

DEVELOPMENT OF PLANT REGENERATION SYSTEM VIA SOMATIC EMBRYOGENESIS FROM ROOTS OF *LILIAM* HYBRID CULTIVARS

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REFERENCES

- ARZATE-FERNANDEZ A. M., NAKAZAKI T., OKUMOTO Y., TANISAKA T. (1997). Efficient callus induction and plant regeneration from filaments with anther in lily (*Lilium longiflorum* Thunb.). *Plant Cell Reports*, 16: 836-840.
- AZADI P., CHIN D. P., KURODA K., KHAN R. S., MII M. (2010). Macro elements in inoculation and co-cultivation medium strongly affect the efficiency of *Agrobacterium*-mediated transformation in *Lilium*. *Plant Cell, Tissue and Organ Culture*, 101: 201-209.
- BACCHETTA L., REMOTTI P. C., BERNARDINI C., SACCARDO F. (2003). Adventitious shoot regeneration from leaf explants and stem nodes of *Lilium*. *Plant Cell, Tissue and Organ Culture*, 74: 37-44.
- BEYL C. A., SHARMA G. C. (1983). Picloram induced somatic embryogenesis in *Gasteria* and *Haworthia*. *Plant Cell, Tissue and Organ Culture*, 2: 123-132.
- GODO T., MATSUI K., KIDA T., MII M. (1996). Effect of sugar type on the efficiency of plant regeneration from protoplasts isolated from shoot tip-derived meristematic nodular cell clumps of *Lilium × formolongi* hort. *Plant Cell Reports*. 15: 401-404.
- GODO T., KOBAYASHI, K., TAGAMI T., MATSUI K., KIDA T. (1998). *In vitro* propagation utilizing suspension cultures of meristematic nodular cell clumps and chromosome stability of *Lilium × formolongi* hort. *Scientia Horticulturae*, 72:193-202.
- JIMÉNEZ V. M., BANGERTH F. (2001). Endogenous hormone concentrations and embryogenic callus development in wheat. *Plant Cell, Tissue and Organ Culture*, 67: 37-46.
- KANCHANAPOOM K., PIMOLTHAI P., KANCHANAPOOM K. (2012). The effect of chitosan on regeneration of lily (*Lilium longiflorum* Thunb. 'Ester Lily') from bulb scale explants cultured *in vitro*. *Propagation of Ornamental Plants*, 12: 127-129.
- KEFFORD N. P., CASO O. H. (1966). A potent auxin with unique chemical structure-4-amino-3,5,6-trichloropicolinic acid. *Botanical Gazette*, 127: 159-163.
- KOMAI F., MOROHASHI H., HORITA M. (2006). Application of nurse culture for plant regeneration from protoplasts of *Lilium japonicum* Thunb. *In Vitro Cellular & Developmental Biology-Plant*, 42: 252-255.
- LU W., ENOMOTO K., FUKUNAGA Y., KUO C. (1988). Regeneration of tepals, stamens and ovules in explants from perianth of *Hyacinthus orientalis* L. Importance of explants age and exogenous hormones. *Plantta*, 175: 478-484.
- MII M., YUZAWA Y., SUETOMI H., MOTEGI T., GODO T. (1994). Fertile plant regeneration from protoplasts of a seed-propagated cultivar of *Lilium × formolongi* by utilizing meristematic nodular cell clumps. *Plant Science*, 100: 221-226.
- MORI S., ADACHI Y., HORIMOTO S., SUZUKI S., NAKANO M. (2005). Callus formation and plant regeneration in various *Lilium* species and cultivars. *In Vitro Cellular & Developmental Biology-Plant*, 41: 783-788.
- MURASHIGE T., SKOOG F. (1962). A revised medium for rapid growth and bioassays with tobacco tissue cultures. *Physiologia Plantarum*, 15: 473-497.
- NAKANO M., SAKAKIBARA T., SUZUKI S., SAITO H. (2000). Decrease in the regeneration potential of long-term cell suspension cultures of *Lilium formosanum* Wallace and its restoration by the auxin transport inhibitor, 2,3,5-triiodobenzoic acid. *Plant Science*, 158: 129-137.
- NHUT D. T., LE B. V., VAN K. T. T. (2001). Manipulation of the morphogenetic pathways of *Lilium Longiflorum* transverse thin cell layer explants by auxin and cytokinin. *In Vitro Cellular & Developmental Biology-Plant*, 37: 44-49.
- NHUT D. T., LE B. V., MINH N. T., DE SILVA J. T., FUKAI S., TANAKA M., VAN K. T. T. (2002). Somatic embryogenesis through pseudo-bulblet transverse thin cell layer of *Lilium longiflorum*. *Plant Growth Regulation*, 37: 193-198.
- PAN Y., ZHAO Y., LIU X., KE Z. (2011). Different explants of *Lilium lancifolium* have different potential to differentiate and regenerate in tissue culture. *Agricultural Biotechnology*, 12: 1437-1440.
- PHILLIPS G. C., HUBSTENBERGER J. F. (1987). Plant regeneration *in vitro* of selected *Allium* species and interspecific hybrids. *Hort-Science*, 22: 124-125.
- PHILLIPS G. C., LUTEYN K. J. (1983). Effects of picloram and other auxins on onion tissue cultures. *Journal of the American Society for Horticultural Science*, 108: 948-953.
- PRIYADARSHI S., SEN S. (1992). A revised scheme for mass propagation of Easter Lily. *Plant Cell, Tissue and Organ Culture*, 30: 193-197.
- PTAK A., BACH A. (2007). Somatic embryogenesis in tulip (*Tulipa gesneriana* L.) flower stem cultures. *In Vitro Cellular & Developmental Biology-Plant*, 43: 35-39.
- SIMMONDS J. A., CUMMING B. G. (1976). Propagation of *Lilium* hybrids. II. Production of plantlets from bulb-scale callus cultures for increased propagation rates. *Scientia Horticulturae*, 5:161-170.

- STELLA A., BRAGA M. R. (2002). Callus and cell suspension cultures of *Rudgea jasminoides*, a tropical woody Rubiaceae. *Plant Cell, Tissue and Organ Culture*, 68: 271-276.
- SUZUKI S., NIIMI Y., SAKAKIBARA T., HOSOKAWA K., YAMAMURA S., NAKANO M. (1998). Effects of several antibiotics and bialaphos on the growth and organ formation of *Lilium formosanum* calluses and transient expression of the *gusA* gene after co-cultivation with *Agrobacterium tumefaciens*. *Plant Biotechnology*, 15: 213-216.
- TRIBULATO A., REMOTTI P. C., LÖFFLER H. J. M., VAN TUYL J. M. (1997). Somatic embryogenesis and plant regeneration in *Lilium longiflorum* Thunb. *Plant Cell Reports*, 17: 113-118.
- WATANABE H. (1989). The use of growth regulators applied to stem cuttings of lilies. *Bulletin of the Nara Agricultural Experiment Station*, 20: 67-71.
- WICKREMESINHE E. R. M., HOLCOMB E. J., ARTECA R. N. (1994). A practical method for the production of flowering Easter lilies from callus cultures. *Scientia Horticulturae*, 60: 143-152.
- YADAV J. S., RAJAM M. V. (1997). Spatial distribution of free and conjugated polyamines in leaves of *Solanum melongena* L. associated with differential morphogenetic capacity: efficient somatic embryogenesis with putrescine. *Journal of Experimental Botany*, 48: 1537-1545.
- ZHENG S. J., HENKEN B., KRENS F. A., KIK C. (2003). The development of an efficient cultivar-independent plant regeneration system from callus derived from both apical and non-apical root segments of garlic (*Allium Sativum* L.) *In Vitro Cellular & Developmental Biology-Plant*, 39: 288-292.
- ZIMMERMANN E. S., READ P. E. (1986). Micropropagation of *Typha* species. *HortScience*, 21: 1214-1216.