

# **Biotechnology in Agriculture and Forestry 49**

**Somatic Hybridization  
in Crop Improvement II**

Edited by T. Nagata  
and Y. P. S. Bajaj



**Springer**

# Somatic Hybridization In Crop Improvement Ii

**Y. P. S. Bajaj, Toshiyuki Nagata, Yutaka  
Ebizuka**



## **Somatic Hybridization In Crop Improvement II:**

**Somatic Hybridization in Crop Improvement II** Toshiyuki Nagata,Y.P.S. Bajaj,2001-07-17 Somatic hybrids through the fusion of plant protoplasts have widened the genetic variability of cultivated plants As Somatic Hybridization in Crop Improvement I published in 1994 this volume describes how this discipline can contribute to the improvement of crops It comprises 24 chapters dealing with interspecific and intergeneric somatic hybridization and cybridization It is divided into four sections I Cereals Barley rice and wheat II Vegetables and Fruits Arabidopsis Asparagus Brassica chicory Citrus Cucumis Diospyros Ipomoea and various Solanaceous species e g tomato potato and eggplant III Medicinal and Aromatic Plants Atropa Dianthus Nicotiana and Senecio IV Legumes Pasture Crops Alfalfa This book is tailored to the needs of advanced students teachers and researchers in the fields of plant breeding genetic engineering and plant tissue culture

Somatic Hybridization in Crop Improvement II Toshiyuki Nagata,Y.P.S. Bajaj,2012-12-06 This richly illustrated volume describes how somatic hybrids can contribute to the improvement of crops It comprises 24 chapters dealing with interspecific and intergeneric somatic hybridization and cybridization providing valuable tools for plant breeders

**Tobacco BY-2 Cells: From Cellular Dynamics to Omics** Toshiyuki Nagata,Ken Matsuoka,Dirk Inzé,2006-09-22 It is our utmost pleasure to present a new book on tobacco BY 2 cells Tobacco BY 2 Cells From Cellular Dynamics to Omics as the 58th volume in the book series Biotechnology in Agriculture and Forestry BAF It represents an extension of the previous book Tobacco BY 2 Cells vol 53ofthe BAF Moreover the content is rather different from the latter and includes new topics gleaned from the First International Symposium on Tobacco BY 2 Cells held at the Plant Science Center of the RIKEN Yokohama organized by Nagata Matsuoka and Inze in September 2004 To this symposium came more than 200 people from different parts of the world to discuss issues Although most of the contributors to thepreviousvolumeof Tobacco BY 2 Cells gave talks on their subjects there were many other speakers who presented new topics and approaches So we enjoyed the symposium very much Thus we decided to compile a new volume on tobacco BY 2 cells which includes these new topics In addition towards the end of the symposium our common understanding was that the tobacco BY 2 cell system is still important in plant biology in particular for studying the dynamic features of plant cells We hope this volume is useful for plant biologists Contents of the book are as follows in Chapters I 1 I 6 various aspects of the cell cycle and cellular dynamics using BY 2 cells are described In Chapters II 1 II **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 Somatic Hybridization in Crop Improvement I Y. P. S. Bajaj, 1994-11-04 Fantasies and dreams have their rightful place in science and sometimes they turn into reality Regeneration of hybrid plants through protoplast fusion is one such dream come true In the early 1970s I shared the pioneering excitement in the field of protoplast technology at the Second International Congress of Plant Tissue Culture held in Strasbourg France Subsequently I participated in three international conferences devoted to plant protoplasts in Salamanca Spain 1972 Versailles France 1972 and Nottingham England 1975 At Versailles Dr P S Carlson presented his work on the successful regeneration of somatic hybrids between *Nicotiana glauca* and *Nicotiana langsdorffii* The enthusiasm shown by the participants was sufficient indication of the bright future of somatic hybridization On my return from Versailles I gathered my thoughts and prepared a concept paper on Potentials of Protoplast Culture Work in Agriculture which was published in *Euphytica* Bajaj 1974 The studies on protoplast fusion and somatic hybridization then gained momentum and active work started in many laboratories Very significant work was done by Melchers et al 1978 who obtained a somatic hybrid between potato and tomato calling it Pomato Somaclonal Variation in Crop Improvement II Y. P. S. Bajaj, 2012-12-06 In continuation of Somaclonal Variation and Crop Improvement I 1990 this volume is comprised of twenty four chapters dealing with somaclonal variants showing resistance to salt drought herbicides viruses *Alternaria* *Fusarium* *Glomerella* *Verticillium* *Phytophthora* fall armyworm etc in a number of plants of economic importance It is divided into two sections Section I Somaclonal Variation in Agricultural Crops wheat rice maize sorghum potato tomato Lotus *Stylosanthes* banana strawberry citrus colt cherry Section II Somaclonal Variation in Medicinal and Aromatic Plants *Atropa* *Carthamus* *Hypericum* *Lavatera* *Nicotiana* *Primula* *Rauwolfia* *Scilla* and *Zinnia* This book will be of great assistance to research workers teachers and advanced students of plant pathology tissue culture pharmacy horticulture and especially plant breeding Transgenic Crops III Y.P.S. Bajaj, 2013-06-29 There has been tremendous progress in the genetic transformation of agricultural crops and plants resistant to insects herbicides and diseases have been produced field tested and patented Transgenic Crops III compiles this information on ornamental aromatic medicinal and various other crops It comprises 26 chapters and is divided into two sections I Ornamental Aromatic and Medicinal Plants *Anthurium* *Antirrhinum* *Artemisia* *Begonia* *Campanula* carnation chrysanthemum *Dendrobium* *Eustoma* *Gentiana* *Gerbera* *Gladiolus* *Hyoscyamus* *muticus* *Hyssopus officinalis* ornamental *Ipomoea* *Leontopodium alpinum* *Nierembergia* *Phalaenopsis* *Rudbeckia* *Tagetes* and *Torenia* II Miscellaneous Plants *Craterostigma* *plantagineum* *Flaveria bidentis* *Moricandia* *Solanum brevidens* and freshwater wetland monocots The book is of special interest to advanced students teachers and research workers in the fields of plant breeding genetics molecular biology plant tissue culture and plant biotechnology in general **Tobacco BY-2 Cells**

Toshiyuki Nagata, Seiichiro Hasezawa, Dirk Inzé, 2013-03-09 The first compilation of a wealth of knowledge on tobacco BY 2 cells often cited as the HeLa cell line of higher plants Basic issues of cell cycle progression cytokinesis cell organization and factors that are involved in these processes are covered in detail Since the tobacco cell line is used as a tool for research in molecular and cellular biology several chapters on such studies are also included Further changes of primary and secondary metabolites during culture and factors that affect these processes are treated Last but not least the so far unpublished historical background of the BY 2 cell line is described This volume is a must for any scientist working in the field of plant biology

Cryopreservation of Plant Germplasm II L.E. Towill, Y.P.S. Bajaj, 2013-03-14 Ex situ preservation of germplasm for higher plant species has been accomplished using either seeds or clones but storage of these under typical conditions does not provide the extreme longevities that are needed to minimize risk of loss Costs of maintenance and regeneration of stocks are also high Systems that provide virtually indefinite storage should supplement existing methods and it is within this context that cryopreservation is presented The use of low temperature preservation was initially more a concern of medicine and animal breeding and was expanded to plants in the 1970s Survival after cryogenic exposure has now been demonstrated for diverse plant groups including algae bryophytes fungi and higher plants If survival is commonplace then the eventual application is a cryopreservation system whereby cells tissues and organs are held indefinitely for use often in the unforeseen future The increasing interest and capabilities for application could not have occurred at a more opportune time since expanding human populations have placed unprecedented pressures on plant diversity This book emphasizes cryopreservation of higher plants and was initially driven by the concern for loss of diversity in crops and the recognized need that this diversity would be essential for continued improvement of the many plants used by society for food health and shelter The interest in cryopreservation has been expanded by conservationists and their concerns for retaining as much as possible the diversity of natural populations The need for cryopreservation thus is well established

**Brassica** Eng Chong Pua, Carl J. Douglas, 2013-04-17 Recent advances in plant cell and molecular biology have opened new avenues for the improvement of crop plants in the genus Brassica oilseeds and vegetables of worldwide economic importance This volume reviews advances in various areas of Brassica biotechnology It covers the use of rapid cycle brassicas tissue culture and gene transfer molecular genetics biotic and abiotic stress resistance and molecular farming Contributors are world leading international Brassica researchers The volume is an invaluable reference for plant breeders researchers and graduate students in the fields of plant biotechnology agronomy horticulture genetics and cell and molecular biology

Brassicas and Legumes From Genome Structure to Breeding Toshiyuki Nagata, Satoshi Tabata, 2013-03-09 Genome sequence studies have become more and more important for plant breeding Brassicas and Legumes From Genome Structure to Breeding comprises 16 chapters and presents both an overview and the latest results of this rapidly expanding field Topics covered include genome analysis of a flowering plant Arabidopsis thaliana the sequence of the Arabidopsis genome as a tool for comparative

structural genomics in Brassicaceae application of molecular markers in Brassica coenospecies the molecular genetic basis of flowering time variation in Brassica species quantitative trait loci for clubroot resistance in Brassica oleracea structural differences of S locus between Brassica oleracea and Brassica rapa Brassica and legume chromosomes sequence analysis of the Lotus japonicus genome introduction of an early flowering accession Miyakojima MG 20 to molecular genetics in Lotus japonicus genetic linkage map of the model legume Lotus japonicus construction of a high quality genome library of Lotus japonicus genome analysis of Mesorhizobium loti a symbiotic partner to Lotus japonicus molecular linkage map of the model legume Medicago truncatula genetic mapping of seed and nodule protein markers in diploid alfalfa Medicago sativa mapping the chickpea Cicer arietinum genome localization of fungal resistance genes in interspecific crosses Molecular Marker Systems in Plant Breeding and Crop Improvement Horst Lörz, Gerhard Wenzel, 2008-11-01 Successful release of new and better crop varieties increasingly requires genomics and molecular biology This volume presents basic information on plant molecular marker techniques from marker location up to gene cloning The text includes a description of technical approaches in genome analysis such as comparison of marker systems positional cloning and array techniques in 19 crop plants A special section focuses on converting this knowledge into general and specific breeding strategies particularly in relation to biotic stress Theory and practice of marker assisted selection for QTL gene pyramiding and the future of MAS are summarized and discussed for maize wheat and soybean Furthermore approaches in silviculture on the examples of Fagus Populus Eucalyptus Picea and Abies are presented The volume ends with a comprehensive review of the patents relevant for using molecular markers and marker assisted selection **Genetic Resources, Chromosome Engineering, and Crop Improvement:** Ram J. Singh, 2009-01-15 In recent decades livestock producers have moved away from open grazing for a number of reasons none having to do with the health of consumers Genetic Resources Chromosome Engineering and Crop Improvement Forage Crops demonstrates how state of the art technology can encourage the raising of livestock in open pastures where they can be fed gra **Transgenic Crops I** Y.P.S. Bajaj, 2012-12-06 Recently there has been tremendous progress in the genetic transformation of agricultural crops and plants resistant to insects herbicides and diseases have been produced field tested and patented Transgenic Crops I compiles this information on cereals grasses legumes and oilseed crops It comprises 25 chapters and is divided into two sections I Cereals and Grasses wheat rice maize barley sorghum pearl millet triticale Agrostis spp Cenchrus ciliaris Dactylis glomerata Festuca arundinacea Lolium spp and sugarcane II Legumes and Oilseed Crops Arachis hypogaea Brassica juncea Brassica napus Cicer arietinum Glycine max Gossypium hirsutum Helianthus annuus Lens culinaris Linum usitatissimum Sinapis alba Trifolium and Vicis narbonensis This book is of special interest to advanced students teachers and research workers in the field of plant breeding genetics molecular biology plant tissue culture and plant biotechnology in general *Transgenic Trees* Y.P.S. Bajaj, 2012-12-06 Annotation This volume on Transgenic Trees comprising 22 chapters deals with the genetic transformation of fruit and forest trees It is of special

interest to advanced students teachers and research workers in the field of forestry horticulture molecular biology plant tissue culture botany and plant biotechnology in general **BOOK JACKET Title Summary** field provided by Blackwell North America Inc All Rights Reserved Medicinal and Aromatic Plants XII Toshiyuki Nagata,Yutaka Ebizuka,2013-11-11 Medicinal and Aromatic Plants XII comprises 18 chapters It deals with the distribution importance conventional propagation micropropagation tissue culture studies and the in vitro production of important medicinal and pharmaceutical compounds in the following plants *Artemisia annua* *Coriandrum sativum* *Crataegus* *Dionaea muscipula* *Hyoscyamus reticulatus* *Hypericum canariense* *Leguminosae* *Malva* *Ocimum* *Pergularia tomentosa* *Phellodendron amurense* *Sempervivum* *Solanum aculeatissimum* *S. chrysotrichum* *S. kasianum* *Stephania* *Trigonella* and *Vaccinium* It is tailored to the needs of advanced students teachers and research scientists in the fields of pharmacy plant tissue culture phytochemistry biomedical engineering and plant biotechnology in general 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

**Molecular Genetic Approaches to Maize Improvement** Alan L. Kriz,Brian A. Larkins,2008-11-14 During the past decade there has been tremendous progress in maize biotechnology This volume provides an overview of our current knowledge of maize molecular genetics how it is being used to improve the crop and future possibilities for crop enhancement Several chapters deal with genetically engineered traits that are currently or soon will be in commercial production Technical approaches for introducing novel genes into the maize genome the regeneration of plants from transformed cells and the creation of transgenic lines for field production are covered Further the authors describe how molecular genetic techniques are being used to identify genes and characterize their function and how these procedures are utilized to develop elite maize germplasm Moreover molecular biology and physiological studies of corn as a basis for the improvement of its nutritional and food making properties are included Finally the growing use of corn as biomass for energy production is discussed Medicinal and Aromatic Plants XII Y. P. S. Bajaj,Toshiyuki Nagata,Yutaka Ebizuka,2002-04-24 Deals with the distribution importance conventional propagation micropropagation tissue culture study and in vitro production of important medicinal and pharmaceutical compounds in plants *Rice Biology in the Genomics Era* Hiro-Yuki Hirano,Atshushi Hirai,Yoshio Sano,Takuji Sasaki,2008-01-08 Rice *Oryza sativa* is one of the most important staple food crops in the world Breeding efforts to improve the agronomical quality of rice have been conducted and studies on rice from the viewpoint of basic biological interest have also been carried out In 1991 a book entitled *Rice* edited by Dr Bajaj was published as the 14th volume in the series *Biotechnology in Agriculture and Forestry* BAF detailing rice research activities at that time and focusing mainly on cell and tissue culture and genetic variability Studies on rice have fundamentally advanced

since then whose outcomes are mentioned below This is a good reason to compile a new volume on rice The situation regarding rice research has markedly changed in the last 16 years First the genomic sequences of rice were completely determined by the International Rice Genome Sequencing Project in 2004 Since the genome sequence of *Arabidopsis thaliana* had been determined in 2000 rice became the second species in the seed plants to have its genome well understood Second the technology to transform rice by the *Agrobacterium* mediated method was developed and is now established In classical phytopathology Poaceae including rice has not been considered as a host for *Agrobacterium* This transformation method is relatively easy and reproducible as compared to conventional transformation methods using protoplasts and is now widely used in rice research



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## **Table of Contents Somatic Hybridization In Crop Improvement Ii**

1. Understanding the eBook Somatic Hybridization In Crop Improvement Ii
  - The Rise of Digital Reading Somatic Hybridization In Crop Improvement Ii
  - Advantages of eBooks Over Traditional Books
2. Identifying Somatic Hybridization In Crop Improvement Ii
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Somatic Hybridization In Crop Improvement Ii
  - User-Friendly Interface
4. Exploring eBook Recommendations from Somatic Hybridization In Crop Improvement Ii
  - Personalized Recommendations
  - Somatic Hybridization In Crop Improvement Ii User Reviews and Ratings
  - Somatic Hybridization In Crop Improvement Ii and Bestseller Lists
5. Accessing Somatic Hybridization In Crop Improvement Ii Free and Paid eBooks
  - Somatic Hybridization In Crop Improvement Ii Public Domain eBooks
  - Somatic Hybridization In Crop Improvement Ii eBook Subscription Services
  - Somatic Hybridization In Crop Improvement Ii Budget-Friendly Options
6. Navigating Somatic Hybridization In Crop Improvement Ii eBook Formats
  - ePub, PDF, MOBI, and More
  - Somatic Hybridization In Crop Improvement Ii Compatibility with Devices
  - Somatic Hybridization In Crop Improvement Ii Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Somatic Hybridization In Crop Improvement Ii
  - Highlighting and Note-Taking Somatic Hybridization In Crop Improvement Ii
  - Interactive Elements Somatic Hybridization In Crop Improvement Ii

8. Staying Engaged with Somatic Hybridization In Crop Improvement Ii
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Somatic Hybridization In Crop Improvement Ii
9. Balancing eBooks and Physical Books Somatic Hybridization In Crop Improvement Ii
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Somatic Hybridization In Crop Improvement Ii
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Somatic Hybridization In Crop Improvement Ii
  - Setting Reading Goals Somatic Hybridization In Crop Improvement Ii
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Somatic Hybridization In Crop Improvement Ii
  - Fact-Checking eBook Content of Somatic Hybridization In Crop Improvement Ii
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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 relative mass and the mole 161 mole ratios 169 limiting and excess reactants 175 properties of gases

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