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Crop Improvement Utilizing Biotechnology

Rup Lal, Sukanya Lal

Special Indian Edition

 **CRC Press**
Taylor & Francis Group

Crop Improvement Utilizing Biotechnology

**Satbir Singh Gosal, Shabir Hussain
Wani**



Crop Improvement Utilizing Biotechnology:

Crop Improvement Utilizing Biotechnology Rup Lal, 2019-07-23 This book discusses somaclonal variation in crop improvement the role of tissue culture in rapid clonal propagation and production of pathogen free plant protoplasts in crop improvement cell selection and long term high frequency regeneration of cereals and legumes agrobacteria mediated gene transformation and vectors for gene cloning in plants and plant frost injury and its management **Crop Improvement**

Utilizing Biotechnology Rup Lal, 2019-07-23 This book discusses somaclonal variation in crop improvement the role of tissue culture in rapid clonal propagation and production of pathogen free plant protoplasts in crop improvement cell selection and long term high frequency regeneration of cereals and legumes agrobacteria mediated gene transformation and vectors for gene cloning in plants and plant frost injury and its management **Crop improvement using biotechnology**

, 1989 Crop Improvement Pankaj Kumar, Ajay Kumar Thakur, 2021-06-29 Crop Improvement Biotechnological Advances Biomedical Science The field of biotechnology is advancing at a fast pace The availability of low cost DNA genome sequencing technologies has led to the discovery and functional characterization of myriad of genes imparting stress tolerance and quality traits The omics group of technologies including genomics proteomics transcriptomics and metabolomics has revolutionized the agricultural biotechnology sector The Nobel Prize winning technology such as the genome editing technique is being employed to edit various gene functions in plants aiding in crop improvement This technology may be adopted very quickly by consumers compared with the transgenic technique because the genome edited plants have no adverse effects on the genome of the plant itself and on the environment and related species non target organisms In this book authors have attempted to compile the latest techniques of agricultural biotechnology and their applications in crop improvement Certain chapters have been dedicated to describe the use of nanotechnology a fast emerging new technique in the agriculture sector Features Development potential and safety issues in biotechnology Advances in genomics proteomics and transcriptomics in agriculture Protein bioinformatics and its applications Genetically modified GM technology and its implications Genome editing in crop improvement Marker assisted selection MAS in crop improvement Mutation breeding Cryobiotechnology Nanotechnology and biosensors This book includes real world examples and applications making it accessible to a broader interdisciplinary readership We hope that it will serve as a reference book for researchers engaged in molecular biology and biotechnology and will act as a ready reckoner for postgraduate PG students in the biotechnology discipline **Biotechnology and Crop Improvement** Nitish Kumar, 2022-09-14

Biotechnology and Crop Improvement The green revolution led to the development of improved varieties of crops especially cereals and since then classical or molecular breeding has resulted in the creation of economically valuable species Thanks to recent developments in biotechnology it has become possible to introduce genes from different sources such as bacteria fungi viruses mice and humans to plants This technology has made the scientific community aware of the critical role of

transgenic not only as a means of producing stress tolerant crops but also as a platform for the production of therapeutics through molecular farming Biotechnology and Crop Improvement Tissue Culture and Transgenic Approaches focuses on important field crops to highlight germplasm enhancement for developing resistance to newly emerging diseases pests nutrient and water use efficiency root traits and improved tolerance to increasing temperature and introduces significant recent achievements in crop improvement using methods such as micropropagation somaclonal variation somatic embryogenesis anther pollen embryo culture and compressing the breeding cycle for accelerated breeding and early release of crop varieties Plant biotechnology has now become an integral part of tissue culture research The tremendous impact generated by genetic engineering and consequently of transgenic now allows us to manipulate plant genomes at will There has indeed been a rapid development in this area with major successes in both developed and developing countries Development of transgenic crop plants their utilization for improved agriculture health ecology and environment and their socio political impacts are currently important fields in education research and industry and also of interest to policy makers social activists and regulatory and funding agencies This work prepared with a class room approach on this multidisciplinary subject will fill an existing gap and meet the requirements of such a broad section of readers It describes the recent biotechnological advancement and developments in plant tissue culture and transgenic Plant tissue culture techniques such as such as micropropagation regeneration somaclonal variation somatic embryogenesis anther pollen embryo culture are discussed for genetic improvement of crop plant Transgenic techniques are discussed for developing resistance to newly emerging diseases pests nutrient and water use efficiency root traits and improved tolerance to increasing temperature Key Features Shows the importance of plant tissue culture and transgenic technology on plant biology research and its application to agricultural production Provides insight into what may lie ahead in this rapidly expanding area of plant research and development Contains contributions from major leaders in the field of plant tissue culture and transgenic technology This book is devoted to topics with references at both graduate and postgraduate levels The book traces the roots of plant biotechnology from the basic sciences to current applications in the biological and agricultural sciences industry and medicine The processes and methods used to genetically engineer plants for agricultural environmental and industrial purposes along with bioethical and biosafety issues of the technology are vividly described in the book

Genetic Engin of Plants for Crop Improvement Rup Lal, Sukanya Lal, 1993-04-13 Genetic Engineering of Plants for Crop Improvement discusses current genetic engineering methods for plants and addresses the commercial opportunities for transgenic plants Topics covered include Agrobacterium mediated transformations the use of electroporation PEG mediated transformation microinjection the microprojectile bombardment method and the electrical discharge particle acceleration method A concise account of the resistance of transgenic plants to insect attack viral infection and herbicides has also been provided Possibilities for genetic manipulation for proteins that have superior nutritional properties are discussed and a brief account

of tests confirming the safety and commercial validity of transgenic plants is included Genetic Engineering of Plants for Crop Improvement provides valuable information for researchers and students in plant biotechnology plant gene manipulation molecular biology and all areas of the life sciences

Biotechnological Advances in Agriculture, Healthcare, Environment and Industry Priyanka Siwach, Suresh Kumar Gahlawat, Raj Kumar Salar, Joginder Singh Duhan, Pardeep Kumar Sadh, 2024-12-16 There has been a surge in critical situations such as malnutrition agricultural productivity viral diseases noncommunicable diseases antibiotic resistance and depletion of natural resources threatening human welfare during the last decade Fortunately a parallel unprecedented growth and development have also taken place in various biotechnological sectors giving hope and direction to meet these challenges This book has been written with a very clear purpose of highlighting the contributions of modern biotechnology in solving emerging problems in various sectors It has been divided into four major sections Agricultural Biotechnology Healthcare Biotechnology Environmental Biotechnology and Industrial Biotechnology The chapters under each section are dedicated to the latest developments with comprehensive information about background prospects and applications We have tried to incorporate the latest innovative biotechnological solutions such as biofortification exome sequencing genome sequencing RNAi drug discovery nutrigenomics bioremediation nanobiotechnology and many more which have contributed remarkably in recent years to address the modern challenges in various sectors The key highlights of this book are as follows Multidisciplinary perspective of biotechnological approaches Extensive investigation of hot topics Updated information with relevant data and statistics Application based study of biotechnology Profusely illustrated and labeled diagrams to supplement the descriptions This fully updated book will serve as a high value resource book for students teachers researchers and industry personnel in various disciplines of life sciences agricultural sciences medicine environment and industrial biotechnology It will serve as a comprehensive resource book to develop an in depth understanding of the emerging challenges in the areas of human welfare and analyze the latest biotechnological advancements in the direction of solving these concerns

Industrial Crops Improvement Nitish Kumar, 2025-01-24 This book explores the different conventional and biotechnological techniques for enhancing the productivity of industrial crops The growth of the industrial crop sector has become a widespread global phenomenon that helps rural livelihoods and propels economic development Contrary to staple crops industrial crops are cultivated with the intention of being sold for a high profit Industrial crops are a crucial component of plans to increase food security because they offer the required stability during periods of economic or climatic crises In order to maintain their livelihood and food security many farm households balance the advantages and disadvantages of producing food crops and industrial crops Avoiding land use rivalry with crops grown for food and feed production is crucial when considering growing industrial crops on agricultural soils The past several years have seen a rise in the awareness of scholars and decision makers regarding the immediate and long term effects of climatic variables on economic food security social and political results In order to sustain

food production with more climate resilient crops for future generations genetic variety both natural and artificial is crucial Therefore addressing the problem of finding a compromise between increasing crop production under a specific set of conditions and reducing the chance of crop failure when conditions change is important and difficult An assortment of meteorological conditions is used to grow industrial crops Many are subsistence farmers who run extremely tiny farms with very little agricultural input to produce products that can be sold It is a significant problem to preserve the variety of these crops and handle all crop culture related difficulties By offering the knowledge required to minimize the dangers of industrial crop breeding through managing genetic diversity the author believe that this book will primarily address a need that has not yet been met in this and other grower groups

Crop Improvement Khalid Rehman Hakeem, Parvaiz Ahmad, Munir Ozturk, 2013-06-13 The improvement of crop species has been a basic pursuit since cultivation began thousands of years ago To feed an ever increasing world population will require a great increase in food production Wheat corn rice potato and few others are expected to lead as the most important crops in the world Enormous efforts are made all over the world to document as well as use these resources Everybody knows that the introgression of genes in wheat provided the foundation for the Green Revolution Later also demonstrated the great impact that genetic resources have on production Several factors are contributing to high plant performance under different environmental conditions therefore an effective and complementary use of all available technological tools and resources is needed to meet the challenge

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 genes 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 Biotechnology in Agriculture, 1986-May 1992 Charles N. Bebee,1992 **Molecular Markers and Crop Improvement** Nand K. Sharma,2025-09-28 This book covers the fundamentals of plant molecular marker techniques from marker location to gene cloning Molecular marker technology has brought about significant changes in plant breeding and agriculture Numerous molecular marker types have been employed in recent decades for a variety of tasks including genetic resource characterization marker assisted selection mapping etc Though the limited number of markers that could be tested at once has resulted in time consuming and expensive results these have produced effective genotyping Recent advancements in molecular marker techniques have opened up new possibilities for crop improvement These include the development of high throughput genotyping platforms genotyping by sequencing and the release of genome sequences of significant crop plants In addition functional molecular markers association mapping methodologies and genotype by sequencing have unlocked up new possibilities for the identification of new genetic resources lines that can accelerate crop breeding programs for higher productivity higher nutritional quality and tolerance to a range of biotic and abiotic stresses Technical methods for genome analysis such as array techniques positional cloning and marker system comparison are described in the text This book discusses the use of molecular technologies in crop improvement going forward reviewing recent developments as well as past accomplishments All the significant and pertinent research in the field is collected in one volume A comprehensive explanation of crop molecular markers is given along with conclusions regarding the method s worth potential drawbacks and challenges for future use in different crops In addition a critical analysis and discussion of the existing literature are conducted crop by crop This is a very thorough manual for academics researchers students and anybody else interested in using molecular markers as a crop tool **Biotechnology in Tropical Crop Improvement** International Crops Research Institute for the Semi-Arid Tropics,1988 Genetic manipulation Products and Uses Biotechnology For Fruit Crop Improvement Atul Kumar,V.A.,2000

Advancement in Crop Improvement Techniques Narendra Tuteja,Renu Tuteja,Nishat Passricha,Shabnam Saifi,2020-06-13 Advancement in Crop Improvement Techniques presents updates on biotechnology and molecular biological approaches which have contributed significantly to crop improvement The book discusses the emerging importance of bioinformatics in analyzing the vast resources of information regarding crop improvement and its practical application and utilization Throughout this comprehensive resource emphasis is placed on various techniques used to improve agricultural crops providing a common platform for the utility of these techniques and their combinations Written by an international team of contributors this book provides an in depth analysis of existing tools and a framework for new research Reviews techniques used for crop improvement from selection and crossing over to microorganismal approaches Explores the role of conventional biotechnology in crop improvement Summarizes the combined approaches of cytogenetics and biotechnology for crop improvement including the importance of molecular techniques in this process Focuses on the emerging role of

bioinformatics for crop improvement

Transgenic Technology Based Value Addition in Plant Biotechnology Usha Kiran, Malik Zainul Abidin, Kamaluddin, 2020-06-19 Transgenic Technology Based Value Addition in Plant Biotechnology discusses the principles methodology and applications of transgenic technologies With step by step methods on genome editing techniques and a range of potential applications from improving crop yield to increasing therapeutic efficacy this book is a one stop reference for plant gene editing technologies It will be of particular interest to researchers interested in plant biotechnology and plant genetics as well as agricultural scientists and those concerned with medicinal plants Includes step by step methods to assist students and researchers with genome editing and bioinformatics tools Highlights a number of applications of plant biotechnology including how to achieve desired traits such as improved crop yield Discusses principles methodology and applications of transgenic technologies

Biotechnologies of Crop Improvement, Volume 2 Satbir Singh Gosal, Shabir Hussain Wani, 2018-07-09 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 genes 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

Genetic Improvement of Under-Utilized and Neglected Crops in Low Income Food Deficit Countries Through Irradiation and Related Techniques International Atomic Energy Agency, 2004 This publication contains the results of an FAO IAEA Coordinated Research Project CRP It highlights the integration of radiation induced mutations in vitro culture and molecular genetics methods into the conventional breeding of neglected and under utilized crops The successful results included are plant regeneration strategies in *Dioscorea* spp grass peas and bambara ground nuts root rot disease tolerant putative mutants of cocoyam and a genetic diversity bank

of bambara ground nuts quinoa narajilla okra *Amaranthus tricolor* and *A. cruentus* This publication is relevant to individuals working in the area of enhancing the genetic improvement of such crops and for further advancing international programmes for improving food security nutrition socioeconomic aspects employment generation and sustainable food production

Biotechnologies of Crop Improvement, Volume 3 Satbir Singh Gosal, Shabir Hussain Wani, 2018-08-09 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 genes 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 Molecular Breeding for Sustainable Crop Improvement Vijay Rani Rajpal, S. Rama Rao, S.N. Raina, 2016-02-02 The world population is estimated to reach to more than 10 billion by the year 2050 These projections pose a challenging situation for the agricultural scientists to increase crops productivity to meet the growing food demands The unavailability and or inaccessibility to appropriate gene pools with desired traits required to carry out genetic improvement of various crop species make this task formidable for the plant breeders Incidentally most of the desired genes reside in the wild genetic relatives of the crop species Therefore exploration and characterization of wild genetic resources of important crop species is vital for the efficient utilization of these gene pools for sustainable genetic improvements to assure food security Further understanding the myriad complexities of genic and genomic interactions among species more particularly of wild relatives of crop species and or phylogenetically distant germplasm can provide the necessary inputs to increase the effectiveness of genetic improvement through traditional and or genetic engineering methods This book provides comprehensive and latest insights on the evolutionary genesis of diversity access and its utilization in the evolution of various crop species A

comprehensive account of various crops origin exploitation of the primary secondary and tertiary gene pools through breeding biosystematical cytogenetical and molecular phylogenetical relationships and genetic enhancement through biotechnological interventions among others have been provided as the necessary underpinnings to consolidate information on the effective and sustainable utilization of the related genetic resources The book stresses upon the importance of wild germplasm exploration characterization and exploitation in the assimilation of important crop species The book is especially intended for students and scientists working on the genetic improvement of crop species Plant Breeders Geneticists Taxonomists Molecular Biologists and Plant Biotechnologists working on crop species are going to find this book very useful

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