Plant Biotechnology And Molecular Markers

This book summarises various aspects of plant biotechnology and is divided into 27 chapters. This edition discusses: plant cell culture and development, plant tissue culture, micropropagation, germplasm storage, haploid plants, triploid plants, in vitro pollination and fertilisation, protoplast isolation and culture, somatic cell hybridisation, synthetic seeds, plant breeding, plant derived vaccines, genetically modified foods, improving photosynthesis and crop yield, insect resistant plants, fungus resistant plants, virus resistant plants, ornamental plants, medicinal plants, recombinant DNA, molecular markers, intellectual property rights. Chapters on nanotechnology for micronutrients in soil-plant systems are a unique feature of the book.

Genetic mapping and marker assisted selection (MAS) is considered as one of the major tools in genetic improvement of crop plants in this genomics era. This book describes basics in linkage mapping, step-by-step procedure to perform MAS, achievements made so far in different crops, and limitations and prospects of MAS in plant breeding. It summarizes all this in a simple but comprehensive mode using suitable examples so as to explain the concept and its historical developments. To summarize, this book describes technologies for identification of genes of interest through genetic mapping, recaps the major applications of MAS to plant breeding; lists examples in which MAS is being applied to various breeding programs, and emphasizes the various difficulties that limit the application of MAS in plant breeding, providing possible solutions to overcome these difficulties, and finally tries to illustrate the future prospects. This book would be a valuable guide to the under-graduates and post-graduates of agricultural universities and institutes that are interested and/or involved in genetic improvement of crop plants using modern tools. Bibliography listed in this book constitutes two parts: literature cited and further reading. Literature cited contains references cited in the text and further information on the given concept/technique can be obtained from these references. Further reading provides a list of suggested readings for in-depth coverage of the topics.

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.

The impact of molecular genetics on plant breeding and, consequently, agri culture, is potentially enonnous. Understanding and directing this potential im pact is crucial because of the urgent issues that we face concerning sustainable agriculture for a growing world population as well as conservation of the world's rapidly dwindling plant genetic resources. This book is largely devoted to the applications of genetic markers that have been developed by the application of molecular genetics to practical problems. These are known as DNA markers. They have gained a certain notoriety in foren sics, but can be used in a variety of practical situations. We are going through a period of accelerated breakthroughs in molecular ge netics. Therefore, the authors of each chapter were encouraged to speculate about both current bottlenecks and the future of their subfields of research. We can cer tainly apply molecular genetic tools and approaches to help resolve crucial ge netic resource problems that face humanity. However, little has been discussed with respect to when or how we should use

such tools, nor to who specifically should use them; therefore, social and economic analyses are important in the planning stages of projects that are aimed at practical results.
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.
The book, “A Laboratory Manual of Plant Biotechnology and Molecular Biology” comprises of workable laboratory protocols for a large number of techniques related to plant biotechnology, genetic engineering and molecular biology. This includes plant cell and tissue culture, callus and suspension culture, anther culture, ovule culture, embryo culture, Cryopreservation, Isolation of Plant protoplasts, Protoplast culture and regeneration, production of somatic hybrids through protoplast fusion, gene transformation using Agrobacterium as vector, direct gene transfer using biolistic gun, Isolation of plant and organells DNA, construction and screening of genomic DNA libraries, Molecular markers like RFLP, RAPD, SCARS and CAPS, DNA sequencing, RNA isolation and northern blotting, Isolation of proteins and western blotting etc. The manual is prepared with the objective to cater the needs of post- graduate students as well as for scientists working in the disciplines of Plant Breeding, Genetics, Botany, Plant physiology, Biochemistry, Plant Biotechnology, Molecular Biology etc. It gives an update on some well established methods and presents reliable protocols.
Over the past decade, progress in plant science and molecular technologies has grown considerably. This book focuses on plant biotechnology applications specializing in certain aspects of breeding and molecular marker-assisted selection processes, omic strategies, usage of bioinformatic tools, and nanotechnological improvements in agricultural sciences. Most farmers and breeders can no longer simply turn to the older strategies, and new instructions are needed to adapt their systems to achieve their production goals. The book covers new information on using metabolomics and nanotechnology in agriculture. In these circumstances, all new data and technology are very important in plant science. The topics in this book are practical and user-friendly. They allow practitioners, students, and academicians with specific background knowledge to feel confident about the principles presented on a new generation of molecular plant biotechnology applications.
Plant Biotechnology comprehensively covers different aspects of the subject based on the latest outcomes of this field. Topics such as tissue culture, nutrient medium, micronutrients, macronutrients, solidifying agents/supporting systems, and growth regulators have been dealt with extensively. The book also discusses in detail plant genetic engineering for productivity and performance, resistance to herbicides, insect resistance, resistance to abiotic stresses, molecular marker aided breeding, molecular markers, types of markers, and biochemical markers. Different aspects of important issues in plant biotechnology, commercial status and public acceptance, biosafety guidelines, gene flow and IPR have been also thoroughly examined. This book caters to the needs of graduate, postgraduate and researchers. Please note: This volume is Co-published with The Energy and Resources Institute Press, New Delhi. Taylor & Francis does not sell or distribute the Hardback in India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka
Gene Editing Principles and Applications

Recent advances in plant genomics and molecular biology have revolutionized our understanding of plant genetics, providing new opportunities for more efficient and controllable plant breeding. Successful techniques require a solid understanding of the underlying molecular biology as well as experience in applied plant breeding. Bridging the gap between developments in biotechnology and its applications in plant improvement, Molecular Plant Breeding provides an integrative overview of issues from basic theories to their applications to crop improvement including molecular marker technology, gene mapping, genetic transformation, quantitative genetics, and breeding methodology.

This book, first of this new two-volume set, provides an informative tour of the basics of biotechnology to recent advances in biotechnology. Knowledge of new and fresh approaches is a prerequisite to solving plant biological problems, and to this end, the editors have brought together a group of contributors who address the most recent techniques and their applications in plant biotechnology. The chapters discuss some recent techniques such as TILLING (Targeting Induced Local Lesions In Genomes), advances in molecular techniques to study diversity, protein purification, and methods and analysis in protein-protein interaction detection. The volume also covers molecular markers and QTL mapping, including four chapters that deal with different molecular markers, development of mapping populations, and association mapping for dissecting the genetic basis of complex traits in plants in sufficient detail. The knowledge of biotechnology techniques and their applications will be valuable for researchers and scientists as well as for the many students engaged in plant biotechnology studies.

Marker-assisted plant breeding involves the application of molecular marker techniques and statistical and bioinformatics tools to achieve plant breeding objectives in a cost-effective and time-efficient manner. This book is intended for beginners in the field who have little or no prior exposure to molecular markers and their applications, but who do have a basic knowledge of genetics and plant breeding, and some exposure to molecular biology. An attempt has been made to provide sufficient basic information in an easy-to-follow format, and also to discuss current issues and developments so as to offer comprehensive coverage of the subject matter. The book will also be useful for breeders and research workers, as it offers a broad range of up-to-the-year information, including aspects like the development of different molecular markers and their various applications. In the first chapter, the field of marker-assisted plant breeding is introduced and placed in the proper perspective in relation to plant breeding. The next three chapters describe the various molecular marker systems, while mapping populations and mapping procedures including high-throughput genotyping are discussed in the subsequent five chapters. Four chapters are devoted to various applications of markers, e.g. marker-assisted selection, genomic selection, diversity analysis, finger printing and positional cloning. In closing, the last two chapters provide information on relevant bioinformatics tools and the rapidly evolving field of

phenomics.

The discipline of plant breeding has undergone transformation due to the assimilation of the rapid developments in molecular biology. The existing books on plant breeding deal mainly with the classical approaches, while specialized books on molecular approaches usually lack discussion of the classical methods. The book Plant Breeding for 21st Century attempts to present the complete picture of plant breeding ranging from the classical to the molecular approaches applied to crop improvement. The book is divided into four sections: Classical Plant Breeding, Transgenic technology, Molecular Markers, and Miscellaneous. The first section deals with the classical plant breeding and is divided into eight chapters. The second section has four chapters and describes transgenic technology. The third section discusses various aspects of molecular markers and is spread over three chapters. The final section has a single chapter dealing with variety release, seed multiplication and intellectual property rights. This book is designed primarily for graduate students, viz., B.Sc. agriculture and B.Sc. science students with botany as one of the subjects, who would get their first exposure to plant breeding. It would also be useful for the post-graduate students, especially in botany, and to teachers of the subject. The book is written in simple and easy to understand language. Illustrations and photographs have been provided wherever they were expected to facilitate comprehension of the subject under discussion.

The book entitled Molecular Markers and Plant Biotechnology is an exclusive collection of molecular marker based techniques narrated in 40 chapters through 578 pages along with figures makes it essential for biotechnology people. To supplement the practical working the relevant equipments have been described. Laboratory safety rules placed in the beginning is a wise task. Appendices include basic calculations; basic principles in preparation of reagents, abbreviations and glossary show the carefulness while preparing this text. This is an unavoidable text for biotechnology laboratory and class.

The book provides an overview on adoption of biotechnological approaches for the conservation, micropropagation, synseed production of various medicinal and ornamental climbers. The work includes a brief chapter on evolution and diversification of climbers. Other chapters give insights on protocols for in vitro propagation and synseed production of selected threatened medicinal and ornamental climbers. Informative chapter on the production of bioactive compound and their enhancement through genetic transformation and elicitation have been incorporated to cover latest advancement in the field of plant biotechnology. This book also explores the use of molecular marker technique for the desired improvement/magnification of medicinal and aesthetic value of climbing plants.

Plant biotechnology applies to three major areas of plants and their uses: (1) control of plant growth and development; (2) protection of plants against biotic and abiotic stresses; and (3) expansion of ways by which specialty foods, biochemicals, and pharmaceuticals are produced. The topic of recent advances in plant biotechnology is ripe for consideration because of the rapid developments in this ?eld that have revolutionized our concepts of sustainable food production, cost-effective alt- native energy strategies, environmental bioremediation, and production of pla- derived medicines through plant cell biotechnology. Many of the more traditional approaches to plant biotechnology are woefully out of date and even obsolete. Fresh approaches are therefore required. To this end, we have brought together a group of contributors who address the most recent advances in plant biotechnology and what they mean for human progress, and hopefully, a

more sustainable future. Achievements today in plant biotechnology have already surpassed all previous expectations. These are based on promising accomplishments in the last several decades and the fact that plant biotechnology has emerged as an exciting area of research by creating unprecedented opportunities for the manipulation of biological systems. In connection with its recent advances, plant biotechnology now allows for the transfer of a greater variety of genetic information in a more precise, controlled manner. The potential for improving plant productivity and its proper use in agric- ture relies largely on newly developed DNA biotechnology and molecular markers.

The study of plant genetics helps in understanding the structure and functions of genes in plants. These studies are used in crop biotechnology to modify plants and crops. Crop biotechnology uses the techniques of tissue culture, molecular markers and genetic engineering to produce desired traits in crops. The modification of crops aims to improve characteristics like disease resistance, flavor, size, color, etc. This book explores all the important aspects of plant genetics and crop biotechnology. It attempts to understand the multiple branches that fall under these disciplines and how such concepts have practical applications. Researchers, experts and students in these fields will be assisted by this book.

2nd Edition

Molecular Markers and Plant Biotechnology

Plant Biotechnology and Molecular Biology : A Laboratory Manual

Current Technologies in Plant Molecular Breeding

Triticale

Buckwheat Germplasm in the World

Biotechnology in Plant Improvement

Plant Biotechnology, Volume 1

New Visions in Plant Science

Biotechnology Has Made Significant Advances In Recent Years And Emerged As A Frontline Area Of Research And Development, With An Overwhelming Impact On The Society. Plant Biotechnology Is A Engine For Green To Evergreen Revolution. It Has Shown Great Promise In Recent Years For Improving Crop Productivity, Reducing Environmental Pollution And Improving The Quality Of Agricultural Produce. This Book Contains 17 Chapters Written By Leading Experts In The Discipline Incorporating Recent Developments In The Subject. Major Section Includes Articles On Plant Biotechnology. Topic Covering Information On Genetic Modification In Plants - A Biotechnological Scenario; Genetic Transformation In Leguminous Crops; Role Of Biotechnology In Ornamental Crops; Genetic Engineering For Major Abiotic Stresses Tolerance In Crop Plants; Transgenic Technology For Future; Molecular Markers In Plant Genome Analysis And Molecular Markers For Assessing Genetic Diversity In Coconut Palm. Topics On Micropropagation Of Prosopis, Callusing Response And Direct In Vitro Regeneration Of Nodal Explants; In Vivo Propagation And Conservation Of Pogostemon; In Vivo & In Vitro Comparison Of Bioactive Substances From Bacopa, Centella And Convolvulus Related To Memory Improvement Provide Useful Information On Application Of Tissue Culture Technique In

Biotechnology. Articles On Microfluidics; Tannase: A Versatile Enzyme For Future'S Biotechnology; Bioplastics- Biotechnological Solution For Undegradable Plastic Wastes; Peptide Nucleic Acid: Prospects Of 21St Century & Genetic Engineering Of Plants For Environmental Cleaning Up Are Some Of The Important Areas Which Have Been Specifically Addressed In Order To Make This Book More Distinct And Relevant, In The Present Day Context. This Book Will Be Useful To Biotechnologists, Agriculture Scientists, Researches, Teachers & Students Of Plant Science.

Molecular Markers in Plants surveys an array of technologies used in the molecular analysis of plants. The role molecular markers play in plant improvement has grown significantly as DNA sequencing and high-throughput technologies have matured. This timely review of technologies and techniques will provide readers with a useful resource on the latest molecular technologies. Molecular Markers in Plants not only reviews past achievements, but also catalogs recent advances and looks forward towards the future application of molecular technologies in plant improvement. Opening chapters look at the development of molecular technologies. Subsequent chapters look at a wide range of applications for the use of these advances in fields as diverse as plant breeding, production, biosecurity, and conservation. The final chapters look forward toward future developments in the field. Looking broadly at the field of molecular technologies, Molecular Markers in Plants will be an essential addition to the library of every researcher, institution, and company working in the field of plant improvement.

This book has been written to meet the needs of students for biotechnology courses at various levels of undergraduate and graduate studies. This book covers all the important aspects of plant tissue culture viz. nutrition media, micropropagation, organ culture, cell suspension culture, haploid culture, protoplast isolation and fusion, secondary metabolite production, somaclonal variation and cryopreservation. For good understanding of recombinant DNA technology, chapters on genetic material, organization of DNA in the genome and basic techniques involved in recombinant DNA technology have been added. Different aspects on rDNA technology covered gene cloning, isolation of plant genes, transposons and gene tagging, in vitro mutagenesis, PCR, molecular markers and marker assisted selection, gene transfer methods, chloroplast and mitochondrion DNA transformation, genomics and bioinformatics. Genomics covers functional and structural genomics, proteomics, metabolomics, sequencing status of different organisms and DNA chip technology. Application of biotechnology has been discussed as transgenics in crop improvement and impact of recombinant DNA technology mainly in relation to biotech crops.

Brinjal (Solanum melongena L.) is an important solanaceous vegetable crop of India. Total 75 genera and over 2000 species includes with wide range of morphological characters of brinjal including fruits shapes, color and size. Brinjal is a native to Indian sub-continent with India as probable centre of origin. It has 2n=24 chromosome number. Only characterization based on phenotypic character is unreliable since they can be affected by environmental conditions. Therefore use of biochemical markers like isoenzyme, protein profiling and molecular markers like RAPD, ISSR, SSR are of great significance in characterization of genotypes and in phylogeny studies.These biochemical and molecular markers having great important; and applications in field of plant biotechnology, plant breeding, seed production and seed testing programs.

This book provides comprehensive information on the latest tools and techniques of molecular genetics and their applications in crop improvement. It thoroughly discusses advanced techniques used in molecular markers, QTL mapping, marker-assisted breeding, and molecular cytogenetics.

Written in easy to follow language, the book presents cutting-edge agriculturally relevant plant biotechnologies and applications in a manner that is accessible to all. This book introduces the scope and method of plant biotechnologies and molecular breeding within the context of environmental analysis and assessment, a diminishing supply of productive arable land, scarce water resources and climate change. Authors who have studied how agro ecosystems have changed during the first decade and a half of commercial deployment review effects and stress needs that must be considered to make these tools sustainable.

The first chapter details the different techniques of molecular markers, emphasizing genetic aspects, because these determine the type of use one can put it to. The construction of genetic linkage maps is the subject of the second chapter, where the advantages and disadvantages of the most common mapping populations are specified. The particular ca

Plant Biotechnology And Plant Genetic Resources, which boasts a truly international list of contributors with a variety of expertise, thoroughly explores all the major contemporary concerns. It discusses the strategies for the best use of modern biotechnology and precious plant genetic resources to alleviate components associated with global constraints in hunger, environment and health. This book is a valuable resource for scientists and policy makers as the world faces unprecedented challenges in the sustainability and productivity of the global food and fibre system.

PLANT BIOTECHNOLOGY

Plant Biotechnology: Principles and Applications

Brinjal Characterization Using Biochemical and Molecular Markers

Plants, Genes and Crop Biotechnology
Volume II: Plant Genomics and Biotechnology
Molecular Markers & Plant Biotechnology
Plant Biotechnology
Basics, Practice and Benefits
DNA-based markers in plants

Plant science is one of the fundamental subjects to begin with. Biotechnology has given it a force to get modified into an applied field known as plant biotechnology. Plant tissue culture is widely used for direct commercial applications. Metabolic engineering of plants promises to create new opportunities in agriculture, environmental applications, production of chemicals and even medicine. Therefore, molecular techniques encompassing the use of plants are being focused in this era. The main aim of this book is to provide readers about the applied aspects of plant biotechnology.

The double helix architecture of DNA was elucidated in 1953. Twenty years later, in 1973, the discovery of restriction enzymes helped to create recombinant DNA molecules in vitro. The implications of these powerful and novel methods of molecular biology, and their potential in the genetic manipulation and improvement of microbes, plants and animals, became increasingly evident, and led to the birth of modern biotechnology. The first transgenic plants in which a bacterial gene had been stably integrated were produced in 1983, and by 1993 transgenic plants had been produced in all major crop species, including the cereals and the legumes. These remarkable achievements have resulted in the production of crops that are resistant to potent but environmentally safe herbicides, or to viral pathogens and insect pests. In other instances genes have been introduced that delay fruit ripening, or increase starch content, or cause male sterility. Most of these manipulations are based on the introduction of a single gene - generally of bacterial origin - that regulates an important monogenic trait, into the crop of choice. Many of the engineered crops are now under field trials and are expected to be commercially produced within the next few years. The early successes in plant biotechnology led to the realization that further molecular improvement of plants will require a thorough understanding of the molecular basis of plant development, and the identification and character ization of

genes that regulate agronomically important multi genic traits.

Recent progress in biotechnology and genomics has expanded the plant breeders' horizon providing a molecular platform on the traditional plant breeding, which is now known as 'plant molecular breeding'. Although diverse technologies for molecular breeding have been developed and applied individually for plant genetic improvement, common use in routine breeding programs seems to be limited probably due to the complexity and incomplete understanding of the technologies. This book is intended to provide a guide for researchers or graduate students involved in plant molecular breeding by describing principles and application of recently developed technologies with actual case studies for practical use. The nine topics covered in this book include the basics on genetic analysis of agronomic traits, methods of detecting QTLs, the application of molecular markers, genomics-assisted breeding including epigenomic issues, and genome-wide association studies. Identification methods of mutagenized plants, actual case studies for the isolation and functional studies of genes, the basics of gene transfer in major crops and the procedures for commercialization of GM crops are also described. This book would be a valuable reference for plant molecular breeders and a cornerstone for the development of new technologies in plant molecular breeding for the future.

Triticale crop species has received substantial research support since the mid-20th century making it a commercial success in many countries, in diverse value propositions. However, no recent book captures the new knowledge and progresses made in more than 2 decades. The purpose of this work is to review and collate the new knowledge of triticale plant biology and agronomy, while considering the contribution of biotechnology enablers such as molecular markers, doubled haploid technology and genetic engineering in breeding for traits important for crop production, feed, food and industrial end-uses.

Practical Applications of Plant Molecular Biology is an important new title which covers the major techniques and how they are applied to a range of vitally important areas. Divided broadly into four sections, this book covers key subjects including the identification of plants and plant pathogens using molecular techniques, the estimation of

genetic variation in plants, the use of molecular markers in plant improvement and the use of plant transformation techniques for the improvement of quality and the introduction of resistance. Also included is a comprehensive listing and description of the most frequently used techniques and a set of appendices covering useful topics of reference for the reader. All undergraduates studying plant sciences, molecular biology, biotechnology and agricultural sciences would benefit from having access to this title as would those studying for upper-level Masters courses concentrating on the disciplines covered. This book also provides an invaluable source of reference for professionals in agriculture, plant breeding, crop protection and improvement, biotechnology and molecular biology.

The genesis of the volume, Plant Biotechnology and Molecular Markers, has been the occasion of the retirement of Professor Sant Saran Bhojwani from the Department of Botany, University of Delhi. For Professor Bhojwani, retirement only means relinquishing the chair as being a researcher and a teacher which has always been a way of life to him. Professor Bhojwani has been an ardent practitioner of modern plant biology and areas like Plant Biotechnology and Molecular Breeding have been close to his heart. The book contains original as well as review articles contributed by his admirers and associates who are experts in their area of research. While planning this contributory book our endeavour has been to incorporate articles that cover the entire gamut of Plant Biotechnology, and also applications of Molecular Markers. Besides articles on in vitro fertilization and micropropagation, there are articles on forest tree improvement through genetic engineering. Considering the importance of conservation of our precious natural wealth, one article deals with cryopreservation of plant material. Chapter on molecular marker considers DNA indexing as markers of clonal fidelity of in vitro regenerated plants and prevention against bio-piracy. A couple of write-ups also cover stage-specific gene markers, DNA polymorphism and genetic engineering, including raising of stress tolerant plants to sustain productivity and help in reclamation of degraded land.

Plant biotechnology is a field of agricultural science that makes use of scientific tools and techniques for the purpose of modifying plants. Some of the techniques and tools used

within this field are genetic engineering, molecular markers, vaccines, molecular diagnostics and tissue culture. One of its major sub-domains is crop biotechnology where a desired trait from one species of plant is added to an entirely different species. These desired characteristics include flavor, growth rate and resistance to diseases and pests. There are diverse modification techniques which are used in plant biotechnology such as mutagenesis, polyploidy, protoplast fusion, transgenics and genome editing. This book elucidates the concepts and innovative models around prospective developments with respect to plant biotechnology. It aims to shed light on some of the unexplored aspects of this field. Coherent flow of topics, student-friendly language and extensive use of examples make this book an invaluable source of knowledge.

Buckwheat Germplasm in the World offers an overview of this globally important crop, including its general characterization and genetic diversity—particularly in Russia, China, India and Eastern Europe. The book presents the latest research on molecular marker development, genetics and phenotype analysis of new wild buckwheat to examine the nutritional values of this pseudocereal crop. Due to its short growth span, ability to grow at high altitudes and the high quality of its protein content, buckwheat is considered an important crop for addressing global food needs. Ideal for researchers and advanced-level students seeking better understanding of the buckwheat germplasm. Summarizes all the reported and distributed buckwheat species in the world Offers researchers the ability to exchange resources with each other to breed new cultivars Classifies buckwheat species based on perennial and annual from their growth span, and self-incompatible or self-compatible from their flower morphology and characterization Facilitates hybridization of different species

Molecular Marker Systems in Plant Breeding and Crop Improvement

Introduction to Plant Biotechnology (3/e)

Principles, Techniques, and Applications

Molecular Markers in Plants

Recent Advances in Plant Biotechnology

Plant Biology and Biotechnology

A Guide Book of Plant Molecular Breeding for Researchers

The Impact of Plant Molecular Genetics

The present book has been designed to provide detailed knowledge about molecular biology in relation with crop improvement. The topics mainly covered includes cell structure and function, molecular genetics and gene expression, molecular biology techniques, PCR and gene cloning, mutations and in vitro mutagenesis, molecular markers and genomics, tissue culture and plant genetic engineering, transgenics, biosafety and regulations and biomolecules like carbohydrates, proteins, lipids, nucleic acids and enzymes. Hope this book would be useful for graduate and post-graduate students of Agriculture, Biotechnology and Biology in all the Universities. This will also be useful for those appearing in competitive examinations such as Agricultural Research Services of the Indian Council of Agricultural Research, National Eligibility Test, Civil Services Examinations and other allied examinations.

Gene or genome editing is barely two decades old, but its impact is palpable in every discipline of biological sciences, especially basic and applied biomedical researches. It enables a planned and precise alterations in genome sequences as well as controlled activation or repression of selected gene functions. Base editors based on CRISPR-Cas system were created a couple of years ago, and they permit permanent conversion of the single targeted base pair into another base pair. The potential of this powerful discipline are testified by its contributions in the form of gene therapies of otherwise intractable human diseases and improved crop varieties with novel traits. The present book is designed to provide the basic principles of gene editing as well describe its realized and potential applications. The book targets biologists in general and geneticists, biomedical researchers and plant breeders in particular. It is hoped that it will be useful to post-graduate students, research scholars and research workers concerned with analyses of biological phenomena and development of strains with novel and useful traits.

Biotechnology and Plant Breeding includes critical discussions of the newest and most important applications of biotechnology in plant breeding, covering key topics such as biometry applied to molecular analysis of genetic diversity, genetically modified plants, and more. This work goes beyond recombinant DNA technology to bring together key information and references on new biotech tools for cultivar development, such as double-haploids, molecular markers, and genome-wide selection, among others. It is increasingly challenging for plant breeders and agricultural systems to supply enough food, feed, fiber and biofuel for the global population. As plant breeding evolves and becomes increasingly sophisticated, a staggering volume of genetic data is now generated. Biotechnology and Plant Breeding helps researchers and students become familiar with how the vast amounts of genetic data are generated, stored, analyzed and applied. This practical resource integrates information about plant breeding into the context of modern science, and

assists with training for plant breeders including those scientists who have a good understanding of molecular biology/biotechnology and need to learn the art and practice of plant breeding. Plant biologists, breeding technicians, agronomists, seed technologists, students, and any researcher interested in biotechnologies applied to plant breeding will find this work an essential tool and reference for the field. Presents in-depth but easy-to-understand coverage of topics, so plant breeders can readily comprehend them and apply them to their breeding programs Includes chapters that address the already developed and optimized biotechnologies for cultivar development, with real-world application for users Features contributions by authors with several years of experience in their areas of expertise

Plant genomics and biotechnology have recently made enormous strides, and hold the potential to benefit agriculture, the environment and various other dimensions of the human endeavor. It is no exaggeration to claim that the twenty-first century belongs to biotechnology. Knowledge generation in this field is growing at a frenetic pace, and keeping abreast of the latest advances and calls on us to double our efforts. Volume II of this two-part series addresses cutting-edge aspects of plant genomics and biotechnology. It includes 37 chapters contributed by over 70 researchers, each of which is an expert in his/her own field of research. Biotechnology has helped to solve many conundrums of plant life that had long remained a mystery to mankind. This volume opens with an exhaustive chapter on the role played by thale cress, Arabidopsis thaliana, which is believed to be the Drosophila of the plant kingdom and an invaluable model plant for understanding basic concepts in plant biology. This is followed by chapters on bioremediation, biofuels and biofertilizers through microalgal manipulation, making it a commercializable prospect; discerning finer details of biotic stress with plant-fungal interactions; and the dynamics of abiotic and biotic stresses, which also figure elsewhere in the book. Breeding crop plants for desirable traits has long been an endeavor of biotechnologists. The significance of molecular markers, marker assisted selection and techniques are covered in a dedicated chapter, as are comprehensive reviews on plant molecular biology, DNA fingerprinting techniques, genomic structure and functional genomics. A chapter dedicated to organellar genomes provides extensive information on this important aspect. Elsewhere in the book, the newly emerging area of epigenetics is presented as seen through the lens of biotechnology, showcasing the pivotal role of DNA methylation in effecting permanent and transient changes to the genome. Exclusive chapters deal with bioinformatics and systems biology. Handy tools for practical applications such as somatic embryogenesis and micropropagation are included to provide frontline information to entrepreneurs, as is a chapter on somaclonal variation. Overcoming barriers to sexual incompatibility has also long been a focus of biotechnology, and is addressed in chapters on wide hybridization and hybrid embryo rescue.

Another area of accomplishing triploids through endosperm culture is included as a non-conventional breeding strategy. Secondary metabolite production through tissue cultures, which is of importance to industrial scientists, is also covered. Worldwide exchange of plant genetic material is currently an essential topic, as is conserving natural resources in situ. Chapters on in vitro conservation of extant, threatened and other valuable germplasms, gene banking and related issues are included, along with an extensive account of the biotechnology of spices – the low-volume, high-value crops. Metabolic engineering is another emerging field that provides commercial opportunities. As is well known, there is widespread concern over genetically modified crops among the public. GM crops are covered, as are genetic engineering strategies for combating biotic and abiotic stresses where no other solutions are in sight. RNAi- and micro RNA- based strategies for crop improvement have proved to offer novel alternatives to the existing non-conventional techniques, and detailed information on these aspects is also included. The book's last five chapters are devoted to presenting the various aspects of environmental, marine, desert and rural biotechnology. The state-of-the-art coverage on a wide range of plant genomics and biotechnology topics will be of great interest to post-graduate students and researchers, including the employees of seed and biotechnology companies, and to instructors in the fields of plant genetics, breeding and biotechnology.

Molecular Marker and Plants Biotechnology
Biotechnology and Plant Breeding
Plant Biotechnology and Molecular Markers
Experience and Future Prospects
PLANT BREEDING IN 21ST CENTURY
Molecular Markers in Plant Genetics and Biotechnology
Genetic Mapping and Marker Assisted Selection
Plant Biotechnology And Molecular Markers
Key Notes on Plant Biotechnology