

EFFECT OF CONDITIONS FOR GAMETOPHYTE PROLIFERATION AND SPOROPHYTE PRODUCTION OF *ONOCLEA INTERRUPTA* (MAXIM.) CHING & P. C. CHIU

Ha Min Lee^{1,2}, Bo Kook Jang^{1,2}, Kyungtae Park^{1,2}, and Cheol Hee Lee^{1,2*}

¹Division of Animal, Horticultural and Food Sciences, Chungbuk National University, 1 Chungdae-ro, Seowon-gu, 28644 Cheongju-si, Chungcheongbuk-do, Republic of Korea,

*Fax: + 82-43-271-0414, *E-mail: leech@chungbuk.ac.kr

²Brain Korea 21 Center for Bio-Resource Development, Chungbuk National University, 1 Chungdae-ro, Seowon-gu, 28644 Cheongju-si, Chungcheongbuk-do, Republic of Korea

REFERENCES

- CHO J. S., HAN J. H., LEE C. H. (2017). Effects of medium components and composition on mass propagation of *Arachniodes aristata* (G. Forst.) Tindale. Korean Journal of Horticultural Science & Technology, 35: 131-141.
- CHOI J. M., CHUNG H. J., CHOI J. S. (1999). Physical properties of pine bark affected by peeling method and improving moisture retention as container media. Korean Journal of Horticultural Science & Technology, 40: 363-367.
- CHOI J. M., CHUNG H. J., CHOI J. S. (2000). Physico-chemical properties of organic and inorganic materials used as container media. Korean Journal of Horticultural Science & Technology, 18: 529-535.
- DYER A. F. (1979). The experimental biology of ferns. Academic Press, London, 657 pp.
- FERNÁNDEZ H., BERTRAND A. M., SÁNCHEZ-TAMÉS R. (1997). Gemmation in cultured gametophytes of *Osmunda regalis*. Plant Cell Reports, 16: 358-362.
- FERNÁNDEZ H., REVILLA M. A. (2003). *In vitro* culture of ornamental ferns. Plant Cell, Tissue and Organ Culture, 73: 1-13.
- FRIDBORG G., PEDERSEN M., LANDSTROM L. E., ERIKSSON T. (1978). The effect of activated charcoal on tissue culture: absorption of metabolites inhibiting morphogenesis. Physiologia Plantarum, 43: 104-106.
- FUENTES S. R. L., CALHEIROS M. B. P., MANETTI-FILHO J., VIEIRA L. G. E. (2000). The effects of silver nitrate and different carbohydrate sources on somatic embryogenesis in *Coffea canephora*. Plant Cell, Tissue and Organ Culture, 60: 5-13.
- GABRIELS R., VERDONCK O., MEKERS O. (1986). Substrate requirement for pot plants in recirculating water culture. Acta Horticulturae, 178: 93-99.
- GIBSON S. I. (2001). Plant sugar-response pathways: part of a complex regulatory web. Plant Physiology, 124: 1532-1539.
- HIRSCH A. M. (1975). The effect of sucrose on the differentiation of excised fern leaf tissue into either gametophytes or sporophytes. Plant Physiology, 56: 390-393.
- JANG B. K., CHO J. S., PARK K. T., LEE C. H. (2019a). A methodology for large-scale *Athyrium shearerii* gametophyte proliferation and sporophyte production using tissue culture. In Vitro Cellular & Developmental Biology - Plant, 55: 519-526.
- JANG B. K., CHO J. S., LEE C. H. (2019b). Propagation methods for gametophyte proliferation and sporophyte formation in silver cloak fern (*Cheilanthes argentea*). Horticulture, Environment, and Biotechnology, 60: 435-442.
- JANG B. K., CHO J. S., KWON H. J., LEE C. H. (2019c). Optimal conditions for spore germination and gametophyte and sporophyte production in the autumn fern *Dryopteris erythrosora*. Horticulture, Environment, and Biotechnology, 60: 115-123.
- JEONG J. A., LEE C. H. (2006). Effect of medium composition on *in vitro* prothallus culture of 3 fern species in the family Aspleniaceae. Korean Journal of Plant Resources, 19: 259-264.
- KARAMI O., DELJOU A., ESNA-ASHARI M., OSTAD-AHMADI P. (2006). Effect of sucrose concentrations on somatic embryogenesis in carnation (*Dianthus caryophyllus* L.). Scientia Horticulturae, 110: 340-344.
- KBIS (2020). *Onoclea interrupta* (Maxim.) Ching & P. C. Chiu Korea Biodiversity Information System (KBIS). Korea National Arboretum. Pocheon, Korea. <http://www.nature.go.kr/kbi/plant/pilbk/selectPlantPilbkDtl.do?plantPilbkNo=40992>.
- KNOP W. (1865). Quantitative untersuchungen uber die ernahrungsprozesse der pflanzen. Die Landwirtschaftlichen Versuchs-Stationen, 7: 93-107.
- LAURENT S., LEFEBVRE M. F. (1980). Etude de l'effet de différentes carences en éléments minéraux sur la teneur en tanoïdes de gamétophytes de Filicinées. Bulletin de la Société Botanique de France, Lettres Botaniques, 127: 119-127.
- LEE C. H. (2000). Characters and mass propagation of Pteridophyta native to Korea. Korean Journal of Plant Resources, 13: 1-10.
- LEE C. S., LEE K. H. (2018). Pteridophytes of Korea: Lycophytes & Ferns. Geobook, Seoul, Korea, 491 pp.
- LEE H. H., KIM K. H., KANG J. Y. (2006). Comparison of the European standard methods and the rural development administration methods for determining chemical properties of horticultural substrates. Korean Journal of Horticultural Science & Technology, 24: 425-430.
- LEE K. Y., MIN J. Y., KIM M. S., MOON B. C., KANG Y. M. (2016). Optimized production through enlargement comparison grown in various mixed soils using tubers of *in vitro* *Pinellia triparita* (Blume) Schott. Journal Agriculture & Life Science, 50: 33-43.
- MANNAN M. M., MARIDASS M., VICTOR B. (2008). A review on the potential uses of ferns. Ethnobotanical Leaflets, 12: 281-285.
- MENÉNDEZ V., ARBESÚ R., SOMER M., REVILLA A., FERNÁNDEZ H. (2011). From spore to sporophyte: how to proceed *in vitro*. In: Kumar A., Fernández H., Revilla M. (Eds). Working with ferns. Springer, New York, USA: 97-110.
- MORAN R. C. (2004). A Natural History of Ferns. Timber Press, Portland, OR, USA, 302 pp.
- MURASHIGE T., SKOOG F. (1962). A revised medium for rapid growth and bioassays with tobacco tissue cultures. Physiologia Plan-

- tarum, 15: 473-497.
- PARK K. T., JANG B. K., LEE C. H. (2019). Culture condition for gametophyte and sporophyte masspropagation of bamboo fern (*Coniogramme japonica*) using tissue culture. *Journal of Plant Biotechnology*, 49: 119-126.
- RAVI B. X., ROBERT J., GABRIEL M. (2014). *In vitro* spore germination and gametophytic growth development of a critically endangered fern *Pteris tripartita* Sw. *African Journal of Biotechnology*, 13: 2350-2358.
- SAAD A. I. M., ELSHAHED A. M. (2012). Plant tissue culture media. *In: Leva A.R. (Ed.). Recent advances in plant in vitro culture. InTech, Rijeka, Croatia*, 29-40.
- SCHWABE W. W. (1951). Physiological studies in plant nutrition XVI. The mineral nutrition of bracken. *Annals of Botany*, 15: 417-446.
- SMEEKENS S. (2000). Sugar-induced signal transduction in plants. *Annual Review of Plant Physiology and Plant Molecular Biology*, 51: 49-81.
- STEEVES T. A., SUSSEX I. M., PATANEN C. R. (1955). *In vitro* studies on abnormal growth of prothalli of the Blecken fern. *American Journal of Botany*, 42: 232-245.
- TENG W. L. (1997). Activated charcoal affects morphogenesis and enhances sporophyte regeneration during leaf cell suspension culture of *Platycerium bifurcatum*. *Plant Cell Reports*, 17: 77-83.
- THOMAS T. D. (2008). The role of activated charcoal in plant tissue culture. *Biotechnology Advances*, 26: 618-631.
- VERDONCK O., PENNINGCK R., DE BOODT M. (1983). The physical properties of different horticultural substrates. *Acta Horticulturae*, 150: 155-159.
- WFO (2020). *Onoclea interrupta* (Maxim.) Ching & P.C. Chiu World Flora Online (WFO). <http://www.worldfloraonline.org>.
- ZIMMERMANN M. H., ZIEGLER H. (1975). List of sugar alcohols in sieve-tube exudates. *In: Zimmermann M. H., Milburn J. A. (Eds.) Encyclopedia of Plant Physiology New Series, Springer-Verlag, Berlin: 480-503.*