

Applied and Fundamental Aspects of

Plant Cell, Tissue, and Organ Culture

Edited by J. Reinert and Y. P. S. Bajaj



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Applied And Fundamental Aspects Of Plant Cell Tissue And Organ Culture

John H. Dodds, Lorin W. Roberts



Applied And Fundamental Aspects Of Plant Cell Tissue And Organ Culture:

Applied and Fundamental Aspects of Plant Cell, Tissue, and Organ Culture Jakob Reinert, Yashpal S. Bajaj, 2013-04-17 Progress in the field of plant cell and tissue culture has made this area of research one of the most dynamic and promising not only in plant physiology cell biology and genetics but also in agriculture forestry horticulture and industry Studies with plant cell cultures clearly have bearing upon a variety of problems as yet unsolved in basic and applied research This was the compelling reason for assembling such a comprehensive source of information to stimulate students teachers and research workers This book comprises 34 articles on regeneration of plants vegetative propagation and cloning haploids cytology cytogenetics and plant breeding protoplasts somatic hybridization and genetic engineering plant pathology secondary products and a chapter on isoenzymes radiobiology and cryobiology of plant cells Particular attention has been paid to modern fast growing and fascinating disciplines e g the induction of haploids somatic hybridization and genetic manipulation by protoplast culture which possess an enormous potential for plant improvement

Experiments in Plant Tissue Culture John H. Dodds, Lorin W. Roberts, 1985-10-31 The second edition of Experiments in Plant Tissue Culture makes available new information that has resulted from recent advances in the applications of plant tissue culture techniques to agriculture and industry This comprehensive laboratory text takes the reader through a graded series of experimental protocols and also provides an introductory review of each topic Topics include a plant tissue culture laboratory aseptic techniques nutritional components of media callus induction organ formation xylem cell differentiation root cultures cell suspensions micropropagation embryogenesis isolation and fusion of protoplasts haploid cultures storage of plant genetic resources secondary metabolite production and quantification of procedures This volume offers all of the basic experimental methods for the major research areas of plant tissue culture and it will be invaluable to undergraduates and research investigators in the plant sciences

Plant Cell and Tissue Culture J. Reinert, M.M. Yeoman, 2012-12-06 The techniques of plant organ tissue and cell culture concentrated on reproducibility simplicity and accuracy are now established in many research laboratories racy with sufficient illustration to make all mani throughout the world and are being used in numerous pulations clear areas of plant science Methods have been developed The drawings of items used in the bench layout to propagate plants and free them from viruses using diagrams are symbolic and are keyed in by number to shoot tip culture The regeneration of plants from callus the list of materials and equipment A line around an culture has also proved useful commercially Elegant item indicates that is sterile techniques have been used to synthesise somatic The adoption of an integrated text in which diagrams hybrids by the fusion of protoplasts and to transform are related spatially to the methods will we hope help cells These and many other techniques have been the student to grasp the techniques quickly and effec and can be used to investigate a variety of botanical tively This is first and foremost a manual which has its phenomena as well as to improve crop plants and now place on the laboratory bench open in front of the provide an important part of the basic

experimental student a book to be used skills required by a majority of experimental botanists Chemistry and World Food Supplies L. W. Shemilt, 1983 Soil and crop management for efficient use of water and nutrients integrated approaches to pest management the role of chemistry and biochemistry in improving animal production systems contributions of chemistry and biochemistry to developing new and improved food sources chemistry and biochemistry in the processing and storage of food chemistry in the assessment and control of the food supply the forward edge Innovative Approaches to Rice Breeding ,
Plant Breeding H.K. Jain, M.C. Kharkwal, 2012-12-06 The Indian Society of Genetics and Plant Breeding was established in 1941 in recognition of the growing contribution of improved crop varieties to the country's agriculture Scientific plant breeding had started in India soon after the rediscovery of Mendel's laws of heredity The Indian Agricultural Research Institute set up in 1905 and a number of Agricultural Colleges in different parts of the country carried out some of the earliest work mostly in the form of pure line selections In subsequent years hybridization programmes in crops like wheat rice oilseeds grain legumes sugarcane and cotton yielded a large number of improved cultivars with significantly higher yields A turning point came in the 1960s with the development of hybrids in several crops including inter specific hybrids in cotton And when new germplasm with dwarfing genes became available in wheat and rice from CIMMYT and IRRI respectively Indian plant breeders quickly incorporated these genes into the genetic background of the country's widely grown varieties with excellent grain quality and other desirable traits This was to mark the beginning of modern agriculture in India as more and more varieties were developed characterized by a high harvest index and response to modern farm inputs like the inorganic fertilizers India's green revolution which has led to major surpluses of food grains and other commodities like sugar and cotton has been made possible by the work of one of the largest groups of plant breeders working in a coordinated network Plant Protoplasts and Genetic Engineering IV Y. P. S. Bajaj, 2012-12-06 In continuation of Volumes 8 9 and 22 on in vitro manipulation of plant protoplasts this new volume deals with the regeneration of plants from protoplasts and genetic transformation in various species of Actinidia Amoracia Beta Brassica Cicer Citrus Cucumis Duboisia Fragaria Glycine Ipomoea Lactuca Lotus Lycopersicon Manihot Medicago Nicotiana Petunia Phaseolus Pisum Prunus Psophocarpus Saccharum Solanum Sorghum Stylosanthes and Vitis These studies reflect the far reaching implications of protoplast technology in genetic engineering of plants They are of special interest to researchers in the field of plant tissue culture molecular biology genetic engineering and plant breeding Biotechnology G. Thottappilly, 1992 Need for biotechnology research in Africa Enhancing the genetic base Cell and tissue culture Controlled gene manipulation Using molecular markers Other selected applications of biotechnology Policy issues Recent Advances in Plant in vitro Culture Annarita Leva, Laura Rinaldi, 2012-10-17 The purpose of this book is to provide the advances in plant in vitro culture as related to perennial fruit crops and medicinal plants Basic principles and new techniques now available are presented in detail The book will be of use to researchers teachers in biotechnology and for individuals interested to the commercial application of plant in vitro culture

Cryopreservation of Plant Germplasm I Y. P. S. Bajaj, 2013-03-09 The germ plasm of numerous plant species especially those of forest trees some agricultural crops and medicinal plants is endangered and threatened with extinction This depletion of germplasm pools and the shrinkage of naturally occurring genetic resources have caused international concern Conventionally the germplasm of plants is conserved through seeds tubers roots corms rhizomes bulbs cuttings etc However the germ plasm of a number of trees and plantation crops such as coconut cocoa coffee oil palm rubber mango horse chestnut etc cannot be preserved since their seed are short lived recalcitrant Likewise germplasm of vegetatively propagated crops such as potato and cassava cannot be stored on a long term basis and has to be grown and multiplied periodically in nurseries and fields The plants are thus exposed to unpredictable weather conditions and diseases with the result that instances are known where entire genetic stocks are lost Therefore unconventional methods are being developed for the storage and international exchange of germplasm For this purpose in vitro cultures have been employed but they can only enable short to medium term preservation moreover cell cultures upon repeated subculture undergo genetic erosion In view of the recent developments in the in vitro induction of genetic variability through somaclonal variation somatic hybridization recombinant DNA technology etc new methods need to be employed for the storage of desirable cultures In this regard freeze preservation of cells in liquid nitrogen 196 0q like that of semen enables long term storage theoretically for an indefinite period of time

Pollen Biology K.R. Shivanna, N.S. Rangaswamy, 2012-12-06 Pollen grains are everywhere in the air in the water in soil and in the food we eat Pollen has direct relevance in agriculture horticulture plant breeding crop improvement and biotechnology They are further of use for monitoring cytotoxic effects by herbicides pesticides and pollutants testing for allergic reactions and for basic studies on gene expression research on differentiation and polarity Detailed instructions of the standard techniques which have all been tested and improvised by the authors are given such as collection and storage of pollen pollen culture germination tests for viability incompatibility and isolation of protoplasts Introduced by an explanation of the principles involved the step by step protocols are complemented by personal notes and precautions specifying the reagents used and various appendices on basic and specific requirements for laboratory exercises on pollen

Biotechnology in International Agricultural Research International Rice Research Institute, 1985

Crops II Y. P. S. Bajaj, 2015-12-09 **Experimental Embryology of Vascular Plants** B. M. Johri, 2012-12-06 A long time ago botany used to be regarded as the scientia amabilis the friendly science eminently suitable for leisured amateurs Since then and particularly in this century it has grown tremendously in its importance and in its intimate contacts with various other disciplines of science some of which like plant genetics and plant physiology at one time indeed used to be included under the broad term botany In spite of the fact that such subjects have expanded into major scientific fields of their own botany the mother science continues to maintain its central place this is because it deals with plants which constitute one of the most vital life supporting systems of this planet Furthermore interacting and benefiting from advances made in

other sciences it has steadily progressed in a number of areas Experimental embryology of vascular plants is one such field where spectacular advances have been made in recent years The time is therefore particularly opportune for the publication of an authoritative book on the subject It is very appropriate that the book has been planned and edited by Professor B M Johri one of India's foremost botanists whose contributions in embryology plant morphology and morphogenesis are internationally known He was closely associated over a number of years with Professor P Maheshwari the great botanist and embryologist to whom the book is dedicated

High-Tech and Micropropagation I Y. P. S. Bajaj, 2012-12-06 Presented here is another classic from this series and deals with general aspects of micropropagation of plants for commercial exploitation It includes chapters on setting up a commercial laboratory meristem culture somatic embryogenesis factors affecting micropropagation disposable vessels vitrification acclimatization induction of rooting artificial substrates cryopreservation and artificial seed Special emphasis is given on modern approaches and developing technologies such as automation and bioreactors robots in transplanting artificial intelligence information management and computerized greenhouses for en masse commercial production of plants

Trees I Y. P. S. Bajaj, 2012-12-06 Biotechnology has come to a stage where by replacing some of the age old practices of breeding it can produce novel and improved plants and animals that can better serve human beings and their purposes The techniques of cellular and subcellular engineering such as gene splicing and recombinant DNA cloning hybridomas and monoclonal antibodies production of human insulin protein engineering industrial fermentation artificial insemination cryopreservation and ovum transfer plant tissue culture and somatic hybridization nitrogen fixation phytomass production for biofuels etc have advanced greatly in the past decade due to the availability of better equipment and the consolidation of knowledge Product orientation has removed biotechnology from the area of pure academic interest to one of utility where the final product is a spur to action Businesses have started pouring money into projects which has aided greatly in improving equipment information exchange and arousing the interest and imagination of the public The common goal of science industry and the public opens wide vistas and great hopes for biotechnology The business of biotechnology addresses itself to issues of factory farming technology transfer joint ventures international cooperation and to specific topics as well as the production of diagnostic kits Industry is particularly concerned with the pharmaceutical field and microbial biotechnology from which profitable return can accrue Commercial interests have led to better management practices and systematisation

Transgenic Crops of the World Ian S. Curtis, 2012-08-10 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 of cultured plant organs such as leaf abnormalities By the mid 1980s the use 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 where inaccessible to Agrobacterium infection Even today this technology is now standard practice for the production of some transgenic plants

Plant Tissue Culture: Theory and Practice S.S. Bhojwani,M.K. Razdan,1996-11-08 Since the publication of the first edition in 1983 several new and exciting developments have taken place in the field of plant tissue culture which forms a major component of what is now called plant biotechnology The revised edition presents updated information on theoretical practical and applied aspects of plant tissue culture Each chapter has been thoroughly revised and as before is written in lucid language includes relevant media protocols and is profusely illustrated with self explanatory diagrams and original photographs This book includes three new chapters Variant selection Genetic Engineering and Production of Industrial Compounds and contains a complete bibliography and a glossary of terms commonly used in tissue culture literature This updated version proves to be an excellent text for undergraduate postgraduate students and teachers in various fields of plant sciences and a useful reference book for those interested in the application of any aspect of this aseptic technology

Somatic Embryogenesis in Woody Plants S.M. Jain,Pramod P.K. Gupta,R.J. Newton,2012-12-06 The quality of human life has been maintained and enhanced for generations by the use of trees and their products In recent years ever rising human population growth has put a tremendous pressure on trees and tree products growing awareness of the potential of previously unexploited tree resources and environmental pollution have both accelerated the development of new technologies for tree propagation breeding and improvement Biotechnology of trees may be the answer to solve the problems which can not be solved by conventional breeding methods The combination of biotechnology and conventional methods such as plant propagation and breeding could become a novel approach to improving and multiplying a large number of the trees and woody plants So far plant tissue culture technology has largely been exploited by commercial companies in propagation of ornamentals especially foliage house plants Generally tissue culture of woody plants has been recalcitrant However limited success has been achieved in tissue culture of angiosperm and gymnosperm woody plants A number of recent reports on somatic embryogenesis in woody plants such as Norway spruce *Picea abies* Loblolly pine *Pinus taeda* Sandalwood *Santalum album* Citrus and mango *Mangifera indica* offer a ray of hope for inexpensive clonal propagation for large scale production of plants or emblings or somatic seedlings protoplast work cryopreservation genetic transformation and synthetic or artificial or manufactured seed production

Somatic Hybridization in Crop Improvement I Y. P. S. Bajaj,2012-12-06 Thirty five chapters on various aspects of fusion of plant protoplasts and somatic hybridization deal with the regeneration of interspecific and intergeneric somatic hybrids and cybrids in various plants cereals grasses legumes potato tomato eggplant

lettuce Brassica Datura Hyoscyamus Nicotiana Catharanthus Rauwolfia Citrus Poncirus Prunus Pyrus Populus algae bryophytes and ferns The implications of somatic hybridization in gene transfer in wide crosses and for the induction of genetic variability in various crops are discussed The book is an invaluable source of information for advanced students teachers and research scientists in the field of plant breeding genetic engineering plant tissue culture and general plant biotechnology

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