

Contents

Section I Cereals

I.1 Somatic Hybridization Between *Hordeum vulgare* L. (Barley) and *Daucus carota* L. (Carrot)

H. KISAKA, M. KISAKA, A. KANNO, and T. KAMEYA (With 8 Figures)

1 Introduction	3
2 Protoplast Fusion and Culture of Fused Cells	4
3 Analysis of the Three Regenerated Plants	5
4 Characterization of Somatic Hybrids	7
5 Quantification and Effects of Betaine	9
6 Discussion	9
7 Protocol	12
References	14

I.2 Cybridization in *Oryza sativa* L. (Rice)

H. AKAGI (With 8 Figures)

1 Introduction	17
2 Somatic Hybridization	19
3 Characterization of Rice Cybrids	27
4 Selection of CMS Cybrid Plants	29
5 Application of the Cybridization Method in Rice Breeding	29
6 Summary and Conclusion	32
7 Protocol	32
References	34

I.3 Somatic Hybridization Between *Oryza sativa* L. (Rice) and *Hordeum vulgare* L. (Barley)

H. KISAKA, M. KISAKA, A. KANNO, and T. KAMEYA (With 7 Figures)

1 Introduction	37
2 Protoplast Fusion and Culture	38
3 Analysis of Regenerated Plant	40
4 Assessment of Cold and Salt Tolerance	41
5 Protocol	43
References	46

I.4 Somatic Hybridization Between *Triticum aestivum* L. (Wheat) and *Haynaldia villosa* L.

G.M. XIA, A.F. ZHOU, and H.M. CHEN (With 22 Figures)

1 Introduction	48
2 Preparation and Treatment of Parental Protoplasts	49
3 Protoplast Fusion and Culture	50
4 Verification of Hybridity	53
5 Growth and Development of Hybrid Plants	59
6 Summary and Conclusion	61
7 Protocol	62
References	64

I.5 Asymmetric Somatic Hybridization Between *Triticum aestivum* L. (Wheat) and *Leymus chinensis* (Trin.) Tzvel

G.M. XIA, A.F. ZHOU, F. XIANG, and H.M. CHEN (With 5 Figures)

1 Introduction	65
2 Preparation and Inactivation of Wheat Protoplasts	65
3 Preparation of <i>L. chinensis</i> Protoplasts from Irradiated Calli	66
4 Fusion of Parental Protoplasts and Culture of Fusion Products	69
5 Identification of Hybrid Calli and Plants	70
6 Summary and Conclusion	73
7 Protocol	75
References	76

Section II Vegetables and Fruits

II.1 Somatic Hybridization Between *Arabidopsis* and *Brassica*

J. SIEMENS and M.D. SACRISTÁN (With 3 Figures)

1 Introduction	81
2 Somatic Hybridization	82
3 Summary and Conclusion	90
4 Protocol	91
References	92

II.2 Somatic Hybridization in *Asparagus*

H. KUNITAKE and M. MII (With 9 Figures)

1 Introduction	95
2 Somatic Hybridization	97
3 Summary and Conclusion	105
4 Protocol	108
References	110

II.3 Somatic Hybridization in *Cichorium intybus* L. (Chicory)

C. RAMBAUD and J. VASSEUR (With 2 Figures)

1 Introduction	112
2 Somatic Hybridization	113
3 Analysis of the Regenerated Plants	118
4 Summary and Conclusion	120
5 Protocol for the Regeneration of Somatic Hybrids	121
References	122

II.4 Cybridization in *Citrus unshiu* Marc. (Satsuma Mandarin)and *C. sinensis* (L.) Osbeck (Sweet Orange)

M. YAMAMOTO, S. KOBAYASHI, T. YOSHIOKA, and R. MATSUMOTO

(With 10 Figures)

1 Introduction	124
2 Somatic Hybridization	126
3 Summary and Conclusion	135
4 Protocol	136
References	137

II.5 Somatic Hybridization in *Cucumis*

C.I. JARL (With 6 Figures)

1 Introduction	139
2 Somatic Hybridization	142
3 Summary and Conclusion	148
4 Protocol	148
References	149

II.6 Somatic Hybridization in *Diospyros* (Persimmon)

M. TAMURA and R. TAO (With 8 Figures)

1 Introduction	152
2 Somatic Hybridization	153
3 Summary and Conclusion	159
4 Protocol	160
References	162

II.7 Somatic Hybridization in *Ipomoea* (Sweet Potato) Species

M.M. BELARMINO and T. SASAHARA (With 8 Figures)

1 Introduction	164
2 Protoplast Isolation	166

3 Protoplast Culture and Plant Regeneration	169
4 Interspecific Hybridization Between Sweet Potato and Wild Relatives	172
5 Asymmetric Protoplast Fusion Between Sweet Potato (<i>Ipomoea batatas</i> Lam.) and African Marigold (<i>Tagetes erecta</i> L.)	177
6 Summary and Conclusion	180
7 Protocol for Asymmetric Protoplast Fusion Between Sweet Potato (<i>Ipomoea batatas</i> Lam.) and Wild Relative, <i>I. trifida</i> Don	183
References	184

II.8 Somatic Hybridization Between *Lycopersicon esculentum*
Mill. (Tomato) and Wild Nontuberos *Solanum* Species
T. GAVRILENKO (With 4 Figures)

1 Introduction	188
2 Methods of Protoplast Isolation, Protoplast Culture, and Plant Regeneration	189
3 Production and Analysis of Intergeneric Somatic Hybrids	191
4 Summary and Conclusion	196
5 Protocol	197
References	198

II.9 Somatic Hybridization Between *Lycopersicon esculentum* Mill.
(Tomato) and *Solanum melongena* L. (Eggplant)
V.M. SAMOYLOV and K.C. SINK (With 6 Figures)

1 Introduction	199
2 Somatic Hybridization	200
3 Analysis of Somatic Hybrids	202
4 Elimination of the Donor Genome	207
5 Polyploidization and Elimination of the Donor Genome	211
6 Protocol	213
References	214

II.10 Somatic Hybridization Between *Lycopersicon esculentum* Mill.
(Tomato) and *Solanum ochranthum* Dun.
J.R. STOMMEL, R.S. KOBAYASHI, and S.L. SINDEN (With 8 Figures)

1 Introduction	217
2 Isolation of Protoplasts	218
3 Culture of Protoplasts	219
4 Fusion of Protoplasts and Regeneration of Somatic Hybrids	221

5 Regeneration and Characterization of Somatic Hybrids	222
6 Summary and Conclusion	229
7 Protocol	229
References	230

II.11 Somatic Hybridization Between *Solanum melongena* L. (Eggplant) and *Solanum sanitwongsei* Craib.

H. ASAO, S. ARAI, and M. HIRAI (With 4 Figures)

1 Introduction	233
2 Somatic Hybridization	234
3 Summary and Conclusions	241
4 Protocol	243
References	243

II.12 Somatic Hybridization Between *Solanum commersonii* Dun. and *S. tuberosum* L. (Potato)

T. CARDI (With 4 Figures)

1 Introduction	245
2 Somatic Hybridization	246
3 Summary and Conclusion	258
4 Protocol	259
References	260

II.13 Somatic Hybridization Between *Solanum tuberosum* L. (Potato) and *Solanum phureja*

S. MILLAM and P. DAVIE (With 3 Figures)

1 Introduction	264
2 Somatic Hybridization	266
3 Summary and Conclusion	273
References	273

Section III Medicinal and Aromatic Plants

III.1 Somatic Hybridization in *Dianthus* Species

M. NAKANO, Y. HOSHINO, and M. MII (With 3 Figures)

1 Introduction	277
2 Protoplast Isolation	278
3 Protoplast Culture	279
4 Protoplast Fusion	280

5 Regeneration of Somatic Hybrids	281
6 Summary and Conclusion	289
7 Protocol	290
References	290

III.2 Somatic Hybridization Between *Nicotiana sylvestris* Speg. & Comes and *N. plumbaginifolia* Viv.

C.C. CHEN, Y.Y. KAO, F.M. LEE, and R.F. LIN (With 4 Figures)

1 Introduction	292
2 Somatic Hybridization	294
3 Applications of Somatic Hybrids	298
4 Summary and Conclusion	300
5 Protocol	301
References	302

III.3 Somatic Hybridization Between *Nicotiana tabacum* L. (Tobacco) and *Atropa belladonna* L. (Deadly Nightshade)

M.K. ZUBKO, E.I. ZUBKO, O.A. KHVEDYNICH, S.V. LOPATO,
S.A. LATIPOV, and YU. YU. GLEBA (With 10 Figures)

1 Introduction	304
2 Somatic Hybridization	308
3 Conclusions and Prospects	320
4 Protocol	322
References	324

III.4 Somatic Hybridization and Cell Grafting in *Senecio*

G. WANG and H. BINDING (With 2 Figures)

1 Introduction	328
2 Results and Discussion	328
3 Summary and Conclusion	335
4 Protocol	335
References	336

Section IV Legumes/Pasture Crops

IV.1 Somatic Hybridization Between *Medicago sativa* L. (Alfalfa) and *Lotus corniculatus* L. (Birdsfoot Trefoil)

M. NIIZEKI (With 8 Figures)

1 Introduction	341
2 Symmetric Somatic Cell Hybridization	342

3 Asymmetric Somatic Cell Hybridization	345
4 Summary and Conclusion	351
5 Protocol	353
References	354

IV.2 Somatic Hybridization Between *Medicago sativa* L. (Alfalfa)
and *Medicago falcata* L.

S. ARCIONI, F. DAMIANI, F. PAOLOCCI, and F. PUPILLI (With 2 Figures)

1 Introduction	356
2 Isolation and Fusion of Protoplasts	358
3 Culture and Selection of Fused Protoplasts	360
4 Regeneration of Somatic Hybrids	362
5 Identification and Characterization of Somatic Hybrid Plants	363
6 Summary and Conclusion	369
7 Protocol	370
References	371

Subject Index	375
----------------------------	-----

Somatic Hybridization in Crop Improvement II

Nagata, T.; Bajaj, Y.P.S. (Eds.)

2001, XXI, 378 p. 146 illus., 5 illus. in color., Hardcover

ISBN: 978-3-540-41112-3