

Doubled Haploid Production in Crop Plants

A Manual

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Doubled Haploid Production In Crop Plants A Manual

Suprasanna Penna, S. Mohan Jain



Doubled Haploid Production In Crop Plants A Manual:

Doubled Haploid Production in Crop Plants M. Maluszynski, 2003-11-30 Includes various protocols and approaches of DH production proven for different germplasm of the same species *Doubled Haploid Production in Crop Plants* M.

Maluszynski, Kenneth Kasha, B.P. Forster, I. Szarejko, 2013-06-29 The production of doubled haploids has become a necessary tool in advanced plant breeding institutes and commercial companies for breeding many crop species However the development of new more efficient and cheaper large scale production protocols has meant that doubled haploids are also recently being applied in less advanced breeding programmes This Manual was prepared to stimulate the wider use of this technology for speeding and opening up new breeding possibilities for many crops including some woody tree species Since the construction of genetic maps using molecular markers requires the development of segregating doubled haploid populations in numerous crop species we hope that this Manual will also help molecular biologists in establishing such mapping populations For many years both the Food and Agriculture Organization of the United Nations FAO and the International Atomic Energy Agency IAEA have supported and coordinated research that focuses on development of more efficient doubled haploid production methods and their applications in breeding of new varieties and basic research through their Plant Breeding and Genetics Section of the Joint FAO IAEA Division of Nuclear Techniques in Food and Agriculture The first FAO IAEA scientific network Coordinated Research Programme CRP dealing with doubled haploids was initiated by the Plant Breeding and Genetics Section in 1986 **Advances in Haploid Production in Higher Plants** Alisher

Touraeu, Brian P. Forster, Shri Mohan Jain, 2008-12-18 The importance of haploids is well known to geneticists and plant breeders The discovery of anther derived haploid *Datura* plants in 1964 initiated great excitement in the plant breeding and genetics communities as it offered shortcuts in producing highly desirable homozygous plants Unfortunately the expected revolution was slow to materialise due to problems in extending methods to other species including genotypic dependence recalcitrance slow development of tissue culture technologies and a lack of knowledge of the underlying processes Recent years have witnessed great strides in the research and application of haploids in higher plants After a lull in activities drivers for the resurgence have been 1 development of effective tissue culture protocols 2 identification of genes controlling embryogenesis and 3 large scale and wide spread commercial uptake in plant breeding and plant biotechnology arenas The first major international symposium on Haploids in Higher Plants took place in Guelph Canada in 1974 At that time there was much excitement about the potential benefits but in his opening address Sir Ralph Riley offered the following words of caution I believe that it is quite likely that haploid research will contribute cultivars to agriculture in several crops in the future However the more extreme claims of the enthusiasts for haploid breeding must be treated with proper caution Plant breeding is subject from time to time to sweeping claims from enthusiastic proponents of new procedures **Progress and**

Opportunities of Doubled Haploid Production Muhammad Asif, 2013-07-17 Deals with the historical perspectives and the

current status of doubled haploid production along with its practical implications in basic and applied research It highlights various haploid production methods with a comprehensive discussion on their pros and cons bottlenecks and embryogenic pathways The review also describes in detail the results of molecular and genomic studies conducted to investigate the underlying principles of this spectacular technique that has changed the status of many species from recalcitrant to responsive over the last ninety years

Haploids in Crop Improvement II Constantine E. Don Palmer,Wilfred A.

Keller,Kenneth J. Kasha,2006-01-27 Doubled haploid technology is an important tool for plant breeding It allows for significant time reduction in the achievement of homozygous breeding lines of value in crop improvement This volume provides an excellent overview of haploid induction and the application of doubled haploids The authors emphasize advances made in the understanding of microspore embryogenesis but treat also advances in gynogenesis and the manipulation of parthenogenetic haploid development The text contains a thorough discussion of the application of haploidy to the improvement of a number of species from various families including Brassicaceae Poaceae and Solanaceae The various methods applicable to these species are described in detail Each chapter contains critical evaluation of the scientific literature and an extensive list of references This volume is ideally suited for plant breeders geneticists and plant cell biologists

Doubled Haploids: Technological Advances and Role In Crop Improvement Zenu Jha,Satish B.

Verulkar,Suprasanna Penna,2025-03-05 This contributed volume covers the technology of double haploid production with special reference to anther culture and double haploid production in crop plants and applications for basic and applied research in crop improvement Globally plant breeders aim to achieve higher crop productivity by using different breeding techniques The double haploid genotypes have made this monotonous work easier and more efficient to a greater extent by achieving homozygosity and genetic fixation Haploids are genotype with a gametophytic chromosome number and a double haploid is a genotype developed when haploid cells undergo chromosome doubling Artificial production of double haploids can easily shorten the time required to create homozygous plants which is vital in plant breeding The book discusses how double haploids can help in accelerating conventional plant breeding programs and make early release of cultivars with superior and desirable traits along with greater utility in other research aspects of plant breeding genetics and genetic engineering It also explains the role of double haploids in complementing back cross breeding by transferring genes of interest from wild relatives thus breaking genetic barriers The book highlights the role of double haploids in genetic studies like inheritance of quantitative traits quantitative trait loci QTL mapping Genomics gene identification whole genome mapping and production of stable transgenic plants This book is essential for plant breeders geneticists researchers and students in agricultural and crop sciences offering insights into the transformative potential of double haploid technology in modern plant breeding

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 *Somatic Embryogenesis* Abdul Mujib, Jozef Šamaj, 2006-02-22 Somatic embryogenesis the initiation of embryos from previously differentiated somatic cells is a unique process in plants This volume expands our view of a subject that is important for plant biotechnology genetics cell biology development and agricultural applications All chapters present the latest research progress including functional genomic genetic and proteomic approaches A special focus is placed on the effects of stress environment and plant growth regulators on embryogenesis The role of genes such as Leafy Cotyledons and Baby Boom in defining and maintaining cell competence is discussed Accelerated Plant Breeding, Volume 1 Satbir Singh Gosal, Shabir Hussain Wani, 2020-05-23 Plant improvement has shifted its focus from yield quality and disease resistance to factors that will enhance commercial export such as early maturity shelf life and better processing quality Conventional plant breeding methods aiming at the improvement of a self pollinating crop such as wheat usually take 10 12 years to develop and release of the new variety During the past 10 years significant advances have been made and accelerated methods have been developed for precision breeding and early release of crop varieties This work summarizes concepts dealing with germplasm enhancement and development of improved varieties based on innovative methodologies that include doubled haploidy marker assisted selection marker assisted background selection genetic mapping genomic selection high throughput genotyping high throughput phenotyping mutation breeding reverse breeding transgenic breeding shuttle breeding speed breeding low cost high throughput field phenotyping etc It is an important reference with special focus on accelerated development of improved crop varieties Crop Improvement Under Adverse Conditions Narendra Tuteja, Sarvajeet Singh Gill, 2012-12-09 Plant development and productivity are negatively regulated by various environmental stresses Abiotic stress factors such as heat cold drought and salinity represent key elements limiting agricultural productivity worldwide Thus developing crop plants with the ability to tolerate abiotic stresses is a critical need which demands modern novel strategies for the thorough understanding of plant response to abiotic stresses Crop Improvement under Adverse Conditions will serve as a cutting edge resource for researchers and students alike who are studying plant abiotic stress tolerance and crop improvement The book presents the latest trends and developments in the field including the impact of extreme events on salt tolerant forest species of Andaman

Nicobar Islands the overlapping horizons of salicylic acid in different stresses and fast and reliable approaches to crop improvement through In Vitro haploid production Written by renowned experts and featuring useful illustrations and photographs Crop Improvement under Adverse Conditions is a concise and practical update on plant abiotic stress tolerance and crop improvement

The Gentianaceae - Volume 2: Biotechnology and Applications Jan J. Rybczyński, Michael R. Davey, Anna Mikula, 2015-06-17 This book the second of two volumes on the Gentianaceae is devoted to aspects of biotechnology and their applications It consists of 18 chapters and covers micropropagation by means of organogenesis or somatic embryogenesis and single cell manipulation of various species belonging to the horticultural genera Blakstonia Centaurium Gentiana Gentianella and Swertia Furthermore the application of somatic cell hybridization haploidization and genetic variation arising from tissue and organ culture for the production of plants with new horticultural traits such as new flower colors or sizes or with special pharmaceutical values is treated in detail Also discussed are molecular markers that facilitate breeding and cultivar identification the preservation of genetic resources by cryopreservation the postharvest physiology of cut Gentian flowers and potted plants and different analytical methods for the evaluation of Gentians as sources of secondary metabolites such as xanthenes and flavonoids secoiridoids and C glucanols and their positive impacts on human health This volume as well as the companion book The Gentianaceae Volume 1 Characterization and Ecology will serve as key reference works for scientists and students in the fields of botany plant breeding biotechnology and horticulture as well as professional gardeners

Transgenic Crops IV Eng Chong Pua, Michael R. Davey, 2007-05-22 This volume presents the current knowledge of plant biotechnology as an important tool for crop improvement It covers cereals vegetables root crops herbs and spices This volume is an invaluable reference for plant breeders researchers and graduate students in the fields of plant biotechnology agronomy horticulture genetics and both plant cell and molecular biology

Improving Cereal Productivity through Climate Smart Practices Sindhu Sareen, Pradeep Sharma, Charan Singh, Poonam Jasrotia, Gyanendra Pratap Singh, Ashok Kumar Sorial, 2020-11-19 Improving Cereal Productivity through Climate Smart Practices is based on the presentations of the 4th International Group Meeting on Wheat productivity enhancement through climate smart practices and moves beyond the presentations to provide additional depth and breadth on this important topic Focused specifically on wheat and with chapters contributed by globally renowned pioneers in the field of cereal science the book helps readers understand climate change and its effects on different aspects of wheat production in different parts of the world This book will be important for those in research and industry seeking to contribute to the effective feeding of the world's population Encompasses the possible impact of climate change and future strategies to enhance wheat production on a sustainable basis Explores the genetic manipulation of wheat to mitigate the effects of climate change Includes both biotic and abiotic stresses and their management under changing climate

Biotechnological Approaches for Medicinal and Aromatic Plants Nitish Kumar, 2018-09-11 For the majority of the world's population medicinal and aromatic plants are the

most important source of life saving drugs Biotechnological tools represent important resources for selecting multiplying and conserving the critical genotypes of medicinal plants In this regard in vitro regeneration holds tremendous potential for the production of high quality plant based medicines while cryopreservation a long term conservation method using liquid nitrogen provides an opportunity to conserve endangered medicinal and aromatic plants In vitro production of secondary metabolites in plant cell suspension cultures has been reported for various medicinal plants and bioreactors represent a key step toward the commercial production of secondary metabolites by means of plant biotechnology Addressing these key aspects the book contains 29 chapters divided into three sections Section 1 In vitro production of secondary metabolites Section 2 In vitro propagation genetic transformation and germplasm conservation Section 3 Conventional and molecular approaches

Alien Gene Transfer in Crop Plants, Volume 1 Aditya Pratap, Jitendra Kumar, 2013-11-01 Genetic engineering and biotechnology along with conventional breeding have played an important role in developing superior cultivars by transferring economically important traits from distant wild and even unrelated species to the cultivated varieties which otherwise could not have been possible with conventional breeding There is a vast amount of literature pertaining to the genetic improvement of crops over last few decades However the wonderful results achieved by crop scientists in food legumes research and development over the years are scattered in different journals of the World The two volumes in the series Alien Gene Transfer in Crop Plants address this issue and offer a comprehensive reference on the developments made in major food crops of the world These volumes aim at bringing the contributions from globally renowned scientists at one platform in a reader friendly manner The 1st volume entitled Alien Gene Transfer in Crop Plants Innovations Methods and Risk Assessment will deal exclusively with the process and methodology The contents of this volume have been designed to appraise the readers with all the theoretical and practical aspects of wide hybridization and gene transfer like processes and methods of gene transfer role of biotechnology with special reference to embryo rescue genetic transformation protoplast fusion and molecular marker technology problems such as cross incompatibility and barriers to distant hybridization and solutions to overcome them Since wild and weedy relatives of crop plants may have negative traits associated with them there are always possibilities of linkage drag while transferring alien alleles Therefore problems and limitations of alien gene transfer from these species will also be discussed in this series Further the associated risks with this and assessment of risks will also be given due weightage

Mutation Breeding for Sustainable Food Production and Climate Resilience Suprasanna Penna, S. Mohan Jain, 2023-04-04 This book highlights the recent progress on the applications of mutation breeding technology in crop plants Plant breeders and agriculturists are faced with the new challenges of climate change human population growth and dwindling arable land and water resources which threaten to sustain food production worldwide Genetic variation is the basis which plant breeders require to produce new and improved cultivars The understanding of mutation induction and exploring its applications has paved the way for enhancing genetic

variability for various plant and agronomic characters and led to advances in gene discovery for various traits Induced mutagenesis has played a significant role in crop improvement and currently the technology has resulted in the development and release of more than 3600 mutant varieties in most of the crop plants with great economic impact The field of mutation breeding has come long way to become an important approach for crop improvement This book covers various methodologies of mutation induction screening of mutants genome editing and genomics advances and mutant gene discovery The book further discusses success stories in different countries and applications of mutation breeding in food crops horticultural plants and plantation crops This informative book is very useful to plant breeders students and researchers in the field of agriculture plant sciences food science and genetics

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

Genetics and Breeding for Productivity Traits in Forage and Bioenergy Grasses John W. Forster, Kevin F. Smith, 2018-03-20 This book is a printed edition of the Special Issue Genetics and Breeding for Productivity Traits in Forage and Bioenergy Grasses that was published in Agronomy

Plant Breeding Ibromkhim Y. Abdurakhmonov, 2012-01-11 Modern plant breeding is considered a discipline originating from the science of genetics It is a complex subject involving the use of many interdisciplinary modern sciences and technologies that became art science and business Revolutionary developments in plant genetics and genomics and coupling plant omics achievements with advances on computer science and informatics as well as laboratory robotics further resulted in unprecedented developments in modern plant breeding enriching the traditional breeding practices with precise fast efficient and cost effective breeding tools and approaches The objective of this Plant Breeding book is to present some of the recent advances of 21st century plant breeding exemplifying novel views approaches research efforts achievements challenges and perspectives in breeding of some crop species The book chapters have presented the latest advances and comprehensive information on selected topics that will enhance the reader's knowledge of contemporary plant breeding

Biotechnologies of Crop Improvement, Volume 1 Satbir Singh Gosal, Shabir Hussain Wani, 2018-06-22 During the past 15 years cellular and molecular approaches have emerged as valuable adjuncts to supplement and complement conventional breeding methods for a wide variety of crop plants Biotechnology increasingly plays a role in the creation conservation characterization and utilization of genetic variability for germplasm enhancement For instance anther microspore culture somaclonal variation embryo culture and somatic hybridization are being exploited for obtaining incremental improvement in the existing cultivars In addition genes that confer insect and disease resistance abiotic stress tolerance herbicide tolerance and quality traits have been isolated and re

introduced into otherwise sensitive or susceptible species by a variety of transgenic techniques Together these transformative methodologies grant access to a greater repertoire of genetic diversity as the gene s may come from viruses bacteria fungi insects animals human beings unrelated plants or even be artificially derived Remarkable achievements have been made in the production characterization field evaluation and commercialization of transgenic crop varieties worldwide Likewise significant advances have been made towards increasing crop yields improving nutritional quality enabling crops to be raised under adverse conditions and developing resistance to pests and diseases for sustaining global food and nutritional security The overarching purpose of this 3 volume work is to summarize the history of crop improvement from a technological perspective but to do so with a forward outlook on further advancement and adaptability to a changing world Our carefully chosen case studies of important plant crops intend to serve a diverse spectrum of audience looking for the right tools to tackle complicated local and global issues

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