

TABLE OF CONTENTS

Section A / Genetic Manipulation and Propagation

Micropropagation in Crop Species W.D. Beversdorf	3
Genetic Preservation <i>in vitro</i> B.W.W. Grout	13
Current Research in Biotechnology with Application to Plant Breeding D.T. Tomes	23
Plant Regeneration from Embryogenic Calli, Cell Suspension Cultures and Protoplasts of <i>Triticum aestivum</i> L. (Wheat) I.K. Vasil, V. Vasil, F. Redway	33
Tissue, Cell, and Protoplast Culture of Maize (<i>Zea mays</i> L.) L.M. Prioli, W.J. da Silva, M.R. Söndahl	38
Antioxidants Influence the Plating Efficiency and Microcallus-Growth of Protoplasts in <i>Lolium perenne</i> L. J. Creemers-Molenaar, Y. van Oort	44
Enhancement of Sugar Yield: A Molecular Biological Approach J.S. Gartland, M.R. Flower, A. Slater, N.W. Scott, K.M.A. Gartland, M.C. Elliott	50
Applications of the Particle Gun in Plant Biology T.M. Klein, S.A. Goff, B.A. Roth, M.E. Fromm	56
X-Irradiation and Co-Transformation of <i>Petunia</i> "Mitchell" Protoplasts with Two Antibiotic Resistance Genes I. Benediktsson, F. Köhler, O. Schieder	67
Gene Transfer to Barley R.R. Mendel, E. Clauss, R. Hellmund, J. Schulze, H.H. Steinbiß, A. Tewes	73
Promoterless Reporter Genes and Their Use in Plant Gene Transformation B. Klein, R. Töpfer, A. Sohn, J. Schell, H.-H. Steinbiß	79
Transformation of Cucumber via <i>Agrobacterium tumefaciens</i> P.P. Chee	85
Rejuvenation and Micropropagation R.L.M. Pierik	91
Genotype-Phenotype Interplay in Micropropagation T. Törmälä	102
Effect of Mineral Nutrition on the Growth and Multiplication of <i>in vitro</i> Cultured Plants P.J. Lumsden, S. Pryce, C. Leifert	108
Rapid Regeneration of Sugarbeet (<i>Beta vulgaris</i> L.) Plants from <i>in vitro</i> Cultures B.K. Konwar, R.H.A. Coutts	114
Morphogenesis of Gladiolus Buds in Bioreactors – Implication for Scaled-Up Propagation of Geophytes M. Ziv	119

Dormancy Development in Lily Bulblets Propagated <i>In Vitro</i> G. J. M. de Klerk, P. Aguetaz, A. M. G. Paffen, I. Delvallee, A. J. R. van den Berg, A. F. Croes	125
Do We Understand Somaclonal Variation? R.L. Phillips, S.M. Kaeppler, V.M. Peschke	131
Gene Expression in Salt Tolerant Alfalfa Cell Cultures and the Salt Tolerant Plants Regenerated from these Cultures I. Winicov	142
Glyphosate Resistance and Gene Amplification in Selected <i>Daucus carota</i> Suspension Cultures Y.Y. Shyr, J.M. Widholm	148
RFLP-Analysis of Rice Plants Regenerated from Tissue Cultures E. Müller, P.T.H. Brown, S. Hartke, H. Lörz	153
<i>In vivo</i> and <i>in vitro</i> Mutagenesis of a <i>Brassica napus</i> Acetolactate Synthase Gene for the Production of Herbicide Resistance P.A. Wiersma, D.L. Durda, I. Babic, W.L. Crosby, M.M. Moloney	157
Cell Culture of Alien Chromosome Addition Lines to Induce Somatic Recombination and Gene Introgression P.J. Larkin, L.H. Spindler, P.M. Banks	163
Antibiotic Resistant Mutants of <i>Solanum nigrum</i> P.J. Dix, C.P. McKinley, P.F. McCabe	169
Establishing a Tomato Transposon Tagging System with Heterologous Transposons J.D.G. Jones, G. Bishop, K. Harrison, D. Jones, S. Scofield, C.M. Thomas	175
The Use of the Polymerase Chain Reaction to Detect Specific Sequences in Transformed Plant Tissues J.D. Hamill, S. Rounsley, A. Spencer, G. Todd, M.J.C. Rhodes	183
Differential Expression of Agropine Synthase Gene during Morphogenesis <i>in vitro</i> M. Inoguchi, H. Kamada, H. Harada	189
Intrinsic GUS-Like Activity Ching-yeh Hu, P.P. Chee, R.H. Chesney, J.H. Zhou, P.D. Miller, W.T. O'Brien	195
Field Testing of Cucumber Plants which express the CMV Coat Protein Gene: Field Plot Design to Test Natural Infection Pressures J.L. Slightom, P.P. Chee, D. Gonsalves	201
Two Years of Transgenic Flax Field Tests: What Do They Tell Us? A. McHughen, M. Jordan, S. McSheffrey	207
From Microspore to Embryoid: Faces of the Angiosperm Pollen Grain V. Raghavan	213
Two Pathways in Pollen Protoplast Culture: Cell Divisions and Tube Growth C. Zhou, Y. Wu	222
Biochemical and Cytological Changes in Young Tobacco Pollen during <i>in vitro</i> Starvation in Relation to Pollen Embryogenesis V. Žárský, L. Říhová, J. Tupý	228
Molecular and Physiological Differentiation of Pollen <i>in vitro</i> M.M.A. Van Herpen, J.A.M. Schrauwen, K.A.P. Weterings, P.F.M. de Groot, W.H. Reijnen, K.J.P.T. van den Heuvel, G.J. Wullems	234

Sex Determination in the Dioecious <i>Melandrium</i> : The <i>in vitro</i> Culture Approach Y. Wu, D. Ye, P. Installé, M. Jacobs, I. Negrutiu	239
Transformation of Pollen E. Heberle-Bors, R.M.B. Moreno, A. Alwen, E. Stöger, O. Vicente	244
<i>In vitro</i> Fertilization of Single, Isolated Gametes, Transmission of Cytoplasmic Organelles and Cell Reconstitution of Maize (<i>Zea mays</i> L.) E. Kranz, J. Bautor, H. Lörz	252
Anther Culture Selection to Enhance Snow Mold Disease Resistance in Winter Wheat J.H. McBeath, F. Mehdizadege, H. Lockwood	258
Haploid Suspension and Protoplast Culture from Isolated Microspores of Maize J.C. Mitchell, J.F. Petolino	264
Embryo Rescue of Interspecific Hybrids of <i>Brassica spinescens</i> X <i>Brassica campestris</i> and DNA Analysis A. Agnihotri, M. Lakshmikumaran, K.R. Shivanna, V. Jagannathan	270
Haploids from Unpollinated Ovaries of <i>Allium cepa</i> -Single Plant Screening, Haploid Determination, and Long term Storage J. Keller	275
Partial Genome Transfer in Interspecific Tomato Hybrids J. Wijbrandi, M. Koornneef	280
Transfer of Resistance to PLRV, PVX and PVY from <i>S. brevidens</i> to Potato by Somatic Hybridisa- tion: Characterisation and Field Evaluation M.G.K. Jones, R. Dunckley, S. Steele, A. Karp, R. Gibson, N. Fish, J. Valkonen, T. Poutala, E. Pehu	286
Transfer of Tobacco Mosaic Virus Resistance by Asymmetric Protoplast Fusion G.W. Bates	293
Improvements of the Brassica Crops by Transfer of Genes from Alien Species via Somatic Hybridiza- tion K. Glimelius, J. Fahlesson, M. Landgren, C. Sjödin, E. Sundberg	299
Section B / Morphogenesis and Metabolism	
Mechanisms of Somatic Embryogenesis in Cell Cultures – Physiology, Biochemistry and Molecular Biology A. Komamine, M. Matsumoto, M. Tsukahara, A. Fujiwara, R. Kawahara, M. Ito, J. Smith, K. Nomura, T. Fujimura	307
Lipid Synthesis and Transfer J.-C. Kader, P. Laurent	314
Biosynthesis of Triacylglycerols in Plant Cell and Embryo Cultures. Their Significance in the Breeding of Oil Plants N. Weber, D.C. Taylor	324
Lipid Composition of Plasma Membrane from Crown Gall Tumour <i>in vitro</i> B. Pandley	332
Intracellular Pi-Compartmentation during Phosphate Starvation-Triggered Induction of an Extracel- lular Ribonuclease in Tomato Cell Culture K. Glund, T. Nürnberger, S. Abel, W. Jost, J. Preisser, E. Komor	338

Aerobic Hexose Metabolism in Embryogenic Cell Lines of <i>Daucus carota</i> Studied by ^{13}C NMR Using ^{13}C -Enriched Substrates C. Dijkema, H. Booij, P.A. de Jager, S.C. de Vries, T.J. Schaafsma, A. van Kammen	343
Are Two Localization Sites of Nitrate Reductase Responsible for the Differential Expression in Tobacco Cells during the Growth Cycle? A. Nato, D. Lavergne, V. Flipo, J. Hoarau	349
Phytochrome in Plant Cell Cultures E. Schäfer, B. Bruns, H. Frohnmeier, K. Hahlbrock, K. Harter, T. Merkle, S. Ohl	355
Blue-Light Effects on Gene Expression in Plant-Cell Cultures G. Richter, I. Dannhauer, R. Kaldenhoff, N. Ottersbach	366
Light-Dependent Growth and Differentiation Processes in Photoautotrophic Cell Cultures W. Hüsemann, S. Amino, K. Fischer, H. Herzbeck, R. Callis	373
Light Stimulated Cell Proliferation and Glyoxalase Activity in Callus Cultures of <i>Amaranthus paniculatus</i> T. Chakravarti, S.K. Sopory	379
Spatial and Temporal Expression of Regulatory Genes in <i>Zea mays</i> C. Tonelli, G. Consonni, M. Mereghetti, S. Dolfini, S. Dellaporta, A. Viotti, G. Gavazzi	385
Developmental Mutants in Carrot M. Terzi, F. Lo Schiavo	391
Tissue and Cell-Specific Expression of Genes Encoding Carrot Extracellular Proteins H. Booij, P. Sterk, G.A. Schellekens, A. van Kammen, S.C. de Vries	398
Microspore-Derived Embryos: A Tool for Studies in Regulation of Gene Expression in Zygotic Embryos L.A. Holbrook, W.R. Scowcroft, D.C. Taylor, M.K. Pomeroy, R.W. Wilen, M.M. Moloney	402
Molecular Changes Associated with the Commitment Phase of Microspore Embryogenesis P.M. Pechan, J. Schell	407
Expression of Chimeric Genes in Developing Embryos Derived from Isolated Microspores from Transgenic <i>Brassica napus</i> Plants S.E. Radke, J.C. Turner, D. Facciotii, V.C. Knauf	410
Detection of Androgenesis-Related Proteins in Maize P. Vergne, F. Riccardi, M. Beckert, C. Dumas	416
Significant Higher Proportions of 1BL-1RS Wheat-Rye Translocation Lines Among Doubled Haploid Progenies Derived from F1 Hybrids Between Translocated and Non-Translocated Wheat Cultivars P. Devaux, P. Lonnet, R. Jean	422
Differences in Responses to 2,4-Dichlorophenoxy Acetic Acid (2,4-D) Treatment between Embryogenic and Non-Embryogenic Lines of Alfalfa L. Bögre, I. Stefanov, M. Ábrahám, I. Somogyi, D. Dudits	427
The Commitment to Embryogenesis, A Cytological Approach V.N. Ronchi, L. Giorgetti, M.G. Tonelli	437
Immunocytochemical Localization of Calmodulin During Carrot Somatic Embryogenesis A.C.J. Timmers, J.H.N. Schel	443

pH Control of Carrot Somatic Embryogenesis D.L. Smith, A.D. Krikorian	449
Somatic Embryogenesis in Celery: Induction, Control and Changes in Polyamines and Proteins A. Altman, B.L. Nadel, Z. Falash, N. Levin	454
Production and Characterization of Monoclonal Antibodies against Marker Proteins for Somatic Embryogenesis in Pea (<i>Pisum sativum</i> L.) S. Stirn, H.-J. Jacobsen	460
Signal Transduction at the Membrane Level of Plant Cells J. Guern, G. Ephritikhine, V. Imhoff, J.M. Pradier	466
Inhibition of Polyamine Biosynthesis Affects the Rhizogenic Response in Tobacco Thin Cell Layers P. Torrigiani, M.M. Altamura, F. Capitani, G. Falasca, N. Bagni, D. Serafini-Francassini	480
Plant Growth Regulator Manipulations in Sugar Beet S.J. Brown, K.M.A. Gartland, A. Slater, J.F. Hall, M.C. Elliott	486
Regulation of Cytokinin Catabolism in Tobacco Callus Cultures V. Motyka, M. Kamínek	492
Differential Sensitivity to Auxin at the Plasma Membrane Level M. Rossignol, V. Santoni, W. Szponarski, G. Vansuyt	498
Roles of the Primary Cell Wall in Morphogenesis S.C. Fry	504
Signals Influencing Cell Elongation, Cell Enlargement, Cell Division and Morphogenesis K. Tran Thanh Van, S. Mutaftschiev	514
Effect of A Xyloglucan-Derived Nonasaccharide on Carrot Protoplasts M. Emmerling, H. Warneck, H.U. Seitz	520
Characterization of GP57, An Auxin-Regulated and Dermal-Tissue-Localized Extracellular Glycoprotein of Carrot S. Satoh	526
Molecular Aspects of the Cell Cycle in <i>Catharanthus roseus</i> Synchronous Cell Division Cultures H. Kodama, M. Ito, A. Komamine	532
Microtubules and the First Cell Cycle in Cultured Mesophyll Protoplasts of <i>Nicotiana</i> W. Wernicke, M. Rös, G. Jung	538
Section C / Secondary Metabolites	
Possibilities for Improving Yields of Secondary Metabolites in Plant Cell Cultures Y. Yamada, T. Hashimoto	547
The Toxic Compartment of Plant Cells P. Matile	557
Transport and Accumulation of Secondary Metabolites P.E. Brodelius	567
Accumulation of Ajmalicine and Serpentine in Vacuoles Isolated from <i>Catharanthus roseus</i> Cell Suspension Cultures T.J.M. Blom, M. Sierra, F. van Iren, R. Verpoorte, K.R. Libbenga	577

Recovery of Secondary Metabolites with Minimal Loss of Cell Viability	
P.J. Weathers, A. Diiorio, R. Cheetham, M. O'Leary	582
Cellular Aspects of Thiophene Accumulation in Relation to Root Differentiation	
R.R.J. Arroo, H. Kenkel, H. Meijers, A.F. Croes, G.J. Wullems	587
Possibilities of Finding New Products from Plant Cell Cultures	
J.D. Phillipson	592
Large-Scale Production of New Biologically Active Compounds in Plant-Cell Cultures	
K. Westphal	601
Terpene Production by Liverworts of <i>in vitro</i> Cultures	
H. Becker	609
Immobilized <i>Ginkgo biloba</i> Cell Cultures	
D.J. Carrier, P. Coulombe, M. Mancini, R. Neufeld, M. Weber, J. Archambault	614
Production of Terpenes by Transformed Differentiated Shoot Cultures of <i>Mentha piperita citrata</i> and <i>M. Piperita vulgaris</i>	
A. Spencer, J. D. Hamill, J. Reynolds, M. J. C. Rhodes	619
Isolation and Distribution of 7 β - Hydroxyhyoscyamine in Solanaceous Plants	
K. Shimomura, K. Ishimaru	625
Bioconversion of xenobiotics (Pesticides) in Plant Cell Cultures	
W. Barz, M. Jordan, G. Metschulat	631
Bioconversion of Precursors Occurring in Plants and of Related Synthetic Compounds	
N. Pras	640
Bioconversion of Xenobiotics in Different Plant Systems - Cell Suspension Cultures, Root Cultures and Intact Plants	
H. Harms, E. Kottutz	650
Metabolism of Polychlorinated Biphenyls (PCBs) by Plant Tissue Cultures	
I. Lee, J. S. Fletcher	656
Metabolism of Metribuzin in Tomato Cell Cultures by a Glucosyltransferase	
D. G. Davis, P. A. Olson, H. R. Swanson, D. S. Frear	661
Conversion of Glucosinolate Synthetic Precursors in <i>Brassica</i> Cultures	
J. W. D. Grootwassink, A. D. Kolenovsky, J. J. Balsevich, J. C. Jain, E. W. Underhill	667
Possibilities, Problems, and Pitfalls of Large-Scale Plant Cell Cultures	
H. J. G. Ten Hoopen, W. M. Van Gulik, J. J. Meijer	673
Biosynthesis of Sanguinarine by Elicitation of Surface Immobilized Cells of <i>Papaver somniferum</i> L.	
W. G. W. Kurz, N. L. Paiva, R. T. Tyler	682
The Effect of Continuous High Shear Stress on Plant Cell Suspension Cultures	
F. Leckie, A. H. Scragg, K. C. Cliffe	689
Application of the Liquid-Impelled Loop Reactor for the Production of Anthraquinones by Plant Cell Cultures	
R. M. Buitelaar, I. Susaeta, J. Tramper	694
The Cultivation of Transformed Roots from Laboratory to Pilot Plant	
P. D. G. Wilson, M. G. Hilton, P. T. H. Meehan, C. R. Waspe, M. J. C. Rhodes	700

Production of Deacetyllanatoside C by <i>Digitalis lanata</i> Cell Cultures W. Kreis, E. Reinhard	706
Use of Genetic Engineering to Improve Yields in Cell Cultures, e.g. (Anti)sense DNA Technology J. N. M. Mol, P. de Lange, A. Oostdam, L. H. W. van der Plas	712
Strategies to Improve Yields of Secondary Metabolites to Industrially Interesting Levels F. DiCosmo	717
Selection of High-Yielding Cell Lines of <i>Tagetes</i> Using Flow Cytometry P. Adamse	726
The Effects of Over-Expressing the Yeast Ornithine Decarboxylase Gene upon the Nicotine and Polyamine Levels in Transformed Roots of <i>Nicotiana rustica</i> J. D. Hamill, R. J. Robins, A. J. Parr, D. M. Evans, J. M. Furze, E. G. Bent, M. J. C. Rhodes	732
Semisynthetic Production of Vinblastine Involving Cell Cultures of <i>Catharanthus roseus</i> and Chemical Reaction Y. Fujita, Y. Hara, T. Morimoto, M. Misawa	738
Principles Regulating Formation and Activity of Secondary Metabolic Enzymes on Plant Tissue and Cell Cultures M. Luckner, B. Dietrich	744
Enzymology of Alkaloid Production in Plant Cell Cultures E. Galneder, M. H. Zenk	754
Affecting Secondary Product Formation in Suspension and Hairy Root Cultures – A Comparison J. Berlin, C. Mollenschott, N. Greidziak, S. Erdogan, I. Kuzovkina	763
Purification of Cytochrome P-450-Dependent Geraniol-10-Hydroxylase from a Cell Suspension Culture of <i>Catharanthus roseus</i> A. H. Meijer, E. J. M. Pennings, A. de Waal, R. Verpoorte	769
Molecular Cloning, and Tissue- and Cell-Specific Expression of Hyos-Cyamine 6 β -Hydroxylase T. Hashimoto, J. Matsuda, S. Okabe, Y. Amano, D. J. Yun, A. Hayashi, Y. Yamada	775

Section D / Biotechnology and Developing Countries

Perspectives in Plant Cell and Tissue Culture in Developing Countries A. I. Robertson	783
Commercialisation of Agricultural Biotechnology in India: Opportunities, Progress and Problems J. Prakash	789
Impact of Tissue Culture Techniques on the Development of Agribusiness in Mexico F. Medina-Gomez	795
A Model For Comparing and Evaluating Biotechnological Innovations for Small-Scale Farmers in Developing Countries J. E. W. Broerse, J. F. G. Bunders, J. D. Byloo, A. Stolp	801