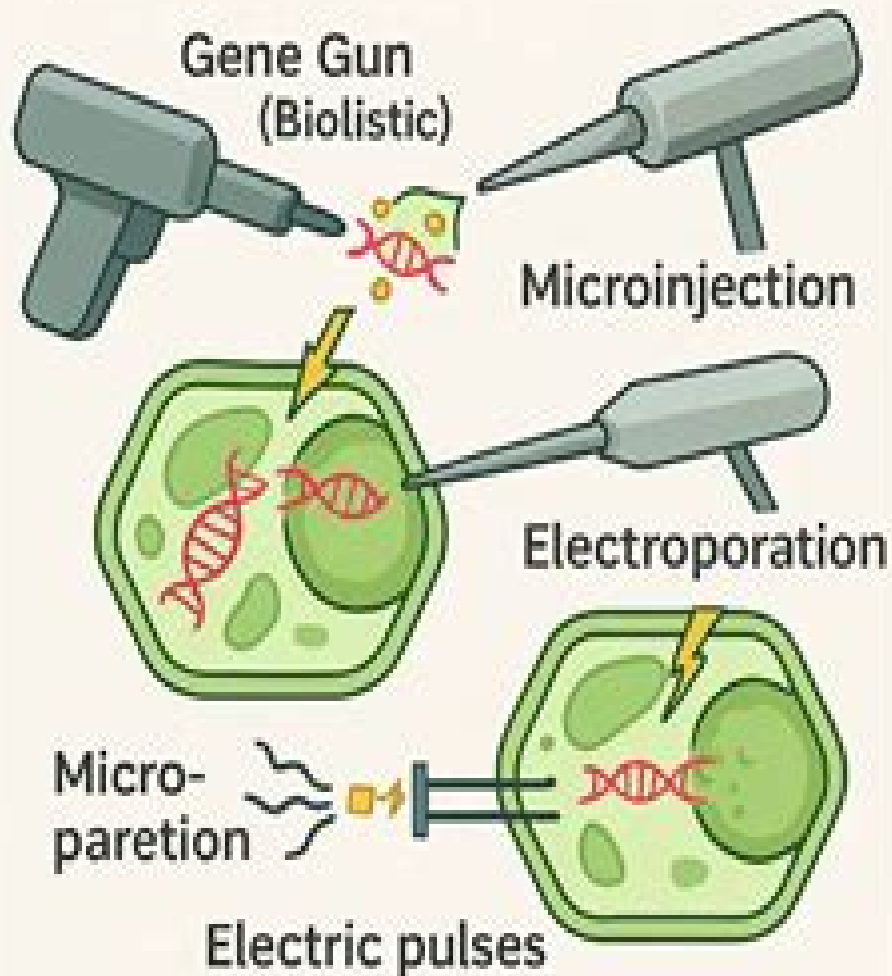
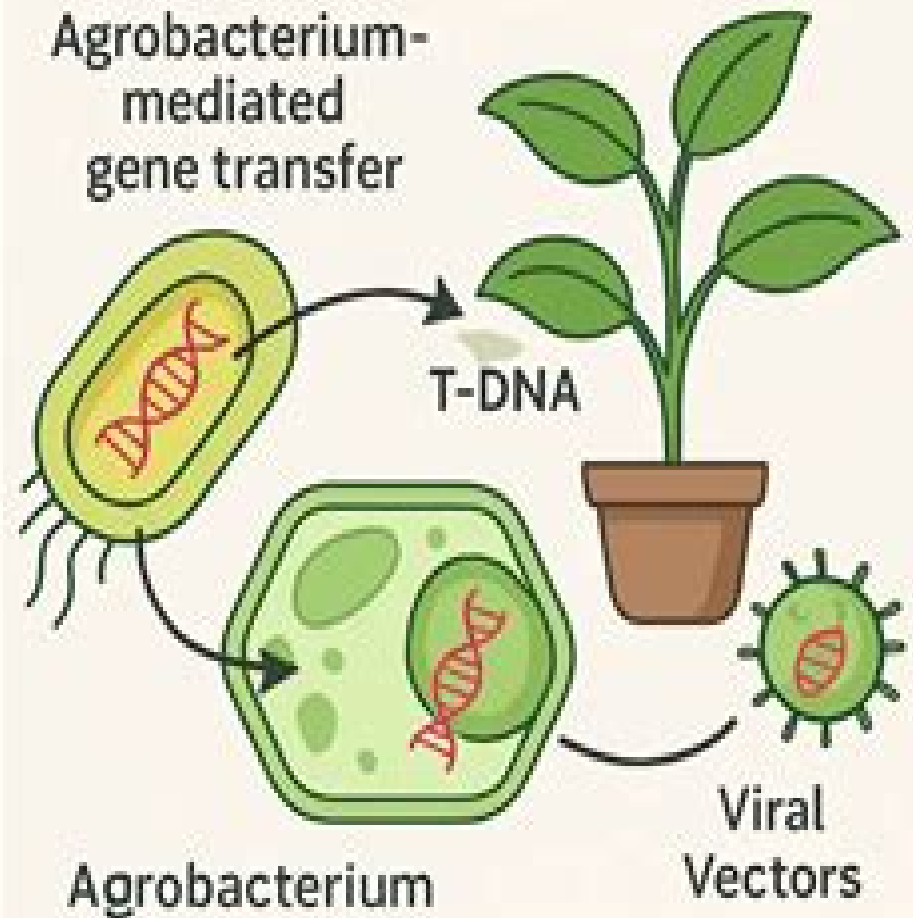


DIRECT AND INDIRECT METHODS OF GENE TRANSFER IN PLANTS

DIRECT METHODS



INDIRECT METHODS



Plant Gene Transfer

Wagdy Sawahel



Plant Gene Transfer:

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.

Plant Gene Transfer and Expression Protocols Heddwyn Jones, 2013-08-21 The development of recombinant DNA technology and methods for transferring recombinant genes into plants has brought about significant advances in plant science. First, it has allowed investigation using reporter genes into the transcriptional regulation of plant genes, a key to the understanding of the biochemical basis of growth and development in plants. Second, gene transfer technology has facilitated the molecular cloning by tagging genomic sequences of important genes, e.g. homeotic genes whose gene products control the normal pattern of growth and differentiation of plants. Third, overproducing foreign or endogenous proteins in plants can often lead to a better understanding of biochemical and physiological processes. Fourth, gene transfer technology has allowed the improvement of plant agricultural productivity. For example, plants have been engineered with improved viral resistance or the ability to withstand herbicide attack, therefore allowing a more effective use of herbicides to kill weeds. Fifth, there have been recent successes that demonstrate the potential use of plants as biotechnological chemical factories. For example, it is possible to use plants in the production of human antibodies and antigens of medical importance. It has been demonstrated recently that plants can be engineered to produce modified oils and even plastics. This paves the way to redirect agriculture from the production of surplus foods to the production of bio

technological products of industrial importance **Gene Transfer to Plants** Ingo Potrykus, German Spangenberg, 2013-06-29 **Plant Genetic Transformation Technology** Wagdy Sawahel, 1997 The introduction of foreign genetic material into host cells is a vital step in genetic engineering It is especially important when one considers the potential application of gene transfer systems to crop improvement with the aim of engineering specific traits into a wide variety of plants The book is an overview of the current research into gene transfer technology and will be valuable for those who are involved in the field of plant molecular biology genetics biochemistry physiology and biotechnology Contents Chapter 1 Genetic Transformation History Chapter 2 Gene Delivery systems Polycation mediated transformation Particle gun Electroporation Microinjection U V laser microbeam Electroinjection Electrophoresis Protoplast fusion Macroinjection Liposome system Ca DNA co precipitation method Silicon carbide fiber vortex Sonication Chapter 3 Strategies for Improving Transformation Efficiency Plasmid DNA Carrier DNA DNA repair Transformation of synchronized protoplasts Restriction enzyme mediated event Transformation booster sequence Chapter 4 Organelle Transformation Chapter 5 Shotgun Transformation Plasmid rescue Gene rescue Promoter enhancer rescue **Genetic Transformation of Plants** John Flex Jackson, Hans F. Linskens, 2013-03-09 Molecular Methods of Plant Analysis Concept of the Series The powerful recombinant DNA technology and related developments have had an enormous impact on molecular biology Any treatment of plant analysis must make use of these new methods Developments have been so fast and the methods so powerful that the editors of Modern Methods of Plant Analysis have now decided to rename the series Molecular Methods of Plant Analysis This will not change the general aims of the series but best describes the thrust and content of the series as we go forward into the new millennium This does not mean that all chapters apriori deal only with the methods of molecular biology but rather that these methods are to be found in many chapters together with the more traditional methods of analysis which have seen recent advances The numbering of the volumes of the series therefore continues on from 20 which is the most recently published volume under the title Modern Methods of Plant Analysis Plant Gene Transfer and Expression Protocols Heddwyn Jones, 1995 In Plant Gene Transfer and Expression Protocols leading experts present the latest step by step recipes for introducing genes into model and agricultural plants and for studying gene activity using reporter enzyme assays RNA techniques and immunological methods The book contains not only a complete collection of mainstream methods but also methods for studying gene expression and genetic manipulation in chloroplasts and mitochondria There are also methods for introducing and analyzing plant genes in Xenopus and heterologous yeast hosts Plant Gene Transfer and Expression Protocols is an indispensable tool for scientists working in both fundamental biochemical physiological and genetic and applied aspects of plant biotechnology plant breeding agriculture and horticulture It provides concise practical help that produces the desired results even for beginners and opens the doors to new research possibilities **Transgenic Crops of the World** Ian S. Curtis, 2004-11-30 Since the first transgenic plants were produced back in the early 1980s there have been

substantial developments towards the genetic engineering of most crops of our world Initial studies using isolated plant cells and removing their cell walls to form protoplasts offered the possibility of transferring genetic material by Agrobacterium mediated gene transfer chemical agents or electrical charges However in those cases where isolated protoplasts could be transformed often a shoot regeneration system was not available to induce the production of transgenic plants and any such regenerated plants were subject to mutation or chromosomal changes of cultured plant organs such as leaf abnormalities By the mid 1980s the use of disks offered the convenience of combining gene transfer plant regeneration and selection of transformants in a single system This approach enabled the production of stable phenotypically normal transgenic potato and tomato plants in culture By the late 1980s the use of biolistics offered a means of inserting foreign genes into plant cells which were inaccessible to Agrobacterium infection Even today this technology is now standard practice for the production of some transgenic plants

Transgenic Plants Leandro Peña, 2008-02-05 The aim of Transgenic Plants Methods and Protocols is to provide a source of information to guide the reader through a wide range of frequently used broadly applicable and easily reproducible techniques involved in the generation of transgenic plants Its step by step approach covers a series of methods for genetically transforming plant cells and tissues and for recovering whole transgenic plants from them The volume then moves on to the use of selectable and reporter markers positive selection marker elimination after recovery of transgenic plants and the analysis of transgene integration expression and localization in the plant genome Although contributors usually refer to model plants in most chapters the protocols described herein should be widely applicable to many plant species The last two sections are devoted to methods of risk assessment and to exploring the current and future applications of transgenic technology in agriculture and its social implications in a case study Transgenic Plants Methods and Protocols is divided into six major sections plus an introduction comprising 27 chapters Part I the Introduction is a review of the past present and perspectives of the transgenic plants from the discovery of Agrobacterium tumefaciens as a feasible transformation vector to its use as a tool to study gene expression and function and the current and possible future applications of this technology in agriculture industry and medicine

Plant Biotechnology S. Ignacimuthu, 1997 Summarizes the latest scientific findings and methods in molecular biology genetic engineering and tissue culture applied to agriculture Emphasis is on cell and tissue culture genetic transformation and regeneration of transgenic plants Contains chapters on the plant genome plant genetic engineering gene transfer systems for plants and plant tissue culture plus study outlines and questions For undergraduate and graduate students Annotation copyrighted by Book News Inc Portland OR

Transgenic Crop Plants Chittaranjan Koley, Charles Michler, Albert G. Abbott, Timothy C. Hall, 2010-01-13 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 industries 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 Volume 1 with ten chapters contributed by 31 eminent scientists from nine countries deliberates on the basic concepts strategies and tools for development of transgenic crop plants including topics such as explants used for the generation of transgenic plants gene transfer methods organelle transformation selection and screening strategies expression and stability of transgenes silencing undesirable genes transgene integration biosynthesis and biotransformation and metabolic engineering of pathways and gene discovery Transgenic Plant Research Alan R. Lindsey, 2022-01-26 This text is split into four main sections gene transfer techniques transgenic approaches to gene isolation manipulation of plant development biochemistry and physiology and predictability of transgene expression **Horizontal Gene Transfer** Tomás G. Villa, Miguel Viñas, 2019-08-13 The book focuses on the evolutionary impact of horizontal gene transfer processes on pathogenicity environmental adaptation and biological speciation Newly acquired genetic material has been considered as a driving force in evolution for prokaryotic genomes for many years with recent technical developments advancing this field further However the extent and implications of gene transfer between prokaryotes and eukaryotes still raise controversies This multi authored volume introduces various means by which DNA can be exchanged covers gene transfer between prokaryotes and their viruses as well as between bacteria and eukaryotes such as fungi plants and animals and addresses the role of horizontal gene transfer in human diseases Aspects discussed also include the relevance for virulence and drug resistance development on one hand and for the occurrence of naturally derived antibiotics and other secondary metabolites on the other hand This book offers new insights to anyone interested in genome evolution and the exchange of DNA between the different domains of life the genetic toolkit for adaptation and the emergence of multidrug resistant bacteria **Plant Genetic Engineering** D. Grierson, 2013-03-08 Plant biotechnology offers important opportunities for agriculture horticulture and the food industry by generating new transgenic crop varieties with altered properties This is likely to change farming practices improve the quality of fresh and processed plant products and reduce the impact of food production on the environment The purpose of this series is to review the basic science that underpins plant biotechnology and to show how this knowledge is being used in directed plant breeding It is intended for those involved in fundamental and applied research on transgenic plants in the academic and commercial sectors The first volume deals with plant genes how they work and their transfer from one organism to another Authors discuss the production and evaluation of the first generation of transgenic crops resistant to insects viruses and herbicides and consider aspects of gene regulation and targeting of their protein products to the correct cellular location All the contributors are actively engaged in research in plant biotechnology and several are concerned directly with its commercial applications Their chapters highlight the importance of a fundamental understanding of plant physiology biochemistry and cell and molecular biology for the successful genetic engineering of plants This interdisciplinary approach which focuses research from traditionally separate areas is the key to further developments which are considered in subsequent volumes Don Grierson Contributors Alan B

Bennett Mann Laboratory Department of Vegetable Crops University of California Davis CA 95616 John W s *Transgenic Plant Research* Alan R. Lindsey, 1998-11-26 This text is split into four main sections gene transfer techniques transgenic approaches to gene isolation manipulation of plant development biochemistry and physiology and predictability of transgene expression

Alien Gene Transfer in Crop Plants, Volume 2 Aditya Pratap, Jitendra Kumar, 2014-02-03 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 second volume entitled Alien Gene Transfer in Crop Plants Achievements and Impact will deal more with the practical aspects This volume will cover achievements of alien gene transfer in major food crops of the world and their impact on development of newer genetic variability and additional avenues for selection development of superior cultivars for increased yield resistance to biotic and abiotic stresses improved nutritional and industrial quality innovation of new techniques and positive as well as negative environmental implications This volume has been divided into four groups with an aim to cover all major cereals pulses oilseeds and other crops vegetable and horticultural crops which are of economic importance

Agrobacterium biology and its application to transgenic plant production Hau-Hsuan Hwang, Stanton B. Gelvin, 2015-06-26 The broad host range pathogenic bacterium *Agrobacterium tumefaciens* has been widely studied as a model system to understand horizontal gene flow secretion of effector proteins into host cells and plant pathogen interactions *Agrobacterium* mediated plant transformation also is the major method for generating transgenic plants for research and biotechnology purposes *Agrobacterium* species have the natural ability to conduct interkingdom genetic transfer from bacteria to eukaryotes including most plant species yeast fungi and even animal cells In nature *A. tumefaciens* causes crown gall disease resulting from expression in plants of auxin and cytokinin biosynthesis genes encoded by the transferred T DNA Gene transfer from *A. tumefaciens* to host cells requires virulence *vir* genes that reside on the resident tumor inducing Ti plasmid In addition to T DNA several Virulence *Vir* effector proteins are also translocated to host cells through a bacterial type IV secretion system These proteins aid in T DNA trafficking through the host cell cytoplasm nuclear targeting and T DNA integration Genes within native T DNAs can be replaced by any gene of interest making *Agrobacterium* species important tools for plant research and genetic engineering In this research topic we provided updated information on several important areas of *Agrobacterium* biology and its use for

biotechnology purposes *Introduction to Plant Biotechnology* H. S. Chawla, 2002 Plant biotechnology has created unprecedented opportunities for the manipulation of biological systems of plants To understand biotechnology it is essential to know the basic aspects of genes and their organization in the genome of plant cells This text on the subject is aimed at students The Methodology of Plant Genetic Manipulation: Criteria for Decision Making Alan C. Cassells, Peter Jones, 2012-12-06 A range of novel techniques is available to the plant breeder today to complement classical breeding methods The new options are based on the integration of advances in plant cell biology with those in plant molecular biology Plant cell tissue and organ cultures provide efficient systems for transformation for the achievement of wide crosses and for the production of variation through spontaneous and induced mutation while permitting effective isolation of desired genotypes by in vitro selection This book presents a critical appraisal of the methodologies of plant genetic manipulation for advanced undergraduates postgraduates researchers and plant breeders and provides guidance on the choice of breeding options The latter depends on the breeding system of the crop the breeding objective and the tissue culture systems applicable to the target genotype s **Plant Genome Science** United States. Congress. House. Committee on Science. Subcommittee on Basic Research, 2000 *New Approaches to Agrobacterium Tumefaciens-Mediated Gene Transfer to Plants* Mustafa Yıldız, 2016 *Agrobacterium tumefaciens* a plant pathogen is commonly used as a vector for the introduction of foreign genes into plants and consequent regeneration of transgenic plants *A. tumefaciens* naturally infects the wound sites in dicotyledonous plants and induces diseases known as crown gall The bacterium has a large plasmid that induces tumor induction and for this reason it was named tumor inducing Ti plasmid The expression of T DNA genes of Ti plasmid in plant cells causes the formation of tumors at the infection site The molecular basis of *Agrobacterium* mediated transformation is the stable integration of a DNA sequence T DNA from Ti tumor inducing plasmid of *A. tumefaciens* into the plant genome *A. tumefaciens* mediated transformation has some advantages compared with direct gene transfer methods such as integration of low copy number of T DNA into plant genome stable gene expression and transformation of large size DNA segments That is why manipulations of the plant bacteria and physical conditions have been applied to increase the virulence of bacteria and to increase the transformation efficiency Preculturing explants before inoculation modification of temperature and medium pH addition chemicals to inoculation medium such as acetosyringone changing bacterial density and co cultivation period and vacuum infiltration have been reported to increase transformation In this chapter four new transformation protocols that can be used to increase the transformation efficiency via *A. tumefaciens* in most plant species are described

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