Propagation of Ornamental Plants
Vol. 16, № 1, 2016: 19-27

MICROPROPAGATION OF TREE PEONY (*PAEONIA* × *LEMOINEI* 'HIGH NOON') AND THE ASSESSMENT OF GENETIC STABILITY BY SSR ANALYSIS

Shusheng Wen, Fangyun Cheng*, and Yuan Zhong

National Flower Engineering Research Center, College of Landscape Architecture, Beijing Forestry University, Tsinghua East Road 35, Haidian District, 100083 Beijing, China,
*Fax: + 86-010-62338570, *E-mail: chengfy8@263.net

REFERENCES

Agarwal M., Shrivastava N., Padh H. (2008). Advances in molecular marker techniques and their applications in plant sciences. Plant Cell Reports, 27: 617-631.

Albers M. R. J., Kunneman B. P. A. M. (1992). Micropropagation of *Paeonia*. Acta Horticulturae, 314: 85-92.

Amoo S. O., Finnie J. F., Van Staden J. (2011). The role of *meta*-Topolins in alleviating micropropagation problems. Plant Growth Regulation, 63: 197-206.

Amoo S. O., Van Staden J. (2013). Influence of plant growth regulators on shoot proliferation and secondary metabolite production in micropropagated *Huernia hystrix*. Plant Cell, Tissue and Organ Culture, 112: 249-256.

Aoki N., Inoue I. (1992). Studies on production of nursery stock in tree peony (*Paeonia suffuticosa*). 1: Effects of bud position of scion, binding material, time, cultivar and temperature after grafting on graft-take of grafted tree peony. Bulletin of the Faculty of Agriculture, Shimane University, 26: 83-89 (in Japanese).

Aremu A. O., Bairu M. W., Doležal K., Finnie J. F., Van Staden J. (2012). Topolins: A panacea to plant tissue culture challenges?. Plant Cell, Tissue and Organ Culture, 108: 1-16.

Bairu M. W., Stirk W. A., Doležal K., Van Staden J. (2007). Optimizing the micropropagation protocol for the endangered *Aloe polyphylla*: can *meta*-topolin and its derivatives serve as replacement for benzyladenine and zeatin? Plant Cell, Tissue and Organ Culture, 90: 15-23.

Bairu M. W., Stirk W. A., Doležal K., Van Staden J. (2008). The role of topolins in micropropagation and somaclonal variation of banana cultivars 'Williams' and 'Grand Naine' (*Musa* spp. AAA). Plant Cell, Tissue and Organ Culture, 95: 373-379.

Bairu M. W., Aremu A. O., Van Staden J. (2011a). Somaclonal variation in plants: causes and detection methods. Plant Growth Regulation, 63: 147-173.

Bairu M. W., Novák O. E., Doležal K., Van Staden J. (2011b). Changes in endogenous cytokinin profiles in micropropagated *Harpagophytum procumbens* in relation to shoot-tip necrosis and cytokinin treatments. Plant Growth Regulation, 63: 105-114.

Beruto M., Lanteri L., Portogallo C. (2004). Micropropagation of tree peony (*Paeonia suffruticosa*). Plant Cell, Tissue and Organ Culture, 79: 249-255.

Beruto M., Curir P. (2007). *In vitro* culture of tree peony through axillary budding. *In*: Jain S.M., Häggman H. (Eds). Protocols for Micropropagation of Woody Trees and Fruits. Springer: 477-497.

Bouza L., Sotta B., Bonnet M., Jacques M., Arnaud Y. (1992). Hormone content and meristematic activity of *Paeonia suffruticosa* Andr. cv. 'Madame de Vatry' vitroplants during *in vitro* rooting. Acta Horticulturae, 320: 213-213.

Bouza L., Jacques M., Miginiac E. (1994a). *In vitro* propagation of *Paeonia suffruticosa* Andr. cv. 'Mme de Vatry': developmental effects of exogenous hormones during the multiplication phase. Scientia Horticulturae, 57: 241-251.

Bouza L., Jacques M., Miginiac E. (1994b). Requirements for *in vitro* rooting of *Paeonia suffruticosa* Andr. cv. 'Mme de Vatry'. Scientia Horticulturae, 58: 223-233.

Bouza L., Jacques M., Sotta B., Miginiac E. (1994c). Relations between auxin and cytokinin contents and *in vitro* rooting of tree peony (*Paeonia suffruticosa* Andr.). Plant Growth Regulation, 15: 69-73.

Bouza L., Jacques M., Sotta B., Miginiac E. (1994d). The reactivation of tree peony (*Paeonia suffruticosa* Andr.) vitroplants by chilling is correlated with modifications of abscisic acid, auxin and cytokinin levels. Plant Science, 97: 153-160.

Brito G., Lopes T., Loureiro J., Rodriguez E., Santos C. (2010). Assessment of genetic stability of two micropropagated wild olive species using flow cytometry and microsatellite markers. Trees, 24: 723-732.

Černá K., Dedičová B., Borbélyová D. (2001). Micropropagation of *Paeonia arborea* Donn., syn. *P. suffruticosa* Andr. Acta Fytotechnica et Zootechnica, 4: 51-54.

Cheng F. Y. (2007). Advances in the breeding of tree peonies and a cultivar system for the cultivar group. International Journal of Plant Breeding, 1: 89-104.

Gentile A., Jàquez Gutiérrez M., Martinez J., Frattarelli A., Nota P., Caboni E. (2014). Effect of *meta*-topolin on micropropagation and adventitious shoot regeneration in *Prunus* rootstocks. Plant Cell, Tissue and Organ Culture, 118: 373-381.

Harris R. A., Mantell S. (1991). Effects of stage II subculture durations on the multiplication rate and rooting capacity of micropropagated shoots of tree paeony (*Paeonia suffruticosa* Andr.). Journal of Horticultural Science, 66: 95-102.

Kong X. S., Zhang M. X. (1998). The research of peony propagation technology *in vitro*. Northern Horticulture, 3: 87-89 (in Chinese).

Larkin P. J., Scowcroft W. R. (1981). Somaclonal variation – a novel source of variability from cell cultures for plant improvement. Theoretical and Applied Genetics, 60: 197-214.

Li S. S., Yuan R. Y., Chen L. G., Wang L. S., Hao X. H., Wang L. J., Zheng X. C., Du H. (2015). Systematic qualitative and quantitative assessment of fatty acids in the seeds of 60 tree peony (*Paeonia* section *Moutan*) cultivars by GC – MS. Food Chemistry, 173: 133-140.

Li Y. L., Wu D. Y., Pan S. L., Xu S. L., Wei Z. M., Xu Z. H., Li X. J. (1984). *In vitro* propagation of *Paeonia suffruticosa*. Kexue Tongbao, 29: 500-502 (in Chinese).

Lloyd G., McCown B. (1980). Commercially-feasible micropropagation of mountain laurel, *Kalmia latifolia*, by use of shoot-tip culture. Combined Proceedings, International Plant Propagators' Society, 30: 421-427.

Lopes T., Capelo A., Brito G., Loureiro J., Santos C. (2009). Genetic variability analyses of the somatic embryogenesis induction process in *Olea* spp. using nuclear microsatellites. Trees, 23: 29-36.

Murashige T., Skoog F. (1962). A revised medium for rapid growth and bioassays with tobacco tissue cultures. Physiologia Plantarum, 15: 473-497.

Palavan-Ünsal N., Çağ S., Çetin E. (2004). The role of *meta*-topolin in senescence of wheat leaf segments. Journal of Cell and Molecular Biology, 3: 23-31.

Podwyszynska M., Wegrzynowicz-Lesiak E., Doležal K., Krekule J., Strnad M., Saniewski M. (2012). New cytokinins-meta-methoxytopolins in micropropagation of *Cotinus coggygria* Scop. 'Royal Purple'. Propagation of Ornamental Plants, 12: 220-228.

Pospíšilová J., Solárová J., Catsky J. (1992). Photosynthetic responses to stresses during *in vitro* cultivation. Photosynthetica, 26: 3-18.

Qin L., Cheng F. Y., Zhong Y. (2012a). Advances in the *in vitro* culture and micropropagation of tree peonies during the past half century. Acta Horticulturae, 977: 39-51.

Qin L., Cheng F. Y., Zhong Y., Gao P., Yu H. P. (2012b). Callus development in tree peonies (*Paeonia* sect. *Moutan*): Influence of genotype, explant developmental stage and position, and plant growth regulators. Propagation of Ornamental Plants, 12: 117-126.

Rathore M. S., Yadav P., Mastan S. G., Prakash C. R., Singh A., Agarwal P. K. (2014). Evaluation of genetic homogeneity in tissue culture regenerates of *Jatropha curcas* L. using flow cytometer and DNA-based molecular markers. Applied Biochemistry and Biotechnology, 172: 298-310.

Regalado J. J., Carmona-Martín E., Castro P., Moreno R., Gil J., Encina C. L. (2015). Micropropagation of wild species of the genus *Asparagus* L. and their interspecific hybrids with cultivated *A. officinalis* L., and verification of genetic stability using EST-SSRs. Plant Cell, Tissue and Organ Culture, 121: 501-510.

Rogers A. (Ed.) (1995). Peonies. Timber Press, Portland, Oregon, 384 pp.

Silva J. A. T. D. (2011). Studies on multiple shoot induction and proliferation of *Paeonia lactiflora* 'Zhong Sheng Fen'. Propagation of Ornamental Plants, 11: 144-148.

Strnad M., Hanu J., Vaněk T., Kamínek M., Ballantine J. A., Fussell B., Hanke D. E. (1997). Meta-topolin, a highly active aromatic cytokinin from poplar leaves (*Populus* × *canadensis* Moench., cv. Robusta). Phytochemistry, 45: 213-218.

Wang H. Y., He S. L., Tanaka M., Van P. T., Da Silva J. A. T. (2012). Effect of IBA concentration, carbon source, substrate, and light source on root induction ability of tree peony (*Paeonia suffruticosa* Andr.) plantlets *in vitro*. European Journal of Horticultural Science, 77: 122-128.

Wen S. S., Cheng F. Y., Zhong Y., Wang X., Li L. Z., Zhang Y. X., Qiu J. M. (2016). Efficient protocols for the micropropagation of tree peony (*Paeonia suffruticosa* 'Jin Pao Hong', *P. suffruticosa* 'Wu Long Peng Sheng', and *P.* × *lemoinei* 'High Noon') and application of arbuscular mycorrhizal fungi to improve plantlet establishment. Scientia Horticulturae, 201: 10-17.

Werbrouck S., Bruno V. D. J., Dewitte W., Prinsen E., Van Onckelen H. A., Debergh P. (1995). The metabolism of benzyladenine in *Spathiphyllum floribundum* 'Schott Petite' in relation to acclimatisation problems. Plant Cell Reports, 14: 662-665.

Werbrouck S. P. O., Strnad M., Onckelen H. A. V., Debergh P. C. (1996). *Meta*-topolin, an alternative to benzyladenine in tissue culture? Physiologia Plantarum, 98: 291-297.

Wister J. C. (Ed.) (1995). The Peonies, 2nd edition. American Peony Society, Hopkins, MN, 220 pp.

Wojtania A. (2010). Effect of *meta*–topolin on *in vitro* propagation of *Pelargonium* × *hortorum* and *Pelargonium* × *hederaefolium* cultivars. Acta Societatis Botanicorum Poloniae, 79: 101-106.

Wu J., Cai C. F., Cheng F. Y., Cui H. L., Zhou H. (2014). Characterisation and development of EST-SSR markers in tree peony using transcriptome sequences. Molecular Breeding, 34: 1853-1866.