
Contents

Preface	v
Contributors	xi

PART I. INTRODUCTION

1 An Introduction to Plant Cell Culture: <i>Back to the Future</i> Victor M. Loyola-Vargas and Felipe Vázquez-Flota	3
2 History of Plant Tissue Culture Trevor A. Thorpe	9

PART II. CELL CULTURE AND PLANT REGENERATION: THE FUNDAMENTALS

3 Pathogen and Biological Contamination Management: The Road Ahead Alan C. Cassells and Barbara M. Doyle	35
4 Growth Measurements: <i>Estimation of Cell Division</i> <i>and Cell Expansion</i> Gregorio Godoy-Hernández and Felipe A. Vázquez-Flota	51
5 Callus and Suspension Culture Induction, Maintenance, and Characterization Alejandrina Robledo-Paz, María Nélida Vázquez-Sánchez, Rosa María Adame-Alvarez, and Alba Estela Jofre-Garfías	59
6 Measurement of Cell Viability in In Vitro Cultures Lizbeth A. Castro-Concha, Rosa María Escobedo, and María de Lourdes Miranda-Ham	71
7 Cryopreservation of Embryogenic Cell Suspensions by Encapsulation-Vitrification Qiaochun Wang and Avihai Perl	77
8 Somatic Embryogenesis in <i>Picea</i> Suspension Cultures Claudio Stasolla	87
9 Indirect Somatic Embryogenesis in Cassava for Genetic Modification Purposes Krit Raemakers, Isolde Pereira, Herma Koehorst van Putten, and Richard Visser	101

- 10 Direct Somatic Embryogenesis in *Coffea canephora*
**Francisco Quiroz-Figueroa, Miriam Monforte-González,
 Rosa M. Galaz-Ávalos, and Victor M. Loyola-Vargas** 111

PART III. PLANT PROPAGATION IN VITRO

- 11 A New Temporary Immersion Bioreactor System
 for Micropropagation
**Manuel L. Robert, José Luis Herrera-Herrera,
 Gastón Herrera-Herrera, Miguel Ángel Herrera-Alamillo,
 and Pedro Fuentes-Carrillo** 121
- 12 Protocol to Achieve Photoautotrophic Coconut Plants
 Cultured In Vitro With Improved Performance Ex Vitro
**Gabriela Fuentes, Carlos Talavera, Yves Desjardins,
 and Jorge M. Santamaría** 131
- 13 Use of Statistics in Plant Biotechnology
Michael E. Compton 145
- 14 An Efficient Method for the Micropropagation of Agave Species
**Manuel L. Robert, José Luis Herrera-Herrera, Eduardo Castillo,
 Gabriel Ojeda, and Miguel Angel Herrera-Alamillo** 165
- 15 Micropropagation of Endangered Plant Species
Zhihua Liao, Min Chen, Xiaofen Sun, and Kexuan Tang 179
- 16 Clonal Propagation of Softwoods
Trevor A. Thorpe, Indra S. Harry, and Edward C. Yeung 187

PART IV. APPLICATIONS FOR PLANT PROTOPLASTS

- 17 Isolation, Culture, and Plant Regeneration From Leaf
 Protoplasts of *Passiflora*
**Michael R. Davey, Paul Anthony, J. Brian Power,
 and Kenneth C. Lowe** 201
- 18 Isolation, Culture, and Plant Regeneration From *Echinacea*
purpurea Protoplasts
**Zeng-guang Pan, Chun-zhao Liu, Susan J. Murch,
 and Praveen K. Saxena** 211
- 19 Production of Cybrids in Brassicaceae Species
**Maksym Vasylenko, Olga Ovcharenko, Yuri Gleba,
 and Nikolay Kuchuk** 219
- 20 Guard Cell Protoplasts: Isolation, Culture,
 and Regeneration of Plants
Gary Tallman 233

21	Production of Interspecific Hybrid Plants in <i>Primula</i> <i>Juntaro Kato and Masahiro Mii</i>	253
PART V. PROTOCOLS FOR GENOMIC MANIPULATION		
22	<i>Agrobacterium</i> -Mediated Transformation of Petunia Leaf Discs <i>Ingrid M. van der Meer</i>	265
23	Transformation of Wheat Via Particle Bombardment <i>Indra K. Vasil and Vilma Vasil</i>	273
24	Chloroplast Transformation <i>Xiao-Mei Lu, Wei-Bo Yin, and Zan-Min Hu</i>	285
25	The Biochemical Basis for the Resistance to Aluminum and Their Potential as Selection Markers <i>César De los Santos-Briones and Teresa Hernández-Sotomayor</i>	305
26	Transformation of Maize Via <i>Agrobacterium tumefaciens</i> Using a Binary Co-Integrate Vector System <i>Zuo-yu Zhao and Jerry Ranch</i>	315
PART VI. ACCUMULATION OF METABOLITES IN PLANT CELLS		
27	Capsaicin Accumulation in <i>Capsicum</i> spp. Suspension Cultures <i>Neftalí Ochoa-Alejo</i>	327
28	Isolation and Purification of Ribosome-Inactivating Proteins <i>Sang-Wook Park, Balakrishnan Prithiviraj, Ramarao Vepachedu, and Jorge M. Vivanco</i>	335
29	<i>Catharanthus roseus</i> Shoot Cultures for the Production of Monoterpenoid Indole Alkaloids <i>Elizabeta Hernández-Domínguez, Freddy Campos-Tamayo, Mildred Carrillo-Pech, and Felipe Vázquez-Flota</i>	349
30	Methods for Regeneration and Transformation in <i>Eschscholzia californica</i> : A Model Plant to Investigate Alkaloid Biosynthesis <i>Benjamin P. MacLeod and Peter J. Facchini</i>	357
Appendix A: The Components of the Culture Media		369
Appendix B: Plant Biotechnology and Tissue Culture Resources on the Internet		379
Index		385