

EFFICIENT IMMATURE EMBRYO GERMINATION *IN VITRO*  
OF HICKORY (*CARYA CATHAYENSIS* SARG.)

Hengkang Hu<sup>1,2,3</sup>, Qixiang Zhang<sup>1,2</sup>, Xiangmei Jiang<sup>4</sup>, Huawei Xv<sup>1,2</sup>, Kunyi Han<sup>1,2</sup>,  
Yanqing Shen<sup>1,2</sup>, Feiyan Lv<sup>1,2</sup>, and Jianqin Huang<sup>1,2\*</sup>

<sup>1</sup>The Nurturing Station for the State Key Laboratory of Subtropical Silviculture Zhejiang Agriculture  
and Forestry University, Lin'an 311300, Zhejiang, China,  
\*Fax: + 86 (0) 571 63740809, \*E-mail: huangjq@zafu.edu.cn

<sup>2</sup>School of Forestry and Biotechnology, Zhejiang Agriculture and Forestry University  
Lin'an, Zhejiang, 311300, China,

<sup>3</sup>College of Landscape Architecture and Art, Jiangxi Agriculture of University, Nanchang 330045, China

<sup>4</sup>Jiangxi Academy of Forestry, Nanchang 330032, China

REFERENCES

- BAE K. H., KIM C. H., SUN B. Y., CHOI Y. E. (2010). Structural changes of seed coats and stimulation of *in vitro* germination of fully mature seeds of *Cypripedium macranthos* Swartz (Orchidaceae) by NaOCl pretreatment. Propagation of Ornamental Plants, 10: 107-113.
- BENMAHIOUL B., KAID-HARCHE M., DORION N., DAGUIN F. (2009). *In vitro* embryo germination and proliferation of pistachio (*Pistacia vera* L.). Scientia Horticulturae, 122: 479-483.
- BUYUN L., LAVRENTYEVA A., KOVALSKA L., IVANNIKOV R. (2004). *In vitro* germination of seeds of some rare tropical orchids. Acta Universitatis Latviensis Biology, 676: 159-162.
- CORREDOIA E., SAN-JOSE M. C., BALLESTER A., VIEITEZ A. M. (2004). Cryopreservation of zygotic embryo axes and somatic embryos of European chestnut. Cryo-Letters, 25: 33-42.
- EVANS D. A., SHARP W. P., AMMIRATO P. V. (Eds) (1986). Handbook of plant cell culture. New York, MacMillan Publishing Company, 720 pp.
- FENG D. L., ZHANG J., LIU X., PENG W. X., WU T. Y. (2009). *In vitro* culture of immature embryos from *Koelreuteria bipinnata* var. *integrifoliola*. Forestry Studies in China, Project of Innovation Team of Zhejiang A & F University (2007), 11:179-184.
- GREER S. P., RINEHART T. A. (2009). *In vitro* germination and dormancy responses of *Hydrangea macrophylla* and *Hydrangea paniculata* seeds to ethyl methane sulfonate and cold treatment. HortScience, 44: 764-769.
- HOQUE A., RAHMAN S. M., ARIMA S., TAKAGI Y. (2001). Efficient *in vitro* germination and shoot proliferation of chilling-treated water chestnut (*Trapa japonica* Flerov) embryonal explants. In Vitro Cellular and Developmental Biology-Plant, 37: 369-374.
- HORMAZA J. I. (1999). Early selection in cherry combining RAPDs with embryo culture. Scientia Horticulturae, 79: 121-126.
- HUANG J. Q., ZHANG B. S., LU J. W., FU G. W. (2001). Anatomical observation in graft union of *Carya cathayensis*. Journal of Zhejiang Forestry College, 18: 111-114 (in Chinese).
- JOHNSON T., KANE M. E. (2007). Asymbiotic germination of ornamental *Vanda*: *in vitro* germination and development of three hybrids. Plant Cell, Tissue and Organ Culture, 91: 251-261.
- KAUR R., SHARMA N., KUMAR K., SHARMA D. R., SHARMA S. D. (2006). *In vitro* germination of walnut (*Juglans regia* L.) embryos. Scientia Horticulturae, 109: 385-388.
- KORNOVA K., STEFANOVA A., TERZIISKI D. (1993). *In vitro* culture of immature embryos and cotyledons of *Juglans regia* L. Morphological and anatomical analyses of some regenerants. Acta Horticulturae, 311: 125-133.
- LIU C. H., HONG J., XIA G. H., HUANG J. Q. (2009). Cytological observation on healing responses in grafting of *Carya cathayensis*. Scientia Silvae Sinicae, 45: 34-38 (in Chinese).
- LLOYD G., MCCOWN B. (1980). Commercially-feasible micropropagation of mountain laurel, *Kalmia latifolia*, by use of shoot tip culture. Proceedings of the International Plant Propagators' Society, 30: 421-427.
- MURASHIGE T., SKOOG F. (1962). A revised medium for rapid growth and bioassay with tobacco tissue cultures. Physiologia Plantarum, 15: 473-497.
- OZYIGIT I. I., KAHRAMANZ M. V., ECRANZ O. (2007). Relationship between explant age, total phenols and regeneration response in tissue cultured cotton (*Gossypium hirsutum* L.). African Journal of Biotechnology, 6: 3-8.
- PADILLA I. M., ENCINA C. L. (2003). *In vitro* germination of cherimoya (*Annona cherimola* Mill.) seeds. Scientia Horticulturae, 97: 219-227.
- PAYGHAMZADEH K., KAZEMITABAR S. K. (2010). *In vitro* germination of Pecan (*Carya illinoensis*) embryo. Biharean Biologist, 4: 37-43.
- RAMBABU M., UPENDER M., UJJWALA D., UGANDHAR T., PRAVEEN M., RAMASWAMY N. (2006). *In vitro* zygotic embryo culture of an endangered forest tree *Givotia rottleriformis* and factors affecting its germination and seedling growth. In Vitro Cellular and Developmental Biology-Plant, 42: 418-421.
- RENUKDas N. N., MANOHARAN M., GARNER J. O. (2010). *In vitro* plant regeneration of pecan [*Carya illinoensis* (Wangenh.) K. Koch]. Plant Biotechnology, 27: 211-215.

- SAMBE M. A., SAGNA M., SY M. O. (2010). Seed germination and *in vitro* plant regeneration of *Parkia biglobosa* (Jacq.) Benth. African Journal of Biotechnology, 9: 3099-3108.
- SAN-JOSE M. C., BALLESTER A., VIEITEZ A. M. (2001). Effect of thidiazuron on multiple shoot induction and plant regeneration from cotyledonary nodes of chestnut. Journal of Horticultural Science and Biotechnology, 76: 588-595.
- SEBASTINRAJ J., BRITTO J., ROBINSON P. J., KUMAR V. D., KUMAR S. S. (2006). *In vitro* seed germination and plantlet regeneration of *Coelogyne mossiae* Rolfe. Journal of Biological Research, 5: 79-84.
- SHADANG R., DWIVEDI P., HEGDE S. N., AHMED N. (2007). Effect of different culture media on seed germination and subsequent *in vitro* development of protocorm of *Hygrochilus parishii* (Veith & Rchb. f.) Pfitz (Orchidaceae). Indian Journal of Biotechnology, 6: 256-261.
- WAN J. L., HUANG J. Q., XIA G. H., ZHANG Q. X., HUANG L. C. (2009). Adventitious bud induction with immature embryo of *Carya cathayensis*. Journal of Zhejiang Forestry College, 26: 762-766 (in Chinese).
- YU L., ZHANG W. B., YU B. M., XIA G. H. (2009). Study on growth performance of different hickory scion/rootstock combinations and its effect on bearing. Journal of Nanjing Forestry University (Natural Sciences Edition), 33: 143-145 (in Chinese)
- ZHENG B. S., CHU H. L., JIN S. H., HUANG Y. J., WANG Z. J., CHEN M., HUANG J. Q. (2009). cDNA-AFLP analysis of gene expression in hickory (*Carya cathayensis*). Tree Physiology, 30: 297-303.