

**PLANT REGENERATION BY SOMATIC EMBRYOGENESIS FROM IMMATURE
SEEDS OF *STERNBERGIA CANDIDA* MATHEW ET T. BAYTOP,
AN ENDANGERED ENDEMIC PLANT OF TURKEY**

Iskender Parmaksiz¹ and Khalid Mahmood Khawar^{2*}

¹Department of Biology, Faculty of Science and Arts, Gazi Osman Pasa University, Tasliciftilik, Tokat, Turkey,
^{2*}Institute of Biotechnology, Department of Field Crops, Faculty of Agriculture, University of Ankara,
Diskapi, 06110 Ankara, Turkey, *Fax: +90-312-3179815, *E-mail: kmkhawar@gmail.com

REFERENCES

- Arslan N., Gurbuz B., Gumuscu A., Özcan S., Mirici S., Khawar K. M. (2002). Cultivation of *Sternbergia fischeriana* (Herbert) Rupr. and a study on its morphological characteristics. *Pakistan Journal of Botany*, 34: 411-418.
- Arslan N. (1999). Importance of pre-stores for the conservation of native flower bulbs. *Proceedings of XII-th International Symposium on Plant Originated Crude Drugs*, 20-22 May 1998, Ankara, Turkey: 275-288.
- Arzate-Fernandez A. M., Nakazaki T., Okumoto Y., Tanasika T. (1997). Efficient callus induction and plant regeneration from filaments with anther in lily (*Lilium longiflorum* Thunb.). *Plant Cell Reports*, 16: 836-840.
- Baxendale I. R., Ley S. V., Nessi M., Piutti C. (2002). Total synthesis of the Amaryllidaceae alkaloid (+)-plicamine using solid supported reagents. *Tetrahedron*, 58: 6285-6304.
- Blomstedt C., Cameron J., Whiteman P., Chandler S. F. (1991). Micropropagation of juvenile *Eucalyptus regnans* (Mountain ash). *Australian Journal of Botany*, 39: 179-186.
- Collins M. T., Dixon K. W. (1992). Micropropagation of an Australian orchid *Diuris longifolia* R. Br. *Australian Journal of Experimental Agriculture*, 32: 131-135.
- Conchou O., Nichterlein K., Vomel A. (1992). Shoot tip culture of *Arnica montana* for micropropagation. *Planta Medica*, 58: 73-76.
- Davis P. H. (1984). *Flora of Turkey and The East Aegean Islands*, vol. 8, Edinburgh University Press, Edinburgh, 632 pp.
- Davis P. H. (1988). *Flora of Turkey and The East Aegean Islands*, vol.10, Edinburgh University Press, Edinburgh, 590 pp.
- Dumas E., Monteuis O. (1995). *In vitro* rooting of micropropagated shoots from juvenile and mature *Pinus pinaster* explants – influence of activated charcoal. *Plant Cell, Tissue and Organ Culture*, 40: 231-235.
- Ekim T., Koyuncu M., Vural M., Duman H., Aytaç Z., Adıgüzel N. (2000). Red data book of Turkish plants. Turkish association for the conservation of nature, Barışçan Ofset, Ankara, Turkey: 1-41, 221 (In Turkish).
- Fridborg G., Eriksson T. (1975). Effects of activated charcoal on morphogenesis in plant tissue cultures. *Physiologia Plantarum*, 34: 306-308.
- Gabrielsen B., Monath T. P., Huggins J. W., Kefauver D. F., Petit G. R., Groszek G., Hollingshead M., Kirsi J. J., Shannon W. M., Schubert E. M., Dare J., Ugarkar B., Usser M. A., Phelan M. J. (1992). Antiviral (RNA) activity of selected Amaryllidaceae isoquinoline constituents and synthesis of related substances. *Journal of Natural Products*, 55: 1569-1581.
- Güner A., Özhatay N., Ekim T., Başer K. H. C. (2000). *Flora of Turkey (Supplement II)*, vol. 11, Edinburgh University Press, Edinburgh, 656 pp.
- Jaiswal V. S., Amin M. N. (1987). *In vitro* propagation of guava from shoot cultures of mature trees. *Journal of Plant Physiology*, 130: 7-12.
- Khawar K. M., Çöçü S., Parmaksiz I., Sarihan E. O., Sancak C., Özcan S. (2005). Mass proliferation of Madona Lilly (*Lilium candidum* L.) under *in vitro* conditions. *Pakistan Journal of Botany*, 37 (2): 243-248.
- Kim E. K., Hahn E. J., Murthy H. N., Paek K. Y. (2003). High frequency of shoot multiplication and bulblet formation of garlic in liquid cultures. *Plant Cell, Tissue and Organ Culture*, 73: 231-236.
- King R. W. (1976). Abscisic acid in developing wheat grains and its relationship to grain growth and maturation. *Planta*, 132: 43-51.

- Langens-Gerrits M., Albers M., De Klerk G.-J. (1998). Hot water treatment before tissue culture reduces initial contamination in *Lilium* and *Acer*. *Plant Cell, Tissue and Organ Culture*, 52: 75-77.
- Lian M. L., Chakrabarty D., Paek K. Y. (2003). Bulblet formation from bulb scale segments of *Lilium* using bioreactor system. *Biologia Plantarum*, 46: 199-203.
- Mirici S., Parmaksiz I., Özcan S., Sancak C., Uranbey S., Sarihan E. O., Gumuscu A., Gurbuz B., Arslan N. (2005). Efficient *in vitro* bulblet regeneration from immature embryos of endangered *Sternbergia fischeriana*. *Plant Cell, Tissue and Organ Culture*, 80: 239-246.
- Mohamed-Yasseen Y., Splittstoesser W. E. (1990). Regeneration of soybean (*Glycine max* (L.) Merr.) from the seedling apex, stem node, cotyledonary node and cotyledons. *Plant Growth Regulation Society of America*, 18: 203-210.
- Murashige T., Skoog F. (1962). A revised medium for rapid growth and bioassays with tobacco tissue cultures. *Physiologia Plantarum*, 15: 473-497.
- Nayak N. R., Patnaik S., Rath S. P. (1997). Direct shoot regeneration from foliar explants of an epiphytic orchid, *Acampe praemorsa* (Roxb.) Blatter and McCann. *Plant Cell Reports*, 16: 583-586.
- Nhut D. T. (1998). Micropropagation of lily (*Lilium longiflorum*) via *in vitro* stem node and pseudo-bulblet culture. *Plant Cell Reports*, 17: 913-916.
- Nhut D. T., Le B. V., Minh T., Da Silva J. A. T., Fukai S., Tanaka M., Van K. T. T. (2002). Somatic embryogenesis through pseudo bulblet thin cell layer of *Lilium longiflorum*. *Plant Growth Regulation*, 37: 193-198.
- Omura M., Hidaka T. (1992). Shoot tip culture in *Citrus*. II. Longevity of cultured shoots. *Bulletin of the Fruit Tree Research Station*, 22: 37-47.
- Özhatay N. (1997). Wild aromatic petaloid monocots in Turkey. *Proceeding of the XIth Symposium on Plant Originated Crude Drugs*, May 22-24, 1996, Ankara, Turkey: 541-546.
- Paek K. Y., Murthy H. N. (2002). High frequency of bulblet regeneration from bulb scale sections of *Fritillaria thunbergii*. *Plant Cell, Tissue and Organ Culture*, 68: 247-252.
- Pan M. J., Van Staden J. (1998). The use of charcoal in *in vitro* culture – A review. *Plant Growth Regulation*, 26: 155-163.
- Perata P., Picciarelli P., Alpi A. (1990). Pattern of variation in abscisic acid content in suspensors, embryo, and integuments of developing *Phaseolus coccineus* seeds. *Plant Physiology*, 94: 1776-1780.
- Sage D. O., Lynn J., Hammatt N. (2000). Somatic embryogenesis in *Narcissus pseudonarcissus* cvs. Golden Harvest and St. Keverne. *Plant Science*, 150: 209-216.
- Sanchez M. C., San-Jose M. C., Ballester A., Vieitez A. M. (1996). Requirements for *in vitro* rooting of *Quercus robur* and *Q. rubra* shoots derived from mature trees. *Tree Physiology*, 16: 673-680.
- Selles M., Viladomat F., Bastida J., Codina C. (1999). Callus induction, somatic embryogenesis and organogenesis in *Narcissus confusus*: correlation between the state of differentiation and the content of galanthamine and related alkaloids. *Plant Cell Reports*, 18: 646-651.
- Sevimay C. S., Khawar K. M., Parmaksiz I., Cocu S., Sancak C., Sarihan E. O., Ozcan S. (2005). Prolific *in vitro* bulblet formation from bulb scales of Meadow Lily (*Lilium candidum* L.). *Priridicum Biologurum*, 107 (1): 107-111.
- Snedecor G. W., Cochran W. G. (1967). *Statistical Methods*. 6th edition. The Iowa State University Press, Ames, Iowa, USA, 256 pp.
- Tubives. (2006). <http://www.tubitak.gov.tr/tubives>
- Wawrosch C., Malia P. R., Kopp B. (2001). Clonal propagation of *Lilium nepalense* D. Don, a threatened medicinal plant of Nepal. *Plant Cell Reports*, 20: 285-288.
- Weniger B., Italiano L., Beck J. P., Bastida J., Bergonon S., Codina C., Lobstein A., Anton R. (1995). Cytotoxic activity of Amaryllidaceae alkaloids. *Planta Medica*, 61: 77-79.
- Ziv M., Lillien-Kipnis H. (2000). Bud regeneration from inflorescence explants for rapid propagation of geophytes *in vitro*. *Plant Cell Reports*, 19: 845-850.