

Contents

<i>Preface</i>	v
<i>Contributors</i>	xi

PART I SELECTION AND DETECTION METHODS

1 Employment of Cytokinin Vectors for Marker-Free and Backbone-Free Transformation	3
<i>Craig M. Richael and Caius M. Rommens</i>	
2 Organophosphorus Hydrolase: A Multifaceted Plant Genetic Marker Which Is Selectable, Scorable, and Quantifiable in Whole Seed	11
<i>T. Scott Pinkerton, James R. Wild, and John A. Howard</i>	
3 Use of Northern Blotting for Specific Detection of Small RNA Molecules in Transgenic Plants	25
<i>Basel Khraiwesh</i>	

PART II TRANSFORMATION TECHNOLOGY: LOWER PLANTS

4 Genetic Transformation of the Model Green Alga <i>Chlamydomonas reinhardtii</i>	35
<i>Juliane Neupert, Ning Shao, Yinghong Lu, and Ralph Bock</i>	

PART III TRANSFORMATION TECHNOLOGY: RICE

5 A High-Efficiency <i>Agrobacterium</i> -Mediated Transformation System of Rice (<i>Oryza sativa</i> L.)	51
<i>Kenjiro Ozawa</i>	
6 Selection of Transgenic Rice Plants Using a Herbicide Tolerant Form of the Acetolactate Synthase Gene	59
<i>Masaki Endo, Tsutomu Shimizu, and Seiichi Toki</i>	
7 Visual Selection in Rice: A Strategy for the Efficient Identification of Transgenic Calli Accumulating Transgene Products	67
<i>Hiroaki Saika, Haruko Onodera, and Seiichi Toki</i>	
8 Characterization of Rice Genes Using a Heterologous Full-Length cDNA Expression System	75
<i>Mieko Higuchi, Youichi Kondou, Masaki Mori, Takanari Ichikawa, and Minami Matsui</i>	
9 Bioactive Bead-Mediated Transformation of Plants with Large DNA Fragments	91
<i>Naoki Wada, Joyce A. Cartagena, Naruemon Khemkladngoen, and Kiichi Fukui</i>	

PART IV TRANSFORMATION TECHNOLOGY: CEREALS AND OTHER MONOCOTS

- 10 *Agrobacterium*-Mediated Transformation of *Sorghum bicolor* Using Immature Embryos 109
Songul Gurel, Ekrem Gurel, Tamara I. Miller, and Peggy G. Lemaux
- 11 Split-Transgene Expression in Wheat 123
Mario Gils, Myroslava Rubtsova, and Katja Kempe
- 12 *Agrobacterium*-Mediated Transformation of *Brachypodium distachyon* 137
Vera Thole and Philippe Vain
- 13 Transformation of Barley (*Hordeum vulgare* L.) by *Agrobacterium tumefaciens* Infection of In Vitro Cultured Ovules. 151
Inger Bæksted Holme, Henrik Brinch-Pedersen, Mette Lange, and Preben Bach Holm
- 14 Biolistic-Mediated Production of Transgenic Oil Palm 163
Ghulam Kadir Ahmad Parveez and Bobari Bahariah
- 15 Transformation of Oil Palm Using *Agrobacterium tumefaciens* 177
Abang Masli Dayang Izawati, Ghulam Kadir Ahmad Parveez, and Mat Yunus Abdul Masani

PART V TRANSFORMATION TECHNOLOGY: DICOTS

- 16 Highly Efficient Transformation Protocol for Plum (*Prunus domestica* L.). 191
César Petri, Ralph Scorza, and Chinnathambi Srinivasan
- 17 Co-transformation of Grapevine Somatic Embryos to Produce Transgenic Plants Free of Marker Genes. 201
Manjul Dutt, Zhijian T. Li, Sadanand A. Dhekney, and Dennis J. Gray
- 18 Initiation and Transformation of Grapevine Embryogenic Cultures. 215
Sadanand A. Dhekney, Zhijian T. Li, Manjul Dutt, and Dennis J. Gray
- 19 Development of Highly Efficient Genetic Transformation Protocols for Table Grape Sugraone and Crimson Seedless. 227
Mercedes Dabauza and Leonardo Velasco
- 20 Cotton Pistil Drip Transformation Method. 237
Tianzhen Zhang and Tianzhi Chen
- 21 Enhanced *Agrobacterium*-Mediated Transformation of Embryogenic Calli of Upland Cotton. 245
Tianzhen Zhang and Shen-jie Wu
- 22 Targeted Biolistics for Improved Transformation of *Impatiens balsamina* 255
Andy C. Wetten, Jean-Luc Thomas, Alina Wagiran, and Tinashe Chiurugwi
- 23 A Protocol for Transformation of *Torenia*. 267
Ryutaro Aida
- 24 Efficient Modification of Floral Traits by Heavy-Ion Beam Irradiation on Transgenic *Torenia* 275
Norihiro Ohtsubo, Katsutomo Sasaki, Ryutaro Aida, Hiromichi Ryuto, Hiroyuki Ichida, Yoriko Hayashi, and Tomoko Abe

PART VI GENE TARGETING, SILENCING AND DIRECTED MUTATION

- 25 Expression of Artificial MicroRNAs in *Physcomitrella patens* 293
Isam Fattash, Basel Khraiwesh, M. Asif Arif, and Wolfgang Frank
- 26 High Frequency of Single-Copy T-DNA Transformants Produced After Floral
 Dip in CRE-Expressing *Arabidopsis* Plants 317
Annelies De Paepe, Sylvie De Buck, Jonah Nolf, and Ann Depicker
- 27 A Developmentally Regulated Cre-lox System to Generate Marker-Free
 Transgenic *Brassica napus* Plants 335
Lilya Kopertekh, Inge Broer, and Joachim Schiemann
- 28 Exploiting MultiSite Gateway and pENFRUIT Plasmid Collection
 for Fruit Genetic Engineering 351
Leandro H. Estornell, Antonio Granell, and Diego Orzaez
- 29 A One-Time Inducible Transposon to Create Knockout Mutants in Rice 369
Yuh-Chyang Charng
- 30 Marker-Free Gene Targeting by Recombinase-Mediated Cassette Exchange 379
Hiroyasu Ebinuma, Kazuya Nanto, Saori Kasahara, and Atsushi Komamine
- 31 Targeting DNA to a Previously Integrated Transgenic Locus
 Using Zinc Finger Nucleases 391
Tonya L. Strange and Joseph F. Petolino
- 32 Double-Strand Break-Induced Targeted Mutagenesis in Plants 399
L. Alexander Lyznik, Vesna Djukanovic, Meizhu Yang, and Spencer Jones

PART VII METABOLIC ENGINEERING AND PHARMING

- 33 Combinatorial Genetic Transformation of Cereals and the Creation
 of Metabolic Libraries for the Carotenoid Pathway 419
*Gemma Farre, Shaista Naqvi, Georgina Sanahuja, Chao Bai,
 Uxue Zorrilla-López, Sol M. Rivera, Ramon Canela, Gerhard Sandman,
 Richard M. Twyman, Teresa Capell, Changfu Zhu, and Paul Christou*
- 34 Production of a His-Tagged Canecystatin in Transgenic Sugarcane 437
Flavio Henrique-Silva and Andrea Soares-Costa
- 35 Plastid Transformation as an Expression Tool for Plant-Derived
 Biopharmaceuticals 451
Nunzia Scotti and Teodoro Cardi
- 36 Use of a Callus-Specific Selection System to Develop Transgenic
 Rice Seed Accumulating a High Level of Recombinant Protein 467
Yuhya Wakasa and Fumio Takaiwa

PART VIII FIELD TESTS

- 37 How to Grow Transgenic *Arabidopsis* in the Field 483
Hanna Johansson Jänkänpää and Stefan Jansson
- Index* 495