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EFFECT OF IBA AND NAA ON IMPROVING ROOTS FORMATION AND GROWTH OF *SANCHEZIA SPECIOSA* LEONARD STEM CUTTINGS

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REFERENCES

Abbas M. H., Baksh M. A., Ahmad S., Javeid M. A., Rehman A. (2015). Effect of individual and combined concentrations of IBA and NAA for root development of *Rose* cultivar, Bajazzo. Journal of Agricultural Research, 53: 225-231.

Akhtar G., Akram A., Sajjad Y., Balal R., Shahid M., Sardar H., Naseem K., Shah S. (2015). Potential of plant growth regulators on modulating rooting of *Rosa centifolia*. American Journal of Plant Sciences, 6: 659-665.

Anamika, Bakshi M., Singh P. (2022). Studies on the effect of PGR and maturity of cuttings on the propagation in guava (*Psidium guajava* L.). The Pharma Innovation Journal, 11: 2011-2014.

Black C. A., Evans D. D., Ensminger L. E. (1965). Methods of soil analysis. Part 2: Chemical and Microbiological Properties. American Society of Agronomy, Inc. Publisher Madison, Wisconsin, USA: 1149-1176.

Chapman H. D., Pratt P. F. (1961). Methods of Soil, Plants and Water Analysis. University of California, Division of Agricultural Sciences, Berkeley, California, 314 pp.

Chen H., Hong L., Ren A., Yu K., Wang K., He S., Liu C., Xing J. (2023). Growth regulators on the shooting and rooting of *Tamarix chinensis* stem cuttings. Rhizosphere, 25: Article 100679.

Compton M. E. (1994). Statistical methods suitable for the analysis of plant tissue culture data. Plant Cell, Tissue and Organ Culture, 37: 217-242.

Costa J. M., Heuvelink E., Van de Pol P. A., Putm H. M. C. (2007). Anatomy and morphology of rooting in leafy rose stem cuttings and starch dynamics following severance. Acta Horticulturae, 751: 495-502.

Couvillon G. A. (1988). Rooting responses to different treatments. Acta Horticulturae, 27: 187-196.

Da Costa C. T., De Almeida M. R., Ruedell C. M., Schwambach J., Maraschin F. D. S., Fett-Neto A. G. (2013). When stress and development go hand in hand: main hormonal controls of adventitious rooting in cuttings. Frontiers on Plant Science, 4: Article 133.

De Klerk G-J., van Der Krieken W., De Jong J. C. (1999). Review the formation of adventitious roots: new concepts, new possibilities. In Vitro Cellular & Developmental Biology - Plant, 35: 189-199.

Ďurkovič J., Lux A. (2010). Micropropagation with a novel pattern of adventitious rooting in American sweetgum (*Liquidambar styraciflua* L.). Trees, 24: 491-497.

Gehlot A., Gupta R. K., Tripathi A., Arya I. D., Arya S. (2014). Vegetative propagation of *Azadirachta indica*: effect of auxin and rooting media on adventitious root induction in mini-cuttings. Advances in Forestry Science, 1: 1-9.

Gomez K. A., Gomez A. A. (1984). Statistical Procedures for Agricultural Research. 2nd editionл John Wiley & Sons, New York, Chichester, Brisbane, Toronto, Singapore, 680 pp.

Gowda P., Dhananjaya M. V., Kumar R. (2017). Effect of indole butyric acid on rooting of different carnation (*Dianthus caryophyllus*) genotypes. International Journal of Pure Applied Biosciences, 5: 1075-1080.

Hartmann H. T., Kester D. E., Davies F. T., Geneve R. L. (2002). Hartnann and Kester's plant propagation. Principles and practices. Seventh edition. Prentice Hall. Upper Saddle River, New Jersey, 880 pp.

Iliev I., Iliev N., Dancheva D., Corneanu M., Tsaktsira M., Gajdošova A., Mladenova S. (2010). Factors affecting the rooting of cuttings from cultivars of *Chamaecyparis lawsoniana* Parl. *In*: Soare, M., Călina, A., Panzaru, Radu, L., Niculescu, M., Alexandru, T., Stancu, I., Cola, M., Netiou, C., Dimitru, I. (Eds). Durable Agriculture – Agriculture of the Future. Analele Universitatii din Craiova, vol. XL, No 2: 174-181.

Kaushik S., Shukla N. (2020). A review on effect of IBA and NAA and their combination on the rooting of stem cuttings of different ornamental crops. Journal of Pharmacognosy and Phytochemistry, 9: 1881-1885.

Khan M. A., Wang Y., Uddin S., Muhammad B., Badshah M. T., Khan D., Muneer M. A., Munir M. Z., Jia Z. K. (2020). Propagation of *Magnolia biondii* Pamp through stem cuttings using exogenous hormones. Applied Ecology and Environmental Research, 18: 2213-2229.

Kim S. H., Kim J. H., Oh H. J., Kim S. Y., Suh G. U. (2021). Vegetative propagation of *Veronica dahurica* and *Veronica pusanensis* by stem cuttings with auxins. Rhizosphere, 17: Article 100315.

Kumar M., Chaudhary V., Sirohi U. (2021). Plant growth regulators and their implication in ornamental horticulture: an overview. International Journal of Agriculture, Environment and Biotechnology, 14(03): 417-445.

Kumar S., Muraleedharan A., Kamalakannan S., Sudhagar R., Sanjeevkumar K. (2020). Effect of rooting hormone on rooting and survival of nerium (*Nerium oleander* L.) var. Pink single. Plant Archives, 20: 3017-3019.

Kumari A., Arya M. C., Joshi K. P., Ahmed Z. (2023). Response of auxin on semi hardwood cuttings of *Jatropha curcas* under central western Himalayas, India. Agricultural Science Digest, 33: 123-126.

Lei C., Fan S., Li K., Meng Y., Mao J., Han M., Zhao C., Bao L., Zhang D. (2018). TRAQ-based proteomic analysis reveals potential regulation networks of IBA-induced adventitious root formation in apple. International Journal of Molecular Sciences, 19: Article 667.

Lyubomirova T., Iliev I. (2014). Factors affecting the rooting of cuttings of *Syringa vulgaris* L. cultivars. Oltenia Journal for Studies in Natural Sciences, 30: 67-74.

Mascarello C., Cucchiara G., Ruffoni, B. (2003). Effect of season and rooting agents on the rhizogenesis of *Olearıa scıllonıensıs* cuttings. Propagation of Ornamental Plants, 3: 47-49.

Mehraj H., Shiam I. H., Taufique T., Shahrin S., Jamal Uddin A. F. M. (2013). Influence of indole-3-butyric acid (IBA) on sprouting and rooting potential of *Bougainvillea spectabilis* cuttings. Bangladesh Research Publications Journal, 9: 44-49.

Memon N., Ali N., Baloch M. A., Chachar Q. (2013). Influence of naphthalene acetic acid (NAA) on sprouting and rooting potential of stem cuttings of *Bougainvillea*. Science International, 25: 299-304.

Metzner H., Ran H., Senger H. (1965). Studies on synchronization of some pigment- deficient chlorella mutant. Planta, 65: 186-194.

Meyer J. Y., Lavergne C. (2004). Beautes fatales: *Acanthaceae* species as invasive alien plants on tropical Indo-Pacific islands. Diversity and Distributions, 10: 333-347.

Nasri F., Fadakar A., Saba M. K., Yousefi B. (2015). Study of Indole butyric acid (IBA) effects on cutting rooting improving some of wild genotypes of damask roses (*Rosa damascena* mill.). Journal of Agricultural Sciences, 60: 263-275.

Osterc G., Štampar F. (2003). Propagation of the ornamental cherry *Prunus subhirtella* var. autumnalis by softwood cuttings. Propagation of Ornamental Plants, 3: 47-49.

Osterc G., Štefančič M., Štampar F. (2008). The role and significance of polyphenols in adventitious rooting in *Prunus* regarding physiological status of the stock plants. Propagation of Ornamental Plants, 8: 133-137.

Pacurar D. I., Perrone I., Bellini C. (2014). Auxin is a central player in the hormone cross-talks that control adventitious rooting. Physiologia Plantarum, 151: 83-96.

Pal S. (2019). Role of plant growth regulators in floriculture: an overview. Journal of Pharmacognosy and Phytochemistry, 8: 789-796.

Pereira M., Gonçalves L. F. S., Gomes E. N., Rossa Ü. B., Deschamps C. (2021). Auxin type and dilution vehicles on vegetative propagation of *Varronia curassavica* Jacq. and *Melaleuca alternifolia* Cheel. Ornamental Horticulture, 27: 238-246.

Pivetta K. F. L., Pereira F. M., Banzatto D. A., Graziano T. T. (1999). Effect of type of cutting and indole butyric acid on the rooting of rose (*Rosa sp*. 'Red Succes') leaf cuttings during two seasons. Acta Horticulturae, 482: 333-338.

Rahbin A., Aboutalebi A., Hasanzadeh H. (2012). Evaluation the effect of cultural media and IBA on rooting characters of night jessamine (*Cestrum nocturnum*) stem cutting. Journal of Applied and Basic Sciences, 3: 2258-2261.

Sahariya K., Singh J. N., Singh A. (2013). Studies on the effect of IBA on rooting of *Bougainvillea* (var. Thimma) cuttings in open field and polyhouse. The Asian Journal of Horticulture, 8: 140-142.

Sayedi A., Esmaeili A., Zadeh K. N. A., Porsiabidi M. M. (2014). Comparative evaluation of the rooting in cuttings in (*Bougainvillea glabra* L.). International Journal of Farming and Allied Sciences, 3: 872-875.

Scaltsoyiannes A., Tsulpha P., Iliev I., Theriou K., Tsaktsira M., Mitras D., Karanikas C., Mahmout S., Christopoulos V., Scaltsoyiannes V., Zaragotas D., Tzouvara A. (2009). Vegetative propagation of ornamental genotypes of *Prunus avium* L. Propagation of Ornamental Plants, 9: 198-206.

Shahab M., Jamal A., Ayub G., Rahman A., Rashid A., Ali J. (2016). Effect of IBA (Indole Butyric Acid) levels on the growth and rooting of different cutting types of *Clerodendrum splendens*. Pure and Applied Biology, 5: 64-71.

Sheikh M. A., Sundouri A. S., Mir M. A., Bhat S. A., Beigh M. A., Nazir N., Parray M. A. (2022). Effect of IBA and NAA concentrations and types of media on rooting and survival of cuttings in fig (*Ficus carica* L.). The Pharma Innovation Journal, 11: 2779-2784.

Shinde M. B., Rathod N. G., Gupta N. S., Deshmukh M. S., Uphade C. V. (2022). Effect of growth regulators on sprouting and rooting of bougainvillea hardwood cuttings. The Pharma Innovation Journal, 11: 846-850.

Siddiqua A., Thippesha D., Shivakumar B. S., Adivappar N., Ganapathi M. (2018). Effect of growth regulators on rooting and shooting of stem cuttings in dragon fruit [*Hylocereus undatus* (Haworth) Britton & Rose. Journal of Pharmacognosy and Phytochemistry, 7: 1595-1598.

Singh K. K., Choudhary T., Kumar P., Rawat J. M. S. (2014). Effect of IBA for inducing rooting in stem cuttings of *Duranta* Golden. HortFlora Research Spectrum, 3: 77-80.

Siva Prakash M., Rajangam J., Swaminathan V., Venkatesan K. (2018). Effect of plant growth regulators on rooting and sprouting of different stem cuttings of guava (*Psidium guajava* L.) cv. Lucknow-49 under mist chamber condition. Madras Agricultural Journal, 105: 336-340.

Snedecor G. W., Cochran W. G. (1989). Statistical Methods. 8th edition, Iowa State University Press, Ames. Iowa, USA., 503 pp.

Sokhuma P., Intoorathed S., Phonpakdee R. (2018). Effect of IBA and NAA on rooting and axillary shoot outgrowth of 'Himalayan' mulberry stem cutting. International Journal of Agricultural Technology, 14: 1939-1948.

Sujin G. S., Muraleedharan A., Kumar S., Markandayan A. (2020). Effect of PGR's on root and shoot parameters of hard wood cuttings in guava (*Psidium guajava* L.) cv. Lucknow-49. Plant Archives, 20 (Suppliment 1): 3741-3746.

Tsaktsira M., Alevropoulos A., Tsoulpha P., Scaltsoyiannes V., Scaltsoyiannes A., Iliev I. (2018). Inter- intra- genetic variation on rooting ability of *Ilex aquifolium* L. varieties and cultivars. Propagation of Ornamental Plants, 18: 131-138.

Tsaktsira M., Chavale E., Kostas S., Pipinis E., Tsoulpha P., Hatzilazarou S., Ziogou F-T., Nianiou-Obeidat I., Iliev I., Economou A., Scaltsoyiannes A. (2021). Vegetative propagation and ISSR-based genetic identification of genotypes of *Ilex aquifolium* 'Agrifoglio Commune'. Sustainability, 13: Article 10345.

Tripp E. A., Koenemann D. (2015). Nomenclatural synopsis of *Sanchezia* (Acanthaceae), fifty years since last treated. Novon, 24: 213-221.

Tripp E. A., Daniel T. F., Fatimah S., McDade L. (2013). Phylogenetic relationships within *Ruellieae* (*Acanthaceae*) and a revised classification. International Journal of Plant Sciences, 174: 97-137.

Wang M., Hu J., Guo G., Park Y. G., Jeong B. R. (2021). Effect of auxins and their concentrations, immersion time, and rooting medium on rooting of cutting-propagated *Pyracantha angustifolia* C. K. Schneid. Propagation of Ornamental Plants, 21: 3-10.

Wani A. M., Jamir L. L., Rai P. (2018). Effects of IBA, NAA and GA3 on rooting and morphological features of *Ginkgo biloba* Linn. stem cuttings. Journal of Pharmacognosy and Phytochemistry, 7: 1894-1896.

Wasshausen D. C. (2013). Acanthaceae. *In*: Persson C., Ståhl B. (Eds). Flora of Ecuador, vol. 89. Department of Biological Environmental Sciences, University of Gothenburg and Pontificia University of Católica del Ecuador, Göteborg and Quito, 328 pp.

Winkelmann T., Spethmann W., Seegert A. (2020). Propagation of 285-year-old alley linden (*Tilia* × *vulgaris*) trees via long cuttings. European Journal of Horticultural Science, 85: 160-168.

Yang H., Klopotek Y., Hajirezaei M. R., Zerche S., Franken P., Druege U. (2019). Role of auxin homeostasis and response in nitrogen limitation and dark stimulation of adventitious root formation in petunia cuttings. Annals of Botany, 124: 1053-1066.

Yeshiwas T., Alemayehu M., Alemayehu G. (2015). Effects of indole butyric acid (IBA) and stem cuttings on growth of stenting-propagated rose in Bahir Dar, Ethiopia. World Journal of Agricultural Sciences, 11: 191-197.

Yoon A., Oh H. E., Kim S. Y., Park Y. G. (2021). Plant growth regulators and rooting substrates affect growth and development of *Salix koriyanagi* cuttings. Rhizosphere, 20: Article 100437.