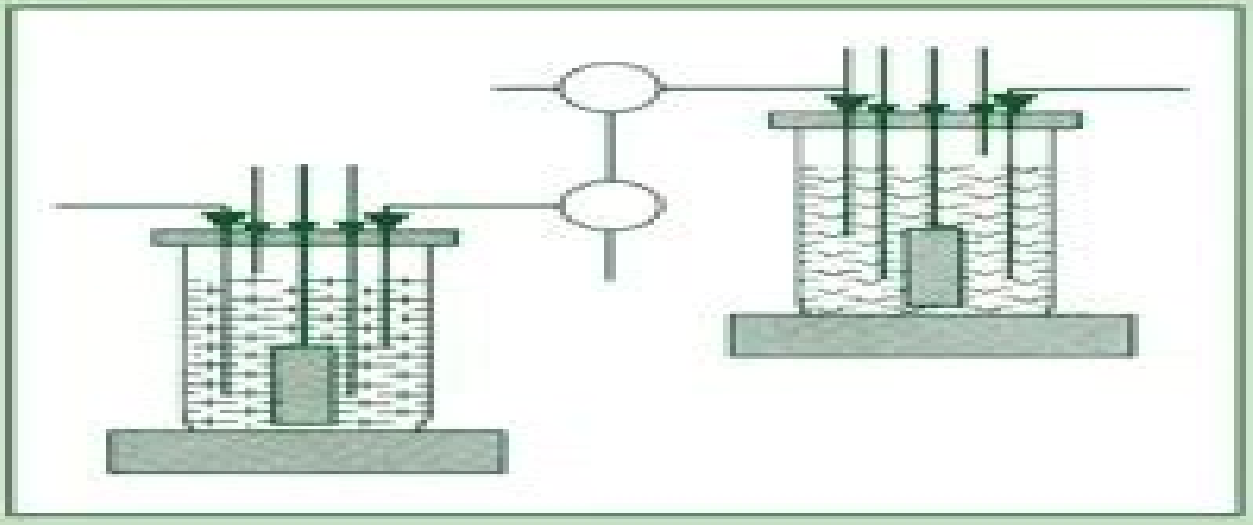
Scale – Up and Automation in Plant Propagation



Edited by

Indra K. Vasil

Scale Up And Automation In Plant Propagation

K. Kurata,T. Kozai

Scale Up And Automation In Plant Propagation:

Scale-Up and Automation in Plant Propagation Indra Vasil,2012-12-02 Scale Up and Automation in Plant Propagation reviews methods of automation and scale up of plant propagation in vitro It looks at the large scale clonal propagation of plants or micropropagation as the first major practical application of plant biotechnology It also discusses the advantages and limitations of micropropagation and evaluates current methods of commercial micropropagation Organized into 13 chapters this volume begins with an overview of the benefits of scaling up and automating plant propagation before proceeding with a discussion of synthetic seeds and their use for plant propagation along with problems and economic considerations associated with synthetic seed technology It then considers the implementation of somatic embryogenesis technology for clonal forestry the development and commercialization of bioreactor technology for automated propagation of potato microtubers and lily microbulbs and approaches to automated propagation of fruit trees Other chapters focus on issues of cost reduction and development of new products scale up and operation of prototype bioreactors for plant propagation and application of machine vision technology to scale up and automated evaluation of somatic embryogenesis in sweet potato The book also describes methods of measurement and control of the environment in culture environmental factors affecting photosynthesis and use of robotics and field transplanters in the automation of plant propagation Scientists and plant breeders will find this book extremely useful **Scale-up and Automation in Plant Propagation** I. K. Vasil,1991 **Automation and environmental control in plant tissue culture** Jenny Aitken-Christie,T. Kozai,M.A.L Smith,1995 Automation in plant tissue culture General introduction and overview Economic analysis of automated micropropagation Economic aspects of somati embryogenesis Systems analysis and engineering Engineering aspects of plant propagation in bioreactors Mechanical engineering approaches to plant biotechnology Image analysis for plant cell culture and micropropagation Image analysis for embryogenesis Automation of the bioreactor process for mass propagation and secondary metabolism Delivery system for tissue culture by encapsulation A delivery system for naked somatic embryos for interior spruce Automated systems for organogenesis Commercialisation of tissue culture and automated systems Environmental control in plant tissue culture General introduction Physical microenvironmental adn its effects Vessels gels liquid media and support systems The chemical mciroenvironment Carbon nutrition in vitro Regulation and manupulation of carbon assimilation in micropropagated systems Ethylene In vitro acclimatization Low temperature storage of plant tissue cultures Environmental measurement and control systems Cell Culture and Somatic Cell Genetics of Plants ,1984

Biotechnology Applications for Banana and Plantain Improvement , *In Vitro Embryogenesis in Plants* Trevor A. Thorpe,2012-12-06 In vitro Embryogenesis in Plants is the first book devoted exclusively to this topic As the ultimate demonstration of totipotency in plants somatic and haploid embryogenesis is of vital importance to all those working on or interested in basic and applied aspects of plantlet information and regeneration The text includes comprehensive reviews

written by experts on all facts of in vitro and in vivo embryogenesis Some chapters deal with the morphogenic structural and developmental physiological and biochemical and molecular biological aspects of the subject Chapters are also devoted to haploid embryogenesis asexual embryogenesis in nature zygotic embryogenesis and zygotic embryo culture Detailed tables summarizing successful somatic embryogenesis in all vascular plants are also included This book therefore brings together previously scattered information to provide an indispensable reference book for both active researchers graduate students and anyone interested in this aspect of tissue culture technology and plant development *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 Transplant Production Systems K. Kurata,T. Kozai,2012-12-06 As biotechnology produces an unprecedented number of new plantvarieties automated transplant production systems offer the means for their large scale introduction via a rapid efficient and economic method As labour costs increase so will automated systems assume even greater importance Reforestation and afforestation projects anti des ertification plantings and an increasing demand for urban greenery also create enormous demands for the mass production of high quality transplants in addition to the commercial needs of the agriculture industry The application of engineering techniques to modern micropropagation techniques and plant production means that many tasks can be automated especially physical manipulation and close control of the microenvironment This volume provides overviews of the main con cepts plug seedling production micropropagation robotization model development measurement and environmental control with an emphasis on practical considerations Examples are drawn from flower vegetable and forest tree species to show how disciplines such as robotics and image analysis have a part to play in plant production *Advances in Plant Tissue Culture* Avinash Chandra Rai,Ajay Kumar,Arpan Modi,Major Singh,2022-05-28 Advances in Plant Tissue Culture Current Developments and Future Trends provides a complete and up to date text on all basic and applied aspects of plant tissue cultures and their latest application implications It will be beneficial for students and early career researchers of plant sciences and plant agricultural biotechnology Plant tissue culture has emerged as a sustainable way to meet the requirements of fresh produces horticultural crops medicinal or ornamental plants Nowadays plant tissue culture is an

emerging filed applied in various aspects including sustainable agriculture plant breeding horticulture and forestry This book covers the latest technology broadly applied for crop improvement clonal propagation Somatic hybridization Embryo rescue Germplasm conservation genetic conservation or for the preservation of endangered species However these technologies also play a vital role in breaking seed dormancy over conventional methods of conservation Focuses on plant tissue culture as an emerging field applied in various aspects including sustainable agriculture plant breeding horticulture and forestry Includes current studies and innovations in biotechnology Covers commercialization and current perspectives in the field of plant tissue culture techniques **Plant Cell and Tissue Culture** Indra K. Vasil,Trevor A. Thorpe,1994-06-30 Plant Cell and Tissue Culture gives an exhaustive account of plant cell culture and genetic transformation including detailed chapters on all major field and plantation crops Part A presents a comprehensive coverage of all necessary laboratory techniques for the initiation nutrition maintenance and storage of plant cell and tissue cultures including discussions on these topics as well as on morphogenesis and regeneration meristem and shoot tip culture plant protoplasts mutant cell lines variation in tissue cultures isogenic lines fertilization control cryopreservation transformation and the production of secondary metabolites Part B then proceeds into detail on the specific in vitro culture of specific crops including cereals legumes vegetables potatoes other roots and tubers oilseeds temperate fruits tropical fruits plantation crops forest trees and ornamentals Plant Cell and Tissue Culture is and is likely to remain the laboratory manual of choice as well as a source of inspiration and a guide to all workers in the field Plant Biotechnology Mahipal singh Shekhawat,Vikrant,2019-06-11 In vitro Plant Biotechnology Status and Scope In vitro Plant Regeneration An Overview In vitro Culture Laboratory Organization and Management Sterilization Techniques Plant Cell In vitro Nutrition Culture Medium Cell Differentiation and Totipotency Micropropagation A Source of Clonal Regeneration Callus Induction and Differentiation Cell Suspension Culture Single Cell Culture Technology and Applications Embryo Culture Somatic Embryo Induction and Regeneration Haploid Production I Androgenesis Haploid Production II In vitro Pollination Fertilization and Gynogenesis Endosperm and Nucellus Culture Protoplast Technology Isolation and Regeneration of Protoplast Protoplast Technology Somatic Hybridization and Cybridization Somaclonal Variation Source and Significance Biodiversity and Preservation of Germplasm Artificial synthetic Seed Production Technology Secondary Metabolite Production I Secondary Metabolite Production II Transgenic Production I Transgenic Production II Transgenic Production III G M Crops and their Impacts Plastid Engineering Plant In vitro Biotechnology in Agriculture Plant In vitro Biotechnology in Forestry Plant In vitro Biotechnology in Industry Conservation and Utilization of Medicinal and Aromatic Plants S. Sahoo,2001 Papers presented at the National Seminar on Conservation and Utilization of Medicinal and Aromatic Plants held at Bhubaneswar during 4 6 December 2001 in Indian context **Photoautotrophic (sugar-free medium) Micropropagation as a New Micropropagation and Transplant Production System** Toyoki Kozai,Ff. Afreen,S.M.A Zobayed,2005-12-05 This book provides two basic concepts on plant propagation and value added

transplant production in a closed structure with artificial lighting 1 photoautotrophic sugar free medium photosynthetic or inorganic nutrition micropropagation systems and 2 closed transplant production systems with minimum resource consumption and environmental pollution This book also describes the methodology technology and practical techniques employed in both systems which have been commercialized recently in some Asian countries such as China and Japan We often use a closed structure such as a tissue culture vessel a culture room a growth chamber a plant factory with lamps and a greenhouse to propagate plants and produce transplants Main reasons why we use such a closed structure is 1 higher controllability of the environment for desired plant growth 2 easier protection of plants from damage by harsh physical environment pathogens insects animals etc 3 easier reduction in resource consumption for environmental control and protection and 4 higher quality and productivity of plants at a lower cost compared with the plant propagation and transplant production under rain wind and sunlight shelters and in the open fields Thus there should be some knowledge discipline methodology technology and problems to be solved on plant propagation and transplant production common to those closed structures regardless of the types and sizes of the closed structure **Introduction to Plant Tissue Culture** M. K. Razdan,2003 Introduction and techniques Introductory history Laboratory organisation Media Aseptic manipulation Basic aspects Cell culture Cellular totipotency Somatic embryogenesis Applications to plant breeding Haploid prodution Triploid production In vitro pollination and fertilization Zygotic embryo culture Somatic hybridisation and cybridisation Genetic transformation Somaclonal 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 **Tree Biotechnology** Kishan Gopal Ramawat,Jean-Michel Mérillon,M. R. Ahuja,2014-04-01 Forest trees cover 30% of the earth s land surface providing renewable fuel wood timber shelter fruits leaves bark roots and are source of medicinal products in addition to benefits such as carbon sequestration water shed protection and habitat for 1 3 of terrestrial species However the genetic analysis and breeding of trees has lagged behind that of crop plants Therefore systematic conservation sustainable improvement and pragmatic utilization of trees are global priorities This book provides comprehensive and up to date information about tree characterization biological understanding and improvement through biotechnological and molecular tools **Liquid Culture Systems for in vitro Plant Propagation** A.K. Hvoslef-Eide,W. Preil,2005-06-15 High efficiency micropropagation with relatively low labour costs has been demonstrated in this unique book detailing liquid media systems for plant tissue culture World authorities e g von Arnold Curtis Takayama Ziv contribute seminal papers together with papers from researchers across Europe that are members of the EU COST Action 843 Advanced micropropagation systems First hand practical applications are detailed for crops including ornamentals and trees using a wide range of techniques from thin film temporary immersion systems to more traditional aerated bioreactors with many types of explant shoots to somatic embryos The accounts are realistic balanced and provide a contemporary account of

this important aspect of mass propagation This book is essential reading for all those in commercial micropropagation labs as well as researchers worldwide who are keen to improve propagation techniques and lower economic costs of production Undergraduate and postgraduate students in the applied plant sciences and horticulture will find the book an enlightened treatise *Japanese Robot Culture* Yuji Sone,2016-12-17 Japanese Robot Culture examines social robots in Japan those in public domestic and artistic contexts Unlike other studies this book sees the robot in relation to Japanese popular culture and argues that the Japanese affinity for robots is the outcome of a complex loop of representation and social expectation in the context of Japan s continuing struggle with modernity Considering Japanese robot culture from the critical perspectives afforded by theatre and performance studies this book is concerned with representations of robots and their inclusion in social and cultural contexts which science and engineering studies do not address The robot as a performing object generates meaning in staged events and situations that make sense for its Japanese observers and participants This book examines how specific modes of encounter with robots in carefully constructed mises en sc ne can trigger reflexive culturally specific and often ideologically inflected responses **Plant Tissue Culture Concepts and Laboratory Exercises** Robert N. Trigiano,2018-04-27 Alternating between topic discussions and hands on laboratory experiments that range from the in vitro flowering of roses to tissue culture of ferns Plant Tissue Culture Concepts and Laboratory Exercises Second Edition addresses the most current principles and methods in plant tissue culture research The editors use the expertise of some of the top researchers and educators in plant biotechnology to furnish students instructors and researchers with a broad consideration of the field Divided into eight major parts the text covers everything from the history of plant tissue culture and basic methods to propagation techniques crop improvement procedures specialized applications and nutrition of callus cultures New topic discussions and laboratory exercises in the Second Edition include Micropropagation of Dieffenbachia Micropropagation and in vitro flowering of rose Propagation from nonmeristematic tissue organogenesis Variation in culture and Tissue culture of ferns It is the book s extensive laboratory exercises that provide a hands on approach in illustrating various topics of discussion featuring step by step procedures anticipated results and a list of materials needed What s more editors Trigiano and Gray go beyond mere basic principles of plant tissue culture by including chapters on genetic transformation techniques and photographic methods and statistical analysis of data In all Plant Tissue Culture Concepts and Laboratory Exercises Second Edition is a veritable harvest of information for the continued study and research in plant tissue culture science Somatic Embryogenesis in Woody Plants S.M. Jain,P.K. Gupta,R.J. Newton,2013-11-11 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 environ mental 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 may be 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 Gene rally 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 taedb Sandalwood Santalum album Citrus mango Mangifera indica etc offer a ray of hope of a inexpensive clonal propagation for large scale production of plants or emblings or somatic seedlings b protoplast work c cryopreservation d genetic transformation and e synthetic or artificial or manufactured seed production Breeding and Biotechnology of Tea and its Wild Species Tapan Kumar Mondal,2014-02-10 Tea is an important non alcoholic beverage plant of the world Cultivation of tea is very important as it earns revenue for the tea growing nations especially the developing countries such as India Although conventional breeding is well established and has contributed significantly for varietal improvement of this plant and other Camellia species with ornamental value yet applications of biotechnology are required to intervene some of the issues where conventional breeding is restricted particularly for woody plants such as tea It is note worthy to mention that some amounts of biotechnology works in several facets of tea and its wild species have also been done In the present book a state of the art on various aspects of breeding and biotechnology has been complied in eight chapters They are i Origin and descriptions of health benefits as well as morphological classification as first chapter ii Breeding and cytogenetics that comprise with various conventional approaches of varietal improvement of tea along with their genetic resources iii Micropropagation which deals with in depth study of clonal propagation iv Somatic embryogenesis along with alternative techniques such as suspension culture cry preservation etc v Molecular breeding that deals with application of various DNA based markers linkage map etc vi Genetic transformation and associated factors vii Stress physiology complied with various works done in tea along with its wild relatives on abiotic as well as biotic stress and viii Functional genomics that describe the various works of molecular cloning and characterizations differential gene expression high throughput sequencing bioinformatics etc Importantly the author has made exclusive tables in most of the chapters that include the summary of the works in particular topic In a nutshell the book compiles the work already been done identifies the problems analyzes the gaps on breeding and biotechnological works of tea as well as its wild species and discusses the future scope as conclusion Every effort has been made to include all the published works till June 2013 The book will be a useful resource for post graduate doctoral as well post doctoral students working on tea as well as other woody plants This will also be useful for the scientists working in the areas of life sciences genomics biotechnology and molecular biology

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