

THE EFFECTS OF PLANT GROWTH REGULATORS ON *IN VITRO* SHOOT MULTIPLICATION AND ROOTING OF *EUDIANTHE COELI-ROSA* 'BLUE ANGEL'

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REFERENCES

- AL-DULAIMY A. F. Z., ALFAHDAMI H. E., ABDULHAMEED S. H. (2025). Effect of humic acid application and CPPU spraying on growth and flowering of Marigold. Ornamental Horticulture, 31: Article e312965.
- BECHKRI S., ALABDUL MAGID A., VOUTQUENNE-NAZABADIOKO L., KABOUCHE A., SAYAGH C., HARAKAT D., KABOUCHE Z. (2023). Triterpenoid saponins from *Silene coeli-rosa*. Phytochemistry Letters, 54: 50-56.
- BILDZIUKEVICH U., WIMMEROVÁ M., WIMMER Z. (2023). Saponins of selected triterpenoids as potential therapeutic agents: a review. Pharmaceuticals, 16: Article 386.
- CABONI E., BIASI R., DELIA G., TONELLI M. (2009). Effect of CPPU on *in vitro* axillary shoot proliferation and adventitious shoot regeneration in kiwifruit. Plant Biosystems, 143: 456-461.
- Çelikel F. G., ZHANG Q., ZHANG Y., REID M. S., JIANG C. (2021). A cytokinin analog thidiazuron suppresses shoot growth in potted rose plants via the gibberellic acid pathway. Frontiers in Plant Science, 12: Article 639717.
- DA COSTA MELLO S., ANGELOTTI-MENDONÇA J., RIBOLDI L. B., DALL'ORTO L. T. C., SUGUINO E. (2016). Impact of indole-3-butyric acid on adventitious root development from cuttings of tea. HortTechnology, 26: 599-603.
- ESPINOSA-LEAL C. A., PUENTE-GARZA C. A., GARCÍA-LARA S. (2018). *In vitro* plant tissue culture: means for production of biological active compounds. Planta, 248: 1-18.
- FAISAL M., ALATAR A. A., ABDEL-SALAM E. M., QAHTAN A. A. (2020). Effects of 4-CPPU on *in vitro* multiplication and sustainable generation of *Hibiscus rosa-sinensis* L. 'White Butterfly'. Saudi Journal of Biological Sciences, 27: 412-416.
- FAN C., LI K., XU L., DENG Z., DENG S., LI J., MOU J. (2024). Plant regeneration through two pathways of direct organogenesis in *Paeonia ostii* 'Feng Dan'. Plant Cell, Tissue and Organ Culture, 158: 599-608.
- GUASSO L., SILVA LATTUADA D., DUTRA DE SOUZA P. V. (2025). *In vitro* root development under different IBA concentrations and culture media. Comunicata Scientiae, 16: Article e4313.
- HAMILL S. D. (2016). Processes, costs and traits of plants produced in tissue culture must be considered to develop effective crop production systems. Acta Horticulturae, 1113: 85-92.
- KALE M. S., HAKE A. A., THAKUR P. P. (2018). *In vitro* regeneration and rapid multiplication of *Kalanchoe blossfeldiana*: an important ornamental plant. International Journal of Chemical Studies, 6: 2509-2512.
- KHAN S., BI T. (2012). Direct shoot regeneration system for date palm (*Phoenix dactylifera* L.) cv. Dhakki as a means of micropropagation. Pakistan Journal of Botany, 44: 1965-1971.
- KIBA T., MIZUTANI K., NAKAHARA A., TAKEBAYASHI Y., KOJIMA M., HOBOT T., OSAKABE Y., OSAKABE K., SAKAKIBARA H. (2023). The trans-zeatin-type side-chain modification of cytokinins controls rice growth. Plant Physiology, 192: 2457-2474.
- KREISER M., GIBLIN C., MURPHY R., FIESEL P., BRAUN L., JOHNSON G., WYSE D., COHEN D. J. (2016). Conversion of indole-3-butyric acid to indole-3-acetic acid in shoot tissue of hazelnut (*Corylus*) and elm (*Ulmus*). Journal of Plant Growth Regulation, 35: 710-721.
- MEHBUB H., AKTER A., AKTER M. A., MANDAL M. S., HOQUE M. A., TULEJA M., MEHRAJ H. (2022). Tissue culture in ornamentals: cultivation factors, propagation techniques, and its application. Plants, 11: Article 3208.
- MURASHIGE T., SKOOG F. (1962). A revised medium for rapid growth and bio assays with tobacco tissue cultures. Physiologia Plantarum, 15: 473-497.
- POWO (2025). *Eudianthe coeli-rosa* (L.) Fenzl ex Endl. Plants of the World Online. <https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:941552-1>.
- RHS (2025). *Eudianthe coeli-rosa* 'Rose of heaven'. The Royal Horticultural Society. <https://www.rhs.org.uk/plants/517791/eudianthe-coeli-rosa/details>.
- RODBOOT N., YENCHON S., TE-CHATO S. (2024). Optimization of explant sterilization and plant growth regulators for enhancing the *in vitro* propagation of *Nymphaea colorata* Peter. Plant Cell, Tissue and Organ Culture, 159: Article 59.
- SAKILA S., AHMED M. B., ROY U. K., HOSSAIN M., ISLAM S. (2007). Micropropagation of strawberry (*Fragaria* × *ananassa* Duch.) a newly introduced crop in Bangladesh. American-Eurasian Journal of Scientific Research, 2: 151-154.
- SARROPOULOU V., MALOUPA E. (2019). Micropropagation and *ex situ* conservation of *Silene fabaria* (L.) Sm. in Sibth. & Sm. subsp. *domokina* Greuter (Caryophyllaceae); an important endemic plant in Greece with medicinal and ornamental value. Journal of Advances in Biotechnology, 8: 1090-1098.
- SUN Y. L., HONG S. K. (2010). Effects of plant growth regulators and L-glutamic acid on shoot organogenesis in the halophyte *Leymus chinensis* (Trin.). Plant Cell, Tissue and Organ Culture, 100: 317-328.
- WOJTANIA A., SKRZYPEK E., GABRYSZEWSKA E. (2015). Effect of cytokinin, sucrose and nitrogen salts concentrations on the growth and development and phenolics content in *Magnolia* × *soulangiana* 'Coates' shoots *in vitro*. Acta Scientiarum Polonorum Hortorum Cultus, 14: 51-62.