts of the world. They are a primary source of proteins in human diet. This volume deals with the most recent advances in genetics, genomics, and breeding of these crops. The "state of the art" for the individual crops differs; however, their phylogenetic proximity justifies the utility of the knowledge available in one crop for speeding up research and improvement in other crops. The first five chapters are devoted individually to the five crops, followed by four chapters presenting comprehensive reviews on recent advances in the fields of functional genomics, comparative genomics, proteomics and metabolomics, and transgenesis as well as three general chapters on nitrogen fixation, broomrapes, and future prospects. This book contains information useful not only to the scientists and scholars working on the cool season grain legumes but also to those working on other legume species.

Advances in Animal Genomics provides an outstanding collection of integrated strategies involving traditional and modern - omics (structural, functional, comparative and epigenomics) approaches and genomics-assisted breeding methods which animal biotechnologists can utilize to dissect and decode the molecular and gene regulatory networks involved in the complex quantitative yield and stress tolerance traits in livestock. Written by international experts on animal genomics, this book explores the recent advances in high-throughput, next-generation whole genome and transcriptome sequencing, array-based genotyping, and modern bioinformatics approaches which have enabled to produce huge genomic and transcriptomic resources globally on a genome-wide scale. This book is an important resource for researchers, students, educators and professionals in agriculture, veterinary and biotechnology sciences that enables them to solve problems regarding sustainable development with the help of current innovative biotechnologies. Integrates basic and advanced concepts of animal biotechnology and presents future developments Describes current high-throughput next-generation whole genome and transcriptome sequencing, array-based genotyping, and modern bioinformatics approaches for sustainable livestock production Illustrates integrated strategies to dissect and decode the molecular and gene regulatory networks involved in complex quantitative yield and stress tolerance traits in livestock Ensures readers will gain a strong grasp of biotechnology for sustainable livestock production with its well-illustrated discussion

Peppers and eggplants are two leading vegetable crops produced and consumed worldwide. To facilitate the breeding for agronomical traits such as disease resistance and quality, diverse molecular genetic studies have been carried out. Recent achievements on pepper genome sequencing and trait-linked marker development have enabled the cloning of genes involved in useful traits. This book explores the agronomical and evolutionary characteristics of peppers and

eggplants and the results of molecular genetic studies. Topics include molecular linkage maps and candidate gene approaches in capsicum and the structure of the pepper genome.

This book presents the latest advances in rice genomics, genetics and breeding, with a special focus on their importance for rice biology and how they are breathing new life into traditional genetics. Rice is the main staple food for more than half of the world's population. Accordingly, sustainable rice production is a crucial issue, particularly in Asia and Africa, where the population continues to grow at an alarming rate. The book's respective chapters offer new and timely perspectives on the synergistic effects of genomics and genetics in novel rice breeding approaches, which can help address the urgent issue of providing enough food for a global population that is expected to reach 9 billion by 2050. Written by researchers representing six countries and 28 institutions, this book highlights the development of the genus *Populus* as a model organism for tree genomics. Reflecting an impressive depth of coverage, the contributors' thorough reviews and analyses of *Populus* genomics provide insight into future discoveries about the basic biology of this fascinating genus and paves the way for applied breeding and genetic improvement of poplars.

With contributions by internationally reputed researchers in the field, this book presents the implications of the genomic revolution for conifers—promoting a better understanding of the evolution of these organisms as well as new knowledge about the molecular basis of quantitative trait variation. Both of these discoveries play important roles in their domestication. Topics include cytogenetics, patterns of nucleotide diversity, genetic mapping, integration of molecular markers in breeding, transcriptomics, advances in proteomics and metabolomics in gymnosperms, and economic importance.

This volume covers the advances in the study of tomato diversity and taxonomy. It examines the mapping of simple and complex traits, classical genetics and breeding, association studies, molecular breeding, positional cloning, and structural and comparative genomics. The contributors also discuss transcriptomics, proteomics, metabolomics, and bioinformatics. The information in this book will be useful to researchers working on other Solanaceous crops as well as those interested in using the tomato as a model crop species.

The soybean is an economically important leguminous seed crop for feed and food products that is rich in seed protein (about 40 percent) and oil (about 20 percent); it enriches the soil by fixing nitrogen in symbiosis with bacteria.

Soybean was domesticated in northeastern China about 2500 BC and subsequently spread to other countries. The enormous

Genetics and genomics in poultry have been the most rapidly advancing subjects since the completion of the chicken genome sequence in 2004 and have been extensively used to understand the genetic determinants of complex traits. This book intends to provide readers with a comprehensive overview of the current progress in the application of genetic and genomic science in the poultry field.

The contents cover genetic variation detection, selection methods for breeding, transgenesis and genome editing, genetic basis of disease resistance, control of gene expression and regulation, reproduction and meat quality, etc. The book should prove useful to researchers and students working in related fields.

Recent interest in the health-related, culinary, and biological properties of berries is stimulating new initiatives in berry breeding and production. Breakthroughs in molecular technologies allow genomics-enabled approaches to augment research efforts. This volume documents the basic botany and culture of four major berry crops and follows the scientific milestones that have ushered these systems into the modern genomics era. Leading researchers in each crop system detail the recent findings in genetics, genomics, and breeding that seek to improve sustainable cultivation, fruit quality, and availability.

Genomic Applications for Crop Breeding: BioticStress is the first of two volumes looking at the latest advances in genomic applications to crop breeding.

This volume 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, Genomic Applications for Crop Breeding: BioticStress will be an essential reference for crop scientists, geneticists, breeders, industry personnel and advanced students in the field.

Sorghum is one of the hardiest crop plants in modern agriculture and also one of the most versatile. Its seeds provide calorie for food and feed, stalks for building and industrial materials and its juice for syrup. This book provides an in-depth review of the cutting-edge knowledge in sorghum genetics and its applications in sorghum breeding. Each

Grapevine is a highly valuable crop worldwide, both from a cultural as well as a commercial point of view. One of its major advantages is that it is well adapted to scarce water conditions. The main object of grapevine breeding is to develop varieties that are resistant to pathogens and at the same time well-adapted to a changing environment. Since the beginning of the 21st century, there has been a concerted effort by the international scientific community to develop genomic tools and resources for grapevine, culminating in its complete genome sequence. The book reviews these efforts and their usefulness for grapevine breeding and viticulture improvement.

The stone fruits—including peaches, apricots, almonds, plums, and cherries—have been bred and grown for thousands of years and today are significant agricultural crops in many local economies worldwide. This volume presents a comprehensive commentary on classical genetics and breeding, molecular mapping and breeding of agronomic traits, and the cloning of genes of interest. It also explores recent advances on omics sciences including structural and functional genomics, proteomics, and metabolomics. The book enumerates the whole genome sequencing of the model fruit plant peach and discusses bioinformatic strategies and tools for stone fruit research

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Peanut, an amphidiploid, is an important food and oil crop and has an interesting evolutionary history. This book provides a glimpse of the advances in genetic resources and genomics research of peanut made during the last decade. It contains an overview of germplasm, advances in genetic and genomic resources, genetic and trait mapping, proteomic and transcriptomic analyses, functional and comparative genomics studies, and molecular breeding applications. This book should prove useful to students, teachers, and young researchers as a ready reference to the latest information on peanut genetics and genomics.

Applications of Genetic and Genomic Research in Cereals covers new techniques for practical breeding, also discussing genetic and genomic approaches for improving special traits.

Additional sections cover drought tolerance, biotic stress, biomass production, the impact of modern techniques on practical breeding, hybrid breeding, genetic diversity, and genomic selection. Written by an international team of top academics and edited by an expert in the field, this book will be of value to academics working in the agricultural sciences and essential reading for professionals working in plant breeding. Provides in-depth and comprehensive coverage of a rapidly developing field Presents techniques used in genetic and genomics research, with coverage of genotyping, gene cloning, genome editing and engineering and phenotyping in various cereals Includes the latest genetic and genomic approaches for improving special traits - drought tolerance, biotic stress and biomass production Covers breeding practices, with chapters on the genetic diversity of wheat, hybrid breeding and the potential of rye and barley crops

Eucalypts are used for the production of paper products, firewood, charcoal, potential feedstocks for bioenergy and biomaterials, as ornamentals and landscape trees, and in land rehabilitation. Eucalypt breeding is at an early stage with many plantings being only at the first stages of domestication. The relatively small genomes of these species make the application of molecular genetics approaches attractive. The application of modern genomics will accelerate the development of improved eucalypts for a wide range of uses. This book brings together diverse information on the genetics, genomics, and breeding of these important forest species.

The fast-growing sugarcane plant is a major source of sugar (sucrose) in tropical and subtropical regions. The high productivity of the plant also makes it a key target for use as an energy crop. The fiber of the plant is used to generate electricity and produce ethanol as a fuel. Sugarcane is a hybrid of two species, each of which is genetically c

In this volume, world leaders in potato research review historical and contemporary discoveries resulting in a range of advances. Topics include nutritional quality, yield, disease and insect resistance, processing, plant growth and development, and other aspects. The book also examines research yielding significant molecular resources that facilit

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The sunflower has fascinated mankind for centuries. The oilseed sunflower contributes approximately ten percent of the world's plant-derived edible oil and the confection type sunflower holds a considerable share of the directly consumed snacks market. In addition, sunflower is also grown as an ornamental for cut flowers, as well as in home gardens. We are now embarking on the age of genomics which will expedite the process of genetic improvement of crops. There has been an explosion of information on genetic markers, DNA sequences, and genomic resources for most major food crops including sunflower. This volume is intended to bridge traditional research with modern molecular investigations on sunflower.

This book provides an overview of the current state of knowledge of the genetics and

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genomics of the agriculturally important Cucurbitaceae plant family, which includes crops such as watermelon, melon, cucumber, summer and winter squashes, pumpkins, and gourds. Recent years have resulted in tremendous increases in our knowledge of these species due to large scale genomic and transcriptomic studies and production of draft genomes for the four major species, *Citrullus lanatus*, *Cucumis melo*, *Cucumis sativus*, and *Cucurbita* spp. This text examines genetic resources and structural and functional genomics for each species group and across species groups. In addition, it explores genomic-informed understanding and commonalities in cucurbit biology with respect to vegetative growth, floral development and sex expression, fruit growth and development, and important fruit quality traits.

This book presents state-of-the-art, authoritative chapters on contemporary issues in the broad areas of quantitative genetics, genomics and plant breeding. Section 1 (Chapters 2 to 12) emphasizes the application of genomics, and genome and epigenome editing techniques, in plant breeding; bioinformatics; quantitative trait loci mapping; and the latest approaches of examining and exploiting genotype-environment interactions. Section 2 (Chapters 13 to 20) represents the intersection of breeding, genetics and genomics. This section describes the use of cutting-edge molecular breeding and quantitative genetics techniques in wheat, rice, maize, root and tuber crops and pearl millet. Overall, the book focuses on using genomic information to help evaluate traits that can combat biotic/abiotic stresses, genome-wide association mapping, high-throughput genotyping/phenotyping, biofortification, use of big data, orphan crops, and gene editing techniques. The examples featured are taken from across crop science research and cover a wide geographical base.

Sequencing of the maize genome has opened up new opportunities in maize breeding, genetics and genomics research. This book highlights modern trends in development of hybrids, analysis of genetic diversity, molecular breeding, comparative and functional genomics, epigenomics and proteomics in maize. The use of maize in biofuels, phytoremediation and pharmaceuticals is also highlighted. Current research trends, future research directions and challenges are discussed by a panel of experts from all over the world.

*Musa* is one of three genera in the family of Musaceae. Over 50 species of *Musa* exist, including bananas and plantains. This book assembles the latest information on the genomic research of this genus. A group of leading experts in *Musa* genetics, genomics, and breeding provide basic as well as advanced information for those interested in learning more about the banana genome. The accessible style is easily understood by students and researchers, making the book an ideal springboard for those looking to do expanded research into this crop.

Forage crops include several species of grasses and legumes that are widely used as animal fodder in the form of hay, pasturage and silage, as well as for turf and erosion control. Some forage grasses are also being considered for bio-energy generation. In this book leading researchers review the latest advances in molecular genetics and genomics; they also examine the success of breeding programs for forage grasses and legume species. The book will be useful for students and young researchers with an interest in forage, turf and bio-energy crops improvements.

The book describes the history of Brassica oilseed crops, introduces the Brassica genome, its evolution, diversity, classical genetic studies, and breeding. It also delves into molecular genetic linkage and physical maps, progress with genome sequencing initiatives, mutagenesis approaches for trait improvement, proteomics, metabolomics,

and bioinfo

Conventional plant breeding techniques have existed since prehistoric times. As times have evolved and new techniques and advancements in genetics and molecular biology have been developed, plant breeding is now carried out by using molecular genetic tools. Techniques may vary from promoting desirable characteristics in plants to increasing crop yield. This book provides comprehensive insights into the field of crop breeding. It aims to shed light on some of the unexplored aspects of genetics and breeding of crops and the recent researches in this field. It is an essential guide for both academicians and those who wish to pursue this discipline further.

This book presents the current state of the art in peanut genomics, focusing particularly on the latest genomic findings, tools and strategies employed in genome sequencing, transcriptomes and analysis, availability of public and private genomic resources, and ways to maximize the use of this information in peanut breeding programs. Further, it demonstrates how advances in plant genomics can be used to improve crop breeding. The peanut or groundnut (*Arachis hypogaea* L. Millsp) is a globally important grain legume and oilseed crop, cultivated in over 100 countries and consumed in the form of roasted seeds, oil and confectionary in nearly every country on Earth. The peanut contributes towards achieving food and nutritional security, in addition to financial security through income generation; as such, it is also vital to the livelihood of the poor in the developing world. There have been significant advances in peanut research, especially in the last five years, including sequencing the genome of both diploid progenitors, and the availability of tremendous transcriptome resources, large-scale genomic variations that can be used as genetic markers, genetic populations (bi- and multiparent populations and germplasm sets), marker-trait associations and molecular breeding products. The immediate availability of the genome sequence for tetraploid cultivated peanuts is the most essential genomic resource for achieving a deeper understanding of peanut traits and their use in breeding programs.

The last two decades has been the most exciting period in cucurbit genetic, genomic, and breeding research especially for cucumber, melon, and watermelon. In addition, cucumber became the first cucurbit to be sequenced, after other field crops such as rice, sorghum, soybean, and maize. In thirteen chapters by 34 internationally renowned scientists, this book provides an in-depth review of the state of the art of genetic and genomic research conducted in cucurbits. It will be an essential resource for cucurbit researchers as well as scientists working in other crops.

Due to their diversity, vegetable Brassicas are of great economic import and offer unique opportunities to enrich our knowledge about plant growth, development, and rapid phenotypic evolution. By applying emerging genomic technologies, we may greatly increase our understanding of the Brassica biology and breeding efficiency. This volume contains 11 chapters contributed by 34 specialists with extensive experience in genetics, molecular breeding, and genomics of vegetable Brassicas. Recent achievements and new technologies presented in this book will provide support to further research the genetics and genomics of vegetable Brassica crops and facilitate their genetic improvement.

The field of whole genome selection has quickly developed into the breeding methodology of the future. As efforts to map a wide variety of animal genomes

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have matured and full animal genomes are now available for many animal scientists and breeders are looking to apply these techniques to livestock production. Providing a comprehensive, forward-looking review of animal genomics, *Genomic Selection in Animals* provides coverage of genomic selection in a variety of economically important species including cattle, swine, and poultry. The historical foundations of genomic selection are followed by chapters that review and assess current techniques. The final chapter looks toward the future and what lies ahead for field as application of genomic selection becomes more widespread. A concise, useful summary of the field by one of the world's leading researchers, *Genomic Selection in Animals* fills an important gap in the literature of animal breeding and genomics.

*Genetics, Genomics and Breeding of Maize* CRC Press

Sequencing of the maize genome has opened up new opportunities in maize breeding, genetics and genomics research. This book highlights modern trends in development of hybrids, analysis of genetic diversity, molecular breeding, comparative and functional genomics, epigenomics and proteomics in maize. The use of maize in biofuels, phytoremediation and

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