

Jameel M. Al-Khayri · S. Mohan Jain
Dennis V. Johnson *Editors*

Advances in Plant Breeding Strategies: Breeding, Biotechnology and Molecular Tools

Advances In Plant Breeding Strategies Breeding Biotechnology And Molecular Tools

Lingjun Ying



Advances In Plant Breeding Strategies Breeding Biotechnology And Molecular Tools:

Advances in Plant Breeding Strategies: Breeding, Biotechnology and Molecular Tools Jameel M. Al-Khayri, Shri Mohan Jain, Dennis V. Johnson, 2016-02-02 The basic concept of this book is to examine the use of innovative methods augmenting traditional plant breeding towards the development of new crop varieties under different environmental conditions to achieve sustainable food production This book consists of two volumes Volume 1 subtitled Breeding Biotechnology and Molecular Tools and Volume 2 subtitled Agronomic Abiotic and Biotic Stress Traits This is Volume 1 which consists of 21 chapters covering domestication and germplasm utilization conventional breeding techniques and the role of biotechnology In addition to various biotechnological applications in plant breeding it includes functional genomics mutations and methods of detection and molecular markers In vitro techniques and their applications in plant breeding are discussed with an emphasis on embryo rescue somatic cell hybridization and somaclonal variation Other chapters cover haploid breeding transgenics cryogenics and bioinformatics

Advances in Plant Breeding Strategies: Vegetable Crops Jameel M. Al-Khayri, S. Mohan Jain, Dennis V. Johnson, 2021-08-25 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 Volume 9 subtitled Vegetable Crops Fruits and Young Shoots consists of 12 chapters focusing on advances in breeding strategies using both traditional and modern approaches for the improvement of individual vegetable crops Chapters are arranged in 2 parts according to the edible vegetable parts Part I Fruits Bell Pepper *Capsicum annuum* L var *grossum* Sendt Chili pepper *Capsicum frutescens* L Bitter gourd *Momordica charantia* L Bottle gourd *Lagenaria siceraria* Molina Standl Eggplant *Solanum* spp Okra *Abelmoschus esculentus* L Plantain *Musa paradisiaca* L Sweet gourd *Cucurbita moschata* Duch ex Poir Melon *Cucumis melo* L Groups *Dudaim* and *Flexuosus* Tomato *Solanum lycopersicum* L and Zucchini *Cucurbita pepo* L and Part II Young shoots *Asparagus officinalis* L The chapters were contributed by 43 internationally reputable scientists from 11 countries Each chapter comprehensively reviews the modern literature on the subject and reflects the authors own experience

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

Advances in Plant Breeding Strategies: Vegetable Crops Jameel M. Al-Khayri, S. Mohan Jain, Dennis V. Johnson, 2021-08-24 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 Volume 8 subtitled Vegetable Crops Bulbs Roots and Tubers consists of 12 chapters focusing on advances in breeding strategies using both traditional and modern approaches for the improvement of individual vegetable crops Chapters are arranged in 3 parts according to the edible vegetable parts Part I Bulbs Garlic *Allium sativum* L Leek *Allium ampeloprasum* L and Shallot *Allium cepa* L Aggregatum group Part II Roots Beetroot *Beta vulgaris* ssp *vulgaris* var *conditiva* Alefeld Carrot *Daucus carota* L Parsnip *Pastinaca sativa* L Radish *Raphanus sativus* L Sugar beet *Beta vulgaris* ssp *vulgaris* L and Turnip *Brassica rapa* var *rapa* L Part III Tubers Potato *Solanum tuberosum* L and Sweet potato *Ipomea batatas* L The chapters were contributed by 38 internationally reputable scientists from 13 countries Each chapter comprehensively reviews the modern literature on the subject and reflects the authors own experience Advances in Plant Breeding Strategies: Fruits Jameel Al-Khayri, Shri Mohan Jain, Dennis V. Johnson, 2018-07-20 This book examines the development of innovative modern methodologies towards augmenting conventional plant breeding for the production of new crop varieties under the increasingly limiting environmental and cultivation factors to achieve sustainable agricultural production and enhanced food security Two volumes of *Advances in Plant Breeding Strategies* were published in 2015 and 2016 respectively Volume 1 Breeding Biotechnology and Molecular Tools and Volume 2 Agronomic Abiotic and Biotic Stress Traits This is Volume 3 Fruits which is focused on advances in breeding strategies for the improvement of individual fruit crops It consists of 23 chapters grouped into three parts according to distribution classification of fruit trees Part I Temperate Fruits Part II Subtropical Fruits and Part III Tropical Fruits Each chapter comprehensively reviews the modern literature on the subject and reflects the authors own experience *Advances in Plant Breeding Strategies: Cereals* Jameel M. Al-Khayri, Shri Mohan Jain, Dennis V. Johnson, 2019-10-11 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 Volume 5 subtitled Cereals focuses on advances in breeding strategies using both traditional and modern approaches for the improvement of individual crops It addresses important staple food crops including barley fonio finger millet foxtail millet pearl millet proso millet quinoa rice

rye tef triticale and spelt wheat The volume is contributed by 53 internationally reputable scientists from 14 countries Each chapter comprehensively reviews the modern literature on the subject and reflects the authors own experience Advances in Plant Breeding Strategies: Industrial and Food Crops Jameel M. Al-Khayri, Shri Mohan Jain, Dennis V. Johnson, 2019-10-14 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 6 subtitled Industrial and Food Crops which consists of two parts Included in Part I are 11 industrial plant species utilized as sources of raw materials for the production of industrial products including pulp and wood crops acacia fiber cotton jute and ramie rubber guayule and rubber tree oil jojoba and flax biofuels and pharmaceutical agave and sugar source sugarcane Part II covers 7 food plants selected for their utilization in food industries for the production of chocolate cacao cooking oil oil palm safflower sesame and sunflower and natural flavors and aroma saffron and vanilla This volume is contributed by 60 internationally reputable scientists from 14 countries Each chapter comprehensively reviews the modern literature on the subject and reflects the authors own experience Advances in Plant Breeding Strategies: Agronomic, Abiotic and Biotic Stress Traits Jameel M. Al-Khayri, Shri Mohan Jain, Dennis V. Johnson, 2016-03-29 The basic concept of this book is to examine the use of innovative methods augmenting traditional plant breeding towards the development of new crop varieties under different environmental conditions to achieve sustainable food production This book consists of two volumes Volume 1 subtitled Breeding Biotechnology and Molecular Tools and Volume 2 subtitled Agronomic Abiotic and Biotic Stress Traits This is volume 2 which contains 18 chapters highlighting breeding strategies for specific plant traits including improved nutritional and pharmaceutical properties as well as enhanced tolerance to insects diseases drought salinity and temperature extremes expected under predicted global climate change

Advances in Plant Breeding Strategies: Vegetable Crops Jameel M. Al-Khayri, S. Mohan Jain, Dennis V. Johnson, 2021-08-25 Plant breeders and geneticists are under constant pressure to sustain and expand food production by using innovative breeding strategies and introducing minor crops which are well adapted to marginal lands provide a source of nutrition and have abiotic and biotic stress tolerance to feed an ever increasing human population The basic concept of this book is to examine the use of innovative methods augmenting traditional plant breeding towards the improvement and development of new crop varieties under the increasingly limiting environmental and cultivation factors to achieve sustainable agricultural production and enhanced food security Three volumes of the book series *Advances in Plant Breeding Strategies* were published in 2015 2016 and 2018 respectively Volume 1 Breeding Biotechnology and Molecular Tools Volume 2 Agronomic Abiotic and Biotic Stress Traits and Volume 3 Fruits In 2019 the following four volumes were published Volume 4 Nut and Beverage Crops Volume 5 Cereals Volume 6 Industrial and Food Crops and Volume 7 Legumes In 2021

three volumes are being concurrently published Volume 8 Vegetable Crops Bulbs Roots and Tubers Volume 9 Vegetable Crops Fruits and Young Shoots and Volume 10 Vegetable Crops Leaves Flowerheads Green Pods Mushrooms and Truffles This Volume 10 subtitled Vegetable Crops Leaves Flowerheads Green Pods Mushrooms and Truffles consists of 14 chapters focusing on advances in breeding strategies using both traditional and modern approaches for the improvement of individual vegetable crops Chapters are arranged in 4 parts according to the edible vegetable parts Part I Leaves Chicory Cichorium intybus L Chinese cabbage Brassica rapa L var pekinensis Rocket salad Eruca vesicaria ssp sativa Mill Spring onion Allium fistulosum L Water spinach Ipomoea aquatica Forsk and Watercress Nasturtium officinale R Br Pat II Flowerheads and Green Pods Cauliflower Brassica oleracea var botrytis L Globe artichoke Cynara cardunculus var scolymus L Garden pea Pisum sativum L and Yardlong bean Vigna unguiculata L Walp ssp sesquipedalis L Verdc Part III Mushrooms Enoki mushroom Flammulina velutipes Curtis Singer and Shiitake mushroom Lentinula edodes Berk Sing Part IV Truffles Desert truffles Terfezia spp and White truffle Tuber magnatum Picco and T borchii Vittad Each chapter comprehensively reviews the contemporary literature on the subject and reflects the experiences of the authors Chapters are written by internationally reputable scientists and subjected to a review process to assure quality presentation and scientific accuracy Each chapter begins with an introduction covering related backgrounds and provides in depth discussion of the subject supported with high quality color photos illustrations and relevant data The chapter concludes with recommendations for future research directions a comprehensive list of pertinent references to facilitate further reading and appendixes of genetic resources and concerned research institutes This book series is a valuable resource for advanced students researchers scientists commercial producers and seed companies as well as consultants and policymakers interested in agriculture particularly in modern breeding technologies

Advances in Plant Breeding Strategies: Nut and Beverage Crops Jameel M. Al-Khayri, Shri Mohan Jain, Dennis V. Johnson, 2020-01-01 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 Volume 4 subtitled Nut and Beverage Crops focuses on advances in breeding strategies using both traditional and modern approaches for the improvement of individual plantation crops Included in Part I eleven important nut species recognized for their economical and nutritional importance including Almond Argan Brazil nut Cashew nut Chestnut Hazelnut Macadamia Peanut Pine nut Pistachio and Walnut Part II covers two popular beverage species coffee and tea This volume is contributed by 53 internationally reputable scientists from 13 countries Each chapter comprehensively reviews the modern literature on the subject and reflects the authors own experience

Advances in Plant Breeding Strategies: Vegetable Crops Jameel M. Al-Khayri, S. Mohan Jain, Dennis V. Johnson, 2021 Plant breeders and geneticists are under constant pressure to sustain and

expand food production by using innovative breeding strategies and introducing minor crops which are well adapted to marginal lands provide a source of nutrition and have abiotic and biotic stress tolerance to feed an ever increasing human population The basic concept of this book is to examine the use of innovative methods augmenting traditional plant breeding towards the improvement and development of new crop varieties under the increasingly limiting environmental and cultivation factors to achieve sustainable agricultural production and enhanced food security Three volumes of the book series *Advances in Plant Breeding Strategies* were published in 2015 2016 and 2018 respectively Volume 1 *Breeding Biotechnology and Molecular Tools* Volume 2 *Agronomic Abiotic and Biotic Stress Traits* and Volume 3 *Fruits* In 2019 the following four volumes were published Volume 4 *Nut and Beverage Crops* Volume 5 *Cereals* Volume 6 *Industrial and Food Crops* and Volume 7 *Legumes* Recent volumes published in 2021 include Volume 8 *Vegetable Crops Bulbs Roots and Tubers* Volume 9 *Vegetable Crops Fruits and Young Shoots* and Volume 10 *Vegetable Crops Leaves Flowerheads Green Pods Mushrooms and Truffles* This Volume 8 subtitled *Vegetable Crops Bulbs Roots and Tubers* consists of 12 chapters focusing on advances in breeding strategies using both traditional and modern approaches for the improvement of individual vegetable crops Chapters are arranged in 3 parts according to the edible vegetable parts Part I *Bulbs Garlic Leek and Shallot* Part II *Roots Beetroot Carrot Parsnip Radish Sugar beet and Turnip* Part III *Tubers Potato and Sweet potato* Each chapter comprehensively reviews the contemporary literature on the subject and reflects the experiences of the authors Chapters are written by internationally reputable scientists and subjected to a review process to assure quality presentation and scientific accuracy Each chapter begins with an introduction covering related backgrounds and provides in depth discussion of the subject supported with high quality color photos illustrations and relevant data The chapter concludes with recommendations for future research directions a comprehensive list of pertinent references to facilitate further reading and appendixes of genetic resources and concerned research institutes This book series is a valuable resource for advanced students researchers scientists commercial producers and seed companies as well as consultants and policymakers interested in agriculture particularly in modern breeding technologies

Advances in Plant Breeding Strategies: Vegetable Crops

Jameel M. Al-Khayri, S. Mohan Jain, Dennis V. Johnson, 2021 Plant breeders and geneticists are under constant pressure to sustain and expand food production by using innovative breeding strategies and introducing minor crops which are well adapted to marginal lands provide a source of nutrition and have abiotic and biotic stress tolerance to feed an ever increasing human population The basic concept of this book is to examine the use of innovative methods augmenting traditional plant breeding towards the improvement and development of new crop varieties under the increasingly limiting environmental and cultivation factors to achieve sustainable agricultural production and enhanced food security Three volumes of the book series *Advances in Plant Breeding Strategies* were published in 2015 2016 and 2018 respectively Volume 1 *Breeding Biotechnology and Molecular Tools* Volume 2 *Agronomic Abiotic and Biotic Stress Traits* and Volume 3

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practices for ensuring food security This book delves into the fundamental principles and recent breakthroughs in plant breeding and genetic improvement It focuses on the application of physiological and molecular approaches to augment plant tolerance to stressful environmental conditions Additionally the book provides plant breeders researchers and scientists with updated insights into the prospective developments in plant breeding

Advances in Plant Breeding Strategies:

Vegetable Crops Jameel M. Al-Khayri, S. Mohan Jain, Dennis V. Johnson, 2021 Plant breeders and geneticists are under constant pressure to sustain and expand food production by using innovative breeding strategies and introducing minor crops which are well adapted to marginal lands provide a source of nutrition and have abiotic and biotic stress tolerance to feed an ever increasing human population The basic concept of this book is to examine the use of innovative methods augmenting traditional plant breeding towards the improvement and development of new crop varieties under the increasingly limiting environmental and cultivation factors to achieve sustainable agricultural production and enhanced food security Three volumes of the book series *Advances in Plant Breeding Strategies* were published in 2015 2016 and 2018 respectively Volume 1 *Breeding Biotechnology and Molecular Tools* Volume 2 *Agronomic Abiotic and Biotic Stress Traits* and Volume 3 *Fruits* In 2019 the following four volumes were published Volume 4 *Nut and Beverage Crops* Volume 5 *Cereals* Volume 6 *Industrial and Food Crops* and Volume 7 *Legumes* Recent volumes published in 2021 include Volume 8 *Vegetable Crops Bulbs Roots and Tubers* Volume 9 *Vegetable Crops Fruits and Young Shoots* and Volume 10 *Vegetable Crops Leaves Flowerheads Green Pods Mushrooms and Truffles* This Volume 10 subtitled *Vegetable Crops Leaves Flowerheads Green Pods Mushrooms and Truffles* consists of 14 chapters focusing on advances in breeding strategies using both traditional and modern approaches for the improvement of individual vegetable crops Chapters are arranged in 4 parts according to the edible vegetable parts Part I *Leaves* Chicory Chinese cabbage Rocket salad Spring onion Water spinach and Watercress Part II *Flowerheads and Green Pods* Cauliflower Globe artichoke Garden pea and Yardlong bean Part III *Mushrooms* Enoki mushroom and Shiitake mushroom Part IV *Truffles* Desert truffles and White truffle Each chapter comprehensively reviews the contemporary literature on the subject and reflects the experiences of the authors Chapters are written by internationally reputable scientists and subjected to a review process to assure quality presentation and scientific accuracy Each chapter begins with an introduction covering related backgrounds and provides in depth discussion of the subject supported with high quality color photos illustrations and relevant data The chapter concludes with recommendations for future research directions a comprehensive list of pertinent references to facilitate further reading and appendixes of genetic resources and concerned research institutes This book series is a valuable resource for advanced students researchers scientists commercial producers and seed companies as well as consultants and policymakers interested in agriculture particularly in modern breeding technologies

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

Sustainable Agriculture Vishnu D. Rajput, Abhishek Singh, Karen Ghazaryan, Tatiana M. Minkina, Abdel Rahman M. Al-Tawaha, 2024-04-22 The agricultural food system needs to provide access to enough healthy and affordable food for the growing population and mitigate its impact on the planet for future generations Emerging technologies can help farmers increase yields The book presents theoretical and applied aspects of nanotechnology biotechnology plant breeding and smart farming to increase plant productivity crop yield soil fertility and crop soil monitoring

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

Plant Mutagenesis and Crop Improvement Nitish Kumar, 2024-02-23 Crop improvement using classically induced mutagenesis is now well standardized Many new promising varieties of different crops have been successfully developed worldwide using both physical and chemical mutagens Voluminous literature is now available on basic and applied aspects of mutagenesis The mutation technique has been refined and holds the promise of generating much wider and more desirable variability than classical breeding Recent advances in

technology combined with classical mutation breeding offer new and exciting challenges for the development of new varieties A global inventory of induced mutagenesis activities for crop improvement is required This book covers both basic and applied aspects of mutation and its impact on various crops it is extremely well prepared and contains a huge volume of information accumulated using classically induced mutagenesis on different crops in different countries Three key features Describes the importance of induced mutation in crop plant research and its application to production Highlights new advances in the understanding of plant mutagenesis in crop improvement Contains contributions from major leaders in the field of plant mutation research This volume brings together all the important and relevant literature in the field It provides a complete account of the mutation breeding of crops presenting conclusions about the value of the method its possibilities limitations and shortcomings and the possible difficulties of further application in various crops The initial chapters deal with the interactions between mutagenic treatment and plant material such as aspects of mutagenic treatment postirradiation behavior of shoot apices and adventitious bud techniques All available literature is then discussed crop by crop and critically evaluated This will serve as an extremely comprehensive guide for researchers teachers students and individuals who are interested in using induced mutagenesis as a tool for crop improvement **Next Generation Sequencing (NGS)**

Technology in DNA Analysis Hirak Ranjan Dash, Kelly M. Elkins, Noora Rashid Al-Snan, 2023-11-30 Next Generation Sequencing NGS Technology in DNA Analysis explains and summarizes next generation sequencing NGS technological applications in the field of forensic DNA analysis The book covers the transition from capillary electrophoresis CE based technique to NGS platforms and the fundamentals of NGS technologies applications and advances Sections provide an overview of NGS technology and forensic science including information on processing biological samples for forensic analysis sequence analysis and data analysis software as well as the analysis of NGS data The book explores the valuable applications of NGS based forensic DNA analysis and covers the validations and interpretation guidelines of NGS workflows With chapter contributions from an international array of experts and the inclusion of practical case studies this book is a useful reference for academicians and researchers in genetics biotechnology bioinformatics biology and medicine as well as forensic DNA scientists and practitioners who aim to learn use apply and validate NGS based technologies Describes the fundamentals of NGS and its advances for forensic applications Explains the transition from CE based technique to NGS technology Includes case studies related to NGS and DNA fingerprinting Explores the future use and applications of NGS technologies

Unveiling the Energy of Verbal Art: An Psychological Sojourn through **Advances In Plant Breeding Strategies Breeding Biotechnology And Molecular Tools**

In a world inundated with displays and the cacophony of instantaneous conversation, the profound power and psychological resonance of verbal art usually fade into obscurity, eclipsed by the continuous onslaught of noise and distractions. Yet, located within the musical pages of **Advances In Plant Breeding Strategies Breeding Biotechnology And Molecular Tools**, a charming perform of fictional beauty that pulses with fresh thoughts, lies an memorable journey waiting to be embarked upon. Written by way of a virtuoso wordsmith, this enchanting opus instructions visitors on an emotional odyssey, softly exposing the latent potential and profound affect stuck within the complex web of language. Within the heart-wrenching expanse of this evocative examination, we will embark upon an introspective exploration of the book is main subjects, dissect its interesting writing fashion, and immerse ourselves in the indelible effect it leaves upon the depths of readers souls.

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Advances In Plant Breeding Strategies Breeding Biotechnology And Molecular Tools Introduction

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