In Vitro Haploid Production In Higher Plants Volume 1 Fundamental Aspects And Methods Current Plant Science And Biotechnology In Agriculture / 84220a70b37a5296afc20635e76ca8a1

Androgenesis and Haploid Plants

Haploids in Crop Improvement II
In Vitro Application in Crop Improvement
Introduction to Plant Tissue Culture
Double Haploid Production in Crop Plants
Crop Improvement Under Adverse Conditions
In Vitro Haploid Production in Higher Plants:
Cereals
In Vitro Haploid Production in Higher Plants
Plant Mutation Breeding and Biotechnology
Plant Cell, Tissue and Organ Culture
In Vitro Haploid Production in Higher Plants
Standardization of In Vitro Techniques for Haploid Production Throughanther Culture in Rice (Oryza Sativa L.).
Double Haploid Technology
In vitro Haploid Production in Higher Plants
Haploids in Crop Improvement
In Vitro Haploid Production in Higher Plants
Advances in Haploid Production
In Vitro Haploid Production in Higher Plants
Biotechnology in Forage and Turf Grass Improvement
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Haploids in Crop Improvement
I
An Introduction to the Embryology of Angiosperms
In Vitro Haploid Production in Higher Plants
Crops I
Introduction and techniques; Introductory history; Laboratory organisation; Media; Aseptic manipulation; Basic aspects; Cell culture; Cellular totipotency; Somatic embryogenesis; Applications to plant breeding; Haploid production; Triploid production; In vitro pollination and fertilization; Zygotic embryo culture; Somatic hybridisation and cybridisation; Genetic transformation; Smoclonal and gametoclonal variant selection; Application to horticulture and forestry; Production of disease-free plants; clonal propagation; General applications; Industrial applications: secondary metabolite production; Germplasm conservation.

Create improved crops with these techniques for plant cell culture! This comprehensive book presents the basic concepts and applied techniques of plant cell and tissue culture. More and more, commercial plant breeding and development employs these methods to protect crops from weather, pests, and disease. Covering the history of in vitro breeding as well as emerging research trends, In Vitro Plant Breeding offers specific techniques for crop improvement and breeding. Designed as a text for undergraduate students, In Vitro Plant Breeding presents the theory of tissue culture as well as practical techniques. Its step-by-step instructions and clear illustrations facilitate learning and laboratory work. In Vitro Plant Breeding gives in-depth information and the latest research on the vital concepts and techniques of in vitro breeding, including: applications of plant tissue culture morphogenesis and organogenesis micropropagation producing haploid plants in vitro in vitro pollination and fertilization problems of embryo culture somatic hybridization protoplast technology selection of desirable traits cryopreservation and plant breeding micrografting This helpful book is plentifully illustrated with examples, schematic descriptions, and tables to make the concepts clear and easy to learn. In Vitro Plant Breeding is an essential resource. Jointly published with INRA, Paris. The use of haploid plants is of increasing importance in plant biology and plant breeding. This book illustrates how the advances in plant molecular and cell biology provide an exciting means for the analysis of androgenesis in terms of pollen development and the initiation of embryogenesis. It provides both an appraisal of techniques and their practical application, and is the most up-to-date source of information about the biology of gametophytes.Forty chapters deal with various aspects of tissue culture, in vitro manipulation, and other biotechnological approaches to the improvement of maize. They are arranged in eight sections: - In Vitro Technology, Callus Cultures and Regeneration of Plants, Somatic Embryogenesis. - Wide Hybridization, Embryo, Ovule, and Inflorescence Culture, in Vitro Fertilization. - Production of Haploids and Double Haploids, Anther and Pollen Culture. - Protoplast Culture, Genetic Transformation. - Somaclonal Variation and Mutations. - Molecular Biology and Physiological Studies. - Proteins and Nutritional Improvement. Pollen Storage, Cryopreservation of Germplasm.Covers research achievements in the fields of developmental biology, physiology, and pathology. Chapters discuss sericulture techniques, cocoons, dormancy and hormones, clones, the apple biting silkworm, the sable mutation, separation of male and female eggs, and genetic engineering. An
The Maize Handbook represents the collective efforts of the maize research community to enumerate the key steps of standard procedures and to disseminate these protocols for the common good. Although the material in this volume is drawn from experience with maize, many of the procedures, protocols, and descriptions are applicable to other higher plants, particularly to other grasses. The power and resolution of experiments with maize depend on the wide range of specialized genetic techniques and marked stocks; these materials are available today as the culmination of nearly 100 years of genetic research. A major goal of this volume is to introduce this genetic legacy and to highlight current stock construction programs that will soon benefit our work, e.g. high-density RFLP maps, deletion stocks, etc. Both stock construction and maintenance are relatively straightforward in maize as a result of the ease of crossing and the longevity of stored seeds. Crossing is facilitated by the separate staminate (tassel) and pistillate (ear) flower features almost unique to maize and utilized with the precision of record keeping, can be adapted to other plants. Facile communication and a spirit of co-operation have characterized the maize genetics community since its earliest days. Starting in the 1930s, institutions such as annual Maize Genetics Cooperation Newsletter, the Maize Genetics Stock Center, and the annual maize genetics meetings provide continuity to the field. The production of doubled haploids has become a necessary tool in advanced plant breeding institutes and commercial companies for breeding many crop species. However, the development of new, more efficient and cheaper large scale production protocols has meant that doubled haploids are also recently being applied in less advanced breeding programmes. This Manual was prepared to stimulate the wider use of this technology for speeding and opening up new breeding possibilities for many crops including some woody tree species. Since the construction of genetic maps using molecular markers requires the development of segregating doubled haploid populations in numerous crop species, we hope that this Manual will also help molecular biologists in establishing such mapping populations. For many years, both the Food and Agriculture Organization of the United Nations (FAO) and the International Atomic Energy Agency (IAEA) have supported and coordinated research that focuses on development of more efficient doubled haploid production methods and their applications in breeding of new varieties and basic research through their Plant Breeding and Genetics Section of the Joint F AO/IAEA Division of Nuclear Techniques in Food and Agriculture. The first F AO/IAEA scientific network (Coordinated Research Programme – CRP) dealing with doubled haploids was initiated by the Plant Breeding and Genetics Section in 1986. Rice is a staple crop in many coastal and non-coastal areas of the globe and requires a large production area. With the increasing need to increase the production of this important crop for sustainability, the introduction of high-yielding rice cultivars through molecular breeding is one of the possibilities that can ensure sustainability. Additionally, development of new biotic and abiotic stress-resistant cultivars with higher nutritional value can revolutionize the rice industry. 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. Present 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. The importance of haploids is well known to geneticists and plant breeders. The discovery of anther-derived haploid Datura plants in 1964 initiated great excitement in the plant breeding and genetics communities as it offered shortcuts in producing highly desirable homozygous plants. Unfortunately, the expected revolution was slow to materialize due to problems in extending methods to other species, including genotypic dependence, recalcitrance, slow development of tissue culture technologies and a lack of knowledge of the underlying processes. Recent years have witnessed great strides in the research and application of haploids in
higher plants. After a lull in activities, drivers for the resurgence have been: (1) development of effective tissue culture protocols, (2) identification of genes controlling embryogenesis, and (3) large scale and wide spread commercial up-take in plant breeding and plant biotechnology arenas. The first major international symposium on “Haploids in Higher Plants” took place in Guelph, Canada in 1974. At that time there was much excitement about the potential benefits, but in his opening address Sir Ralph Riley offered the following words of caution: “I believe that it is quite likely that haploid research will contribute cultivars to agriculture in several crops in the future. However, the more extreme claims of the enthusiasts for haploid breeding must be treated with proper caution. Plant breeding is subject from time to time to sweeping claims from enthusiastic proponents of new procedures. Overview of Haploidy.-Pathways to Microspore Embryogenesis.—The Role of Stress in the Induction of Microspore Embryogenesis.—Microspore Embryo Induction and Development in Higher Plants.-Cytological and Ultrastructural Aspects of Haploid Embryogenesis.-Storage Product Metabolism in Microspore-Derived Cultures of Brassicaceae.—Chromosome Doubling and Recovery of Doubled Haploids.—Utilization of Microspore-Derived Embryos.—Haploids in the Improvement of Solanaceous Species.—Haploids in the Improvement of Crucifers.—Haploids in the Improvement of Poaceae.—Haploids in the Improvement of Woody Species.—Haploids in the Improvement of Miscellaneous Crop Species (Cucurbitaceae, Liliaceae, Asparageceae, Chenopodiaceae, Araceae and Umbelliferae).—Haploids in the Improvement of Numbers of the Linaceae and Asteraceae.—Challenges and Limitations to the Use of Haploidy in Crop Improvement. In Vitro Haploid Production in Higher Plants are divided into two sections. Section 1 (eight chapters) covers historical and fundamental aspects of haploidy in crop improvement. Section 2 deals with methods of haploid production, including anther culture, microspore culture, ovary culture, pollination with irradiated pollen, in vitro pollination, and special culture techniques, including polyploid production in the Triticeae by sexual hybridization, the influence of ethylene and gelling agents on anther culture, conditional lethal markers, and methods of chromosome doubling. Since the beginning of the 20th century, i.e., the development of hybrid maize by crosses of inbred lines. One of the main applications of anther culture has been to produce diploid homozygous pure lines in a single generation, thus saving many generations of backcrossing to reach homozygosity by traditional means or in crops where self-pollination is not possible. Because doubled haploids are equivalent to inbred lines, their value has been appreciated by plant breeders for decades. The search for natural haploids and methods to induce them has been ongoing since the beginning of the 20th century. Production of food to meet the demands of an ever-increasing human population in the world is the major task and challenge to agriculture today. The conventional methods of plant breeding alone can no longer cope with the situation. The success of any crop improvement program depends on the extent of genetic variability in the base population, but due to denuding of forests and agricultural land, the naturally occurring pool of germplasm is being depleted. An urgent need is therefore apparent to create new variability and increase the genetic base of agricultural crops. Agricultural biotechnology has progressed to a stage in the production of plants where specific characteristics to improve their yield, ap pearance, disease-resistance, nutritional quality and adaptation to adverse soil conditions can be built into the seed. This concept of built-in quality implies a continuous scientific endeavour to improve plant characters using a wide range of possibilities, and it also implies a scrutiny of the materials and methods available in the world today. Mulberry (Morus spp.) is an important horticultural plant in the sericulture industry. It belongs to the family Moraceae. The leaf of mulberry is used to feed the silkworm Bombyx mori L. It is also used as a fodder. Due to its economic and agricultural importance, mulberry is cultivated in many parts of the world. An estimated 60% of the total cost of silk cocoon production is for production and maintenance of...
mulberry plants. Therefore, much attention is needed to improve the quality and quantity of mulberry leaves. It is vital to increase the production of superior quality mulberry leaves with high nutritive value for the sericulture industry. Although a lot of research is going on in mulberry, very little effort has been made to compile the results of this research in a single book. This book provides an update of recent research works going on in this plant. It describes the taxonomy, conservation of germplasm, genetic diversity of various mulberry species, application of breeding techniques to improve the quality of mulberry, in vitro conservation, application of tissue culture techniques to improve mulberry species, production of haploids and triploids in mulberry and improvement of abiotic stress adaptive traits in mulberry with relevance to adaptiveness to global warming.

Plant development and productivity are negatively regulated by various environmental stresses. Abiotic stress factors such as heat, cold, drought, and salinity represent key elements limiting agricultural productivity worldwide. Developing abiotic stress resistant plants is a critical requirement for crop improvement. In vitro haploid production is among the new technologies that show great promise toward the goal of increasing crop yields by making similar germplasm available for many crops that was used to implement one of the greatest plant breeding success stories of this century, i.e., the development of hybrid maize by crosses of inbred lines. One of the main applications of anther culture has been to produce diploid homozygous pure lines in a single generation, thus saving many generations of backcrossing to reach homozygosity by traditional means or in crops where self-pollination is not possible. Because doubled haploids are equivalent to inbred lines, their value has been appreciated by plant breeders for decades. The search for natural haploids and methods to induce them has been ongoing since the beginning of the 20th century. Deals with the historical perspectives and the current status of doubled haploid production along with its practical implications in basic and applied research. It highlights various haploid production methods with a comprehensive discussion on their pros and cons, bottlenecks, and embryogenic pathways. The review also describes in detail the results of molecular and genomic studies conducted to investigate the underlying principles of this spectacular technique that has changed the status of many species from recalcitrant to responsive over the last ninety years.

Since the beginning of agricultural production, there has been a continuous effort to grow more and better quality food to feed ever increasing populations. Both improved cultural practices and improved crop plants have allowed us to divert more human resources to non-agricultural activities while still increasing agricultural production. Malthusian population predictions continue to alarm agricultural researchers, especially plant breeders, to seek new technologies that will continue to allow us to produce more and better food by fewer people on less land. Both improvement of existing cultivars and development of new high-yielding cultivars are common goals for breeders of all crops. In vitro haploid production is among the new technologies that show great promise toward the goal of increasing crop yields by making similar germplasm available for many crops that was used to implement one of the greatest plant breeding success stories of this century, i.e., the development of hybrid maize by crosses of inbred lines. One of the main applications of anther culture has been to produce diploid homozygous pure lines in a single generation, thus saving many generations of backcrossing to reach homozygosity by traditional means or in crops where self-pollination is not possible. Because doubled haploids are equivalent to inbred lines, their value has been appreciated by plant breeders for decades. The search for natural haploids and methods to induce them has been ongoing since the beginning of the 20th century.
the advantages that make DH technology one of the most exciting fields of present and future plant biotechnology. All of the DH methods have model species where these technologies have been developed, or that respond efficiently to their corresponding induction treatment. However, not all the species of economical/agronomical interest respond to these methodologies as they should be in order to obtain DHs on a routine basis. Indeed, many of them are still considered as low-responding or recalcitrant to these treatments, including many of the most important crops worldwide. Although many groups are making significant progresses in the understanding of these intriguing experimental pathways, little is known about the origin, causes and ways to overcome recalcitrancy. It would be very important to shed light on the particularities of recalcitrant species and the special conditions they need to be induced. In parallel, the knowledge gained from the study of basic aspects in model species could also be beneficial to overcome recalcitrancy. In this e-book, we present a compilation of different approaches leading to the generation of DHs in model and recalcitrant species on new and relevant aspects of this process, useful to extract common traits and features, to know better these processes, and eventually, to elucidate how to make DH technology more efficient.

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Abstract: This book presents contemporary information on mutagenesis in plants and its applications in plant breeding and research. The present volume, Haploids In Crop Improvement I, was compiled to focus the attention of agricultural researchers, especially plant breeders, to seek new technologies that will continue to allow us to produce more and better food by fewer people on less land. Both improvement of existing cultivars and development of new high-yielding cultivars are common goals for breeders of all crops. In vitro haploid production is among the new technologies that show great promise toward the goal of increasing crop yields by making similar germplasm available for many crops that was used to implement one of the greatest plant breeding success stories of this century, i. e. , the development of hybrid maize by...
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