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The need for appropriate in vitro plant regeneration methods for woody plants, including both forest and fruit trees, is still

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overwhelming in order to overcome problems facing micropropagation such as somaclonal variation, recalcitrant rooting, hyperhydricity, polyphenols, loss of material during hardening and quality of plant material.

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Micropropagation has become a reliable and routine approach for large-scale rapid plant multiplication, which is based on plant cell, tissue and organ culture on well defined

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tissue culture media under aseptic conditions. A lot of research efforts are being made to develop and refine micropropagation methods and culture media for large-scale plant multiplication of several number of plant species. However, many forest and fruit tree species still remain recalcitrant to in vitro culture and require highly specific culture conditions for plant growth and development. The recent challenges on plant cell cycle regulation and the presented potential molecular mechanisms of recalcitrance are providing excellent background for understanding on totipotency and what is more development of micropropagation protocols. For large-scale in vitro plant production the important attributes are the quality, cost effectiveness, maintenance of genetic fidelity, and long-term storage. The need for appropriate in vitro plant regeneration methods for woody plants, including both forest and fruit trees, is still overwhelming in order to overcome problems facing micropropagation such as somaclonal variation, recalcitrant rooting, hyperhydricity, polyphenols, loss of material during hardening and quality of plant material. Moreover, micropropagation may be utilized, in basic research, in production of virus-free planting material, cryopreservation of endangered and elite woody species, applications in tree breeding and reforestation.

This volume covers recent advances in the vegetative propagation of woody plants by tissue culture. A wide range of topics relevant to micropropagation of woody plants are discussed by renowned international scientists. These include cellular contro of morphogenesis, light regimes in tissue culture, maturation and rejuvenation, synthetic seed, genetics of micropropagated plants, haploid embryogenesis, protoplast culture, and acclimatization of ex vitro woody plants. In addition to micropropagation of selected woody plants, both

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gymnosperms and angiosperms, this volume also includes in vitro genetic selection, strategic planning for application of biotechnology for genetics and breeding, and clonal options for woody plant improvement. A balanced view of both perspectives and limitations of woody plant micropropagation is presented.

This book provides comprehensive information on micropropagation of economically important forest and fruit trees, which is usually available in scattered literature. Topics cover a wide range, from tropical forest and fruit trees for paper or food supply, to Prunus species for local craft bark production.

World population is increasing at an alarming rate and this has resulted in increasing tremendously the demand for tree products such as wood for construction materials, fuel and paper, fruits, oils and medicines etc. This has put immense pressure on the world's supplies of trees and raw material to industry and will continue to do so as long as human population continues to grow. Also, the quality of human diet, especially nutritional components, is adversely affected due to limited genetic improvement of most of fruit trees. Thus there is an immediate need to increase productivity of trees. Improvement has been made through conventional breeding methods, however, conventional breeding is very slow due to long life cycle of trees. A basic strategy in tree improvement is to capture genetic gain through clonal propagation. Clonal propagation via organogenesis is being used for the production of selected elite individual trees. However, the methods are labour intensive, costly, and produce low volumes. Genetic gain can now be captured through somatic embryogenesis. Formation of embryos from somatic cells by a process resembling zygotic embryogenesis is one of the

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most important features of plants. In 1958, Reinert in Germany and Steward in USA independently reported somatic embryogenesis in carrot cultures. Since then, tremendous progress in somatic embryogenesis of woody and non-woody plants has taken place. It offers a potentially large-scale propagation system for superior clones.

Micropropagation is a reliable technology applied commercially worldwide for large-scale plant multiplication, germplasm conservation, pathogen elimination, genetic manipulations and supply of selected plants. In *Protocols for Micropropagation of Selected Economically-Important Horticultural Plants*, well recognised researchers in the field compile step-wise protocols for rapid plant multiplication of economically-important horticultural species. The book contains 35 chapters, divided into four major sections. The first three sections (Section A, B and C) contain 29 micropropagation protocols of selected fruit and nut species, indoor and outdoor ornamental plants, cut flowers, and vegetables. In addition to the detailed protocols of in vitro shoot initiation, proliferation, root induction and acclimatization, chapters also include detailed information on medium preparation, explant selection and preparation. The six chapters of Section D cover specific reviews on pivotal topics, such as in vitro rejuvenation, synthetic seed technology, thermotherapy and meristem culture in banana, genetic transformation of pineapple, flower color somaclonal variation in torenia, and cryotherapy of horticultural crops. Moreover, as a part of the highly successful *Methods in Molecular Biology* series, chapters include introductions to the respective topic, lists of necessary materials, notes, and illustrative photos. Comprehensive and well-written, *Protocols for Micropropagation of Selected Economically-Important Horticultural Plants* offers a useful resource for horticulturists,



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researchers, commercial companies, plant propagators, biotechnologists and students interested in micropropagation.

The book "Embryogenesis" is a compilation of cutting edge views of current trends in modern developmental biology, focusing on gametogenesis, fertilization, early and/or late embryogenesis in animals, plants, and some other small organisms. Each of 27 chapters contributed from the authorships of world-wide 20 countries provides an introduction as well as an in-depth review to classical as well as contemporary problems that challenge to understand how living organisms are born, grow, and reproduce at the levels from molecule and cell to individual.

This important reference book is the first comprehensive resource worldwide that reflects research achievements in date palm biotechnology, documenting research events during the last four decades, current status, and future outlook. This book is essential for researchers, policy makers, and commercial entrepreneurs concerned with date palm. The book is invaluable for date palm biotechnology students and specialists. This monument is written by an international team of experienced researchers from both academia and industry. It consists of five sections covering all aspects of date palm biotechnology including A) Micropropagation, B) Somaclonal Variation, Mutation and Selection, C) Germplasm Biodiversity and Conservation, D) Genetics and Genetic Improvement, and E) Metabolites and Industrial Biotechnology. The book brings together the principles and practices of contemporary date palm biotechnology. Each chapter contains background knowledge related to the topic, followed by a comprehensive literature review of research methodology and results including the authors own experience including illustrative tables and photographs.

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Plant Tissue Culture Techniques and Experiments is a manual that contains laboratory exercises about the demonstration of the methods and different plant materials used in plant tissue culture. It provides an overview on the plant cell culture techniques and plant material options in selecting the explant source. This book starts by discussing the proper setup of a tissue culture laboratory and the selection of the culture medium. It then explains the determination of an explant which is the ultimate goal of the cell culture project. The explant is a piece of plant tissue that is used in tissue culture. Furthermore, the book discusses topics about callus induction, regeneration and morphogenesis process, and haploid plants from anther and pollen culture. The meristem culture for virus-free plants and in vitro propagation for commercial propagation of ornamentals are also explained in this manual. The book also provides topics and exercises on the protoplast isolation and fusion and agrobacterium-mediated transformation of plants. This manual is intended for college students, both graduate and undergraduate, who study chemistry, plant anatomy, and plant physiology.

Providing crucial information for the expanding ornamental plant industry, leading researchers in the field compile comprehensive and step-wise protocols for rapid plant multiplication and in vitro storage of major commercially viable ornamental plants.

The ability to culture cells is fundamental for mass propagation and as a baseline for the genetic manipulation of plant nuclei and organelles. The introduction to Plant Cell Culture: Essential Methods provides a general background to plant cell culture, including basic principles, technologies and

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laboratory practices that underpin the more detailed techniques described in subsequent chapters. Whilst each chapter provides a background to the topic area and methodology, a crucial aspect is the provision of detailed protocols with emphasis on trouble shooting, describing common problems and detailed advice for their avoidance. Plant Cell Culture: Essential Methods provides the reader with a concise overview of these techniques, including micropropagation, mutagenesis, cryopreservation, genetic and plastid transformation and somatic cell technologies. This book will be an essential addition to any plant science laboratory's bookshelf. Highlights the best and most up-to-date techniques for working on plant cell culture Explains clearly and precisely how to carry out selected techniques in addition to background information on the various approaches Chapters are written by leading international authorities in the field and cover both well-known and new, tried and tested, methods for working in plant cell culture An essential laboratory manual for students and early-career researchers.

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