

OPTIMIZING *IN VITRO* SHOOT PROLIFERATION AND ROOTING OF *MAGNOLIA MACCLUREI* (DANDY) FIGLAR WITH LIGHT EMITTING DIODES

Ying Liu

Research Institute of Tropical Forestry, Chinese Academy of Forestry, 682 Guangshanyi Road, Longdong str.,
510520 Guangzhou, China, Fax: 0086-20-87031622,
E-mail: ly19631210@163.com

REFERENCES

- BATISTA D. S., FELIPE S. H. S., SILVA T. D., CASTRO K. M., MAMEDES-RODRIGUES T. C., MIRANDA N. A., RÍOS-RÍOS A. M., FARIA D. V., FORTINI E. A., CHAGAS K., TORRES-SILVA G., XAVIER A., ARENCIBIA A. D., OTONI W. C. (2018). Light quality in plant tissue culture: does it matter? *In Vitro Cellular & Developmental Biology - Plant*, 54: 195-215.
- BELLO-BELLO J. J., SATO J. A. P., CRUZ-CRUZ C. A., MARTÍNEZ-ESTRADA E. (2017). Light-emitting diodes: progress in plant micro-propagation. In: Jacob-Lopes E., Zepka L. Q., Queiroz M. I. (Eds). *Chlorophyll*. INTECH Open: 93-103.
- BELLO-BELLO J. J., MARTÍNEZ-ESTRADA E., CAAMAL-VELÁZQUEZ J. H., MORALES-RAMOS V. (2016). Effect of LED light quality on *in vitro* shoot proliferation and growth of vanilla (*Vanilla planifolia* Andrews). *African Journal of Biotechnology*, 15: 272-277.
- COMPTON M. E. (1994). Statistical methods suitable for the analysis of plant tissue culture data. *Plant Cell, Tissue and Organ Culture*, 37: 217-242.
- DE HSIE B. S., BUENO A. I. S., BERTOLUCCI S. K. V., DE CARVALHO A. A., DA CUNHA S. H. B., MARTINS E. R., PINTO J. E. B. P. (2019). Study of the influence of wavelengths and intensities of LEDs on the growth, photosynthetic pigment, and volatile compounds production of *Lippia rotundifolia* Cham *in vitro*. *Journal of Photochemistry & Photobiology, B: Biology*, 198: Article 111577.
- GUPTA S. D., JATOTHU B. (2013). Fundamentals and applications of light-emitting diodes (LEDs) in *in vitro* plant growth and morphogenesis. *Plant Biotechnology Reports*, 7: 211-220.
- JONES JR. J. B. (1991). *Kjeldahl Method for Nitrogen (N) Determination*. Micro-Macro Publishing, Inc., Athens, GA, 79 pp.
- LI H., XU Z., TANG C. (2010). Effect of light-emitting diodes on growth and morphogenesis of upland cotton (*Gossypium hirsutum* L.) plantlets *in vitro*. *Plant Cell, Tissue and Organ Culture*, 103: 155-163.
- LI X., WANG S. F., JIANG X. H. (2005). Tissue culture and plantlet regeneration of *Michelia macclurei* Dandy. *Plant Physiology Communications*, 41: 783 (in Chinese).
- LI X. Y., ZENG B. S. (2021). The proliferative efficiency and the photoprotective response of *Aquilaria crassna* Pierre. plantlets under different light quality. *Molecular Plant Breeding*, 19: 291-298 (in Chinese with English abstract).
- LICHTENTHALER H. K., WELLBURN A. R. (1983). Determinations of total carotenoids and chlorophylls *a* and *b* of leaf extracts in different solvents. *Biochemical Society Transactions*, 11: 591-592.
- LIU H., FU Y., HU D., YU J., LIU H. (2018). Effect of green, yellow and purple radiation on biomass, photosynthesis, morphology and soluble sugar content of leafy lettuce via spectral wavebands “knock out”. *Scientia Horticulturae*, 236: 10-17.
- LIU M., XU Z., YANG Y., FENG Y. (2011). Effects of different spectral lights on *Oncidium* PLBs induction, proliferation, and plant regeneration. *Plant Cell, Tissue and Organ Culture*, 106: 1-10.
- LIU M. Q., LIANG S. X. (1985). Tissue culture by shoot segments for *Michelia macclurei*. *Plant Physiology Communications*, 21: 37 (in Chinese).
- LIU Y. (2021). Tissue culture via seed embryo for *Michelia macclurei*. *Bulletin of Botanical Research*, 41: 79-88 (in Chinese with English abstract).
- LIU Y., LI S., MA S., ZHANG Z., ZHANG Q., LUO L., XUE C., PEI X. (2009). Effects of light quality on the growth and development of *in vitro* cultured grape plantlets. *Acta Horticulturae Sinica*, 36: 1105-1112 (in Chinese with English abstract).
- LIU Y., WANG Y. Y., ZHU X., LI R. (2020). Effect of LED light quality on hybrid plantlets growth and physiological characteristics of *Cymbidium hybridum* ‘Hongjiu’×*Cymbidium tortisepalum* ‘Biancaosuhua’. *Journal of West China Forestry Science*, 49: 30-36 (in Chinese with English abstract).
- LIU Z. W., JIA W. Q., LIU H. C., FENG Z. Y. (2012). The effect of different light emitting diode on growth of adventitious bud of *Stachys floridana* Schuttl. ex Benth. *Northern Horticulture*, 34: 152-154 (in Chinese with English abstract).
- LOTFI M., MARS M., WERBROUCK S. (2019). Optimizing pear micropropagation and rooting with light emitting diodes and trans-cinnamic acid. *Plant Growth Regulation*, 88: 173-180.
- MANIVANNAN A., SOUNDARARAJAN P., PARK Y. G., WEI H., KIM S., JEONG B. R. (2017). Blue and red light-emitting diodes improve the growth and physiology of *in vitro*-grown carnations ‘Green Beauty’ and ‘Purple Beauty’. *Horticulture, Environment, and Biotechnology*, 58: 12-20.
- MILER N., KULUS D., WOŹNY A., RYMARZ D., HAJZER M., WIERZBOWSKI K., NELKE R., SZEFFS L. (2019). Application of wide-spectrum light-emitting diodes in micropropagation of popular ornamental plant species: a study on plant quality and cost reduction. *In Vitro Cellular & Developmental Biology - Plant*, 55: 99-108.
- MURASHIGE T., SKOOG F. (1962). A revised medium for rapid growth and bio assays with tobacco tissue cultures. *Physiologia Plantarum*, 15: 473-497.

- NORIKANE A., TEIXEIRA DA SILVA J. A., TANAKA M. (2013). Growth of *in vitro* *Oncidesa* plantlets cultured under cold cathode fluorescent lamps with super-elevated CO₂ enrichment. AoB PLANTS, 5: Article plt044.
- PAWLOWSKA B., ŽUPNIK M., SZEWczyk-TARANEK B., CIOĆ M. (2018). Impact of LED light sources on morphogenesis and levels of photosynthetic pigments in *Gerbera jamesonii* grown *in vitro*. Horticulture, Environment, and Biotechnology, 59: 115-123.
- POUDEL P. R., KATAOKA I., MOCHIOKA R. (2008). Effect of red- and blue-light-emitting diodes on growth and morphogenesis of grapes. Plant Cell, Tissue and Organ Culture, 92: 147-153.
- RAMÍREZ-MOSQUEDA M. A., IGLESIAS-ANDREU L. G., BAUTISTA-AGUILAR J. R. (2017). The effect of light quality on growth and development of *in vitro* plantlet of *Stevia rebaudiana* Bertoni. Sugar Tech, 19: 331-336.
- REIS A., KLEINOWSKI A. M., KLEIN F. R. S., TELLES R. T., DO AMARANTE L., BRAGA E. J. B. (2015). Light quality on the *in vitro* growth and production of pigments in the genus *Alternanthera*. Journal of Crop Science and Biotechnology, 18: 349-357.
- WEI P. L., LIU X. L., FU Y. L. (2020). Physical and mechanical properties of *Michelia macclurei* plantation wood. Journal of Northwest Forestry University, 35: 252-256 (in Chinese with English abstract).
- ZHANG W. R., YANG G. Y., TU X. N., ZHANG P. (1999). Determination of total nitrogen, phosphorus, potassium, sodium, calcium, magnesium in forest plant and forest floor. (LY/T1271-1999). China Standard Press, Beijing, China 3 pp. (in Chinese).