

**CURRENT PLANT SCIENCE AND
BIOTECHNOLOGY IN AGRICULTURE**

***In Vitro* Haploid Production in Higher Plants**

**Volume 2:
Applications**

**S. Mohan Jain
S. K. Sopory
R. E. Veilleux
editors**



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Haploids Of Higher Plants In Vitro

**Edwin F. George, Michael A. Hall, Geert-
Jan De Klerk**



Haploids Of Higher Plants In Vitro:

Haploids of Higher Plants in Vitro Han Hu, Hongyuan Yang, 1986 **In Vitro Haploid Production in Higher Plants** S. Mohan Jain, S.K. Sopory, R.E. Veilleux, 2013-03-09 The 18 chapters making up *In Vitro Haploid Production in Higher Plants* are divided into two sections Section 1 eight chapters covers historical and fundamental aspects of haploidy in crop improvement Section 2 deals with methods of haploid production including anther culture micropore culture ovary culture pollination with irradiated pollen in vitro pollination and special culture techniques including polyhaploid production in the Triticeae by sexual hybridization the influence of ethylene and gelling agents on anther culture conditional lethal markers and methods of chromosome doubling *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

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 **Plant Tissue Culture, Development, and Biotechnology** Robert N. Trigiano, Dennis J. Gray, 2016-03-30 Under the vast umbrella of Plant Sciences resides a plethora of

highly specialized fields Botanists agronomists horticulturists geneticists and physiologists each employ a different approach to the study of plants and each for a different end goal Yet all will find themselves in the laboratory engaging in what can broadly be termed biotechnol

Advances in Haploid Production in Higher Plants Alisher Touraev, 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

In Vitro Culture of Higher Plants R.L.M Pierik, 2012-12-06 *In Vitro Culture of Higher Plants* presents an up to date and wide ranging account of the techniques and applications and has primarily been written in response to practical problems Special attention has been paid to the educational aspects Typical methodological aspects are given in the first part laboratory set up composition and preparation of media sterilization of media and plant material isolation and sub culture mechanization the influence of plant and environmental factors on growth and development the transfer from test tube to soil aids to study The question of why in vitro culture is practised is covered in the second part embryo culture germination of orchid seeds mericlone of orchids production of disease free plants vegetative propagation somaclonal variation test tube fertilization haploids genetic manipulation other applications in phytopathology and plant breeding secondary metabolites

Cell Physiology and Genetics of Higher Plants A. Rashid, 2018-01-18 First Published in 2018 Plants contribute to a wide range of industries including those of food and feed fabric and furnishing chemical paper and energy Some of these industries are central to our needs and others are peripheral Due to an ever increasing population and the consequent decrease in land area for cultivation and forestry and dwindling energy resources it is imperative for plant scientists to have continuous plant improvement programs In the past this has been accomplished through plant breeding However the potentials and properties of plant cells remain to be explored This is Volume I of an exploration into the cell physiology and genetics of higher plants

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

Androgenesis and Haploid Plants Yves Chupeau, 1998-05-20 Jointly published with INRA Paris The use of haploid plants is of increasing importance in plant biology and plant breeding This book illustrates how the advances in plant molecular and cell biology provide an exciting means for the analysis of androgenesis in terms of pollen development and the initiation of embryogenesis It provides both an appraisal of techniques and their practical application and is the most up to date source of information about the biology of gametophytes

Step Wise Protocols for Somatic Embryogenesis of Important Woody Plants Shri Mohan Jain, Pramod Gupta, 2018-05-30 World population is increasing at an alarming rate and this has resulted in increasing tremendously the demand for tree products such as wood for construction materials fuel and paper fruits oils and medicines etc This has put immense pressure on the world's supplies of trees and raw material to industry and will continue to do so as long as human population continues to grow Also the quality of human diet especially nutritional components is adversely affected due to limited genetic improvement of most of fruit trees Thus there is an immediate need to increase productivity of trees Improvement has been made through conventional breeding methods however conventional breeding is very slow due to long life cycle of trees A basic strategy in tree improvement is to capture genetic gain through clonal propagation Clonal propagation via organogenesis is being used for the production of selected elite individual trees However the methods are labour intensive costly and produce low volumes Genetic gain can now be captured through somatic embryogenesis Formation of embryos from somatic cells by a process resembling zygotic embryogenesis is one of the most important features of plants In 1958 Reinert in Germany and Steward in USA independently reported somatic embryogenesis in carrot cultures Since then tremendous progress in somatic embryogenesis of woody and non woody plants has taken place It offers a potentially large scale propagation system for superior clones

Plant Development and Biotechnology Robert N. Trigiano, Dennis J. Gray, 2004-07-28 Biotechnology revolutionized traditional plant breeding programs This rapid change produced new discussions on techniques and opportunities for

commerce as well as a fear of the unknown Plant Development and Biotechnology addresses the major issues of the field with chapters on broad topics written by specialists The book applies an informal style that addresses the major aspects of development and biotechnology with minimal references without sacrificing information or accuracy Divided into five primary parts this volume explores how the field emerged from its early theoretical base to the technical discipline of today It also covers progress being made with genetically engineered plants providing a snapshot of the field s controversial present Part III discusses methods for preparing media creating solutions and dilutions and accomplishing sterile culture work It investigates common methods for visualizing and documenting studies and quantifying responses of tissue culture in research Part IV delivers the essential foundation of plant tissue culture introducing the three types of commonly used culture regeneration systems Part V integrates propagation techniques with other methodologies for the modification and manipulation of germplasm Part VI concludes with special sections Subjects include in vitro plant pathology recent research into genetic and phenotypic variation the mechanics of commercial plant production and the importance of clean cultures and problems associated with maintaining in vitro cultures The final chapter analyzes entrepreneurship in the field and outlines the do s and don ts to consider when launching an enterprise

Genetic Manipulation in Crops International Rice Research Institute, 1988 Special lectures Haploid Mutation Mutagenesis Somaclonal variation Somatic morphogenesis Protoplasts Molecular biology of plant gene and genetic manipulation

Biotechnology for Medicinal Plants Suman Chandra, Hemant Lata, Ajit Varma, 2012-08-10 Plant based medicines play an important role in all cultures and have been indispensable in maintaining health and combating diseases The identification of active principles and their molecular targets from traditional medicine provides an enormous opportunity for drug development Using modern biotechnology plants with specific chemical compositions can be mass propagated and genetically improved for the extraction of bulk active pharmaceuticals Although there has been significant progress in the use of biotechnology using tissue cultures and genetic transformation to investigate and alter pathways for the biosynthesis of target metabolites there are many challenges involved in bringing plants from the laboratory to successful commercial cultivation This book presents the latest advances in the development of medicinal drugs including topics such as plant tissue cultures secondary metabolite production metabolomics metabolic engineering bioinformatics and future biotechnological directions

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 *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 **Transgenic**

Plants and Crops George C. Khachatourians,Y. H. Hui,Ralph Scorza,Wai-Kit Nip,2002-03-26 With contributions from nearly 130 internationally renowned experts in the field this reference details advances in transgenic plant construction and explores the social political and legal aspects of genetic plant manipulation It provides analyzes of the history genetics physiology and cultivation of over 30 species of transgenic seeds fruits and vegetables Stressing the impact of genetic engineering strategies on the nutritional and functional benefit of foods as well as on consumer health and the global market economy the book covers methods of gene marking transferring and tagging public perceptions to the selective breeding hybridization and recombinant DNA manipulation of food **Plant Propagation by Tissue Culture** Edwin F.

George,Michael A. Hall,Geert-Jan De Klerk,2007-10-24 For researchers and students George s books have become the standard works on in vitro plant propagation For this the third edition of the classic work authors with specialist knowledge have been brought on board to cover the hugely expanded number of topics in the subject area Scientific knowledge has expanded rapidly since the second edition and it would now be a daunting task for a single author to cover all aspects adequately However this edition still maintains the integration that was characteristic of the previous editions The first volume of the new edition highlights the scientific background of in vitro propagation The second volume covers the practice of micropropagation and describes its various applications Mulberry Maharaj Krishen Razdan,Dennis Thomas,2021-07-25

Mulberry *Morus* spp is an important horticultural plant in the sericulture industry It belongs to the family Moraceae The leaf of mulberry is used to feed the silkworm *Bombyx mori* L It is also used as a fodder Due to its economic and agricultural importance mulberry is cultivated in many parts of the world An estimated 60% of the total cost of silk cocoon production is for production and maintenance of mulberry plants Therefore much attention is needed to improve the quality and quantity of mulberry leaves It is vital to increase the production of superior quality mulberry leaves with high nutritive value for the sericulture industry Although a lot of research is going on in mulberry very little effort has been made to compile the results of this research in a single book This book provides an update of recent research works going on in this plant It describes the

taxonomy conservation of germplasm genetic diversity of various mulberry species application of breeding techniques to improve the quality of mulberry in vitro conservation application of tissue culture techniques to improve mulberry species production of haploids and triploids in mulberry and improvement of abiotic stress adaptive traits in mulberry with relevance to adaptiveness to global warming *In Vitro Haploid Production in Higher Plants* S. Mohan Jain, S.K. Sopory, Richard Veilleux, 1996-07-31 Since the beginning of agricultural production there has been a continuous effort to grow more and better quality food to feed ever increasing populations Both improved cultural practices and improved crop plants have allowed us to divert more human resources to non agricultural activities while still increasing agricultural production Malthusian population predictions continue to alarm agricultural researchers especially plant breeders to seek new technologies that will continue to allow us to produce more and better food by fewer people on less land Both improvement of existing cultivars and development of new high yielding cultivars are common goals for breeders of all crops In vitro haploid production is among the new technologies that show great promise toward the goal of increasing crop yields by making similar germplasm available for many crops that was used to implement one of the greatest plant breeding success stories of this century i.e the development of hybrid maize by crosses of inbred lines One of the main applications of anther culture has been to produce diploid homozygous pure lines in a single generation thus saving many generations of backcrossing to reach homozygosity by traditional means or in crops where self pollination is not possible Because doubled haploids are equivalent to inbred lines their value has been appreciated by plant breeders for decades The search for natural haploids and methods to induce them has been ongoing since the beginning of the 20th century

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